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From The Sunday Times

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The science of music

Why does music affect us like no other art? An American scientist thinks he can explain these 'glorious illusions'



Bryan Appleyard

In his last, largely barren years on the island of Faro, the great film director Ingmar Bergman listened to music. He saw it, his daughter-in-law said, as "a sort of gateway to other realities, different from those we can immediately perceive with our senses". Bergman had no religious faith, but in music he heard the only possible evidence that there was something beyond this world. The philosopher Ludwig Wittgenstein described Mozart and Beethoven as "the true sons of God". The poet John Ashbery said that music was the perfect art, because it conducted an argument whose terms were never defined; it did not, in other words, depend on the banalities of the ordinary world. "All art," wrote Walter Pater, "constantly aspires towards the condition of music."

Music makes believers of us all. I have heard a hard scientific atheist struggling, in quasi-religious terms, to explain the effect of a late Beethoven quartet, and I have seen a Schubert sonata render strong, dull men speechless and tearful. And, like almost every other baby-boomer, I can remember rock concerts when the sound, the movement and the intense involvement of the crowd transported me to...where, exactly?

Music seems to make no sense. It comes from nowhere and goes nowhere. Literature says something, and the visual arts show something. Music seems only to show or say itself. Yet it feels like the most intimate, the most direct and true art. To be lost in music is to be lost in oneself. Music, we must all have felt at one time or another, is where we truly belong. It is a better place.

To some, this is all that needs to be said. Any attempt to explain music is as futile as putting love on a Petri dish. To others, an explanation is essential. Why do these organised sounds have such radical, such fundamental effects on the human psyche?

That, in a nutshell, is the question Daniel Levitin asked himself. "I wondered how it is that people do this, and what is going on in



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the brain ... I'd be sitting in the studio, and Carlos Santana would play a guitar solo, and I'd get goose bumps. And I thought, 'What is it that's going on in my brain that's causing me to have this weird reaction to some pieces of metal strung across a magnet attached to a piece of wood; and what is going on in Carlos's brain that's allowing him to communicate this?'"

Levitin is a musician, producer and recording engineer – he has worked with the Grateful Dead, Stevie Wonder, the Carpenters, Eric Clapton, Blue Oyster Cult and others – turned cognitive neuroscientist. He runs the Laboratory for Music Perception, Cognition and Expertise at McGill University, in Montreal. He has now written a book – This Is Your Brain on Music: Understanding a Human Obsession – that both describes what music is and explains the current state of the science of music. All his research is directed at understanding his goose bumps. "There is this view that if you understand something, it will no longer be interesting or pleasurable. I just haven't found that to be true in my life. It's why I became a producer: to understand how things are put together to produce these glorious illusions."

The science of music must begin from the fact that it is a universal and ancient human obsession. It appears to be hard-wired into us – not just the appreciation, but also the making of music. One researcher into African music, Levitin reports, apologised to some tribesmen for not joining in, because he couldn't sing. The Africans did not understand: as far as they were concerned, anybody who can talk can sing and dance. Experiments have shown that music played to babies in the womb is familiar to them a year later – they react more strongly to this prenatal music than to any other. And, astonishingly, Levitin's own work has shown that absolute or perfect pitch is not necessarily the attribute of a very few. He has established that, by listening repeatedly to tuning forks, even people who considered themselves entirely unmusical could train themselves to have something like perfect pitch.

Equally astonishing is the way the science of music seems to be exposing special talent as a myth. One experiment involved asking teachers at a conservatory to rate the talent of their new students, then do so again at the end of four years. There was no correlation between the first and second ratings. But there was a correlation between perceived talent at the end of the course and how hard the student had worked. "The most important factor," Levitin says, "was how much time they practised. Many lesser students overtook greater students simply by working at it harder."

In fact, we can quantify how much work is required. To become a master musician requires 10,000 hours of work, irrespective of any preexisting gift. But what about Mozart, the child prodigy? Well, says Levitin, if he'd started working at his music for 32 hours a week from the age of two – not inconceivable, with a father such as his – then he'd have done 10,000 hours by the age of eight. The idle, effortless genius appears to be a myth.

"I've had the chance to ask great musicians where their music came from, and each of them told me these harrowing stories about how hard they worked, and how they gave up everything else, and how it never seemed easy. Stevie Wonder, Paul Simon, Eric Clapton, Sting: all talked about practising and working very hard. Even Stevie Wonder, who everybody regards as a natural, doesn't regard himself as a natural. When somebody like that is telling you it's hard work, you have to listen."

That said, Levitin warns pushy parents that just putting in the hours doesn't mean your child will make it. Furthermore, you might be pushing him the wrong way. Arthur Rubinstein's father wanted him to play the violin. A few fiddles had to be smashed before he let him play the piano.

Such findings tend to suggest that there is nothing special about music, it's in all of us if we want it. Yet, observes Levitin, over the past 40 years, people seem to have forgotten this. "I do find it kind of funny and strange that we live in a world in which people are reluctant to sing in public. It's widespread now, this feeling that singing is reserved for the select few. I walk around

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the city and see people of all ages playing basketball: they don't say they won't do it because they're not Michael Jordan. And they don't say, 'I'm not Martin Luther King, so I'm not going to talk.' But we do that with music. It's contrary to our evolutionary nature. As far as we know, for tens of thousands of years music has always been participatory."

Levitin thinks that this creation of a special realm of musical expertise began 500 years ago. As concert halls and orchestras were created, a class of performers and a separate class of listeners were born. In addition, the listeners were expected to sit quietly and not move. Again, he regards this as a separation of music from its origins. We used to join in. "What people love about rock'n'roll – and why, 50 years later, it's still here – is that you're allowed to move to it." Levitin also points to the way rock and pop have clear generational roots. Unlike classical music, they constantly change, providing successive age groups with what they can regard as their own music.

The further effect of rock – and of recorded music in general – is the elevation of timbre as one of the most important qualities of sound. Though there are, of course, distinct Beethoven and Mozart timbres, audiences at the time would hear a series of performances, each with a slightly different timbre or "flavour". With recorded music, we can hear the same version again and again. Favourite songs – or just insinuatingly irritating ones – become embedded in our brains. In his own experiments, Levitin found listeners could identify songs such as the Beatles' Eleanor Rigby, Elton John's Benny and the Jets or Norah Jones's Don't Know Why after hearing just half a second of each, too little time to hear rhythm or melody. What they recognised was timbre. "When you hear that same song by a favourite artist replicated thousands of times, it lays down memory traces that are very vivid and very detailed."

The ultimate question is, of course, what does all this mean? Why music? One answer comes from the cognitive scientist Steven Pinker. He says that, in essence, it's an accident. It's something that arises from our language abilities and just happens to be pleasurable. It provides no particular adaptive advantages; in evolutionary terms, it is useless. Levitin does not accept this. He believes the mechanisms through which we appreciate music are just too deeply embedded not to be adaptive. Most important, the nucleus accumbens, the part of the brain that releases dopamine to regulate our moods and coordinate our movements, is fundamentally implicated in our experience of music. This particular art, he thinks, lies close to the heart of what we are.

In evolutionary terms, he believes, it is a product of sexual selection, like the peacock's tail. Essentially, some device emerges to demonstrate reproductive fitness to a potential mate. An arms race develops with other randy hopefuls, and the peacock ends up with a gigantic tail and the human with Bach's St Matthew Passion. Both are far beyond strict practical requirements, yet both can be explained by the workings of evolution through natural selection.

Levitin thinks he has gone a long way to explaining his Santana goose bumps, and, in one sense, he clearly has. But, as with all scientific attempts to pin down the human and the ineffable, the experience seems to have been delineated rather than defined. Music – the most intimate resting place of our souls – continues to hint at something more, something, as Bergman and Wittgenstein saw, not quite of this world; something better. The truth, whatever the explanation, is that we all aspire to the condition of music.

Extract from This Is Your Brain on Music by Daniel Levitin: click Related Links panel above. www.bryanappleyard.com

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