

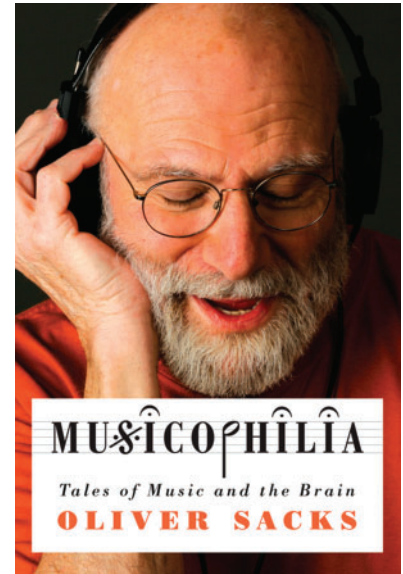
BOOK REVIEW

Another musical mystery tour

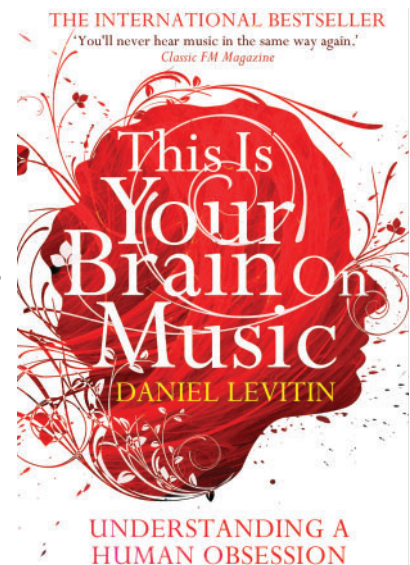
They say that writing about music is like dancing about architecture, and they have a point. Beyond technical description, musical experience rests ultimately with music itself. If I compare the entry of the second subject in Schubert's B flat sonata to a shaft of sunlight, it is hardly illuminating unless the music has a similar effect on you, in which case my saying it is superfluous. Writing about music and the brain, on the other hand, might be a more promising proposition. Music is of great antiquity and exists in all human societies, only humans produce and appreciate it, and (despite certain similarities to language) it is unlike other complex cognitive functions. From the scientific perspective, therefore, music illustrates a universal mode of brain operation with unique features that cannot easily be captured by studying other brain processes. There are metaphysical analogies, too. Like the brain itself, music has the property of emergence: a whole that is more than the sum of its parts. Artists and writers have always recognized this. In *Amadeus* (1980), Peter Shaffer has Salieri rail against 'the cage of those meticulous ink strokes' that contains the mystery. You would never guess from looking at the marks on the page (Fig. 1), any more than our mental lives could be predicted from inspecting a brain on the pathology slab. When Philip Larkin (a jazz critic of great acuity) describes the impact of his favourite saxophone solo as 'like an enormous yes' (Larkin, 1964) we know just what he means, but what was the question, again? Perhaps this metaphysical dimension accounts for why, in contrast to the poets, psychologists and neuroscientists were for a long time oddly reticent on the subject of music. Freud hardly mentions it, while William James considered it an accident of evolution—a bit like seasickness. Clinical neurologists over the years have been fascinated by it—Dejerine, for instance, included a serviceable section on 'amusie' in his textbook (1914); and Critchley and Henson's classic *Music and the Brain* (1977) is justly celebrated. Still, for the neurological polymaths, music was a sideshow rather than the main event. In recent times, all this has changed. The sceptics remain, but the musical brain is now scientifically respectable. Everyone seems to have something to say about it, and people are listening.

Oliver Sacks in *Musicophilia* and Daniel Levitin in *This is Your Brain on Music* have produced two gracefully written and often provocative volumes to add to the grove. Both books are pitched at a general audience and they

MUSICOPHILIA:
TALES OF MUSIC
AND THE BRAIN
By *Oliver Sacks* 2007.
London: Picador and
New York: Knopf
Price: £17.99/\$26
ISBN: 978-0330418379



THIS IS YOUR
BRAIN ON MUSIC
By *Daniel Levitin*
2007.
London: Atlantic
and New York:
Dutton Adult
Price: £18.99/\$24.95
ISBN: 978-0525949695



are note-perfect. Each makes extensive use of personal vignettes, and with great panache. *Your Brain on Music* is probably the only book in whose pages Led Zeppelin's sound engineer rubs shoulders with Francis Crick, and there must be few drawings of an elephant as touching as the one in *Musicophilia*. Levitin is a scientist whose mission is to present an (occasionally idiosyncratic) survey of recent

Fig. 1 ‘...the cage of those meticulous ink strokes...’ Part of the score of the Clarinet Concerto in A major (Adagio - opening), K622, by Wolfgang Amadeus Mozart.

progress in understanding the processing of music by the normal brain. Sacks is a neurologist, and his book is a collection of case studies covering a remarkably diverse range of clinical phenomena. Probably for that reason, it is Sacks who is the more prepared to render the sinister side of the musical brain, the perniciousness of Muzak and earworms, the tunes you cannot forget (even if you want to). Despite that, *Musicophilia*, which amplifies and references his already prolific oeuvre, seems set to become his most beloved book. The clinical cynic in me was ready to cavil in places, but in the end I was won over by the charm and humanity of his descriptions. Levitin has perhaps the harder brief. He adopts an ecological and ‘functionalist’ perspective that favours the ‘software’ of mentation over the ‘hardware’ of the warm, wet brain, and real musical experience over the synthetic stimuli of the psychoacoustician and the ‘atheoretical cartography’ of the imager. This is bound to raise neuroscientific hackles. As far as we know, only human brains are wired to run musical ‘programmes’: there is surely, then, a good *prima facie* case that the details of human brain anatomy and physiology matter a lot. It is difficult to see how a phenomenon as complex as music can be understood unless it can first be deconstructed into simpler components to test specific hypotheses. Reductionism can still be psychologically relevant (Warren *et al.*, 2003).

Reading Sacks and Levitin together, one is struck by the sheer strangeness and beauty of their subject matter, and by its deeply private nature. Both men have spent their professional lives hunting a kind of divinity, and their books tell this eloquently, and without sententiousness. When it comes to music, emotions really do run high, and this may explain why it is so highly valued by our species. The advent of functional imaging technology has allowed us to catch the brain in the act of listening to music, revealing that we listen not merely with the cerebral cortex but with the ancient subcortical and limbic apparatus of biological drives, rewards and punishments (Blood and Zatorre, 2001). It is astonishing that abstract tones should engage the same brain areas that in our primate relatives are

concerned mainly with sex and violence, but not just any old music will do. My musical meat may be your poison, and there are plenty of examples of this in Sacks’ and Levitin’s books. I find it hard to imagine, for instance, how anyone could describe Schumann as ‘militaristic’ or Philip Glass as ‘inaccessible’, and to discuss Tchaikovsky’s compositional style in connection with autism seems a harsh judgment on the greatest of all melodists. On the other hand, for some people a whole fortnight listening to Mendelssohn’s violin concerto might be a kind of torture. The core of music for the individual listener is the emotional response it engenders, yet that response is notoriously difficult to analyse. In general, it is not like the cognitive pleasure we take in solving a crossword puzzle, for example. It is of course possible for music to affect us in this way (otherwise there would be no 4’33’’), and cognitive factors can increase the delight we take in it—like the incongruity of Brian Jones’ delicate dulcimer on *Lady Jane*, or the New York Philharmonic letting their hair down in Copland’s *Hoedown*. But such things are not essential.

The palette of musical emotions is kaleidoscopic, and frequently difficult to categorize in non-musical terms. For most of us, ‘chills’ are induced reliably only by music (and, dependably and specifically, by certain musical pieces). The dread instilled by *Bluebeard’s Castle* is a long way from ordinary fear, and what exactly is being expressed by, say, the magical dialogue between piano and horn that opens Brahms’ B major concerto? On the other hand, there are vistas of emotional experience that seem largely closed to music—humour, for example. A very funny musical gag like Flanders’ and Swann’s ‘I’ve lost my horn’ (in which the singer bewails its absence to the rollicking tune of a Mozart concerto) depends on an existential sophistication that is irrelevant to the original. Even in the sparkling confections of Peter Schickele (a.k.a. P.D.Q. Bach), the wit seems more about music than intrinsically musical. This raises a wider issue: to what extent does music rely on extra-musical associations for its effects? Music rivals odours in its ability to vividly re-animate our past. The ethereal call of a King’s

treble signals Christmas as no other sound can, and songs like *Yesterday* or *Nightswimming* gain in poignancy as life accumulates heartaches to match their own. But you do not have to be an exile to appreciate *Ma Vlast*. The role of memory and experience in our response to music is a theme taken up by both Sacks and Levitin, yet perhaps it is overemphasized. If the sheer eclecticism of their books shows anything, it shows that musical potency neither depends on any style, genre or instrument, nor on any imported conception of surface beauty. The Berg violin concerto articulates an anguish that transcends the intellectualism of its serialist roots. Bittersweet is conveyed at least as well by an Oscar Peterson as a Maurizio Pollini, and for the adventurously amorous, a Stone might do better than a Bach. The harmonica and bassoon carry all kinds of music hall baggage, but the artistry of a Larry Adler or Gwydion Brooke proves that ‘it ain’t necessarily so’. Every piece of music is a world unto itself.

Attempting to unpack all this scientifically is fraught with difficulty, and to their credit neither Sacks nor Levitin minimizes that. Even agreeing a vocabulary is problematic. It is not simply a matter of learning the technical terminology; some crucial properties of music, like its emotional topography, are inherently untranslatable. The mission to treat music as a kind of language, which has proved so seductive to so many (Leonard Bernstein was a famous victim), founders in the end on the reef of referentiality. Languages are about things in the world: for every poem, there are countless shopping lists and memos. Music does not have a shopping-list function, and its currency is non-exchangeable. Language that strives to be primarily musical, like Joyce’s in the *Wake*, sacrifices intelligibility (perhaps fatally), while music that tries to represent real sounds (like Saint-Saëns’ *Carnaval* or Messiaen’s artificial birdsong) remains a curiosity. This does not imply, of course, that there are no correspondences between the two dimensions of human communication. Neurologists all know aphasic patients who can sing, but that time-honoured dissociation does not resolve the issue. If functional imaging has taught us anything, it is that music and language are not monolithic brain states arising from opposite cerebral hemispheres, but sets of component sub-processes distributed across the whole brain. Evolution prefers efficiency, and it is therefore likely *a priori* that certain cognitive operations are common to music and language. This issue is discussed at length by Ani Patel in his fine and scholarly book *Music, Language and the Brain* (2008), quoted by both Sacks and Levitin. The parallels are sometimes surprising. It turns out, for instance, that the rhythmic structure of speech is echoed in the music that a society produces, undersigning the quintessential national style of an Elgar or a Fauré. At a deeper level, musical and linguistic syntax share a number of formal and functional resources. But meaning in language is very different to meaning in music. Music may ‘mean’ emotions, but it cannot be used to send a message

about an object or event outside itself. There are tonal and whistled languages that use a limited set of tone categories with agreed semiotics, but it is surely no accident that no known language is based on music (Tolkien had a go at creating one, in Old Entish, and that was notoriously cumbersome and difficult for other inhabitants of Middle-earth to learn). The puzzle of musical semantics has fundamental consequences for neuropsychological models of music based on linguistic prototypes. Should a musical piece be regarded principally as a semantic entity, or an episode, and in which memory system is it stored? If I ask you to hum *Greensleeves* you can probably do it without mentally rehearsing the last occasion on which you heard it performed, and you can probably recognize the tune whether it is played on a lute or a tuba. Perhaps, then, well-known tunes are encoded in the brain somewhat like familiar faces, which can also be recognized under many different ‘viewing’ conditions.

A capacity to respond to music clearly has been hard-wired into the human brain by evolution, but why? What is music for? This is the big question behind Sacks’ and Levitin’s books, and indeed much else that has been published on music and the brain. To Levitin’s caveat that we should not draw conclusions from the music of our recent past, one could retort that most of the music that has ever been in the world is irretrievably lost to us, so we only have our own small sample to go on. That sample poses a considerable problem for theories that credit music with a single communicative, social or psychological function. Most such theories just do not ring true. It is difficult to see, for example, how music and language could lie on a common evolutionary pathway; how did one morph into the other? To take another example, it seems implausible that music arose as a form of courtship display, like the peacock’s tail; most of us do not produce it, and those that do are not conspicuously successful in the mating stakes. For every promiscuous rock star, there is a childless Handel, Beethoven or Chopin; and Mozart had to settle for Aloysia Weber’s less vivacious sister.

My own interpretation of the evidence presented by Sacks, Levitin and others is that music is essentially a mechanism for the brain to represent and objectify feeling states for off-line analysis. This notion is not original; it is broadly aligned with similar ideas expressed by many philosophers and musicologists, including Schopenhauer, Deryck Cooke and Peter Kivy, and roundly rejected by some (Scruton, 1997). I think this affective representational account is at least compatible with the theory of musical expectation recently advanced by David Huron in his lovely book *Sweet Anticipation* (2006), though it does not require Huron’s focus on the psychological machinery of surprise and resolution. Here I wish to consider the implications in neuroscience terms. To ‘represent’ a feeling in this context implies a neural code, rather than a replica. If the Barber *Adagio* made us feel actual grief, presumably no one would

seek to listen to it. Why should sound be the medium? Language provides an evolutionary precedent for the use of sounds for abstract communication. A more basic justification may lie with the advantages of sound over sight for transmitting information to other members of the social group under conditions of reduced vision (like the primeval forest). Many monkey species use calls in this way, and any new human parent will tell you how particular sounds can rapidly acquire an acute emotional resonance. Whatever the basis for its initial selection, the medium of sound as music is well fitted to code feeling states, because sound necessarily evolves in time and can therefore mirror the dynamic and transient quality of actual feelings. Why should such a process be selected by evolution? From the standpoint of the individual, the objectification and delayed analysis of sensory experience allows that experience to be integrated with behaviour. This may indeed be a general principle of frontal lobe operation. Applied to feeling states, it would provide the brain with a capacity to make sense of the chaos of the shifting emotional milieu, to distil the key features of the experience in surrogate form and, once it is abstracted, to resolve contradictory aspects of the experience and to unite it with other perceptual and cognitive processes, especially memories. Individuals with a greater capacity to respond would be better equipped to adapt behaviour to experience, and thus enjoy a reproductive advantage. From the standpoint of the social group, such a capacity would promote empathy—the ability to represent the feeling states of others, a powerful factor in the formation of inter-personal bonds. This factor might subsume those theories about the origins of music that emphasize its social utility. It follows that a process of high evolutionary value should also be subjectively pleasurable (Blood and Zatorre, 2001), and that our brains should be primed to do it. Far from being ‘auditory cheesecake’ (*pace* Steven Pinker), something like music might turn out to be essential for the development of all brains beyond a certain threshold of complexity (perhaps that is why HAL, the supercomputer in *2001*, was taught nursery rhymes).

This account might explain why musical emotions are so peculiarly difficult to characterize—in a sense, they are meta-emotions, abstract compounds of emotional raw experience. The idea sits well with the clinical dichotomy between Williams syndrome and autism as laid out by Sacks, which amounts (crudely speaking) to a distinction between social facility and musicophilia on the one hand, and social withdrawal and emotional insufficiency on the other. It also chimes with many of the first-hand experiences and anecdotes recounted by Sacks and Levitin, and with the evidence of the everyday. For a great many people, music occupies an emotional citadel that is breached by few other human creations. The discs reserved for desert islands and Top Five lists epitomize the emotional landscape of an entire life. Music is a balm for personal and communal

crisis, and more pervasively, a means to buffer the emotional wear and tear of the quotidian grind, like Casals’ daily Bach (the *48* helped me in a similar way when I was a harassed junior registrar trying to cope with A&E). On the down side, the avidity with which our brains lock on to music with particular structural properties might explain the unwonted tenacity of earworms and musical hallucinations.

One might go further. Can this neuroscientific position inform musical aesthetics? At least in the case of Western music, many of the pieces we value highly are emotionally ambiguous, resisting a pat label, or they preserve a tension between powerful feeling and formal restraint. The soloist’s lament in Shostakovich’s first violin concerto makes a devastating impact through the prism of the passacaglia that binds it. Perhaps it is structural integrity (or lack thereof) that separates all those Rachmaninoff wannabes from the real thing. At the extreme, we get music that seems to expand to embrace any experience, all human life. The uncanny sense we have from, say, the Bach works for unaccompanied instruments or some late Beethoven, that the universe is speaking to us directly, is musical ventriloquism of the highest order. Paradoxically, this oceanic sense, in which the self is submerged, may be the purest expression of the biology of self-affirmation (Trimble, 2007). Perhaps it is the same grace that visits so many in the pages of Sacks and Levitin. Besides endorsing certain propensities of music, a neuroscience of musical aesthetics might usefully remind us that music *per se* has no moral dimension. The *St Matthew Passion*, *Kind of Blue*, *The Chicken Dance*, *Salome* and *Cats* do not lie on some moral continuum; they are profound or banal according to whatever musical qualities they possess. The bad press given the music of Richard Wagner by Levitin and many others reflects a fundamental confusion. Wagner’s life and writings contain some truly despicable things, but works like the *Tristan* Prelude, Wotan’s farewell music and the closing minutes of *Götterdämmerung* are rightly numbered among the treasures of our civilization. The music cannot redeem the life, any more than the words and deeds should sully the music. To insist otherwise is like despising a Beatles song because you disapprove of recreational drugs. Here again, music sets itself apart from most other art forms, because it sets itself apart from the world of objects. *Guernica* or the Sistine ceiling would disappear without their objective referents; a Beethoven symphony has no need of them.

It has been said that music has no secrets (Scruton, 1997), but as a neuroscientist no less than as a listener, I cannot accept that. My semantic faculty tells me *À Chloris* by Reynaldo Hahn is a sentimental meditation on Bach’s cool little prelude, that Hahn was a minor figure in the musical pantheon, and that in all probability he wrote the song as a deliberate pastiche. But play the music, and all reservations melt in a moment of heart-stopping rightness.

It is Larkin's 'enormous yes' all over again. There is mystery enough here to sustain many more books.

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References

- Blood AJ, Zatorre RJ. Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion. *Proc Natl Acad Sci USA* 2001; 98: 11818–23.
- Critchley M, Henson RA, editors. *Music and the brain*. London: Heinemann; 1977.
- Dejerine JJ. *Sémiologie des Affections du Système Nerveux*. Paris: Masson; 1914.
- Huron D. *Sweet anticipation*. Cambridge: MIT Press; 2006.
- Larkin P. For Sidney Bechet. In: *The Whitsun weddings*. London: Faber & Faber; 1964.
- Levitin DJ. *This is your brain on music*. London: Atlantic Books; 2007.
- Patel AD. *Music, language and the brain*. Oxford: Oxford University Press; 2008.
- Sacks O. *Musicophilia*. London: Picador; 2007.
- Shaffer P. *Amadeus*. London: Harper Perennial; 1980.
- Scruton R. *The aesthetics of music*. Oxford: Oxford University Press; 1997.
- Trimble MR. *The soul in the brain*. Baltimore: Johns Hopkins University Press; 2007.
- Warren JD, Uppenkamp S, Patterson RD, Griffiths TD. Separating pitch chroma and pitch height in the human brain. *Proc Natl Acad Sci USA* 2003; 100: 10038–42.