

## BOOK REVIEW

D. J. LEVITIN, *This Is Your Brain On Music: The Science of a Human Obsession*. 2006. New York: Dutton, Penguin Group (USA) Inc., 316 pp. ISBN 078658405X (ebk) \$ 21.21

Author Daniel J. Levitin's interesting professional career started as a member of rock band, continued as a music producer and a recording engineer, and he now enjoys an outstanding reputation as a researcher in the cognitive neuroscience of music. His background provides one with cues about the nature of this book, and his experiences are also apparent in the introductory chapter, entitled "I Love Music and I Love Science: Why would I Want to Mix the Two?"

This introductory chapter reveals both the style and the main themes of the book:

- What is music?
- Where does it come from?
- Why do some sequences of sounds move us?
- Why is there a distinction between a class of expert performers and the rest of us?
- What function did music serve humankind as we were evolving and developing?
- Did particular regions and pathways evolve in our brains specifically for making and listening to music?

The answers to these seemingly naive questions are drawn from the fields of cognitive neuroscience, philosophy of the mind, linguistics, anthropology of music, theory of evolution and cultural issues, and are presented as an astonishing amalgam with autobiographical anecdotes. These personal anecdotes, found throughout the book with respect to both famous musicians such as Paul Simon, Joni Mitchell, Carlos Santana, Stevie Wonder and Sonny Rollins as well as foremost scientists such as Steven Pinker, Francis Crick, Richard Parncutt, make the book highly readable and enjoyable both for the colleagues and lay readers.

Levitin succeeds in explaining many of the issues found in the book by giving examples from daily life and well-known musical excerpts. These musical excerpts range from nursery songs, rock, jazz, rock'n'roll to Western classical music. Examples include Elvis Presley, The Beatles, Bob Dylan, Queen, The Sex Pistols, The Doors, Miles Davis, Antonio Carlos Jobim, Sonny Rollins, Dave Brubeck, Depeche Mode, Micheal Jackson, Bach, Rossini, Beethoven, Cage, Varese, and many others.

The easy reading style of the book seems to justify the author's declaration that it is not written for the specialist and colleagues. On the other hand, the highly specialized reading list at the end of the book and the quotation below make this declaration "arguable" to a degree:

I've found that many of my colleagues who study difficult, intricate topics such as neurochemistry or psychopharmacology feel unprepared to deal with

research in the neuroscience of music. And who can blame them? Music theorists have an arcane, rarified set of terms and rules that are as obscure as some of the most esoteric domains of mathematics. ... It's a shame that many people are intimidated by the jargon musicians, music theorists and cognitive scientists throw around. There is specialized vocabulary in every field of inquiry (try to make a sense of a blood-analysis report from your doctor). But in the case of music, music experts and scientists could do a better job of making their work accessible. That is something I tried to accomplish in this book. (p. 9)

This would seem to indicate that this book is also intended for professional researchers. Firstly, the book introduces basic concepts about music to those lacking expertise in music theory. Secondly, the book introduces basics of cognitive science. However, this does not mean that Levitin only speaks of basic issues. On the contrary, these basics are used to present deeper discussions and recent research in the cognitive neuroscience of music. Furthermore, Levitin is successful both in explaining the most complex concepts and in linking them with the most recent research. As stated by Levitin, the book can be considered to be state of art: "But no one until now has taken all this new work together and used it to elucidate what is for me the most beautiful obsession. Your brain on music is a way to understand the deepest mysteries of human nature. That is why I wrote this book" (p. 238). These qualities make the book attractive to both researchers and curious lay readers. On the other hand, the book does not seem to be literally intended to serve as a textbook, so it would be inappropriate to consider it such.

There is another reason to avoid considering *This Is Your Brain On Music* as a textbook on the brain and music. Levitin introduces neurological issues ranging from the basic workings of neurons to more complicated structures of the brain, and does so in a way that helps to construct a cognitive model presented in successive chapters. So, instead of introducing brain structures in detail, they are presented in a more comprehensive way whenever they are necessary for clarifying the relations between the mind and music. Levitin frankly declares his views about this approach:

The point for me isn't to develop a map of the brain, but to understand how it works, how the different regions coordinate their activity together, how the simple firing of neurons and shuttling around of neurotransmitters leads to thoughts, laughter, feelings of profound joy and sadness, and how all these in turn, can lead us to create lasting, meaningful works of art. (p. 94)

*This Is Your Brain On Music* is indisputably a comprehensive book. However, this does not result only from the subjects that it covers. Rather, it results from its approach to music, such as its interdisciplinary nature that takes into account to varying degrees almost every discipline that can be related to music. Besides philosophy of the mind, linguistics and theory of evolution, the most astonishing point about Levitin's approach is his emphasis on cultural issues as a cognitive scientist. Levitin seems to find an equilibrium point for the famous nature-nurture debate. It should also be noted that the book mainly "drives at a neuropsychological perspective on how music affects our brains, our minds, our thoughts, and our spirit."(p. 14 )

In spite of the book's main title, "This Is Your Brain on Music", Levitin's main motivation seems to expand beyond simply music and the brain. The discussions on music lead to questions about the relations between human evolution and music, as the subtitle "The Science of a Human Obsession" implies. It can be said that the main thesis of the book is that music is an adaptive result of human evolution. Levitin lays the foundations of this thesis starting from the first chapters, and the last chapter, "The Music Instinct: Evolution's #1 Hit" is mainly dedicated to the discussion of this thesis. Levitin implicitly expresses the motivations behind this in the introduction:

By better understanding what music is and where it comes from, we may be able to better understand our motives, fears, desires, memories, and even communication in the broadest sense. Is music listening more along the lines of eating when you're hungry, and thus satisfying an urge? Or is it more like seeing a beautiful sunset or getting a backrub, which triggers sensory pleasure systems in the brain? Why do people seem to get stuck in their musical tastes as they grow older and cease experimenting with new music? This is the story of how brains and music coevolved- what music can teach us about the brain, what the brain can teach us about music, and what both can teach us about ourselves. (p. 12)

There are also other theses beside the one about evolution and music, but these are introduced only after the necessary background is supplied in the first chapters. Chapter 1 is therefore is mainly devoted to basic concepts about music, such as tone, pitch, rhythm, tempo, contour, timbre and loudness, as well as more complicated concepts such as key, meter, melody, scale and harmony. Chapter 2 can be said to deepen these concepts while introducing their foundation in perception and cognition. As in most chapters, Levitin introduces these issues by briefly reviewing both past and recent research.

Levitin's thesis on the relation of music and the cerebellum reveals itself both in Chapter 2 in relation to motor skills and rhythm, and in Chapter 3 in relation to emotion and music. Chapter 3 can also be considered to be a brief introduction to philosophy of the mind and neurology of music, where famous mind-brain debates and basic assumptions about music-brain relations take place, respectively. Levitin also shows here his preference for connectionism as a cognitive scientist via the famous analogy of hardware-brain and software-mind:

The prevailing view of the brain is that it is a computational system, and we think of the brain as a type of computer. Networks of interconnected neurons perform computations on information and combine their computations in ways that lead to thoughts, decisions, perceptions and ultimately consciousness. (p. 82)

In this chapter Levitin can be said to lay down a background for discussions to be developed in the chapters that follow. The answers to the provocative questions quoted below seem to outline other themes of the book:

- How are thoughts formed?
- Are memories "stored" in a particular part of the brain?

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- Why do some songs sometimes get stuck in your head and you can't get them out?
- Does your brain take some sick pleasure in slowly driving you crazy with inane commercial jingles?

I believe that colleagues studying artificial intelligence, music information retrieval and linguistics would find these sections closer to their research areas. Firstly, although Levitin does not name it directly, common sense knowledge (one of the challenging problems in artificial intelligence) is considered and, secondly, some issues relating to auditory information processing are presented. Also, Levitin's discussion of linguistics in these sections includes relating Chomsky's universal grammar approach to music.

In the remaining chapters Levitin mainly continues to construct a cognitive model by considering musical processes both in the mind and the brain. Issues from representation of data to categorization of concepts in the mind are considered with reference to research involving new neuroimaging techniques which Levitin himself participated in. In particular, the philosophical discussions and empirical studies relating to categorization would remind electrical engineers and computer scientists of Lotfi Zadeh's fuzzy logic theory. On the other hand, the same discussions where Eleanor Rosch's research on the categorization of colors made among New Guinea people is presented, would remind anthropologists and ethnomusicologists of Franz Boas's studies. Boas, who played a pioneering role in the formation of cultural anthropology, also studied the perception of color among Eskimos. One of his students, Alan Merriam, later established a new discipline, the anthropology of music.

Chapter 6, subtitled "Music, Emotion and the Reptilian Brain", reviews one of the most challenging issues in the neuroscience of music, music and emotion. Levitin reviews recent neuroimaging studies on music and emotions in which he himself played a crucial role, and emphasizes music's effect on the reward system of the brain. Here the Hippocampus appears to be the most important structure for memory formation and retrieval. Finally, Levitin points to the close relation between memory, emotion and music:

The story of your brain on music is the story of an exquisite orchestration of brain regions, involving both the oldest and newest parts of the human brain, and regions as far apart as the cerebellum in the back of the head and the frontal lobes just behind your eyes. It involves a precision choreography of neurochemical release and uptake between logical prediction systems and emotional reward systems. When we love a piece of music, it reminds us of other music we heard, and it activates memory traces of emotional times in our lives. Your brain on music is all about ... connections. (p. 188)

Another thesis of the book is presented in Chapter 7, "What makes a Musician". This chapter can be considered to be a more detailed discussion of the view presented in the introduction, where Levitin also implies this thesis:

Only relatively recently in our own culture, five hundred or so ago, did a distinction arise that cut society in two, forming separate classes of music performers and music listeners. Throughout most of the world and for most of

human history, music making was as natural an activity as breathing and walking, and everyone participated. Concert halls, dedicated to the performance of music, arose only in the last several centuries. (p. 6)

Levitin makes reference to the experiences of an anthropologist friend of his in Leshoto, South Africa, where villagers were surprised by his statement of “I don’t sing” when they asked him to sing with them. The villagers’ answer was quite short and clear: “What do you mean you don’t sing!?! You Talk!” This story is quite similar to the experiences of the pioneering ethnomusicologist John Blacking’s (1995) when he lived among the Venda. Levitin further develops this view by considering both previous studies and recent research in the cognitive neuroscience of music.

Levitin’s emphasis on cultural issues as a cognitive scientist mostly reveals itself in his discussion on musical preferences in the next chapter, “My Favorite Things: Why Do We Like the Music We Like?” To begin with, musical preferences and musical tastes are discussed in terms of the basic concepts which were introduced in earlier chapters, such as cognitive schemas, evolution, consonance and dissonance, neuroplasticity, neural circuits of music, musical expectations, and so on. Musical preferences are also considered with respect to detailed research involving infants. These studies range from investigations involving fetuses in the womb to research on musical ways in which mothers speak (motherese) with their babies. Afterwards Levitin discusses musical preferences in relation to cultural issues such as music’s role in the formation of identity and socializing, as well as psychological issues such as music’s role in mood regulation.

The last chapter, “The Music Instinct: Evolution’s #1 Hit”, is mainly devoted to music’s role in human evolution. Here Levitin discusses two contrary views: music as a non-adaptive result and music as an adaptive result of evolution. Levitin begins by introducing the views of Steven Pinker, John Barrow and Dan Sperber, who respectively consider music to be a spandrel, to be useless to the survival of the species and to be an evolutionary parasite. Next, Darwin’s theory of evolution is reconsidered in terms natural and sexual selection. Levitin emphasizes music’s role in sexual selection, based on both recent research and Darwin’s theory and views about music. Levitin also proposes four more arguments:

First, if music was nonadaptive, then music lovers should be at some evolutionary or survival disadvantage. Second, music shouldn’t have been around very long. .... A third argument in favor of music’s primacy in human evolution is that music evolved because it promoted cognitive development ...A fourth argument for music as an adaptation comes from other species. (p. 249-250, 204, 257)

The first and second arguments are supported by archeological findings such as bone flutes, ethnomusicologist John Blacking’s views on the existence of music across cultures and times, and evidence of music’s role in social bonding and cohesion from patients suffering from Williams syndrome(WS) and autism spectrum disorders(ASD). Levitin also presents a neurological basis for his view with respect to the latter by comparing social behaviors and musical attitudes of patients- with WS (social and good at music) and ASD (anti-social and not much musical), in terms of the amygdala and the cerebellum. Music’s role in the development of speech and

language is also discussed with respect to the third argument. Furthermore, Levitin states that “rhythm and melody bridges our cerebellum (the motor control, primitive little brain) and our cerebral cortex (the most evolved, most human of our brain)” (p. 257). Levitin supports fourth argument by research on bird songs.

Levitin ends the book with these words that demonstrate the motivation behind “the most beautiful human obsession, music”:

As a tool for activation of specific thoughts, music is not as good as language.  
As a tool for arousing feelings and emotions, music is better than language. The combination of the two- as best exemplified in a love song- is the best courtship display of all. (p. 261)

A few shortcomings of the book may be briefly listed. Long chapters without any sub-sections can sometimes prove tiring during reading. Also, the book is stingy with helpful figures. Although the figures demonstrating the regions of the brain related to music found in the appendix are useful, many issues such as auditory pathways would be clearer if figures were present. However Levitin might have consciously chosen to limit the number of figures and avoided sub-sections in order to aid the continuity of the narrative. Also, the book naturally seems to be subjective in those chapters where scientific evidences are lacking. However, these shortcomings are relatively trivial in the overall context of this pioneering study.

## Reference

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