Music and the Nerves, 1700–1900

Edited by

James Kennaway

Music and the Nerves, 1700–1900

Also by James Kennaway

BAD VIBRATIONS: The History of the Idea of Music as a Cause of Disease (2012)

Music and the Nerves, 1700–1900

Edited by

James Kennaway
Research Associate, Newcastle University, UK

palgrave
macmillan

Softcover reprint of the hardcover 1st edition 2014 978-1-137-33950-8

First published 2014 by
PALGRAVE MACMILLAN

Palgrave Macmillan in the UK is an imprint of Macmillan Publishers Limited, registered in England, company number 785998, of Houndmills, Basingstoke, Hampshire RG21 6XS.

Palgrave Macmillan in the US is a division of St Martin's Press LLC, 175 Fifth Avenue, New York, NY 10010.

Palgrave Macmillan is the global academic imprint of the above companies and has companies and representatives throughout the world.

ISBN 978-1-349-46447-0 ISBN 978-1-137-33951-5 (eBook)
DOI 10.1057/9781137339515

This book is printed on paper suitable for recycling and made from fully managed and sustained forest sources. Logging, pulping and manufacturing processes are expected to conform to the environmental regulations of the country of origin.

A catalogue record for this book is available from the British Library.

A catalog record for this book is available from the Library of Congress.

Contents

Illustrations

Acknowledgements

A lot of work has gone into this volume and I would like to express my gratitude to all those who have made it possible. In particular I would like to thank the Wellcome Trust, whose funding allowed me to devote time to this project. Likewise I am grateful to Dr Sebastian Pranghofer, Professor Holger Maehle and Dr Lutz Sauerteig at Durham University, Professor Mark Harrison and Professor Pietro Corsi at the Wellcome Unit for the History of Medicine at Oxford University and my colleagues at Newcastle University for their support over the past few years. The image on the cover is included by kind permission of Wellcome Images. Thanks are also due to the editors at Palgrave Macmillan and the anonymous readers who did much to whip the volume into shape. Finally, I would like to thank Oliver Sacks for his generous encouragement of work on music and the nervous system and his suggestions for further avenues of investigation.

James Kennaway
Newcastle University

Contributors

Penelope Gouk is an Honorary Research Fellow at the University of Manchester, where she was previously Senior Lecturer in the Department of History and funded by the Wellcome Trust. Before this she held a series of research fellowships at the University of Oxford, and was Director of the Achievement Project (1990–1995), an interdisciplinary enquiry into economic growth and technological innovation since 1500. Her most recent research has focused on early modern medical and scientific explanations for music's emotional effects and their relationship to musical practice, a project which has also included an investigation into musical healing in both Western and non-Western societies. Her publications include *Music, Science and Natural Magic in Seventeenth Century England* (1999) and the edited volumes *The Second Sense: Hearing and Musical Judgement* (1992); *Musical Healing in Cultural Contexts* (2000) and *Representing Emotions: New Connections in the Histories of Art, Music and Medicine* (2005).

Amy B. Graziano is Associate Professor and Chair of the Conservatory of Music at Chapman University. She is also Director of Music History for the Conservatory. She received her PhD in musicology (1996) and MM (1990) from the University of Texas at Austin and her BA (music and psychology, 1985) from Vassar College. She also completed a two-year Post-Doctoral Fellowship in Music Cognition at the University of California, Irvine. At Chapman she teaches introductory and advanced courses in music history, *The Psychology of Music*, and *Film Music*. Her research focuses on the history of music psychology, in particular the relationship between music and neurology in the nineteenth century. With colleague Julene Johnson, she has published articles on the history of music and brain studies in top music cognition, history of neuroscience and cognitive science journals, and contributed several chapters to books about music and the brain. She has published on the general history of music psychology and has co-edited a double issue of *Psychomusicology (History of Music Psychology in Autobiography)*. She has received several Chapman University awards for excellence in teaching and scholarship.

Alexandra Hui is Assistant Professor of History at Mississippi State University, where she works on the history of physics, medicine and the human sciences. She completed her dissertation at UCLA in 2008 and was chosen for the European Society for the History of Human Sciences 2010 Early Career Award. She has also been awarded a DAAD research grant to work at

the Max Planck Institute for the History of Science in Berlin and a Dibner Library Resident Scholarship to work at the Smithsonian in Washington DC. Her publications include 'Dead Ears and Dead Ends? Ernst Mach and Max Planck's Studies of Accommodation in Hearing as a Basis for the Theory of Music' in *Osiris*, ' "The Bias of Music-Infected Consciousness": The Aesthetics of Listening in the Laboratory and on the City Streets of fin-de-siècle Berlin and Vienna' in *Journal for the History of the Behavioral Sciences* and 'Instruments of Music, Instruments of Science: Hermann von Helmholtz's Sound Sensations Studies, his Classicism, and his Beethoven Sonata' in *Annals of Science*.

Julene K. Johnson is Associate Professor of Cognitive Neuroscience at the University of California, San Francisco's (UCSF) Institute for Health and Aging. She also has appointments in the UCSF Department of Neurology and Department of Social and Behavioral Sciences. She has a bachelor's degree in music and a PhD in cognitive neuroscience. Trained as a flutist, she has a longstanding interest in music and the brain. In 2010, she was a Fulbright Scholar in Jyväskylä, Finland where she studied how participation in community music promotes quality of life for older adults. With her colleague Amy Graziano, she studies nineteenth-century representations of music in neurology and psychology literature. Together, they have published several manuscripts highlighting the contributions of several pioneering scholars who used music to better understand brain function in the nineteenth century, including August Knoblauch, Richard Wallaschek, John Hughlings Jackson and Hermann Oppenheim. They have published papers in top music cognition, history of neuroscience and cognitive science journals, and contributed several chapters to books about music and the brain. Another area of research focuses on understanding music cognition in aging and neurodegenerative diseases, such as Alzheimer disease and frontotemporal dementia.

James Kennaway is currently a research associate in the history of medicine at Newcastle University. He has previously been a lecturer in the Wellcome Unit for the History of Medicine at the University of Oxford, a Wellcome Research Fellow at Durham University, a Richard Plaschka Fellow at the University of Vienna and a Mellon Postdoctoral Fellow at Stanford University. His research has focused on music and medicine, notably with his monograph *Bad Vibrations: The History of the Idea of Music as a Cause of Disease*, and articles in journals such as *Social History of Medicine*, *Journal of the History of Medicine and Allied Sciences*, *Configurations*, *Davoser Literaturtage* and *Current Musicology*.

Pilar León-Sanz is Associate Professor of History of Medicine at the University of Navarra. She participates in the Research Group Emotional Culture

and Identity, Institute for Culture and Society. She has been a Research Fellow at the Wellcome Trust Centre for the History of Medicine at UCL, Visiting Scholar at the History of Science Department at Harvard University, and member of the Steering Committee, Phoenix European Thematic Network. The focus of her research is the evolution of the concept of emotion and its place in medical knowledge from the eighteenth century onwards. Her publications include 'Evolution of the Concept of Emotion in Medicine: a Music-Therapy Approach' (in *The Emotions and Cultural Analysis* 2012); *Health Institutions at the Origin of the Welfare Systems in Europe* (2010); *La Tarantola Spagnola. Empirismo e tradizione nel XVIII secolo* (2008); (with D. Barettino) *Vicente Ferrer Gorraiz Beaumont y Montesa (1718–1792), un polemista navarro de la ilustración* (2007); 'Science, State and Society: José María Albareda's *Consideraciones sobre la investigación científica*' (*Prose Studies* 2009); 'Medical Theories of Tarantism in Eighteenth-Century Spain' (in *Music as Medicine* 2000).

George Rousseau is a Fellow of the Royal Historical Society and recipient of honorary degrees *honoris causa*. He has been a professor at UCLA, Regius Professor at King's College Aberdeen and Co-Director of the Centre for the History of Childhood at Oxford University where he currently works. His books include (with Marjorie Hope Nicolson) *This Long Disease, my Life: Alexander Pope and the Sciences* (1968); *The Languages of Psyche: Mind and Body in Enlightenment Thought* (1990); a trilogy entitled *Pre- and Post-Modern Discourses: Medical, Scientific, Anthropological* (1991); (with Roy Porter) *Gout: The Patrician Malady* (1998); *Framing and Imagining Disease in Cultural History* (2003); *Nervous Acts: Essays on Literature, Culture and Sensibility* (2004), *Children and Sexuality: The Greeks to the Great War* (2007), and his forthcoming. *The Notorious Sir John Hill: The Man Destroyed by Ambition in the Era of Celebrity* (2012) and the forthcoming *Rachmaninoff's Cape: A Nostalgia Memoir* (2015).

Aris Sarafianos is Lecturer in Art History at the University of Ioannina, Greece. He received his PhD from Manchester University, where he taught for a number of years (2001–2008). He has held long-term fellowships from the Huntington Library and the Clark Library/UCLA, and his research has been supported by awards from the Yale Paul Mellon Centre in London and the YCBA at Yale University. His work focuses on the extensive interactions between the history of medicine (physiology, anatomy, pathology and therapeutic practices) and art history during the eighteenth and nineteenth centuries, as is reflected in his book in progress *Sublime Realism: Medical Men and the Art Profession in Britain, 1757–1824*. Related publications include the following articles: 'Hyperborean Meteorologies of Culture: Vital Sensations and Medical Environmentalism in Arbuthnot, Burke and Barry,' *International Archives of the History of Ideas*; 'The Contractility of the Sublime: Drastic Therapies, Extreme Oppositions and Images of the

Fringe from Burke's Enquiry', *Journal of the History of Ideas*; 'Pain, Labour and the Sublime: Medical Gymnastics and Burke's Aesthetics', *Representations*; and 'Burke's Physiological Iconography of Aesthetic Perception and the Invention of Sublime Medicine', *Comparative Critical Studies*.

Ingrid J. Sykes is Lecturer in History at La Trobe University in Australia with expertise in French modern history and the history of medicine. She has published in *Medical History*, *French History, Journal of Eighteenth-Century Studies* and the *Journal of the History of Medicine and Allied Sciences*. She is the author of *Women, Science and Sound in Nineteenth-Century France* (2007), and is currently completing *Hearing with Humanity: The Birth of an Idea*.

Wiebke Thormählen took her doctorate in musicology from Cornell University in 2008. She is Professor of Music History at the Royal College of Music in London. She was previously an AHRC Early Career Research Fellow in the School of Humanities at the University of Southampton. Her articles have appeared in the *Journal of Musicology*, *Early Music*, *Acta Mozartiana* and *Neues Musikwissenschaftliches Jahrbuch,* and she has contributed numerous reviews to *Notes* and *Eighteenth-Century Music*. Her research focuses on the role that music as social practice played in educating individuals and social groups emotionally during the mid-eighteenth to mid-nineteenth centuries. She explores the social, sociological and psychological functions of various forms of performance, such as the playing of musical arrangements and the display of virtuosity. She brings together perceptions of the interaction of body and mind from contemporaneous medical theories and concurrent art theories. Research leading to the essay presented here was generously funded by the Wellcome Trust.

1

Introduction: The Long History of Neurology and Music

James Kennaway

We live in an age in which interest in the embodied character of aesthetic experience has come to take on enormous significance in both science and cultural studies. Neuroscience is systematically examining aesthetic issues and the humanities seem to be in the grip of a neuroscientific turn. Indeed, several authors have argued recently that the urge to find neurological explanations may have been pushed too far, perhaps amounting to 'neuromania'.[1] In particular, music, with its seemingly direct effect on the nervous system, has been the focus of intense interest among cognitive neuroscientists over the past few decades. Huge strides forward have been made in our understanding of how the brain reacts to music, and representations of music's effects in the humanities and in media reports increasingly reflect the prestige of neurology. Along with the interest in embodiment in the so-called New Musicology, neurological insights into music appear to be at the heart of a new framework for thinking about music well beyond clinical and scientific circles, and some now consider neurology to have the potential to provide a future paradigm for musical aesthetics.

Much of the discussion of the subject seems to assume that recent developments have marked the belated overcoming by science of an unbroken speculative, indeed superstitious, aesthetic tradition of thinking about music. It is no coincidence that many books on music and neurology, when surveying the history of musical aesthetics, tend to cite Plato and Eduard Hanslick, both of whom were generally hostile to the physical aspect of music. However, as this book will demonstrate, far from being a new phenomenon, essentially medical neurological understandings of the body have long played a powerful role in thinking on music, its effects and its aesthetics. Especially since the seventeenth century, natural philosophers and music theorists have often prefigured much of the contemporary debate about music and the nervous system, as neurology in a sense replaced cosmology as the basis for thinking about music and the body. Musical aesthetics has at

times rebelled against this materialist approach and asserted a transcendental view of music's effects, but even here the influence of medical thinking can sometimes be seen. By examining crucial episodes in the history of the relationship between neurology and music, and outlining the previous occasions in which science has affected aesthetics, this volume aims to put both the potential and limitations of contemporary neurological approaches to music in context.

Although important questions about some of the claims of the neurological approach to music have been raised, there is no doubt that extraordinary advances in knowledge about the brain and music have been achieved by cognitive neuroscience in the last 30 years. When Macdonald Critchley and R.A. Henson published *Music and the Brain: Studies in the Neurology of Music* in 1977 it was a rather isolated contribution to the subject. Since then scientists such as Isabelle Peretz, Robert Zatorre, Aniruddh Patel, Lauren Stewart and Tim Griffiths, to name just a few, have provided remarkable insights.[2] Fascinating work is also being conducted to find practical uses for this knowledge, for example, for patients suffering from aphasia. Another leading figure in the neuroscience of music, Stefan Koelsch, has gone as far as to suggest that the complexity of neurological responses to music and its interaction with social and emotional states means that music psychology is '*the* fundamental discipline of psychology'.[3] On a more popular level, books such as Oliver Sacks' superb *Musicophilia,* Robert Jourdain's *Music, the Brain and Ecstasy* and Daniel Levitin's *This Is Your Brain on Music* have demonstrated that there is a remarkable public appetite for scientific insights into music's effects.[4] Other scientists, notably Semir Zeki and Vilayanur Ramachandran, have directly approached issues in aesthetics from a neurological point of view.[5]

To some extent, this is just part of a broader wave of neuro-enthusiasm, but the particular focus on sound is also perhaps a response to a crisis in older paradigms for thinking on music. In a striking parallel with the emphasis on the embodied character of music in a neuroscience context, the so-called New Musicology has also rediscovered the body.[6] In doing so, it has challenged the Idealist positions developed in the early nineteenth century that formed the basis of much subsequent discourse on music. A rejection of music's physicality was a crucial part of what would later be called 'Absolute Music', with its emphasis on the disinterested appreciation of form, interiority, 'structural listening', the cult of the genius, the aesthetic of the sublime and the ideal of the 'autonomous' work.[7] This ideology, which has formed the basis of so much of the culture of 'Classical music', seems to have been in a little intellectual trouble for some time, undermined by anti-hierarchical attitudes, anthropology, feminism, the decline of the positivist predisposition of the post-war generation of musicologists and, most importantly, by enormous social and cultural change.

Some have raised high hopes that neuroscience might offer a way out of a sense of impasse, providing a new sense of objectivity for musical

aesthetics. In a chapter in the recent edited volume tellingly entitled *Bridging the Humanities-Neuroscience Divide: A Field Guide to a New Meta-Field*, David Michael Bashwiner argues that 'Musical aesthetics is poised for its Kuhnian revolution.'[8] This revolution, he suggests, holds out hope that neuroscience will allow musicologists and aestheticians to break out of the tradition of mentalism inherited from the great nineteenth-century critic and aesthetician Eduard Hanslick, who was explicitly against any approach that emphasised its physicality or the role of emotions. While it is perhaps likely that neurology will influence future thinking on music, it is worth remembering that both Hanslickian aesthetics and neurological approaches can, in an extreme form, be flawed by a view of music that eschews cultural and social context and meaning in favour of the disinterested appreciation of form or neurological 'reward circuits' respectively.

The neuroaesthetics of music have been challenged in other ways, too. As Bevil R. Conway and Alexander Rehding have argued, neuroaesthetics can appear to fall between two stools, so to speak, looking for either neurological correlations to an ill-defined and hard to defend universal and objective idea of beauty, or for a subjective view of aesthetic experience that runs the risk of being indistinguishable from other pleasures such as sex or eating cake.[9] More broadly, critics of neuromania such as Raymond Tallis, William Uttal, Paolo Legrenzi and Carlo Umilta have raised questions about the technical and epistemological limitations of fMRI scans, on which much of the research on the topic rests. Matthew Crawford, for instance, has called the scans a 'fast-acting solvent of critical faculties'.[10] One problem with this whole issue is that it is hard to avoid falling into the interminable mind–body debate.[11] It certainly appears that many defenders of an essentially neurological understanding of music suspect that their opponents' real target is mind–brain identity theory, that they reject the idea that mental states are reducible to brain function. Since this is a theoretical cornerstone for many neuroscientists, the stakes go beyond issues related to music.

Whatever the result of academic debates on neuroaesthetics, there is an imperative to challenge some of the wilder unsupported claims made for a neurological approach. The popular neuroscience writer Jonah Lehrer suggested in his bestselling 2007 book *Proust was a Neuroscientist* that the famous riot at the 1913 Paris premiere of *The Rite of Spring* was caused by the neurological effect of unfamiliar sounds on the brain. One does not want to add to the problems of a man who later lost his job at *The* N*ew Yorker* for making up quotations and self-plagiarism, but it must be said that his comments on music and neurology are a clear example of some of the neuro-boosterism that needs to be questioned. For all the world like the nineteenth-century physicians who fretted about the nervous strain caused by music, Lehrer sets up a model of musical stimulation leading directly to madness. 'The premiere of *The Rite,* with its methodical dismantling of the audience's musical expectations, literally stimulated madness. By subverting the listeners'

dopamine neurons, it also subverted their sanity.'[12] Like his nineteenth-century positivist predecessors, he ignores all social and cultural context to come up with a more 'scientific' explanation. Worse, he gets his facts wrong.

The idea that the music of *The Rite of Spring* started a riot in 1913 has been shown to be largely a myth. Truman Bullard's dissertation in 1971 methodically examined all the eye-witness reports of the performance and it is clear that the trouble that occurred could scarcely be called a riot, and that it was principally a response to Nijinsky's choreography, indeed to the choreography for previous pieces.[13] It seems that little of the music was heard at all. In Lehrer's book the facts of the case and the very specific social and cultural context are ignored in favour of an entirely speculative neurological theory. No evidence was provided whatsoever. Alas, this view has been endlessly repeated and quoted in the name of interdisciplinarity and an otherwise laudable attempt to integrate scientific knowledge into understandings of culture.

Another such example of the pitfalls of popularising the neurology of music relates to the famous Mozart Effect, which suggests that listening to that particular composer's music can have a significant impact on cognitive ability. This notion seems to have started with the work of Alfred Tomatis in Paris in the 1960s, but it was really with the publication in *Nature* in 1993 of a paper by Frances Rauscher et al. that reported results that appeared to show that listening to Mozart's Piano Sonata for Two Pianos K488 had a noticeable effect on spatial task performance.[14] Although the study was conducted on adults, the implications for the development of children and especially of foetuses *in utero* came to be the main focus in the media. The widespread consensus today appears to be that the results observed in fact related to issues of mood and temporary arousal rather than to any quasi-magical impact of the music. Stronger evidence seems to have been found to show that playing rather than merely listening to music can improve cognitive ability, but even there the results are 'far from conclusive'.[15]

The way that the Mozart Effect was quickly taken up by the press and gained international attention surely reflects broader assumptions about music associated with the European middle class, and more specifically, about the myth of Mozart as divine child genius. The weakness of certain scientists and, more particularly, certain pop-science writers for this kind of pathos is striking. Don Campbell's *The Mozart Effect for Children* (2000) is typical in the way it assumes that music can 'stimulate brain growth in the womb', even giving selections of Mozart pieces that suit each period of gestation.[16] Campbell's principal source appears to be Tomatis, whom he approvingly quotes on the supposed extraordinary and universal power of Mozart: 'Whether in France, America, Germany, Alaska, Amazonia, or among the Bantus,' he reported, 'Mozart's music indisputably achieves the best results. Obviously, there are other musicians of value, such as Handel, Haydn, Beethoven, and many more. But Mozart's music has an impact far

greater than Bach's. Exception among exceptions . . . Mozart has a liberating, curative, even healing power. With him, we become what we are.'[17]

Similarly, Nancy C. Andreasen's 2005 book *The Creating Brain: The Neuroscience of Genius* argues that learning music is 'good for the brain'. It is perhaps a bad sign that terms like 'genius' and 'Classical music' are bandied about as if they were scientific categories, much as Tomatis and Campbell use Mozart. Andreasen argues that Classical music is beneficial because 'it contains complex musical forms and themes that children may perceive intuitively long before they can understand them analytically'.[18] The entirely spurious idea that 'Classical' music (which remains undefined) is always more complex than all other forms of music and that it has essentially magical properties for brain development is never defended and always assumed. A sense of what music is meant by 'Classical' can be found in the choices made when Governor Zell Miller of Georgia made an agreement with Sony in 1998 by which 100,000 CDs were made available for hospitals to give to mothers of newborns. The CDs included *Eine kleine Nachtmusik*, *Für Elise*, *The Arrival of the Queen of Sheba*, *Ronda alla Turca*, the *Trout Quintet, Jesu, Joy of Man's Desiring*, *Pachabel's Canon*, *Air on a G-String* and *Sheep May Safely Graze* – that is to say, music written between the late seventeenth and the early nineteenth century, the part of the Western canon perhaps least likely to offend or challenge casual listeners.

There is no doubt that this music represents a great accomplishment that means an enormous amount to many people, but the argument that it has special powers to improve children's cognitive abilities is essentially bogus, albeit perhaps generally harmless. Even more depressing is the philistinism that sees music principally as a path to higher exam results and a more secure place in the social order. In the long run such a crudely utilitarian approach is surely not in the interests of music, musicians or audiences. Corporations have not been slow to try to take advantage of the impression that Classical music is a tool to create clever babies. Uterine music, from the Prenatal University of the 1970s and the Pregaphone of the 1980s to today's Bellybuds, special speakers for the womb, is a rather dispiriting phenomenon. While many of these products are circumspect about their claims relating to brain development, Disney's Baby Mozart DVD was withdrawn after the authorities refuted its cognitive enhancement powers.[19]

In this context of sometimes slightly hubristic claims in the mainstream media and corporate opportunism, this volume seeks a sober and long-term approach to the relationship between music and neurology. Because of its status as an art that is seemingly both the expression of mathematical rationality and of the irrationality of the body, music always seems caught, as Susan McClary has put it, in a contest 'between the inescapable body and the West's deep-seated need to control or transcend that body through intellectual idealism'.[20] With all due respect to the fascinating achievements of

neurological research into music, it is also to be hoped that future views of music will see it as both embodied and cultural, understanding what is neural about our experience of music and what is contextual and social, what happens between people as well as inside their heads.

The history of music and the body in science and aesthetics

A variety of theories on the relationship between music and the body were put forward in antiquity.[21] Pre-Socratic philosophers such as Empedocles and Alcmaeon proposed theories about the nature of sound and hearing, notably the idea that the ear contained a kind of 'implanted air' that responds to moving air outside, a theory that was developed by Aristotle and would be influential into the modern era.[22] Later thinkers applied some of this thinking to music itself. For example, in his *Elements of Harmony*, the fourth-century BC Greek peripatetic philosopher Aristoxenus of Tarentum set out a view of music that, although it also contained overtly mystical aspects, essentially understood it as part of the natural world, to be viewed in terms of sensual stimulation. For example, he held that the notes of the scale are to be judged, not, as the Pythagoreans argued, by mathematical ratio, but by the ear.[23]

However, the most influential Greek ideas concerning music tended to take a very different approach that played down its physical character in favour of an emphasis on ethos and cosmology. The Pythagorean focus on the 'music of the spheres' and the conception of music as an aspect of universal harmony in many ways dominated thinking on music for 2000 years.[24] In the Pythagorean and neo-Platonic context of cosmic harmony, it was the macrocosm–microcosm analogy that primarily linked music to the body, rather than direct physical stimulation. The harmony of the body related to Hippocratic ideals of moderation and balance for health more than to actual hearing per se. Until well into the eighteenth century, works on music therapy generally ascribed the effects of music on the body to the way it aligned it with universal order, something that is still reflected in some of the more careless rhetoric about music therapy today.

Plato's discussion of music, the body and the soul also proved enormously influential, although it should be noted that his views on music varied considerably between his works. In his *Timaeus,* music appears in a generally positive, cosmic and Pythagorean guise. Nevertheless, he does give an account of how the impact of music on the soul is conducted via the body. He writes,

> Considering our third sense, that relative to hearing, we must explain the reasons that cause its affections. In general, let us establish that sound is the impact transmitted by the air, through the ears, to the brain and blood, until it reaches the soul; and that the movement caused by it, a

> movement that starts at the head and ends up in the area of the liver, is hearing.[25]

Although he ascribes the transmission of sensation around the body to the blood rather than to the nerves, the basic model Plato puts forward is, *mutatis mutandis*, recognisable as the way twenty-first century observers might think about music's effect on the body. The focus on the liver, the seat of Plato's appetitive soul, is in a sense comparable with the brain in modern models of hearing.

Nevertheless, Plato's principal impact on subsequent thinking on music and the body derived from his arguments in *The Republic* and *The Laws*, where he draws on the ideas of Damon of Oa to show that music's legitimate focus should be the soul, not the body, and that musical sensuality is dangerous.[26] Plato, who took music more seriously than any other philosopher before Nietzsche, argued strongly that music is a way of steeling the spirits of the men of the *polis* to maintain the state in war and peace, like gymnastics was for the body. Although 'Simplicity in music was the parent to temperance in the soul,' music's physicality meant that a man 'melts and liquefies until he has dissolved away his spirit, and he cuts out the sinews of his soul, as it were, and makes himself a "faint-hearted spearman".'[27]

Medieval thinking on music and the body added a degree of Christian general ambivalence to the flesh to Platonic and Pythagorean views. The early sixth-century Roman philosopher Boethius transmitted much of this tradition to later centuries with his book *De institutione musica*, which became a key text in musical education. In it he did not deny music's physical impact, but followed the Greek tradition of regarding it as suspect.[28] Likewise, many of the Church Fathers had mixed feelings about music. Augustine, for instance, had trouble making up his mind about whether music was suitable for church because of the perils of the physical 'pleasure' involved.[29] To this day several Christian denominations, such as the Greek Orthodox, do not approve of the use of musical instruments in church. Along with the tendency to denounce the body in music, the other key way to deal with the issue was to deny the embodied character of music in a context of mathematical abstraction. Thus in the medieval university curriculum, music was famously part of the quadrivium, along with arithmetic, geometry and astronomy, all relating to the natural order of the universe.

Early modern thought on music included a good deal of neo-Platonic speculation on its relationship to cosmic order, but also an increasingly clear defence of musical sensuality. Models of music as a form of nervous stimulation began to become more important as older Pythagorean and neo-Platonic ideas of music as an expression of abstract ratio and universal harmony were challenged by a 'disenchanted' worldview and by experimental work on acoustics that demonstrated the problems with a tuning system using whole number ratios.[30] As scholars such as Penelope

Gouk and Benjamin Wardhaugh have demonstrated, thinking on music was not a passive beneficiary of the Scientific Revolution, but played an active role.[31] Sixteenth and seventeenth-century anatomists of the ear and auditory system such as Gabriel Fallopius, Bartholomeo Eustachio, Fabricius ab Aquapendente and Volcher Coiter achieved considerable, if piecemeal, advances in understanding of hearing. Until the later eighteenth century one sees a gradual and complex shift from the idea of implanted air to a more direct focus on the nervous system. Drawing on their work and, crucially, also that of neurologists such as Thomas Willis, books such as Guichard Joseph Duverney's 1683 *Treatise on the Organ of Hearing* put the nerves firmly at the centre of thinking about hearing, and thus about music.[32]

During the Enlightenment a musical aesthetic of sensibility, expression and feeling developed that incorporated this contemporary scientific discourse on the nerves and largely eschewed abstract correspondences between musical features and specific passions. As George Rousseau has shown, the whole cult of sensibility during the eighteenth century drew heavily on medical ideas about the nerves and sensation. Feeling was understood to be a matter of both the passions and the physical sensations, and to be literally a question of having sensitive nerves. Samuel Taylor Coleridge, for instance, referred to the nerves as 'exquisite electrometers of taste'.[33] Instead of an objective link between certain musical features and specific affects, the likes of the composer and writer C.P.E. Bach and the aesthetician Johann Georg Sulzer advocated a subjective aesthetic of feeling and expression, in which music was viewed as a nerve stimulant, with varying admixtures of thinking linked to the Lockean association of ideas.[34] In a way that has striking parallels with twenty-first century discussions of neurology and music, this eighteenth-century view was based on the idea of music as a 'shocks delivered to the nerves of the body'.[35]

However, in reaction to this increasingly materialist 'neuroculture' way of understanding music, the nineteenth century saw not only advances in scientific understanding associated with names like Hermann Helmholtz, but also a radical rejection of the nerves in musical aesthetics. Around 1800 a view of music as relating not to the nervous system but to a Kantian transcendental subject developed that was in part a conscious rejection of the materialist implications of the aesthetic of sensibility. Reducing music from the grand vision of cosmic harmony to the level of sensual pleasure marked a serious threat to its prestige, leaving open to question its status as an art altogether and making it seem much like cooking or perfume. By ascribing music's power to the level of the transcendental subject, people such as E.T.A. Hoffmann and Arthur Schopenhauer created a whole new metaphysics of music, which formed the roots of an ideology of Classical music that still has enormous influence today. It is important to keep sight of the way that this real paradigm shift in aesthetics was much more of a conscious reaction against neurological approaches than a sign of ignorance of them.

This move away from neurology to the transcendental subject should perhaps also lead us to question some of the technological determinism and whiggish assumptions about scientific progress that abound in our current neurological turn.

In the wake of this shift, it is striking to note that discussion of the relationship between nerves and music became *more* common after its banishment from the musical aesthetics in two very different settings, one in psychiatry and the other in experimental acoustics, physiology and psychology. In medicine, the stimulation model was the basis for a change from seeing music as a source of calming or potentially excessive passions (as it had been in discussions of music therapy until the mid-eighteenth century) to regarding it as a therapeutic or possibly dangerous stimulant, a shift from what one might call moral physiology to stimulation theory. The interaction between music and medicine had a long and varied existence in nineteenth-century medicine, as the idea of music as a powerful stimulant led to both a wave of works of speculative music therapy and to a burgeoning medical critique of the art.[36] Books like Peter Lichtenthal's *Der musikalische Arzt* of 1807, for instance, talked about 'doses' of music that might be administered in the manner of stimulation by drugs or electricity.

It is also striking that these theories about the pathological impact of music on the nerves are almost never mentioned in the other extensive discussion of music's impact on the nerves, that in systematic neurological and psychological studies of the role of the nerves in listening conducted by the likes of Chladni, Oersted, Helmholtz, Wilhelm Wundt and Ernst Mach. There was, however, some interaction between each of them and musical criticism, as Alexandra Hui's recent book *The Psychophysical Ear: Musical Experiments, Experimental Sounds 1840–1910* has demonstrated.[37] However, one important strand of thinking on musical aesthetics consciously distanced it from these scientific advances. Eduard Hanslick's influential 1854 book *Vom Musikalisch-Schönen* (The Beautiful in Music) drew on the Kantian disinterested appreciation of form by an autonomous subject. He mocked those who took a medically informed approach to discussions of the effect of music, saying that they amounted to an attempt to reduce the human mind to the level of a door banging in the wind.[38] At the same time, a psychiatric discourse of nerves and nervousness was also having an impact on discussions of music.[39] 'Serious' music was often generally assumed to be directed at the mind, to be considered at an abstract, disembodied level, but trivial, sensual or effeminate music was relegated to the level of the nerves and the body. The nadir of this development was reached in the Nazi concept of degenerate music in which the idea of nervous over-stimulation played an important role.

Partly in reaction to totalitarian attempts to politicise music, mainstream musicology in the post-war period often took a consciously positivist, apolitical and disembodied view of music.[40] After all, many of the leading figures

in the field, especially in the United States, were exiles from Nazi Germany or the students of those exiles. The social and cultural changes that have taken place since the 1960s rather belatedly started to affect academic discussions of music and the body from the 1980s. At the same time, technological advances in neurological research, and in particular the development of functional magnetic resonance imagining technology, have also been the basis for today's lively debate on music, the brain and the body. It remains to be seen whether the insights of neuroscience will be combined with thinking on aesthetics in the future or if we are doomed to parallel debates and mutual misunderstanding.

Outline

The chapters in this collection deal with topics from the seventeenth to the nineteenth centuries with a wide variety of disciplinary approaches, especially the history of medicine, musicology and neurology. Nevertheless, strong points of continuity are clear, issues that recur in a number of different cultural and historical contexts. Some of them focus more narrowly on the impact of music on the nervous system, whereas others consider the effect on the body more broadly, but for all of them the development and influence of essentially medical conceptions of listening is central. Because of the nature of the relationship between music and those nerves, it is hard to escape the intractable mind–body problem in these debates. Explanations of music's effects always need at least an implicit theory of how physical sound waves become mental states. Similarly, theories of how emotions or passions work and how they relate to physical stimulation are a constant accompaniment to discussions of music's impact on the body, and the chapters in this book reflect that. Physicians have often drawn on considerations of this kind to put forward a range of models of music's effect as a basis for music therapy. Several of the contributions to this volume show how new thinking on music and the nerves has periodically sparked real hopes for the widespread use of music in medicine.

In the next chapter George Rousseau, whose work on the role of neurology on Enlightenment culture has proved enormously influential over the past four decades, gives an overview of the topic including his own personal insights as a classically trained pianist and historian.[41] Starting with a retrospective of the development of his own thinking about music, meaning and the mind, it provides an overview of how thinkers from the Enlightenment to the twentieth century have speculated about the relationship between music, the nervous system and the mind. It takes in a remarkable range of thinkers on music and the mind, from eighteenth-century figures such as Denis Diderot and Jean-Jacques Rousseau, and Romantics such as Friedrich Schlegel and Ludwig Tieck, to scientists such as Samuel Thomas von Sömmerring and Johannes Müller, and to our contemporaries such as

Oliver Sacks. By bringing together such a broad selection, Rousseau brings out some vital historical and thematic continuities in the 'neuroculture' of music.

The third chapter is by Penelope Gouk, arguably the most significant scholar of the history of music and medicine of the last 30 years.[42] It gives an account of the role of the nerves in English thinking on music between the late sixteenth and late eighteenth centuries, and looks at the way it reflected understandings of mind–body interaction that were moving away from the humours towards the state of the nerves. In that context, it considers the image of the body itself, with its string-like nerves as an instrument, and the affinity ascribed to music's motion and the motion of the spirits either flowing or vibrating through the nerves. Similarly, it also examines the continuity of ideas connecting body and soul and the fine substance filling the universe linking the earth to the heavens, a connection that found new life in the work of Newton and his followers.

In the fourth chapter, Ingrid J. Sykes covers the same period for French medical and scientific discourse on the relationship between music's physical and emotional effects.[43] She shows the way that philosophers such as Nicolas Malebranche, Blaise Pascal and Bernard Lamy considered 'soulful' listening to be an important tool in understanding oneself and, by extension, the needs and concerns of others. Such listening did not entail an attentive, responsive auditory state to a logical set of linguistic or musical phrases, but rather demanded an auditory mode of being which allowed for personal and social transformation. Enlightenment scientific research identified the human ear as a crucial site for the development of the key virtues of modern humanity, 'a sensitivity to the misfortunes of others', in the words of *Le dictionnaire de l'Académie française* of 1694. As such, music's physicality was part of groundbreaking and influential research, especially in relation to education (e.g. in the work of Jean-Philippe Rameau), medical diagnosis (notably in the case of Théophile de Bordeu) and technological innovation.

The fifth chapter, by Pilar Leon-Sanz, examines neglected eighteenth-century Spanish thinking on the role of the nervous system in music therapy and aesthetics.[44] For example, it discusses Pedro de Ulloa, who introduced analytic geometry to Spain (1717), and who offered an explanation of music therapy based on mathematical and physical principles and also on the physiological explanations accepted in this period. Similarly, the renowned organist and musician Paul Nasarre (1664–1724) added empirical data as well observation of the resonance phenomenon to traditional explanations of music's impact. For his part, the Madrid composer Rodriguez de Hita (1724–1787) referred to aesthetic and practical purposes of music. This chapter also discusses some disagreements regarding the use of music therapy, such as those between Benito Jerónimo Feijoo y Montenegro (1676–1764), exponent of Enlightenment rationalism, and the musician Juan Francisco Salamanca Corominas.

The sixth chapter is by the Greek scholar Aris Sarafianos, who considers the shift from harmony to radical stimulation in thinking on music in the late eighteenth century and how that related to classical aesthetics.[45] In particular, it focuses on the established physician Richard Brocklesby's *Reflections on Antient and Modern Musick* (1749) and the famous Scottish 'quack' James Graham, in order to show the biomedical connotations of aesthetic concepts in eighteenth-century aesthetic theory. Ironically, however, it was actually a representative of *irregular* medicine, James Graham, who fleshed out the full ramifications of similar medical engagements with music. He introduced a new aesthetics of healing into medical practice, namely treatments of 'beautiful precision and simplicity', or 'easy' and 'elegant' cures, which were deliberately designed to avoid the 'shock', 'pain' and 'confinement' of traditional cures, revitalising neoclassical medical practice. Though Graham did not reject the quietist and normative ideals of contemporary medical music, his language and practice of 'electrical and aetherial' cures represents a consistent attempt to modernize the ideals of classical medicine.

In Chapter 7, neuroscientist Julene Johnson and musicologist Amy Graziano together examine the history of the way physicians working with patients with aphasia used music to investigate remaining cognitive function.[46] Many neurologists were struck by the paradox that their patients were often able to sing after losing the ability to speak. After considering the eighteenth-century discussion of this phenomenon in the work of Olof von Dahlin and Johann August Philipp Gesner, Johnson and Graziano move on to focus on the position of music in French brain localisation debates of the 1860s involving the likes of Paul Broca and J-B. Bouillaud. They then go on to describe the emergence of the diagnosis of amusia (a neurological impairment of the ability to process music) in the work of German, British and French scientists of the late nineteenth century such as August Knoblauch, Hughlings Jackson and Richard Wallaschek.

In the eighth chapter, Alexandra Hui examines the interaction between neurology, experimental psychology and musical aesthetics in Vienna around 1900.[47] In particular, she looks at the ideas of the Austrian physicist, psychophysicist and philosopher Ernst Mach, his friend the journalist, critic and author Eduard Kulke and the comparative musicologist Richard Wallaschek. Building on evolutionary thought and the psychophysical framework set up by Mach, the musical theories of Kulke and Wallaschek ended up with a kind of historical and cultural relativism. In the increasingly poisonous cultural and political atmosphere of Vienna at the turn of the century, their sense of equality between sensations, perspective and cultures stands out for its moderation as much as for its combination of aesthetics and science.

The final chapter takes a more musicological view of the relationship between music and medical ideas of the body. Wiebke Thormählen looks at

the impact of theories of nervousness on debates on virtuosity.[48] Examining the debate on figures such as Franz Liszt, the chapter considers the musical body as the location of nervous stimulation, as an object of display and as the subject of complex discourses on class and gender. Drawing on portraits of virtuosi from the eighteenth and nineteenth centuries and medical literature, it provides an important insight into the position of embodiment at a crucial period in the development of both the ideology of Classical music and of modern bourgeois subjectivity.

By bringing together the scientific and aesthetic discourses on music of the past few centuries, these contributions to the history of music and the nerves enrich our understanding of both in important ways. They provide a basis for overcoming some of the misunderstandings and misconceptions that come from having parallel debates in different disciplines, giving the neuroscience of music a historical context, and supporting those in musicology who are attempting to give musical embodiment a solid grounding in the medical culture of specific periods. As a consideration of the history of the interactions between medical and aesthetic understandings of music, of the challenge of essentially materialist explanations for music's effects, this volume is certainly well timed, and will hopefully contribute to more constructive engagement between musicologists, historians and neuroscientists who deal with music.

Notes

1. Raymond Tallis, *Aping Mankind: Neuromania, Darwinitis and the Misrepresentation of Humanity* (London: Acumen, 2011), Paolo Legrenzi and Carlo Umilta, *Neuromania: On the Limits of Brain Science* (Oxford: Oxford University Press, 2011). See also the debate provoked by A.S. Byatt's article on neuroaesthetics. A.S. Byatt, 'Observe the Neurones', *Times Literary Supplement* (22 September 2006).
2. See, for example, Isabelle Peretz and Robert Zatorre, *The Cognitive Neuroscience of Music* (Oxford: Oxford University Press, 2003), Katie Overy, Isabelle Peretz, Robert Zatorre, Luisa Lopez and Maria Manjo, *Neurosciences and Music IV* (New York: Wiley, 2012), L. Stewart, K. von Kriegstein, Jason D. Warren and Timothy D. Griffiths, 'Music and the Brain: Disorders of Musical Listening', *Brain* CXXIX (2006), 2533–2553, L. Stewart, 'Musical Thrills and Chills', *Trends in Cognitive Sciences* 11 (2007), 5–6, Aniruddh Patel, 'Language, Music, Syntax and the Brain', *Nature Neuroscience* 6 (2003), 674–681.
3. Stefan Koelsch, *Music and the Brain* (Oxford: Wiley-Blackwell, 2012), x.
4. R.A. Henson, 'Neurological Aspects of Musical Experience', in Macdonald Critchley and R.A. Henson, eds., *Music and the Brain: Studies in the Neurology of Music* (London: William Heinemann, 1977), 3–21, here 3. Manfred Clynes, ed., *Music, Mind and Brain* (New York: Plenum, 1982), Isabel Peretz and Robert Zartorre, eds., *The Cognitive Neuroscience of Music* (Oxford, Oxford University Press, 2003), Aniruddh D. Patel, *Music, Language and the Brain* (Oxford: Oxford University Press, 2006), Anthony Storr, *Music and the Mind* (New York: Harper Collins, 1992), John C. Brust, 'Music and the Neurologist: An Historical Perspective', *Annals of the New York Academy of Sciences* 930 (2001), 143–152.

5. Arthur P. Shihamura and Stephen E. Palmer, eds., *Aesthetic Science: Connecting Minds, Brains and Experience* (Oxford: Oxford University Press, 2012).
6. Susan McClary, 'Music, the Pythagoreans and the Body', in Susan Leigh Foster, ed., *Choreographing History* (Bloomington, IN: University of Indiana Press, 1985), 82–104, Susan McClary, *Feminine Endings: Music, Gender and Sexuality* (Minneapolis: University of Minnesota Press, 2002), Suzanne Cusick, 'Feminist Theory, Music Theory, and the Mind-Body Problem', *Perspectives of New Music* 32 (1994), 8–27, Ruth Solie, ed., *Musicology and Difference* (Berkeley and Los Angeles: University of California Press, 1995), Philip Brett, Elizabeth Wood, Gary C. Thomas, eds., *Queering the Pitch: The New Hay and Lesbian Musicology* (New York: Routledge, 1994).
7. Carl Dahlhaus, *The Idea of Absolute Music* (Chicago: University of Chicago Press, 1991), Daniel Chua, *Absolute Music and the Construction of Meaning* (Cambridge, MA: Cambridge University Press, 1999), Scott Burnham, *Beethoven Hero* (Princeton: Princeton University Press, 1995).
8. David Michael Bashwiner, 'Lifting the Foot: The Neural Underpinnings of the 'Pathological' Response to Music', in Barbara Maria Stafford, ed., *Bridging the Humanities-Neuroscience Divide: A Field Guide to a New Meta-Field* (Chicago: University of Chicago Press, 2011), 239–266, here 262.
9. Bevil R. Conway and Alexander Rehding, 'Neuroaesthetics and the Trouble with Beauty', *Plos Biology* 11 (2013).
10. Matthew B. Crawford, 'The Limits of Neurotalk', *New Atlantis*, XIX (2008), 65–78, here 65. See also Edward Vul, Christine Harris, Piotr Winkielman and Harold Pashler, 'Voodoo Correlations in Social Neuroscience' *Perspectives on Psychological Science* 4 (2007), 274–290, Matthew D. Lieberman, Elliot T. Berman and Tor D. Wager, 'Correlations in Social Neuroscience aren't Voodoo', *Perspectives on Psychological Science* 4 (2009), 299–307, Deena Skolnick Weisberg, Frank C. Keil, Joshua Goodstein, Elizabeth Rawson and Jeremy R. Gray, 'The Seductive Allure of Neuroscience Explanations', *Journal of Cognitive Neuroscience* 20 (2008), 470–477.
11. Drawing on the work of people such as Lakoff and Johnson, some have pointed out the extent to which the seemingly abstract language used to describe music itself assumes embodied knowledge. J. Saslawa, 'Forces, Containers and Paths: The Role of Body-Derived Schemas in the Conceptualization of Music', *Journal of Music Theory* 40 (1996), 217–243.
12. Jonah Lehrer, *Proust was a Neuroscientist* (Boston: Houghton Mifflin, 2007), 141. See James Kennaway, *Bad Vibrations: The History of the Idea of Music as a Cause of Disease* (Farnham: Ashgate, 2012).
13. See Truman Bullard's Dissertation The First Performance of Igor Stravinsky's *Sacre du Printemps* 1971 – Eastman School of Music, Richard Taruskin, 'A Myth of the Twentieth Century', *Modernism/Modernity* 2 (1995), 1–26.
14. F.H. Rauscher, G.L. Shaw, K.N. Ky, 'Music and Spatial Task Performance', *Nature* 365 (1995), 611. F.H. Rauscher, G.L. Shaw, K.N. Ky, 'Listening to Mozart Enhances Spatial-Temporal Reasoning, Towards a Neurophysiological Basis', *Neuroscience Letters* 185 (1995), 44–47. E.G. Schellenberg, 'Music and Cognitive Abilities', *Current Directions on Psychological Science* 14 (2005), 317–320. E.G. Schellenberg, 'Long-Term Positive Associations Between Music Lessons and IQ', *Journal of Educational Psychology* 98 (2006), 457–468. E.G. Schellenberg, 'Music Listening and Cognitive Abilities in 10- and 11-Year-Olds: The Blur Effect', *Annals of the New York Academy of Sciences* 1060 (2005), 202–209.
15. Peretz and Zatorre, *The Cognitive Neuroscience of Music*, 438.

16. Don Campbell, *The Mozart Effect for Children* (London: Hodder and Staughton, 2000), 8.
17. Campbell, *The Mozart Effect for Children*, 12.
18. Nancy C. Andreasen, *The Creating Brain: The Neuroscience of Genius* (New York: Dana Press, 2005), 178.
19. Tamar Lewin, 'No Einstein in Your Crib? Get a Refund', *New York Times* (23 October 2009), A1.
20. Susan McClary 'Music, the Pythagoreans and the Body', in Susan Leigh Foster, ed., *Choreographing History* (Bloomington, IN: University of Indiana Press, 1985), 82–104, here 83.
21. Martin West, *Ancient Greek Music* (Oxford: Clarendon, 1992), Ernst Graf, *Die Kampf um die Musik im griechischen Altertum* (Quedlinburg: Kloppel, 1907), Edward A. Lippman, ed., *Musical Aesthetics: A Historical Reader, Volume I: From Antiquity to the Eighteenth Century* (New York: Pendragon Press, 1986), Jamie James, *The Music of the Spheres: Music, Science and the Natural Order of the Universe* (New York: Springer, 1993), Herbert M. Schueller, *The Idea of Music: An Introduction to Musical Aesthetics in Antiquity and the Middle Ages* (Kalamazoo: Medieval Institutes Publications, 1988).
22. Stanley Finger, *Origins of Neuroscience: A History of Explorations into Brain Function* (Oxford: Oxford University Press, 1994), 108–109.
23. See Sophie Gibson, *Aristoxenus of Tarentum and the Birth of Musicology* (London: Routledge, 2005).
24. Lawrence Sterne's character Tristram Shandy reflected the Pythagorean hostility to physicality in typically robust fashion, declaring his admiration for their wisdom in their 'getting out of the body, in order to think well'. Lawrence Sterne, *The Life and Opinions of Tristram Shandy* (Harmondsworth: Penguin, 1967), 472.
25. Francesco Pelosi, *Plato on Music, Soul and Body* (Cambridge, MA: Cambridge University Press, 2010), 156. M.M. Sassi, *Le Teorie della percezione in Democrito* (Florence: La Nouva Italia, 1978), 109–119, L. Brisson, 'Plato's Theory of Sense Perception in the *Timaeus*. How it Works and What it Means', in J.J. Cleary and G.M. Gurtler, eds., *Proceedings of the Boston Area Colloquium in Ancient Philosophy* 13 (1999), 147–176, Andrew Barker, 'Timaeus on Music and the Liver', in M.R. Wright, ed., *Reason and Necessity: Essays on Plato's Timaeus* (London: Gerald Duckworth, 2000), 85–100.
26. Edward A. Lippman, 'The Sources and Development of the Ethical View of Music in Ancient Greece', *The Musical Quarterly* 49.2 (1963), 188–209.
27. Plato, *Republic* (Cambridge, MA: Loeb, 2013), 2 vols, I:317.
28. Boethius, *De institutione musica*. See Calvin M. Bower's translation, *Foundations of Music* (New Haven: Yale University Press, 1989).
29. Saint Augustine, *Confessions,* 10.33.50. See also Bruce Holsinger, *Music, Body and Desire in Medieval Culture: Hildegard of Bingen to Chaucer* (Stanford: Stanford University Press, 2001), 61–83.
30. H.F. Cohen, *Quantifying Music: The Science of Music at the First Stage of the Scientific Revolution* (Dordrecht: D. Reidel, 1984), 13–33, Myles Jackson, 'Music and Science During the Scientific Revolution', *Perspectives on Science* 9 (2001), 106–115.
31. Penelope Gouk, 'The Role of Acoustics in the Scientific Revolution', in Thomas Christensen, ed., *The Cambridge History of Western Music Theory* (Cambridge, MA: Cambridge University Press, 2002), 223–245, Benjamin Wardhaugh, *Music, Experiment and Mathematics in England, 1653–1705* (Farnham: Ashgate, 2008).
32. Joseph Duverney, *A Treatise of the Organ of Hearing* (London, 1737), 89.

33. Ernest Hartley Coleridge, ed., *Letters of Samuel Taylor Coleridge* (Boston: Houghton, Mifflin and Co., 1895) 2 vols, 1.217.
34. Nancy Kovaleff and Thomas Christensen, *Aesthetics and the Art of Musical Composition in the German Enlightenment: Selected Writings of Johann Georg Sulzer and Heinrich Christiph Koch* (Cambridge, MA: Cambridge University Press, 1995), Leslie David Blasius, 'The Mechanics of Sensation and the Construction of the Romantic Musical Experience', Ian Bent, ed., *Music Theory in the Age of Romanticism* (Cambridge, MA: Cambridge University Press, 1996), 3–24.
35. Matthew Riley, *Musical Listening in the German Enlightenment* (Aldershot: Ashgate, 2004), 72.
36. Hans-Jürgen Möller, *Musik gegen Wahnsinn: Geschichte und Gegenwart musiktherapetischer Vorstellungen* (Stuttgart: Fink, 1971), 39–59, and Rudolf Schumacher, *Die Musik in der Psychiatrie des 19. Jahrhunderts* (Frankfurt: Peter Lang, 1982).
37. Alexandra Hui, *The Psychophysical Ear: Musical Experiments, Experimental Sounds 1840–1910* (Cambridge, MA: MIT Press, 2013). See also Michel Meulders, *Helmholtz: From Enlightenment to Neuroscience* (Cambridge, MA: The MIT Press, 2010).
38. Eduard Hanslick, *Vom Musikalisch-Schönen* (Leipzig: R. Weigel, 1854).
39. Kennaway, *Bad Vibrations*, Chapter 3.
40. The dominance of techniques such as Schenkerian analysis is a case in point. See Nicholas Cook, *The Schenker Project: Culture, Race and Music Theory in fin-de-siecle Vienna* (Oxford: Oxford University Press, 2010).
41. George Rousseau, *Nervous Acts Nervous Acts: Essays on Literature, Culture and Sensibility* (Basingstoke: Palgrave, 2004).
42. Penelope Gouk, 'Making Music, Making Knowledge: The Harmonious Universe of Athanasius Kircher', in Daniel Stolzenberg, ed., *The Great Art of Knowing: The Baroque Encyclopaedia of Athanasius Kircher* (Stanford: Stanford University Libraries, 2001), 71–83, Penelope Gouk, *Music, Science and Natural Magic in Seventeenth-Century England* (New Haven: Yale University Press, 1999), Penelope Gouk, 'Raising Spirits and Restoring Souls: Early Modern Medical Explanations for Music's Effects', in Veit Erlmann, ed., *Hearing Cultures: Essays on Sound, Listening, and Modernity* (Oxford: Berg, 2004), 87–105, Penelope Gouk, 'The Role of Harmonics', Penelope Gouk and Helen Hills, eds., *Representing Emotions: New Connections in the Histories of Art, Music and Medicine* (Aldershot: Ashgate, 2005), 191–208.
43. Penelope Gouk and Ingrid Sykes, 'Hearing Science in Mid-Eighteenth-Century Britain and France', *Journal of the History of Medicine and Allied Sciences* 96 (2011), 507–545.
44. Pilar Léon Sanz, 'Medical Theories of Tarantism in Eighteenth-Century Spain', in Peregrine Horden, ed., *Music as Medicine* (Farnham: Ashgate, 2001), 273–292, Pilar Leon-Sanz, 'Teoría de la acción terapeútica de la música en la medicina del s. XVIII', *Nassarre: Revista aragonesa de musicología* 7 (1991), 73–155.
45. Aris Sarafianos, 'Burke's Physiological Iconography of Aesthetic Perception and the Invention of Sublime Medicine', *Comparative Critical Studies* 2 (2005), 227–240, Aris Sarafianos, 'The Contactility of Burke's Sublime and Heterodoxies in Medicine and Art', *Journal of the History of Ideas* 69 (2008), 23–48, Aris Sarafianos, 'Pain, Labor, and the Sublime: Medical Gymnastics and Burke's Aesthetics', *Representations* 91 (2005), 58–83.
46. Julene Johnson, Amy Graziao and Jacky Hayward, 'Historical Perspectives on the Study of Music in Neurology', in Frank Clifford Rose, ed., *The Neurology of Music* (London: Imperial College Press, 2011), 17–30, Amy Graziano, A. Pech,

C. Hou and Julene Johnson, 'Hermann Oppenheim's Observation About Music in Aphasia', *Journal of the History of the Neurosciences* 21 (2012), 1–16, Julene Johnson, Serge Nicolas and Amy Graziano, 'Jean-Martin Charcot's Role in the 19th-Century Study of Music Aphasia', *Brain* 136 (2013), 1662–1670.

47. Hui, *The Psychophysical Ear*, Alexandra Hui, 'Sound Objects and Sound Products: Standardizing a New Culture of Listening in the First Half of the Twentieth Century', *Culture Unbound: Journal of Current Cultural Research* 4 (2012), 599.
48. Wiebke Thormählen, 'Playing with Art: Musical Arrangement as Educational Tools in van Swieten's Vienna', *The Journal of Musicology* 27 (2010), 342–376.

2

(Nervously) Grappling with (Musical) 'Pictures in the Mind': A Personal Account[1]

George Rousseau

New York 1955

I still date my academic development in the performance of chamber music to the day in 1955, in Manhattan, when music coach Carl Mossbacher asked me whether I saw 'pictures in the mind' when I played. Not whether I felt emotions, which would at least have embodied the 'pictures' in some psychosomatic or psychocognitive way, or whether I concentrated on playing the musical notes, but saw mental 'pictures' – specifically 'pictures in the mind', pretty rivulets or wild oceans or dark clouds.

The question resonated to this very young man. Were pictures in the mind *emotions*? How did they get there by listening to the sounds? If not, how could a mental image not drawn on a canvas exist without the presence of an affect? I remember asking myself whether cognition can exist entirely apart from affect. Even young performers effectively know they are cogitating or daydreaming throughout their performances, not only about technical mastery but experiencing some type of stream of consciousness about the music they are playing. Are they thinking or seeing without the presence of any feeling? Besides, which thoughts, what 'pictures'?

The questions raised were prolific. Perhaps Mossbacher should have targeted his question to listeners: did *they too* emplot 'pictures in their minds' when they listened? If they did, *which* pictures? And what are the mechanisms of the emplotment? After all, listeners were not coping with immense technical demands to reproduce the composer's scores but idly sitting and responding to it. Framed this way, by distinguishing between performers and listeners, Mossbacher's question appeared far too simplistic, even to an adolescent; focused on performers to the exclusion of listeners, or vice versa, and omitting other dimensions as well, such as the huge differences between diverse groups of performers and listeners from widely different cultural backgrounds, West and East. The quandary has continued to preoccupy all

manner of philosophers and physicists, those immersed in the history of aesthetics as well as the anatomico-physics of the ear, eye and brain, even when they do so quite separately from the question I was posing to myself about music's reputation as the most accessible of all the arts. The fundamental question appeared to be associative – musical tones giving rise to, or emplotting, certain associations in the listener.[2] The question's historiography has by now involved fields far flung from aesthetics, areas correlating the arts and life sciences in the transformative period of Romanticism, as well as the input of newer sub-disciplines such as neurophysiology and neuropsychology. I had no idea what substratum underlay Mossbacher's question when he first asked it in 1955.

Mossbacher, who died around 1980, was a German émigré who fled the Nazi menace for America before the war. He became a much sought-after chamber-music coach in New York City during the 1950s and was guiding me to perform the Mendelssohn piano trios. This was long before the musical mapping of the brain, the rise of computer-based neurophysiological approaches to aesthetic experience – indeed before all neuro-based avenues of exploration in the arts – or, alternatively, the interrelation of medicine and music in the deft way Oliver Sacks, for example, has configured the two domains.[3]

My reply was tentative: neither yes or no but adolescent waffle. I had never pondered 'pictures' arising from purely instrumental music, unless it was Debussy's *Clair de Lune* or Mussorgsky's *Pictures at an Exhibition* or Tchaikovsky's *Swan Lake*, and as an aspiring virtuoso keyboard performer I had pondered even less the emotions that attached to specific musical compositions. If Mossbacher had asked me about Schumann's instrumental music – *Carnival* or *Nachtmusik* or *Gesang der Frühe* – the question might have elicited a keener reply because Schumann was half invested in programmatic music, as the titles of his works suggest, and I did indeed see 'pictures' when I played it. But Mendelssohn's instrumental music is 'absolute' in Carl Dahlhaus's sense – wordless, non-programmatic, ineffable – although Wagner, rather than Dahlhaus, coined the expression 'absolute' in his famous essay on Beethoven's Ninth Symphony and German music critic Eduard Hanslick (1825–1904) also used it.[4]

I shall turn to Dahlhaus momentarily but first need to comment that as an adolescent performer the only image I associated with the first Mendelssohn trio (opus 49) was *excess*: so many notes, excessive virtuosity, especially if viewed in its musico-historical context, as well as the excess of driving forward, erupting angst explicit in his *agitato tempi* and ever-ascending D-minor chords. So I mulled over Mossbacher's question that year, and finding no satisfactory answer one way or the other, forgot it. Besides, he was too tactful to press me just before the concert.

I forgot it, but not without wondering what music 'tells you' and how it does so, for it tells you something – the age-old debate has been the

type of awareness. I remember concluding, perhaps naively, that because music is something it must come from somewhere. The 'something' had to arise from the rhythms, harmonies, melodies or – alternatively – the combined intuition and imagination of the listener, in which case the more highly attuned her intuition–imagination, the more the music speaks. But I could not unravel this web of mysteries, and even after graduating from universities I was still nowhere in addressing it. I knew I veered towards a quasi-hermeneutical approach leading to the listener's subjectivity and a fraught position suggesting that the music's greatness does not lie in the music itself but in the listener. Much later I learned that a large percentage of professional musicologists pursue the analysis of musical texts as 'absolute music' – instrumental music without words in the way Dahlhaus defined it – through the analysis of form. This was similar to literary structuralists analysing texts according to formal structural principles. And both the literary and musical structuralists often did so in Kant's sense, mandating 'form' as the ultimate meaning of a work of art, especially when citing Kant's principle that 'art is form'.

After becoming a professional academic I puzzled over the case for and against music as universal language, for music as expressing everything and expressing nothing; opposite poles such as Walter Pater's expressionist edict that 'all art constantly aspires towards the condition of music'[5] – presumably because music embodies a universal language – and Eduard Hanslick's (1825–1904) anti-expressionist view that however preponderantly music may be a 'language intended to arouse feelings' in the end it does not – this is why it is absolute. These seemed such plain pronouncements as not to require further comment, except that their simplicity disguised their sphinx-like riddles. To these I supplemented Heinrich Schenker's (1868–1935) far more complicated structuralism, the German musicologist known for an approach to musical forms now referred to as Schenkerian analysis.[6] Schenker considered his analyses as tools to be used by performers, in addition to musicologists, for the acquisition of a deeper understanding of the structure of works they were performing, an approach demonstrated by his editions of Beethoven's late piano sonatas, especially opuses 106, 109, 110 and 111. Schenker defined a musical work's structural essence (*Ursatz)* by the analysis of its tone and pitch, holding at bay in the background its 'rhythms' and what he termed its 'arhythms'. By the 1980s Schenkerian analysis had become a stock analytical tool of Western music theorists. However, even its disciples agreed that it was a subjective analytic method based on the listener's intuition, somewhat like the subjective views I had held earlier without knowing what they were. But if Schenker's theories have been increasingly challenged during three generations for their rigidity and ingrained organicist ideology (philosophically he was a through-and-through organicist committed to the work's 'form' as an organic whole determining the meaning of *all* its constituent parts), the

analytical tradition they inspired has remained central to the study of tonal music.

This was apparent to me by approximately 1980. So too was the supposition that when musicologists discussed programmatic music, in contrast to absolute music, 'pictures' were expected: fate in Tchaikovsky, war and militarism in Mahler, *rites de passage* in Stravinsky, bearing in mind for all these composers that after the 1870s the money was in this type of music rather than the older Romantic style. Similarly, among opera scholars who integrated musical form and libretto: the passions in Mozart, Italian nationalism in Verdi, Eros and redemption in Wagner. But when the object of analysis was non-mimetic instrumental music – tones that did not remind anyone of anything in particular or, in my earlier experience while under the influence of Mossbacher, musical forms not giving rise to 'pictures in the mind' – impediments to interpretation arose about a 'language of art'. This debate about non-mimetic music giving rise to pictures continues to rage well into our era, as philosopher of aesthetics Peter Kivy's many books demonstrate.[7] But I do not want to digress too widely from the chronology of my dilemma, for it was still unclear to me why certain musical forms *without* words were clearly mimetic while others were not. Even in about 1980 mimesis was my thorn: what imitation *was*, why certain felt emotions could be imitated and others not, and precisely how musical forms were mimetic. Yet the more I sought to understand the pre-Schenkerian and pre-Dahlhausian – despite their differences – history of this development up to about1850, paradoxically the less confident I grew about the prior century from approximately 1750.

Thinkers then (1750–1850) also sought to discover the 'meaning of music', especially why music more than any other art has such instant appeal for listeners. Today we can banish the whole debate by declaring that music has *no* meaning; that as the most abstract of the arts, as formally the least representational, it merely *is* – it exists in some higher transcendental sense without any form of representation. Nevertheless, many thinkers in the century prior to 1850 would not surrender their quest to understand it. And it remained one of their fundamental questions in relation to the discovery of the human dimension in music – the theme of this volume: how can the human be discovered without understanding why music speaks so directly, and so powerfully, to human creatures?

Los Angeles 1980

So I continued working chronologically backwards, as it were, turning to the aesthetic theory of the late eighteenth and early nineteenth centuries, pondering oblique pronouncements like Hegel's view that 'instrumental music is not strictly art at all' (Schenker, Drabkin and Bent, *Der Tonwille*, II, 60).

Broadly, I found instrumental music praised for its 'artificiality' rather than for being esoteric or sublime, and melody alone construed as capable of capturing sublimity. The accolade was important: not merely for sublimity's magisterial role in Romanticist aesthetics but because instrumental music without texts had been devalued long before the nineteenth century. Here, again, Kant was a major detractor on the grounds that wordless musical forms, however structurally perfect, could not attain the desired sublimity; among his reasons was the idea that instrumental music without words exists apart from the objects to which it refers – pointing again to the possibility of 'pictures in the mind'.[8]

Flash forward to the 1980s and 1990s and a swath of thought appeared arguing that music was the highest of art forms because it spoke *directly* to us: without passing through the intellect (mind?) it pierced directly to our inner self – so the line went – or to whatever our equivalent for inner self was. The clichés are familiar: that music speaks directly because its language is other than verbal, or that its combination of rhythm, harmony and melody arouses in ways that words cannot, or that it exists beyond the verbal realm. The rationale invoked depended upon terms such as 'language' (the language of music) and symbolic meaning. Music, it was said, was another kind of language than ordinary, spoken, mimetic language, and man alone among living creatures was able to respond – so went the line – to its mysteries. This sounded like a modern version of the Enlightenment dictum that 'music speaks directly to the soul'. But it turns out that neither view is accurate: animals also respond to music, some in sophisticated ways, perhaps in ways relational to their potential for soul, and now that plants too have been shown to 'remember' and 'react' to information contained in light,[9] it may turn out that animals are far more sensitive to musical tones than has been thought.

Even so, 20 years ago the analysis of animal response was a less sophisticated field than it is today, and the kind of 'language' music entails has still not been defined. Besides, and to further complicate the riddles involved, 'language' – ordinary and extraordinary – is now perhaps more than ever recognised for its propensity to critical slippage. Furthermore, we might concur that whereas animals perceive their world by instincts and direct sensory perception, man has created his mental universe out of symbolic meanings, and that this edifice shapes his perception of reality; the main reason why man alone, for example, can conceive of utopias and empathically imagine the abstract of 'pain' in the form of shared human culture. For much of this view we are indebted to Ernst Cassirer (1874–1945), the German scholar of Enlightenment philosophy whose broad theories leaned on Kant's transcendental idealism purporting that the actual world cannot be known, and that the human view of reality is an integrated one shaped by our means of perceiving it, this in opposition to essence it actually possesses.

Cassirer's symbolic forms of thought were categorised as linguistic, scientific and artistic, sharing and extending through communication, individual understanding, discovery and expression. Of all these music, he judged, to be the most symbolic, more so than abstract art. It was not hard to understand why such an ardent Kantian as Cassirer could arrive at this position. Even so, it did not answer Mossbacher's question about 'seeing pictures' when I played. So for further assistance I looked elsewhere during that period, especially to historical writing about the pre-1850 aesthetics of music. Here a classmate helped me. At Princeton during the end of the 1960s I had met John Neubauer, a Hungarian refugee who studied comparative literature and published an important book entitled *The Emancipation of Music From Literature*.[10] Chronologically he focused on the Romantic era (1760–1830) when instrumental music was finally being recognised as 'sublime' in its own right. During this epoch several musical forms broke away from accompanied texts – especially instrumental *Lieder* – and the wordless sound itself was the bearer of its own value. Once independent of language the question about the meaning of music's sounds veered course, and it was not long before scholars like Dahlhaus came along to define 'absolute music' as music without texts, for example, works such as Mendelssohn's 'Songs without Words' begun in 1829, an early experiment to justify sublimity precisely through the production of 'pictures in the mind' having arisen without words.

How did Mendelssohn do it? He wrote his first three volumes of this 'experiment' before the opus 49 trio, composed in 1839, but the leap from one – the songs – to the other – the wordless piano trio – was not great and they shared many qualities, including the absence of verbal glosses other than tempo markings. Mendelssohn's experiment apart, the historical development of the separation of music and words – or words and music, depending on which was elevated over the other – still puzzled me and drove me to rethink music's phenomenological essences. The Pythagorean belief was that music's unique communicative ability rests on numerical relationships, a view the Platonists and neo-Platonists of the ancient world discussed. By the seventeenth century, the important categories had altered to harmony, melody and the significance of voices (in the polyphonic sense). An enduring position was that music is imitative – or mimetic – principally through its melodies, whose tonal configurations echo those of the ordinary world: a swift-moving upscale passage on the flute the flight of a bird, slow and sombre march-like tones a funeral march, and so forth. But this mimetic view was increasingly being challenged by the notion that the harmonic arrangements of musical forms counted for more.

This development, in turn, fuelled the terms for the debate between Rameau and Rousseau: Rousseau defending the mimetic position that music 'paints pictures', or expresses emotions, Rameau the more chronologically recent one about harmonic and polyphonic structures that are non-mimetic.

Much of their argument centred on issues about the 'priority' of each category: that is, which of the two (melody versus harmony) was older in music and therefore more consequential. Rousseau's defence of the imitative approach gathered support from the proponents of 'the word' (*logos*) as the highest authority, and from the universality of verbal languages. They argued that musical forms, especially its melodies, were similar to inflections in speech representing images, objects and sentiments, as well as the nuances and affections so vital to humankind. Rameau claimed that harmony was the opposite of melody and was physicalist; its harmonies presented no 'pictures in the mind' but somehow (this somehow was crucial) resonated in the physical body to elicit the powerful responses listeners had. Rameau's aesthetics seemed on the right track, except that it did not proceed sufficiently far to define the interstices in these processes of resonating.

The mathematical view yielded to the physiological in the eighteenth century, especially under the weight of Newtonian science, and the debates between Rousseau and Rameau further shifted the terms of analysis in the 1760s: Rousseau claiming that melody was antecedent, Rameau harmony for music's effects on listeners. Their emphasis was on the produced sounds themselves rather than the listeners' auditory capability, but Diderot superadded an element in *Rameau's Nephew* – composed during the 1760s and aptly named for the composer at the centre of the musical debates – when claiming that the human anatomical nervous apparatus itself involuntarily produced physiologically induced emotions – so powerfully that his rundown nephew has become mad; as if his nervous system is a harmonically resounding musical clavichord. Diderot's logic is causative: over-wrought nerves, repeatedly strained by practising instrumental music, have corrupted his nephew's anatomy and left him as deranged as any inmate of Hogarth's Bedlam.

Diderot's leap about the production of emotions was prophetic, even if based on intuition rather more than observation, and if generated during decades when the philosophical passage between feelings as 'passions' and feelings as 'emotions' was fraught. Post-Lamarckian biology and zoology would demonstrate the power of music in other living creatures than humans. But the late eighteenth century appears not to have debated in any earnest degree whether cats and dogs respond to music;[11] three centuries later we know they do but not in ways similar to the cognitively more evolved and sophisticated *homo sapiens*. After Diderot's death in 1784 the physiological approach continued for at least another half century, directing discussion to the listener's audio-neurological capability rather than just its sounds. This approach engaged diverse commentators, especially in Germany where the new Romantic ideologies were flourishing. Ludwig Tieck (1773–1853), a literary figure with broad interests, also took up this approach but did not explain whether the 'feelings' were inherent in the sensations or embedded within them. Tieck placed himself within the camp

of 'nervous-affect' (the view that sensory impressions give rise to feelings) but he did not specify exactly how the feelings themselves arise.[12]

Neubauer's book described these debates, especially the reception of Rousseau's musical aesthetics: how music was a 'language' apart from ordinary languages, how its melodies were mimetic and captured images in Nature and produced pictures in the mind. Neubauer also discussed figures such as the Abbé du Bois and Herder and many others defending the view that without the prior production of 'images in the mind' the listener's subsequent emotional response could not exist. This *a priori* requirement was fundamental to my search. The progression from melody to images and further on to emotion made logical sense, yet it did not explain much about the production of the listener's emotional response, at least not in ways implicating the human body and its complex physico-physiological mechanisms, then (1750–1850) under such intense scrutiny in the scientific community.

The debates turned on inherently different premises: first, the barbarity of instrumental music, a view extending well into the nineteenth century, and second, the separation of *musical* sounds from *verbal* languages. One can comprehend how music, an art form so critical to the Christian mass, can have followed this course in eras before the Enlightenment. Contrasts, however, between musical and verbal 'languages' was another, far more precarious, endeavour. Music with words could appear empty, and hence barbaric, to listeners accustomed for centuries to its words leading them to heaven's lofty heights – except in opera, the new musical form straining the debate; but contrasts between musical sounds and verbal languages – especially the notion of verbal languages as inferior or superior to those combinations of sounds – was as knotty a philosophical task as could be imagined. The mimetic case was strong: sounds combined with words move listeners by reminding them of the external world to which it subtly points. It was not surprising, therefore, that debates about the separation of music and language, and their consequences, posed immense hurdles during the eighteenth century.

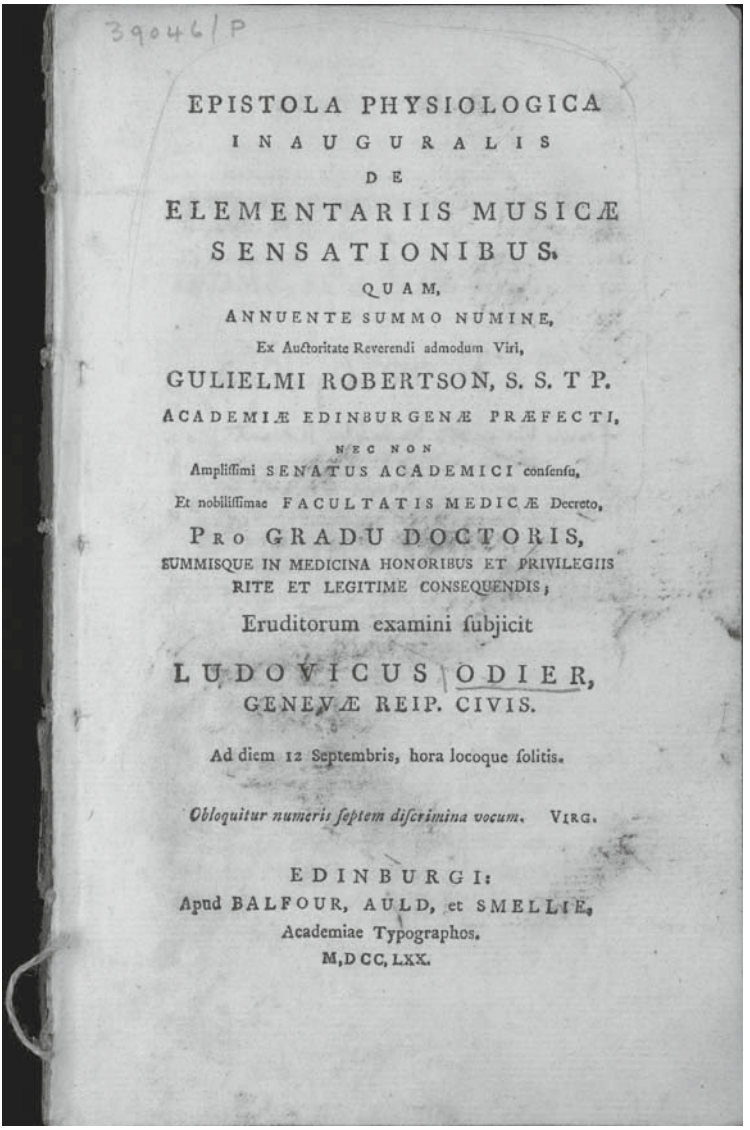
Historians of aesthetics have studied these controversies and there is no reason to retrace their steps here except to identify some of the major positions. Friedrich Schlegel, the Romantic poet-critic, took the position that rhythm is opposed to harmony with the fervour of earlier philosophers, claiming that reason is opposed to imagination, and adding, as Alexander Pope famously did in the *Essay on Criticism*, that '*Wit and Judgment* often are at strife,/ Tho' meant each other's Aid, like Man and Wife.' Schlegel extended Rameau's case by seeming to devalue melody to the detriment of rhythm and harmony, and further contributing the idea that form is 'spirit' in music. In this view musical forms (i.e. symphonies, concertos, sonatas) do not embody the mere shell of a representation or set of affections, but are innately God-given and demonstrate the composer-maker's genius. Ideas about genius had intensified in the late Enlightenment, so markedly that

it is not surprising they dominated Romantic aesthetics, often verging on a theory of soul but rarely explicitly saying so. Yet it was remarkable to me – the player of Mendelssohn and other 'absolute music' – that intuitive thinkers like Schlegel could send underground prior theories about mimetic languages and melody versus harmony, in preference for form, structure and the composer as genius.

Oxford 2000

Despite having immersed myself in theories like these I continued to believe the listener had been omitted from the 'pictures in the mind' debates. Listeners had been marginalised, more generally, throughout recent music history, whose main contour could have been etched along lines of collective listeners relating to individual composers. That is, the collated responses of large bodies of listeners to great individual composers: the masses responding to Bach, Mozart, Beethoven, or – more recently – to Stravinsky, Prokofiev, Shostakovich; or the more clichéd views, with specific examples, that Chopin and Tchaikovsky are 'easy' on their listeners (meaning that most listeners, most audiences in most generations and cultures, easily take to their music rather than resist it) while Schumann, Liszt and Wagner are not. The reasons for these divisions are complex and depend on multiple factors exceeding the single categories of melody, rhythm, harmony, and so forth, but also depend, in some part, on the 'pictures in the mind' thrown up by the musical forms of these composers. Biographically, I had increasingly turned to the history of science and medicine for answers involving the listener, and now had also been working on the rise of Enlightenment neuroculture since the Enlightenment days of George Cheyne in England, Etienne Condillac in France, and Robert Whytt and William Cullen in Scotland. 'Neuroculture' is a slippery term because it implies 'nervous dissemination' above all other cultural influences, but even so there is no doubt that knowledge about the role of nervous neurophysiology greatly increased at the end of the eighteenth century and infiltrated popular thought on many levels.[13]

A basic premise of this late Enlightenment flowering of neuroculture was the view that 'neural life' is enabled by nervous sensation, and that humans would be remarkably different creatures if their cerebral organisation had evolved differently or their neural apparatus had been nuanced in other ways. Their identities and subjectivities, their forms of cognition and ranges of emotional response were predetermined, it seemed, by this fact of cerebral realism. The implications of neuroculture for music theory were vast. But even then, major and minor philosophers and medical doctors saw the relevance. For example, Ludovicus Odier (1748–1817), a name now so obscure it is only found in a few libraries, wrote a dissertation on musical forms and neurophysiology (1770)[14] crudely correlating nervous



EPISTOLA PHYSIOLOGICA
INAUGURALIS
DE
ELEMENTARIIS MUSICÆ
SENSATIONIBUS.
QUAM,
ANNUENTE SUMMO NUMINE,
Ex Auctoritate Reverendi admodum Viri,
GULIELMI ROBERTSON, S. S. T P.
ACADEMIÆ EDINBURGENÆ PRÆFECTI,
NEC NON
Ampliſſimi SENATUS ACADEMICI conſenſu,
Et nobiliſſimae FACULTATIS MEDICÆ Decreto,
PRO GRADU DOCTORIS,
SUMMISQUE IN MEDICINA HONORIBUS ET PRIVILEGIIS
RITE ET LEGITIME CONSEQUENDIS;
Eruditorum examini ſubjicit
LUDOVICUS ODIER,
GENEVÆ REIP. CIVIS.

Ad diem 12 Septembris, hora locoque ſolitis.

Obloquitur numeris ſeptem diſcrimina vocum. VIRG.

EDINBURGI:
Apud BALFOUR, AULD, et SMELLIE,
Academiae Typographos.
M, D CC, LXX.

Figure 2.1 Title page to Ludovicus Odier's *Epistola Physiologica* (1770)

stimulation and its ensuing sensations in the listener; although Odier was Swiss it was conceived in the spirit of French *lumiére* and suggested how these sensations led to feelings and sentiments. Odier (Figure 2.1) had little notion of the stages of the process, and his neuromania (a word he

never uses but which describes his fanatically neurophysiological logical propensity) was later developed among German polymaths such as Gotthilf Heinrich Schubert (1780–1860) – the other Schubert – and Carl Gustaf Carus (1789–1869), the psychologist who expanded the approach into a neuroanatomy of the unconscious deeply ambivalent about locating the soul within it.[15]

Since the late eighteenth century, neuroculture has exponentially grown into the vast realms of neuroscience we know today, many of whose theories filter through to popular social thought, no one recently applying its tenets to music more cogently than Oliver Sacks, also a distinguished practising neurologist. But neuroculture's infiltration into the analysis of music as privileged Romantic discourse in the early nineteenth century is even more glaring than its exports elsewhere. Within a decade – by 1810 – a notion gained currency that music was special among the arts because hearing itself differed from other sensual activities.

This was an odd view. The rise of (what we call) cognition theory in the high Enlightenment had fostered it; the new extension of brain anatomy to theories of an organic soul further enhanced it. Thomas Sömmerring (1755–1830), the most intuitive of the new anatomists, made a strong case for the cranium's structure in arguing the case; especially his view that nerve endings in the brain differ from those elsewhere, constructed in this way – and this is where the argument became ingenious – because they could attach themselves directly to the organic soul.[16] Sömmerring and his fellow German anatomists, thinkers like the 'other Schubert' already mentioned, thereby preserved soul by enlarging brain, and, furthermore, constructed an anatomical base for music's special preserve. The sequelae were these: (a) sounds proceed from a nervously crafted ear to the brain's specially constructed nerve endings; (b) the brain's cranial enhancement permits connection to a materially organic soul; (c) musical sounds thereby flow almost directly into the soul; (d) storing themselves up in the soul the sounds cause moods and sentiments *derived directly* from the music's tones having produced oscillations in the ear then transmitted to the brain and further to the soul. *Stimmung*, the broad German word for feeling of all types, encompasses all these meanings. No wonder its cognates – *Gestimmtheit, Gefühl, Gemütsverfassung, Gemütszustand, Grundgefühl* – all centre on feeling and extend to soul (*Seelenlage*).

These neuroanatomists thought they had an airtight case. Little did they know how much they had been swayed by the larger neuroculture of their Romantic era extolling feeling and desire. Flashing backward and forward, from the present to the Romantics, and then vice versa from the world of Schubert and Sömmerring to that of Oliver Sacks, I began to understand why a German like Mossbacher, who had been well educated in a proficient *Gymnasium* and university, could still think the jury out about 'pictures in the mind'. My own explorations were further deflected by Sacks' intriguing

studies of his compromised patients and their astonishing responses to music.[17]

Prior to Sacks' applications much had been made about brain localisation, yet two centuries earlier phrenologists had also attempted similar localisations far more crudely. Both, in a sense, mapped the brain, Sacks adroitly the musical brain. Sacks asked difficult questions most others left aside, such as why certain of his patients were drawn to music and others not, and why driven to particular types of music. He assumed the answers could be found in their neuroanatomy and never posited an innate mind with genetic coding determining individual musical propensities, although it is possible that such genetic predispositions exist. More recently, in *Musicophilia*, essays devoted to the neurology of music, Sacks writes that 'there was virtually no neuroscience of music prior to the 1980s' (Sacks, Musicophilia, xiv). He is, of course, aware that philosophers since Kant have speculated about the powerful impact of music among listeners but refers to 'neuroscience', and specifically to neurology, as brain localisation enabled by computer technology. There was abundant neuroscience before then, even without advanced technology, and certainly evidences of developing neuroculture, even if not computer assisted.

But flash forward again to our time and Sacks' discussions focus on brains – healthy and diseased – and the so far unsolved mysteries his patients presented, as in this passage:

> To those who are lost in dementia [...] music is no luxury, but a necessity, and can have a power beyond anything else to restore them to themselves, and to others, at least for a while [...] giving the patient access once again to moods and memories. Faces assume expression as the old music is recognised and its emotional power felt. One or two people, perhaps, start to sing along, others join them, and soon the entire group – many of them virtually speechless before – is singing together. 'Together' is a crucial term, for a sense of community takes hold, and these patients who seemed incorrigibly isolated by their disease and dementia are able, at least for a while, to recognise and bond with others.[18]

They do indeed, especially the demented. Studies suggest even *they* are experiencing 'pictures in the mind', but flash back again to thinkers such as Johannes Müller (1801–1858), the Romantic German physiologist and comparative anatomist known for his teaching of neurophysiology, and Sacks' point about 'no neuroscience' gets sharpened. Müller's agenda focused on the physiology of sensation and sentiment, familiar themes in Romantic science. He was such an outstanding teacher in Berlin that he produced the leading neurophysiologists of the next generation, especially Bois-Reymond and Helmholtz, even if they eventually rebelled against his Romantic science in favour of a biophysical model of cognition and aesthetic response based

on biochemistry and biophysics.[19] They formed no 'school' per se; indeed they later recoiled against the master. Goethe's *Farbenlehre* (1810) – best translated as 'theory of colour' – inspired him, especially when Goethe provided a general exposition of how colour is perceived in a variety of circumstances and explains how Isaac Newton's observations were exceptional cases. Müller was not interested in the aesthetics of music yet tried to understand how musical sounds are perceived and how they produce certain emotions: that is, which sounds, or combinations of sounds, give rise to which *particular* emotions. In the twenty-first century we like to think we are the first generation to probe this matter in depth but nothing could be further from the truth – it has been an ongoing and pressing concern, waxing and waning, for two centuries, even if our digital technology enables more refined results.

But Müller never refers to 'pictures in the mind': his concern is comprehension of the source of passions in the breast when stimulated by musical tones. His exploration was not identical to Goethe's, whose concern was for the way the phenomena of colour are *perceived*. You could say that what Goethe was doing for colour Müller attempted for musical sounds. Modern developments to understand how the brain interprets both, for example colour constancy in the context of Edwin H. Land's retinex theory (the view that both the retina and cortex, eye and brain, are involved in the processing), bear striking similarities to Goethe's theory. But it is not far from Goethe and Müller to the modern understanding of music invoking brain localisation and neurological advancement in Sacks' sense. It all depends on whether one is willing to historicise 'pictures in the mind' to locate the continuities (Figure 2.2).

The above descriptions concerns Müller's ideas and theories. His practices and public interactions, so far as they impact on the physiology of music, are another matter. Here Laura Otis, already cited (n. 15), has contributed a profound insight:

> I opened this study by claiming that Müller never had a lab, and I will close it by claiming that he didn't want one. While he never stopped longing for research space, he had no wish to lead a unified group. Müller craved scientific intimacy, gladly sharing his thoughts with younger researchers, but he viewed science as a cooperation among *friends* doing related but independent projects. He did not see it as his job to tell others how to conduct their research or to introduce young scholars investigating related problems.[20]

Otis' language of desiring and craving points to the *affective* Müller cultivating friendship in all he enacted: not merely his 'longing for research space' without craving formal laboratories, but also his intuitive sense that the mystery of music as the universal language of all time was grounded in human

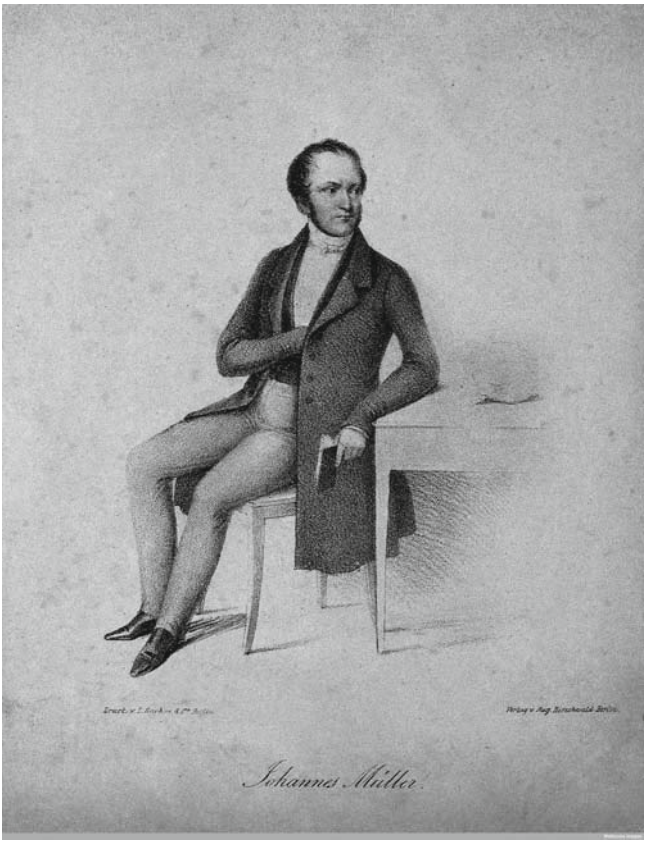


Figure 2.2 Portrait of Johannes Müller

physiology. So strong was his sense of the affective influence on all human understanding and human interaction.

2008: The personal odyssey continues – music and disease

Sacks' book *Musicophilia* (2008) hastened my chase to historicise these concerns to tease out their internal consistencies and contradictions. His neurologically compromised patients – many irreparably ailing – found music beneficial; if not demonstrably restorative to their health, then at least soothing and healing. This in turn caused me to reflect again on the ancient traditions of *musica medicinalis*, so invigorated during the European Enlightenment, wherein listening to music had benign consequences for bodily health. Each generation since the Renaissance, it seems, produced

new reasons for music's healing powers. Yet a strong discourse had concurrently developed in the nineteenth century documenting the illnesses music caused.[21] This was a contrary tradition, invigorated by Romantic era medicine, and calculated to eradicate the whole Enlightenment agenda to quantify and scientise music's salubrious effects. Few commentators agreed about which classical composers were most lethal (although Wagner eventually came near the top of the list). Yet a huge literature developed, compiled primarily by physicians and philosophers, claiming that music had caused – in the sense of cause and effect – their patients' maladies. Unlike painting and literature it was said to be a perfidious art form giving rise to sickness. Their explanations focused on neurological mechanisms corrupted by habitual listening to music, and maladies induced by damaged nerves. How could this negative view about 'perniciously nervous music' coexist, I wondered, with (a) the much more prevalent discourse about music's sublimity and the pleasure it gave listeners, healthy and sick, and (b) Sacks' view that even his acutely damaged patients responded beneficially to its sounds?

This is not the place to assess the neurophysiological intricacies of the Romantic pathological view, except to note that the debate about 'adverse or beneficial' very much continues in the twenty-first century along neuroscientific lines and – more locally – that its ambiguities drove me back to Müller and Helmholtz (teacher and student) and their mid-nineteenth theories. Both men ardently loved classical music, especially German composers, and neither played any role in the discourse about music's pathology. More importantly, their scientific research had specifically dealt with the listener's neurophysiological capability: why did they not discover damaged nervous systems overwrought by classical music? It was this question that gave me pause, as I began to suspect that some medical doctors contributing to the 'music causes illness' school (not all, of course, subscribed to it) were philistines or have had other agendas than aesthetically neutral ones. Either way, I revisited the logic and reason deployed by Müller and his disciples, in the hope of understanding how they avoided music's pathological destructiveness.

The Romantic Müller, for example, attached labels to his observations about the effect music had on nervous systems to codify them better: most crucially, he termed the power of music arising in the brain 'specific nervous energies'. This tag was carefully chosen to emphasise both the neurophysiology ('nervous') and physics ('energy') of the process. He was less bothered by the debate about the 'languages' of music and the role of purely instrumental works. His view was that music arouses the emotions directly because it alone is built on a formal structure *apart from* words; that is, the formal structure bears in itself all the qualities necessary to arouse certain physiological responses presumed to be universal among listeners. This position contains both neurophysiological and neurophilosophical profundity. And if a tribesman in the jungle who has never heard Bach or

Beethoven fails to respond, it may be owing to his own defective or erratic neurophysiology as decidedly as the lack of familiarity with great classical music. Just what this 'form' was, however, no one yet knew: that awaited such figures as Schenker and Dahlhaus. But Müller pronounced it a 'formal structure' nevertheless – a kind of radical idealism investing everything in the belief that musical structures existed in varying degrees of perfection (Bach and Mozart down to the inferior), and that, when perfected by great composers, these musical forms directly and universally aroused the passions. There was not a word about musically induced illness.

More needs to be learned about Müller's vitalistic neuroscience and his sense of a developing European neuroculture. He was born in Koblenz at the turn of the new century when Romantic aesthetics were vibrantly discussed in Germany, and at 18 entered Bonn University, where he later (1824) became a 'Privatdozent', or university teacher, followed two years later by an extraordinary professorship of physiology that was commuted to a higher, ordinary professorship in 1830. In 1833 he proceeded to the Humboldt University of Berlin, where he filled the chair of anatomy and physiology until his death in 1858. He was one of the university's superior mentors of young scientists, his students including the already mentioned distinguished physiologists Hermann von Helmholtz (still perhaps the least appreciated neuroscientist of the nineteenth century) and Emil du Bois-Reymond (one of Freud's teachers), and also Theodor Schwann (who contributed cells named after him in the peripheral nervous system), Friedrich Gustav Jakob Henle (a Jewish physician who made the most prominent contribution to kidney anatomy in the nineteenth century), Carl Ludwig (who demonstrated the existence of a new class of secretory nerves) and Ernst Haeckel (one of the first to consider psychology a branch of physiology), the group forming the spine of late nineteenth-century German neurophysiology.[22]

As important for 'pictures in the mind' was the appearance of Müller's *Handbuch der Physiologie des Menschen* (1833–1840), translated into English by William Baly and published in London in 1842.[23] It marked a new phase of physiology by dint of (what we would call) an interdisciplinary approach to the nervous system. Its influence was so considerable, both in Berlin and abroad, that Müller's students began to apply its tenets, indicating that for the first time, the results of human and comparative anatomy, as well as of chemistry and other domains of physical science, were being brought to bear on physiological problems related to the perception of music. The *Handbuch*'s most germane sections for 'pictures in the mind' deal with nervous action and the mechanism of the senses. In his pre-1837 lectures Müller had enunciated a principle, not articulated before, that the sensation following stimulation of a sensory nerve depended on the originating sense organ itself rather than the mode of stimulation. This was a momentous pronouncement for the aesthetics of music; suggesting that light, pressure

or mechanical stimulation acting on the retina and optic nerve invariably produced luminous impressions, and, by analogy, also did so in other bodily organs such as the tongue, ear and skin. Only a few more steps were needed for the generation of a new theory about the physiology of music dependent on the sensory capability of the affected organs. For Müller had lodged the view that emotion arises according to the particularly stimulated nerve fibres, and that the generation of 'specific nervous energies' produced in the body originates in the organs.

Questions lingered about the anatomic site of Müller's vitalistic 'nervous energy'. His *Handbuch* provided no solution and he never published further speculations about the physiology of music; a task left to the most brilliant of his students, Hermann von Helmholtz, who formulated a theory of thermodynamics and the conservation of energy as early as 1847. Helmholtz developed his teacher's physiological psychology by exploring the sensation of tone, especially the view that music arouses the emotions *directly*, without further intervention or reflective cogitation, because its 'sound structures' were capable of directly impinging on the ear whose particular anatomy enabled direct interaction with musical harmony. This was a significant advance in the neurophilosophical debate about the aesthetics of music, laying even more weight than formerly on the neurophysiological dimensions of the production of feeling within the listener. Helmholtz also refined Müller's view that (what I have been calling) 'pictures in the mind' were not owing to the structural perfection of musical compositions but were localised in the listener's acoustical ear and hearing ability. This localisation constituted the reason – both men noted – why audiences could be deeply stimulated by fourth-rate composers.[24]

But precisely what this 'form' was no one knew, and Helmholtz described it as a human 'nervous capability', almost in the Keatsian sense of 'negative capability'; that is, a human anatomical body flexibly and sufficiently 'nervous' to indulge the listener's needs, just as Keats' so-called uncertainty principle allowed poets the capacity to indulge uncertainty and the realms of the unresolved. 'I mean Negative Capability', Keats wrote to his brother on 21 December 1817, 'that is when man is capable of being in uncertainties, Mysteries, doubts without any irritable reaching after fact & reason . . . '.[25] So too with musical sounds and the powerful emotions they universally give rise to. Except that if the sounds themselves, or combination of tones, contain the secret, then all listeners everywhere should feel the same emotions; but if the localised sensory organ, then no two listeners would experience the same emotion because no two organic bodies were identical. This was the bone of contention.

Helmholtz's view enhanced and extended Müller's considerably. He not only amplified its radical neuromania (if one can somewhat anachronistically label it as such for its positivistic insistence on the nervous system as the sole and primary agent of emotional pleasure) but also superadded

scientific idealism: an optimistic view even if not yet fulfilled, and fervidly hopeful that nervous physiology was sufficiently plastic to live up to this highly heroic expectation. Helmholtz also amplified the view that musical forms existed *in themselves* in varying degrees of perfection – Bach, Mozart and Beethoven down to lesser composers – and that, when perfected, these forms were capable of arousing the passions directly and universally in proportion to their formal perfection. One form of evidence Helmholtz adduced came from listeners themselves: he was struck by the way they accounted for the arousal of their emotions specifically by describing the 'pictures in their minds'.

This was a buoyant view of nervous potential verging on the type of radical positivism extolling the scientific method Auguste Comte had adumbrated at mid-century. It would sweep over Europe for decades afterwards. Yet the more I pondered it, the more sense it made *if* – a big if – if you accepted its belief that 'perfect forms' could impinge directly on a flexible nervous system. That is, if you bought into its variety of neuromania. Helmholtz never explained why imperfect forms did not impinge in this way, but the question begged to be addressed too. Furthermore, who decided on the degree of perfection of forms?

Helmholtz died in 1894, but not before mentoring another great German scientist, Wilhelm Wundt (1832–1920), often called the father of modern experimental psychology.[26] Wundt trained as a medical doctor, rode high on the current wave of scientific positivism by expanding the terms of the mind–body debate and targeting music. He did this by privileging the brain in the context of the age-old view that music was the most potent of the arts because it spoke so directly to the human soul – soul no longer holding any interest for him. The clouds of war forming in 1914 interrupted his most mature views, but afterwards, when ordinary laboratory investigation resumed, he returned to these matters as part of his pursuit in the forming sciences of neurobiology, evolutionary psychology and the new field of ethnomusicology. As early as 1879 he formed a laboratory for psychological research at the University of Leipzig, and mapped out damaged areas of the brain. He never articulated a theory of the musical brain, as Sacks' writings suggest, but the analogy must have occurred to him in light of the tradition of Müller's and Helmholtz's 'specific nervous energy'.

From the 1880s forward the debate over musical tones in relation to human nervous physiology grew acoustically charged – too intricate to be described here. Besides, Professor Robert Gjerdingen has adroitly teased out its main lines.[27] The point, in my own saga to understand 'pictures in the mind' in their affective context, is that the debate now developed (after Wundt) unilaterally from anxiety over the production of 'specific nervous energies' to the physics of tones. Wundt understood the synaptic signals as unique sensations emanating from a particular nerve. The nerve emitted a quantifiable degree of energy, and an inventory of the full range of these

energies – specifically the sensations they produced – would define the elements of consciousness. Gjerdingen's apt analysis surveyed the process just as the periodic table catalogues the elements of matter today.[28]

Preparing for Berlin – 2009

The advantage of invoking the *longue durée* is that one glimpses how the theory of 'pictures' altered: its premises, vocabulary, physiological underpinning; its philosophical and linguistic theories, nuances in the view that neurophysiological science can solve this ongoing riddle, even that the arising image ('pictures') is possibly the wrong question to ask. *Au fond* the base root remains about music's essential difference from the other arts. The evidence is ubiquitous, even in the most practical spheres: the worldwide BBC, for example, plays weekly programmes called *Private Passions* and *Desert Island Discs* that ask their celebrities to reflect on their lives and reveal their innermost identity according to favourite musical works. Not their favourite literary works but the *music* that speaks most to them. These celebrities rarely comment on the neurology of their bodies, or even acknowledge their nervous systems, but all agree that music best discloses the lives they have led. Other similar examples can be given. Is this not sufficient proof?

My preparations for Berlin aroused anxiety about the 'mental' component of the 'pictures'. If 'mind' prevailed over sensation – that is, if mind played a principal role in the sensation's reception – then reception could also lead to affect through certain melodies and harmonies. This pathway seems to have been the basis of Ernst Mach's (1838–1916) theory – Mach in an almost very post-Lockean mood arguing for ideas in the brain. Mach was, of course, a famous Austrian physicist and philosopher, now remembered as a major influence on the growth of logical positivism and as a forerunner of Einsteinian relativity. His music theory entailed a four-part process with particular melodies and harmonies leading to 'conceptions' (rather than 'specific nervous energies') becoming visualised in the all-important mind, which, in turn, gave rise to 'affects' in the listener. But Mach was working towards a gestalt theory of music reception, his proof the idea that we can recognise two melodies as identical even when no two notes are the same. How can this be? Mach speculated that their specific gestalt status arose from the self-evident – to him at least – position that musical forms always equalled more than the sum of their parts. Hence gestalt forms.

Mach's position asked this type of question: does sensation determine the major part of the response – that is the notion that a D-minor chord arouses the sad emotion of grief, and cascades of C major trills, happy feelings of the merry month of May, whereas certain types of melody instil other emotions – or do other neurophysiological factors play larger parts

than the combined tones? Alternatively, do composers intuitively tap into 'conceptions in the mind' stimulated by particular harmonies and melodies, the composer's genius lying specifically in this 'tapping into'? Or is the secret, more anatomically, in the acoustics and the physics of the inner ear where the perception of pitch occurs? Furthermore, do evolutionary processes affect all these possibilities? Notice the assumption throughout the discussion – from Goethe and Müller to Helmholtz and Mach – that music gives rise to powerful emotions, almost directly, and the unwavering ancillary position that no other art form bears such capability.

In preparing for Berlin I did not pursue 'pictures in the mind' beyond Mach before realising how complicated the theory was becoming. Occasionally, I took refuge in earlier Romantic thinkers such as Ludwig Tieck (cited above) even if their notions were less developed than the late nineteenth-century Helmholtzes and Machs. Tieck did his best almost a century earlier but never explained whether the 'feelings' were part of the sensations; that is, whether the feelings were embedded within the sensations or apart from them. He placed himself firmly within the camp of the nervous affect – the school in which the sensory impressions give rise to the feelings – but did not specify how the feelings themselves arise. This is the genealogy of 'pictures' I have been trying to trace from Rousseau and Diderot through the German Romantic School to Kant, Tieck, Schlegel, Müller, Helmholtz, Wundt and Mach – a long and difficult curve. And I have tried to describe the physiological line from the time of Diderot and the *philosophes* through to the important German physiologists of the nineteenth century. For without their work preparing the way there would be no sub-discipline today of the psychology of music, a vital area of contemporary musicological aesthetics, even if less than a 'science', attempting to describe how we assign 'meaning to absolute music' – to music without words such as Mendelssohn's *Lieder ohne Worte*. As musicologist Daniel Chua contends in *Absolute Music and the Construction of Meaning*, only by beginning in the Garden of Eden and explaining how the acquisition of rational knowledge came about, can we begin to understand the nature of the human condition.[29] For the rest of us, the meaning of 'music without words' may be rationally less systematic but nonetheless crucial to understanding why we are so moved by it.

2010: *Après* Berlin

There have been many *après* Berlins since 2009 – aesthetic, cognitive, performative – as well as reconsiderations of Mossbacher's stumping question in 1959. For example, I returned to Stanley Cavell's 1967 essay about 'Music Discomposed' and 'A Matter of Meaning It', written after Mossbacher asked me his question.[30] Cavell becomes immersed in matters lodged in the

interstices between modernist and postmodernist music, usually dispraising the latter at the expense of the former, yet without addressing any of Mossbacher's aesthetic concerns. Perhaps postmodernism's 'pictures' have disappeared in post-war music lacking any of the recognisable aesthetic models the historical figures discussed in this chapter took for granted; if so, then Cavell's crisis in music is existentialist rather than aesthetic, an existentialism altogether devoid of physiology.

Why should music be our universal language? It remains the haunting spectre which, like Hamlet's ghost, will not vanish. But I, an *ingénu* in 1955, had not then imagined it as the universal language; nor now, in 2012, can I construe music as a universal language apart from its neurophilosophical moorings embracing anatomy, physiology, brain science and the production of emotion. Surely, the last mentioned category – the production of emotion – is what I eagerly await: some resolution of this most vexed matter by brain scientists capable of repeated demonstration in the laboratory of how the emotions arise from the moment the chord is struck. No one agrees, of course, certainly not neuroscientists or neuroaestheticians, about this matter, nor should we expect them to; and the factors involved can range from the pointing index finger (the apposite thumb so crucial in playing the instruments that create music in the first instance), to the ability to empathise (the notion that musical forms constitute an extreme, even ultimate, form of human empathy) – that is, all those philosophical and metaphysical pronouncements about what it is fundamentally to be human.[31] I am confident future thinkers will include other solutions, among them the embedded subject of this essay, emplotted from the start, about music as a distinct type of language connecting to the emotions in ways other forms of communication do not.

Proof one way or another will reside, of course, in the neuroscientific laboratories of the future, but it would be folly to overlook the pronouncements and endeavours of the past. If it is the universal language *par excellence* then music is also, in less neurological senses, the language of the soul, as so many nineteenth-century thinkers believed. Nor can soul, amorphous and antiquated as it may seem to contemporaries lacking historical imaginations today, be eliminated from these discussions. What if, for example, to be human embraces rather than rejects the ability to doubt competing views; and celebrates rather than assails the recognition that truth may lodge in more than one sphere – that *many* truths can be contained simultaneously? Keats, the great Romantic poet, intuited this condition for creative artists and judged it a basic human quality: the ability to live in a state of doubt, even so far as the existence of deities was concerned. Hence the very opposite of the scientific method where certainty and verification rule. Less evolved creatures probably inhabit no such nuanced orbits of ambivalence. Ultimately, it is something proximate to a transcendental state of uncertainty – a kind of psychological uncertainty principle – which does not diminish resolution

or truth, yet enables the containment of doubt despite the fixation of experiments and quest for definitive scientific proof. Neuroscience of the future may not produce just *one* explanation about this vexed matter in the history of neuroaesthetics.

Notes

1. This chapter originated as the keynote address at the 2009 Berlin conference 'On Discovering the Human', and was accompanied by a live performance of Mendelssohn's D-minor Trio, opus 49, with the author at the piano together with front chairs of the Berlin Staatskapelle. The original lecture demonstrated aspects of Mendelssohn's 'absolute music' now lost in this reduction to a verbal text, and I have also removed many of the musical illustrations originally made at the piano. But not readily, for as a performing keyboard player and academic historian I continue to believe that *both* are necessary to understand the question about the 'pictures of the mind' that occupy the heart of this retrospective essay offering a personal view. In Berlin, moreover, the audience was mainly composed of non-musicologists and I therefore felt myself compelled to explain terms and developments I would not have before a more specialised conference. I hope readers immersing themselves in this book may find opportunities to listen to a recording of the Mendelssohn trio while reconsidering my suggestions about the type of 'pictures in the mind' it can give rise to. Since then I have also treated the matter at greater length, in the form of a personal memoir, in *Rachmaninoff's Cape: A Nostalgia Memoir* (forthcoming 2015). I am grateful to musicologists Robert Gjerdingen of Northwestern University and Thomas Christensen of the University of Chicago for pointing me in some of the right directions and telling me when I was straying too far from the track, and to critic-scholar John Neubauer for commenting on various versions of this chapter. Recent contributions to these debates include Linda Austern, *Music, Sensation, and Sensuality* (London: Routledge, 2002), Kevin Barry, *Language, Music and the Sign: A Study in Aesthetics, Poetics and Poetic Practice from Collins to Coleridge* (Cambridge, MA: Cambridge University Press, 1987), Leo Baxendale, *Pictures in the Mind* (Stroud: Reaper, 2000), Lydia Goehr, *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music* (Oxford: Clarendon Press, 1992), Michel Meulders, *Helmholtz: from Enlightenment to Neuroscience* (Cambridge, MA: The MIT Press, 2010), John Neubauer, 'Tales of Hoffmann and Others on Narrativizations of Instrumental Music', in Ulla-Britta Lagerroth, ed., *Interarts Poetics: Essays on the Interrelations of the Arts and Media* (Amsterdam: Rodopi, 1997), 117–136, Charles O. Nussbaum, *The Musical Representation: Meaning, Ontology, and Emotion* (Cambridge, MA and London: MIT Press, 2007), Oliver Sacks, *Musicophilia: Tales of Music and the Brain*, rev. and expanded ed. (London: Picador, 2008) and Downing A. Thomas, *Music and the Origins of Language: Theories from the French Enlightenment. New Perspectives in Music History and Criticism* (Cambridge, MA: Cambridge University Press, 1995), but I take responsibility for the views expressed here.
2. This matter of emplotment is hugely important for all theories of mimesis and of utility to theories of representation arising specifically from musical forms; however, Neubauer, 'Tales of Hoffmann', demonstrates that emplotment, in this large theoretical sense, is more complex than one thinks. Furthermore, the encounter

with Mossbacher occurred in 1955, almost sixty years ago, long before a so-called science of musical cognition existed, as represented in approaches such as Honing's who claims that music stirs the profoundest emotions in listeners of all the arts because it challenges ordinary cognitive functions in the mind's inner world. The question is how? Henkjan Honing, *Musical Cognition: A Science of Listening* (London: Transaction, 2011).

3. Sacks, *Musicophilia*.
4. Carl Dahlhaus, *The Idea of Absolute Music* (Chicago: University of Chicago Press, 1989), *Nineteenth-Century Music* (Berkeley and London: University of California Press, 1989), Eduard Hanslick, *Vom Musikalisch-Schönen* (Leipzig: Weigl, 1854).
5. Walter Pater, *The Renaissance. Studies in Art and Poetry*, Adam Philips, ed. (Oxford: Oxford University Press, 1986). See also Patricia Hertzog, 'The Condition to Which All Art Aspires: Walter Pater on Music', *British Journal of Aesthetics* 36 (2 April 1996), 122–134.
6. Heinrich Schenker, William Drabkin and Ian Bent, *Der Tonwille: Pamphlets in Witness of the Immutable Laws of Music, Offered to a New Generation of Youth*, 2 vols (Oxford: Oxford University Press, 2004). See also Tom Pankhurst, *Schenkerguide: A Brief Handbook and Website for Schenkerian Analysis* (New York: Routledge, 2008).
7. Kivy summarises his ideas over several decades, but see Neubauer's reply to him in Neubauer, 1997. Peter Kivy, *Music, Language, and Cognition: And Other Essays in the Aesthetics of Music* (Oxford: Clarendon, 2007), Neubauer, 'Tales of Hoffmann'.
8. Neubauer's chapter on Kant is illuminating on this matter; see John Neubauer, *The Emancipation of Music from Language: Departure from Mimesis in Eighteenth-Century Aesthetics* (New Haven: Yale University Press, 1986), Chapter 3.
9. See http://www.bbc.co.uk/news/10598926.
10. Neubauer, *The Emancipation of Music*.
11. I intentionally write 'appears' because the few remarks I have seen are anecdotal and I am unaware of any study of the topic based on primary research.
12. A position articulated in Wilhelm Heinrich von Wackenroder's *Phantasien über die Kunst* (Hamburg: 1799).
13. George Rousseau, *Nervous Acts: Essays on Literature, Culture and Sensibility* (Basingstoke: Palgrave Macmillan, 2004).
14. Ludovicus Odier, *Epistola physiologica inauguralis de elementariis musicae sensationibus* (Edinburgh, 1770). Swiss Odier had studied at the University of Geneva and then travelled to Edinburgh, where he established himself in the university's Faculty of Medicine by submitting a medical dissertation.
15. Schubert's book about the symbolism of dreams was one of the most widely read books of the Romantic epoch and had terrific influence on E.T.A. Hoffman, Freud and Jung. Gotthilf Heinrich Schubert, *Die Symbolik des Traumes* (Bamberg, 1814). Both Schubert and Carus refer to the psychology of music by digging into the prehistoric past, that is, ancient Greek and Chinese beliefs. In the third lecture of Schubert's *Ansichten von der Nachtseite der Naturwissenschaft* (Views on the Dark Side of Natural Science, 1808, 63) he describes two theories of the origin of languages. In the first, the earth's atmosphere was in a faster and more intense motion than it is now. Some type of divine language of music had to permeate its air, which functioned as a filter, while in the earth's former state this language – Schubert called it a cosmic language – was a type of music, hence its divine origin. Since those prehistoric days the earth's motion has slowed down, altering the filter, and the divine language of music was now

perceived as 'noise' similar to the howl of gales and the wind's rustle through trees. Recent prophets, according to Schubert, interpret these noises as conveying mediums for divine wisdom whereas ancient prophets understood the sounds as the divine language as music. This genealogy explains music's status, Schubert thought, as the oldest of the arts (parallel to astronomy as the most ancient of the sciences). I am indebted to Tobias Leibold of Bochum University for discussing the ambiguities of Schubert's lecture with me, as well as the intricacies of Sömmerring's neuromania in endnote 15. Carus was a fascinating figure in his own right, a polymathic personal physician to the King of Saxony, personally based in Dresden, who also regularly contributed to Goethe's journal *Zur Morphologie*. Even among historians of early psychology Carus's influence has been underestimated. For his collaborations with Goethe, see Stefan Grosche, 'Zarten Seelen ist gar viel gegönnt', *Naturwissenschaft und Kunst im Briefwechsel zwischen C.G. Carus und Goethe* (Göttingen: Wallstein, 2001).

16. Sömmerring came under the sway of the young Blumenbach at Göttingen, then a professor only in his twenties, and elsewhere under the influence of the Dutch anatomist Petrus Camper. Combining their anthropology and anatomy respectively, Sömmerring developed his own neurophysics of the ear capable of giving rise to a new aesthetics of music. For his work in general, and with respect to female anatomy, see Schiebinger 189–213; none of Sömmerring's works, not even his six-volume *De corporis humani fabrica* (Frankfurt am Main 1794–1801), has been translated into English.
17. Sacks, *Musicophilia*.
18. Ibid., 79–80.
19. The most comprehensive analysis of Müller's mentality in a single essay is found in Meulders, *Helmholtz*, 43–54. The most thorough investigation of his career and students is found in the work of Laura Otis, who writes that if George Henry Lewes – the English philosopher-critic who lived openly with Georg Eliot – 'had translated the Müller biography, English readers might have viewed Müller as another Goethe, another German genius worthy of international acclaim': Laura Otis, *Müller's Lab* (Oxford: Oxford University Press, 2007), 108. His importance cannot be overestimated as Germany's leading physiologist in the first half of the nineteenth century for confirming the Bell-Magendie Law about the two different functions of the nervous system, that is, his famous frog experiment.
20. Otis, *Müller's Lab*, 235, emphasis mine.
21. James Kennaway, *Bad Vibrations: The History of the Idea of Music as a Cause of Disease* (Farnham: Ashgate, 2012), James Kennaway, 'Musical Hypnosis: Sound and Selfhood from Mesmerism to Brainwashing', *Social History of Medicine* 25.2 (2012), 271–289.
22. The intricacies of their theories and professional relations can only be done justice in histories of science developed at considerable length. My synoptic account merely attempts to chart an outline in relation to the developing 'pictures of the mind' motif.
23. William Baly (1814–1861) was an English physician born in King's Lynn, Norfolk, and his translation of Müller's *Handbuch der Physiologie des Menschen* as *Elements of Physiology* is sufficiently significant for the development of 'pictures in the mind' in the English-speaking world that I pause to comment briefly on its translator. Baly's translation of this work, and only this book, by Müller into English, provided the Anglo-American world with their whole sense of

Müller as a *physiologist* and not (as some of Müller's students viewed him) as an immortal genius of the stature of Newton and Goethe. Put otherwise, Müller's mid-nineteenth century image at the time of Darwin's publication of the *Origin of Species* (1859) would have been altogether larger if Baly had translated the lives of him Müller's students were just then producing (for example, the biography by Emil du Bois-Reymond) rather than his more mundane *Handbuch der Physiologie*. Biographically Baly probably deserves more attention than he has thus far received. After completing his medical studies at the Royal College of Surgeons and the Society of Apothecaries, Baly continued his education in Paris, Heidelberg and Berlin. He was in Berlin from 1835 to 1836, at the time when the Mendelssohn 'songs without words' debates were occurring (specifically whether the composer's experiment had been successful and gave rise to many pictures without the inclusion of words), and when Müller was giving lectures about the physiology of music. Baly attended the lectures, met Müller, and began to translate his work. After receiving a doctorate in medicine from the University of Berlin in 1836, Baly returned to London and opened a private practice, while simultaneously beginning work on the translation for the next four years (1838–1842). Afterwards he performed significant research on dysentery and cholera and, in the 1840s, worked as a prison physician. In 1859 he was appointed 'physician extraordinary' to Queen Victoria. Two years later he was killed in a railway accident, southwest of London, on 28 January 1861.

24. See Meulders, *Helmholtz*, Chapters 9–11, for further detail. Meulders, an academic neuroscientist, comments on page 151 that

> Helmholtz consistently ignored anatomical data on the nervous system and strangely never referred to the brain. The reason for this omission was probably his mistrust of the concept of an anatomophysiological correlation that might have suggested that anatomical and psychological processes were identical, which was exactly the battle of the [contemporary] natural philosophers.

Helmholtz's 'omission' may indeed have been owing to the conflation of anatomical and psychological data. Yet he rarely overlooked the capacity of some music to arouse the fiercest of nervous responses. For example, in 1847, when he was working as an army physician and deeply in love, he attended a concert at which his lover Olga could not join him, and was so overwhelmed by Beethoven's music that he wrote to her:

> . . . I was there quite alone, abandoned by the beautiful half of my soul, and it would have been the same if I had been listening to scales on the piano. It was not until the overture of *Coriolanus* that I regained my spirits: it is a pure jewel, short and concise, so proud and resolute, oscillating between *nervous anxiety* and the confusion of battle [*einer Menge von Unruhe und wirren Kämpfen*] before finally dissolving into a few melancholic notes . . .

Kremer Richard Lynn, *Letters of Hermann von Helmholtz to his Wife, 1847–1859* (Stuttgart: Franz Steiner, 1990), 195, underlining mine; this letter is not with the rest of Helmholtz's correspondence in the Houghton Library, Harvard University, but has been cited by Lynn quoting Helmholtz's biographer, Königsberger). E.T.A. Hoffmann, whose musical criticism Helmholtz knew and admired, also commented in 1812, on first hearing *Coriolanus*, on the 'extreme nervousness'

instilled in him by Beethoven's overture; claiming it displayed 'implacable unrest [...] insatiable yearning [...] and tension everywhere'; see *E.T.A. Hoffmann's Musical Writings*, 289.

25. Duncan Wu, *Romanticism: An Anthology* (Oxford: Blackwell, 2005), 1351.
26. Wundt's most important work has since been acknowledged as the formative one for the history of experimental psychology. Wilhelm Wundt, *Grundzüge der physiologischen Psychologie* (Zurich: 1874).
27. Robert J. Gjerdingen, 'The Psychology of Music', in Thomas Christensen, ed., *The Cambridge History of Western Music Theory* (Cambridge, MA: Cambridge University Press, 2002), 956–981.
28. The analogy is Gjerdingen's. Gjerdingen, 'The Psychology of Music', 959.
29. Daniel K.L. Chua, *Absolute Music and the Construction of Meaning. New Perspectives in Music History and Criticism* (Cambridge, MA: Cambridge University Press, 1999), xii.
30. Stanley Cavell, 'Music Discomposed', in Stanley Cavell, ed., *Must We Mean What We Say?* (Cambridge, MA: Cambridge University Press, 1976), 141–157.
31. Raymond Tallis, *Michelangelo's Finger: An Exploration of Everyday Transcendence* (London: Atlantic Books, 2010), Iain McGilchrist, *The Master and his Emissary: The Divided Brain and the Making of the Western World* (New Haven: Yale University Press, 2009), 340–344.

3

Music and the Nervous System in Eighteenth-Century British Medical Thought

Penelope Gouk

It is well established that during the eighteenth century learned medical explanations for health and disease gradually moved away from the balance of humours, and increasingly focused on the state of the nerves. George Rousseau, Anne Vila and Christopher Lawrence, for example, have shown us how the Enlightenment culture of sensibility revolved around the nervous system, the assumption being that sensitive nerves were indicative of social refinement and feeling, but also meant susceptibility to certain kinds of disease.[1] With its emphasis on weak nerves as the cause of melancholy and related distempers, George Cheyne's *The English Malady: Or a Treatise of Nervous Diseases of All Kinds* (1733) perfectly exemplifies this new trend.[2] However, despite the attention that has been paid to eighteenth-century doctrines of the nerves, the fact that music played a part in these physiological theories has yet to be fully appreciated.[3] This may well be because some of the most famous physicians who wrote on the nerves (such as Cheyne or Robert Whytt, for example), did not identify music as a likely cure for melancholy or other so-called 'nervous diseases'.[4] In brief, when it did arise in medical discourse there were two main roles that music served, and these were ultimately related to each other.[5] The first was as a topic that merited consideration in its own right: that is, why and how does music affect people? In the eighteenth century music's power to move the passions was not just a literary commonplace but became a distinct subject of medical interest that straddled the boundaries between body and soul because it had a demonstrable effect on both. Indeed, music came to be recognised as a language of the passions on account of its affinity with the motion of the animal spirits, which mediated between body and soul.[6] The second function of music was as a conceptual model: specifically it served as a means of comprehending the sympathy or harmony between body and soul which by its very nature was occluded from sight.[7] In particular the analogy of the body as an

instrument or musical device played by the soul was often favoured, thanks to the influence of Descartes. Thus on the one hand the effects of music were something to be explained scientifically in terms of nerve action and mental functioning, while on the other these same neurological functions were to be explained in terms of music.

Lastly, in the process of talking about music's relationship to the body and soul (the microcosm) this chapter will necessarily also touch on music's relationship to the universe (the macrocosm), since both these topics were constitutive of harmonics, a body of philosophical doctrine which went back to Pythagoras and Plato but which had been radically transformed in the seventeenth century, above all by Isaac Newton.[8] Conventionally the Enlightenment has been seen as a watershed when the magical correspondence between macrocosm and microcosm broke down, and the mechanical philosophy came to dominate physiology as well as physics. What my research reveals is a continuing connection between the external, objective realm of natural philosophy and the subjective inner realm of psychology, a connection which took the form of a vibrating, 'musical' spirit dispersed throughout the cosmos. This concept actually had ancient and magical origins but now found new expression as a result of Newton's influential speculations about the dynamic structure of matter and the interpenetration of spirit.[9]

Medicine and music: The sources

The first English text specifically devoted to music's effects on the nerves was the anonymous *Mechanical Essay on Singing, Musick and Dancing . . . Demonstrating by Clear and Evident Reasons, the Alterations they produce in a Human Body* (1727). Two years later a revised and corrected edition of this work appeared, now with the title of *Medicina Musica: or, a Mechanical Essay on the Effects of Singing, Music, and Dancing, on Human Bodies* and with a *New Essay on the Nature and Cure of the Spleen and Vapours* appended to the text. The author now revealed himself to be one Richard Browne, an apothecary whose principal patron was the young Noel Baptist, 4th Earl of Gainsborough (1708–1751), whom Browne described as having a 'Genius in Musick'.[10] Perhaps surprisingly, it was 20 years before another medical work entirely devoted to music and its therapeutic potential was published in London; this was the physician Richard Brocklesby's *Reflections on Antient and Modern Musick, with the Application to the Cure of Diseases* (1749). Brocklesby had studied medicine in Edinburgh and Leiden (1745) before setting up his practice in London and becoming a Fellow of the Royal Society in 1747.[11] Although he only published this one text about music and the nerves, it is striking that Brocklesby was the first English physician to practically engage with Albrecht von Haller's experiments identifying irritability and sensibility as distinct kinds of nerve action.[12]

These works by Browne and Brocklesby appear to be the only English sources to treat music in such depth, and therefore will receive most attention here. However, if we broaden our search for eighteenth-century medical thinking about music and the nervous system, a number of other works come into view. For example, a handful of Edinburgh medical dissertations on musically related topics were published in the second half of the century, of which three specifically address music's effects on the nerves. These were Isaac Brown's *Disquisitio medica inauguralis de sonorum modulatorum vi in corpora humana* (1751), David Campbell's *Disquisitio inauguralis de musicis effectu in doloribus leniendis aut fugendis* (1777), and Ludovicus Odier's *Epistola physiologia inauguralis de elementariis musicae sensationibus* (1770).[13] The most thorough discussions were by Brown and Campbell, whose dissertation stands out because he describes his own experience of music's therapeutic powers as well as merely citing texts. By contrast, Odier's *Epistola* is quite disappointing in that he tells us that he intended to say a lot more about the effect of music on the human system, but realised it was a long job that would have exceeded his powers. Nevertheless he raises a number of issues that will be addressed in this chapter, including the structure of the nerves, music's use as a sedative or stimulus, and the cure of the tarantula's bite through dancing and music.[14]

This mention of the tarantula brings us to my third category of sources: those which touch on music in the context of broader discussions about the nerves and their properties, as well as the diseases most closely associated with them. These include Dr Richard Mead's *A Mechanical Account of Poisons in Several Essays* (1702/1708/1745), which included one on tarantism, and the physician Nicholas Robinson's *New System of the Spleen, Vapours, and Hypochondriack Melancholy: Wherein all the Decays of the Nerves, and Lowness of the Spirits, are Mechanically accounted for* (1729). Along with Browne's *Medicina Musica*, these books form part of a larger cluster of iatromechanical works published in the early part of the century.[15]

As was typical for English authors at the time, however, Robinson and Mead (who was Robinson's first patron) rejected the Cartesian system of mechanical philosophy and enthusiastically took up the mechanical synthesis of their fellow countryman, Sir Isaac Newton. Cheyne too was a committed Newtonian, an influence which is manifested most clearly in his *Philosophical Principles of Natural Religion* (1705) but also underpins his *Essay on Health and Long Life* (1724) and *The English Malady* (1733), both of which use musical models to help readers think about the action of the nerves in sensation and locomotion. Another Newtonian who used a musical model for nerve action was the philosopher David Hartley, whose *Observations on Man* (1749) linked the laws of bodily action to those of the mind by means of isochronous (i.e. musical) vibrations of a fine medullary substance stored in the brain. As will be discussed in more detail below, nerve action was a hotly debated issue throughout the eighteenth century, as opinion was divided

over whether nervous vibrations or impulses were transmitted through tubes via a spiritous fluid or through longitudinal fibres, or perhaps some combination of the two. In fact from Odier's dissertation of 1770 we know that William Cullen's Edinburgh syllabus on the nervous system (dating from the 1760s) covered the problem of nerve transmission, and also that as a result Odier himself favoured the existence of an elastic fluid in the brain and nerve fibres which seemed to be similar to 'that famous ether diffused through all nature', a connection that (as we shall see below) Newton first mentioned in the second edition of the *Principia* and developed in his *Opticks*.[16]

Music, spirit and the passions

There were various reasons why at least a few medical men chose to write at some length on music. For example, the central premise of Browne's *Medicina Musica* is that singing, music and dancing are essentially healthful pursuits, being especially beneficial for 'the fair sex' because of their tendency to suffer from nervous disorders, including melancholy and the vapours. Indeed, he says that his treatise is principally intended for their good, and will also benefit their singing, music and dancing masters.[17] In other words Browne's work offers a medical justification for partaking in these pleasurable activities, but also points out that they may be harmful in certain contexts (e.g., singing is not to be recommended in cases of phthisis, i.e., consumption). Brocklesby's motivation for writing his *Reflections* was somewhat different, the overall purpose being to promote the use of music in the treatment of mania and related disorders of the mind. He explains that it is the lack of success among physicians using conventional remedies (strong medicines, purging, cold baths) that has led him to marshal the evidence in favour of music.[18] As its title indicates, Campbell's dissertation is about the effect of music in soothing or banishing pain, the proximate cause of which 'appears to consist in an over-violent shock to the nervous fibres out of their natural state, due to any cause'.[19] For example, he describes the occasion when he suffered from an inflammatory fever but found relief from listening to someone playing the fiddle (*fides*) to him for 12 hours at a time over the course of three days. Another time he had smallpox and was covered in ulcers, the pain only becoming bearable when a musician was performing, who soothed Campbell's distress 'with his well-nigh divine singing'.[20]

What these authors agree on is that music can have discernable effects on both the mind (or soul; the terms seem to be used interchangeably) and the body, and in fact these effects provide evidence to show the interdependence of body and mind even though they are distinct in nature. As medical men they have a particular interest in the positive effects music can have on different kinds of mental disturbances, whether these have physical origins or some intangible cause.[21] Together with the other authors I have identified, they share a common understanding of health, disease and the body which

reflects the influence of the Leiden professor of medicine Herman Boerhaave on eighteenth-century medical thought.[22] Boerhaave's teaching built on a Galenic foundation but incorporated the principles of the new experimental philosophy (e.g. in chemistry and Newtonian physics) and Harvey's discovery of the circulation of the blood. This influence is particularly notable in Edinburgh, where a new school of medicine was founded in 1726 by several of Boerhaave's students.[23]

In brief, the body is conceptualised as a system of fluids and fibres whose movements are assumed to follow the laws of mechanics and hydraulics. We will see that there was disagreement over whether these laws were Cartesian or Newtonian in nature, and whether fluids or fibres are more important for the animal economy. At the same time the soul or mind is intimately connected to this animal machine. Robinson, for example, is typical in identifying the soul as a 'spiritual, immaterial principle' capable of producing 'divers thoughts and motions in a system of matter'.[24] Central to the body's functioning are the animal spirits which are secreted from the most subtle parts of the blood, stored in the brain and dispersed to every fibre of the body via the nervous system. These spirits and their associated nerves are responsible for sensation, perception and motion, and health depends on their unimpeded actions. As Isaac Brown explains,

> sensation takes place when bodies are brought into contact with the nerves; for the agitated nerves propel to the brain a very subtle liquid, commonly called animal spirits, and by occasion of the same motion there is aroused in our mind the idea of the object whereby the organ was struck.[25]

Indeed, the spirits act as the fundamental link between the soul and the body, which also have to be in harmony with each other for proper health.[26] Robinson is particularly emphatic that a disordered body will make a disordered mind and vice versa, the connection between them effected through 'a subtle, animal Aether of different elasticities, agreeable to the different springiness of the nervous fibres'.[27] However, I should emphasise that this materialist conception of the animal spirits (which were also called the sensitive soul) and their localisation in the brain and nerves was a long-established medical tradition which had already found new expression in the writings of Francis Bacon and Thomas Willis in the previous century.[28] In particular Willis's *Cerebri anatome: cui accessit nervorum descriptio et usus* (1664) laid the foundations of a new science of neurology, while his *De anima brutorum quae hominis vitalis ac sensitiva est* (1672) developed a physiologically-based psychology that provided a material context for the associationist philosophy of John Locke.[29] As we will see, both these texts had something important to say on music.

Browne's *Medicina Musica*, or *Mechanical Essay*, is clearly informed by iatromechanical principles, and begins with a series of propositions and demonstrations showing that 'there is a sympathy between the soul and the animal spirits', which 'are the cause of sensation and motion' including that of the heart.[30] According to Browne, pulse rate and blood flow increase when there is an influx of spirits to the heart, and diminish when their pressure drops, in the same way that mercury rises or falls in the barometer according to air pressure. He also says that the phenomenon is demonstrated when air is exhausted from Boyle's pneumatical engine and the animal within begins to droop as a result of the 'diminution of the gravity of the air' which impedes the blood in its circulation.[31] Browne goes on to argue that singing increases air pressure on the lungs, causing the blood flowing into the pulmonary vein to break down into smaller particles that move faster and therefore promote stronger contractions in the heart, which is normally good for the health as the blood circulates better and more spirits are secreted from it.

These internal motions, especially in and around the heart, are associated with feelings which we now call emotions but which in the eighteenth century were still identified as the passions of the soul or mind.[32] The passions comprised one category of the six 'non-naturals' which affect the body and its humours, and therefore university-trained physicians were expected to know how they operated and to offer advice or medicines in cases where they caused or exacerbated disease.[33] Their physiological effects were brought about by means of the spirits which serve as the soul's instrument. Indeed, Browne gives examples of contrasting passions to prove there is a sympathy between the soul and the animal spirits. For instance, he says that it can be seen (although he surely means felt) how fear 'produces a defect of spirits', how anger produces 'a violent and irregular motion of them', while hope, mirth and joy inspire 'pleasing and ravishing sensations throughout the body' as they promote a plentiful secretion of spirits. Brocklesby also concurs that passions of the mind produce alterations on the body, the most profound being those of 'anger, grief, excessive joy, enthusiasm in religion or love, the panick of fear and such-like'.[34]

The crucial thing about music for Browne (and for all of the authors being considered in this chapter) is that it has a direct effect on the passions through altering the motions of the spirits. This observation had already been made a hundred years earlier by Francis Bacon in his *Sylva Sylvarum* (1626), where he noted that certain kinds of music 'have most operation upon manners' and that various tunes (merry, doleful, solemn, etc.) dispose the spirits to a variety of passions because they 'have some affinity with the affections'. Bacon thought it was 'no Marvell, if they alter the Spirits; considering that *Tunes* have a Predisposition to the *Motion* of the *Spirits* in themselves'.[35]

Bacon did not elaborate further on the subject, but for Browne, for example, this affinity was the basis for suggesting that music might be deliberately used to stimulate or to suppress the production and flow of the spirits, and thereby to regulate the passions. Not just any music, but 'the fine Adagio and Allegro parts in the Italian Operas' created by a 'well-play'd consort', are recommended by Browne. This particular choice of music suggests Browne's familiarity with the contemporary London musical scene, where the nobility were developing a taste for Italian operas that were mostly staged in the King's Theatre, Haymarket. He conjectures that on the one hand the 'soft, languishing Trills, and melodious strains of an Adagio' played by a fiddle touch the nerves finely and produce a pleasing, ravishing sensation that causes the spirits to flow back in gentle undulations. On the other hand if the strings of a fiddle are struck swiftly while playing a brisk and sprightly allegro the listener will surely feel fresh life and vigour flow 'from the persuasive Sound of such a sprightly harmonious Consort'.[36]

This division into two contrasting effects allows Browne to consider music's potential for managing the passions and therefore for preventing or even causing disease. For example, a soft and gentle adagio can soften the violent and irregular motion of the spirits felt in anger and rage. But this softening can enervate the body and tend to the production of diseases if the spirits are not actually disordered. The solution to this problem is to contrast the adagio with an allegro, by which means we may 'contribute to the preservation of our healths' at the same time as enjoying 'one of the greatest pleasures on earth'.[37] Browne goes on to suggest that this basic principle of contrast in musical styles may also assist digestion and the circulation of the blood by stimulating the secretion of spirits. As for actually curing disease through music, he thinks it may have application in cases where the spirits are deficient, such as apoplexies and lethargies. However, just like Robinson and Brocklesby, Browne thinks that music is particularly appropriate for nervous diseases. As we have already seen, this was a relatively new category of illness that not only included melancholy as such but also the related afflictions of the spleen, vapours and hypochondriac melancholy whose symptoms notably included despair, fear and sadness. Traditionally these were thought to be a result of melancholic vapours, rising from the spleen or hypochondria, adversely affecting the brain, but now they were chiefly ascribed to irregular and disturbed movement of the spirits.[38] Thus Browne supposes that music is particularly good at curing the spleen, since sprightly music can diffuse a 'vivacity' throughout the nervous system, in the same way that a brisk allegro can be good for melancholy. Alternatively, in the case of madness, 'a soft languishing Adagio is only to be admitted', being most adapted to sooth a madman's frenzy. Despite his confident assertions, however, Browne does not seem to have tested this hypothesis himself, or at least gives no indication of having done so.

Indeed, with the notable exception of Campbell, whom we learn employed a musician to play for him for hours while he was running a fever, none of my authors actually admit to testing music's therapeutic potential themselves, or to recommending its use for a patient. The nearest we get to direct evidence is found in Brocklesby's *Reflections*, in which he cites a number of relevant contemporary as well as ancient sources to support his claim that music's capacity to affect people can be proven 'experimentally', a term which indicates his respect for Bacon as 'the prime and chief philosopher of all ages' and inventor of the experimental method.[39] The starting point for his chapter 'on the power of musick in disorders of the mind' is the Platonic notion that music composes the motion of the animal spirits, which he takes from the writings of the fifteenth-century neo-Platonist Marsilio Ficino.[40] From this he goes on to argue that music can therefore allay the strongest passions of the mind, which unchecked may lead to disruptions in the body and even maniacal disorders. One of the passions Brocklesby singles out for particular attention is that of extreme grief and sorrow, for which he offers both an ancient and a contemporary example of music's healing effects. For the first he refers to Homer's *Iliad* at the point where Achilles soothed his 'heartfelt grief for the loss of his mistress with the melodious strains of a harp'.[41] Perhaps of more interest to us is his contemporary example of a successful musical cure using the same instrument, in what may be the first recorded instance of a (British) physician recommending a form of music therapy for his patient.

The story was apparently related to Brocklesby by an Edinburgh physician, who told him of a Scottish gentleman who lost two of his three sons and was injured himself in the Jacobite uprising of 1715. Although the gentleman survived, because of inordinate grief and pride he fell into a nervous fever which led to a deep depression in which he refused food and medicine and shunned all communication with the outside world. Knowing that his patient had formerly loved playing the harp, his doctor encouraged the man's friends to engage one of the best harpists to approach him with 'soft and solemn sounds' that had formerly given him great pleasure. The results were dramatic: as soon as one or two pieces were played 'the patient discovered an uncommon emotion both of body and mind'. The experiment was repeated on a daily basis and gradually the sick person was induced to speak and take his medicines, 'til at length he perfectly recover'd his former state of health'.[42]

Having dealt with major disorders of the mind that affect the body, Brocklesby turns to diseases that proceed from bodily perturbations and go on to affect the mind. These notably include delirium, melancholy, frenzy and mania, all of which he says can be helped by music as is documented by both ancient and contemporary authorities. Two of his latter examples come from successive issues of the *Histoire de l'Académie des Sciences* which were published in 1707 and 1708 respectively.[43] (These are also discussed

extensively by Campbell in his dissertation.) The first of these cases describes the use of music to cure delirium, a disorder which Brocklesby says proceeds from a perturbation of the body such as an irregular motion of the fluids that indicates a morbid affection of the brain or nerves. This internal motion gives rise to a perception that eventually wipes out other sensations and dominates the mind completely. In the French case study which Brocklesby refers to, it was the patient himself who happened to be knowledgeable in music and who persuaded his doctor to arrange a concert of music in his sickroom. As soon as the music started his symptoms abated and his fever was suspended, but all these returned when it stopped. On the basis of this success it was arranged that someone would sing and dance before him every night, and in ten days he was restored to perfect health.[44]

Brocklesby invokes the second French case study in the context of frenzy, a disorder he says has all the symptoms of a delirium as well as an acute fever at the same time. He explains that in the *Histoire de l'Académie des Sciences* a certain Monsieur de Mandajor reported saving a dancing master's life with music by going against the advice of the latter's physician and family and getting a violinist to play some of the dying patient's favourite tunes, to which the latter responded by keeping time with the music with his hands and nodding his head. Left to himself he fell into a deep sleep and had a 'happy crisis', after which his health was eventually restored.[45]

In Brocklesby's view, music is the best remedy for diseases of the mind because it awakens the attention and relieves the anxious mind by substituting a more agreeable series of images, and gradually returns the mental faculties to their normal state. Above all he is interested in encouraging physicians to use music in the treatment of maniacs, which as we have already seen was the motive for writing his *Reflections* in the first place. Brocklesby was aware that it would be difficult to persuade his colleagues to try the experiment, if past experience was anything to go by. He notes that in each of the French cases it was not a physician who initiated the musical cure, and also points out that even though a physician as illustrious as Thomas Willis suggested using music nearly a century ago, since then no one seemed to have followed this lead.[46] For his part, Brocklesby thinks that music is best used in conjunction with other medicines in the treatment of madness. In conventional treatments it is necessary to use extremely large doses of medicine or purgatives to get any response from the patient at all, who can also stand extreme cold and lack of food and sleep for long periods because his mind's attention is 'suspended or unduly stretch'd'. Brocklesby suggests that music can be used to sooth the affections,

> and as it were to reestablish the former union of the body and mind, by the powers of musick, in that interval of time, proper medicines might be administred to better purpose, by which means the material offending

> cause may be evacuated, which could never be reached whilst the mind's attention to the bodily organs so far ceased.[47]

It is notable that Campbell also remarks on music's ability to call the mind's attention away from delirium, and to make more simple and pleasing mental impressions. Like Browne, whom we have seen also favoured Italian styles, Campbell has some general recommendations on the kind of music that is to be used, suggesting first that 'the musical style should generally be gentle, peaceful, and soothing, or what the Italians call *affettuoso*, *dolce*, *piano*, and *pianissimo*'[48] The music should have few (intervallic) leaps, since these create 'a disagreeable sensation in the mind', and any transitions should be gradual rather than sudden. Music 'of the kind the Italians call *allegro* or *galliarda*' (a kind of lively dance) he thinks will sustain the patient's mind in attention and expectation, and will rarely cause unwelcome surprises. However, he thinks that it is also important for the musician to find out in advance whether the patient is used to music (as was the case in the French examples) or has a 'refined ear', since this will increase the likelihood of success, and to spend some initial time singing a great number of songs from which the patient may choose the most pleasing to him. Under normal circumstances listeners like musical variety, but in cases of sickness it is best for the musician to keep playing the same song; and Campbell notes that he himself has known a case of delirium where a song was played for ten hours on end to the great benefit of the patient (whom I believe was Campbell himself).

The mechanics of music: Perception and cognition

We have already seen in the previous section how our authors agreed that music moves the spirits by virtue of its own motion, an affinity which seemed to explain why it could affect the passions so strongly. However, once we look in more detail at their ideas about what we call music perception and cognition it becomes apparent that there were different views held about the processes involved, not least since these included actions of the soul as well as of the body. These differences can be shown most clearly if we start by considering how earlier authors such as Willis tackled the specific topic of hearing as well as the more general problem of mind–body interaction.[49] What is of particular interest here is the use of musical analogies to conceptualise this interaction, of which the best known by 1700 were Descartes' models of the animal machine.[50]

In brief, Willis explained the translation of sound into nervous activity in terms of the transmission of 'sonorous particles' which carry impressions of sound through the air in a wavelike motion from a sounding body to the tympanum.[51] These impressions are then reinforced in the tympanic cavity and transmitted via the oval window to the inward air embedded in the cochlea's winding labyrinth, the cochlea being the true organ of hearing,

where the auditory nerve endings are located. Willis's anatomical observations led him to claim that each of the seventh pair of nerves is divided into two branches, one hard and one soft. He thought that the hard branch of the acoustic nerve is responsible for initiating involuntary motions, 'such as are performed without consulting the brain'. These motions include pricking up the ears and opening the eyes at sudden noises, and also making involuntary vocal sounds as a kind of echo to heard sounds. This latter motion he thought enabled people to reproduce sounds accurately with little or no involvement of the brain.[52]

Meanwhile, sound impressions (which he also called species of sound) are transmitted via the animal spirits and 'nervous juice' in which they are contained through the soft branch of the auditory nerves to the brain. He thought that this extremely fine and spiritous substance, which he also called the sensitive soul, was responsible for all sensory and motor functions and some higher functions including knowledge and simple reasoning. But Willis departed from the standard Galenic belief that the nerves were hollow tubes in that he thought the nervous juice flowed like wind through their solid but porous fibres. (At other times he compared the action of the spirits to that of light.) He also compared the nervous fibres in general to the strings of a harp, which give forth different sounds according to the various strokes of the musician; in other words the impulses of tangible things irritate or provoke the animal spirits into peculiar forms of motion that are propagated through the nerve towards the brain. In this fashion the sound impressions are carried to the medulla oblongata, where Willis located the common sensory, and thence to the cerebrum, where he said that the spirits first stir up the faculty of imagination and then leave an image of themselves in what he called the artificial, or acquired, memory. At the same time the sound impressions are carried by the animal spirits to the seat of the natural memory, the cerebellum, where they are also supposed to impress a 'remembrance of themselves' in its soft substance. At this point in his explanation of hearing Willis offered a digression on why some people have 'musical ears', the first instance where this particular cognitive faculty is identified, with all its connotations for later English thinking about aesthetic responses to music.[53]

According to Willis, having 'musical ears' depends on having a suitably soft cerebellum where the impressions of musical sounds can be embedded and then later recalled by the natural memory. He thought that people who find it difficult to repeat a melody they have heard may suffer from their cerebellum being too hard, which means that music will literally fail to make an impression on them. At the same time he thought that since their cerebrum is busy with other sense impressions as well as those of sound it is 'less apt to keep the composures of harmony' in the artificial memory. By contrast, people who have a softer cerebellum can reproduce, or 'bring forth with exact Symphony' a melody they have heard, because their spirits can flow into the footsteps of the original sound and become organised

like them, enabling the listener to reproduce 'the measures or tunes of the instrument which they had drunk in at the ears'. Here Willis was making an implicit distinction between musical and non-musical sounds, the former organising or composing the spirits in a distinctive and orderly manner. Indeed, at this point he went on to suggest that music's power to allay 'all turbulent passions' excited in the breast through the blood becoming overheated is based on a similar mechanism. That is, the spirits that have been impressed with music go on to compose the spirits in the breast 'to numbers and measures of dancing', and 'so appease all tumults excited therein'.[54] In sum, Willis' treatment of hearing in Chapter 17 of his *Cerebri Anatome* laid the foundations for eighteenth-century British theories about a good ear for music, and also provided a framework for discussing its physiological and psychological effects.

Despite Willis' attention to their anatomy, the precise construction of the nerves and the nature of nerve action continued to elude medical theorists throughout the eighteenth century. This was part of a continuing debate about the different natures of the body and soul and their mode of interaction with each other. As Jamie Kassler has shown in *Inner Music*, a number of seventeenth-century natural philosophers used particular musical instruments as models for understanding this interaction. Most notably Descartes (but also Willis) found that mechanical musical devices were helpful for thinking about how the nerves functioned, and this set a precedent for eighteenth-century theorists. Thus Descartes chose the pneumatic organ to model the animal machine, where the bellows are the heart and arteries, the wind trunks are the brain, and the pipes and air are the hollow nerves and the animal spirits. In vascular function the bellows (heart) pushes wind (animal spirits) into the cavities of the wind trunks (brain), while the fingers (external objects) pressing certain keys make air (animal spirits) enter certain pipes (nerves). To account for nervous function Descartes used the example of a carillon, a set of tuned bells hung in a tower and played from a keyboard. He envisaged the nerves as hollow pipes but containing delicate filaments that compose their marrow. These filaments function like bell pulls, being attached to the sensory organs at one end and to the 'bells' or orifices of the pores of the brain at the other. External stimuli (which either come from outside the body or from the action of the soul) cause a pull on the filaments which instantaneously open the orifices of the brain and allow the animal spirits to flow through the nerves towards the muscles which are thereby inflated.[55] This model assumes that the body may be affected directly upon receipt of sensory data independently from the mind. In the case of hearing Descartes suggested that the nerve filaments at the back of the ear cavities are moved when little blows of the outside air strike the drum. This membrane transmits the blows to the inward air, which in turn moves the nerve filaments that transmit them to the brain, opening a pore or pores and causing the mind to conceive the idea of sound.

A Cartesian influence can clearly be seen at work in the sixth chapter of George Cheyne's *Essay on Health and Long Life* (1724) where he discusses the passions as being at the root of many afflictions, including hypochondria and hysteria. Cheyne begins his explanation of the passions with the observation that

> The soul resides eminently in the brain, where all the *Nervous* fibres terminate inwardly like a *Musician* by a well-tuned *Instrument*, which has *Keys* within, on which it may play, and without, on which other *Persons* and *Bodies* may also play. By the *inward keys* I understand those means by which the *Thoughts* of the *Mind* affect the *Body*; and by the outward, those whereby the Actions or *Sensations* of the *Body* affect the *Mind*. Both these affections may be called Passions in a general view, as either part of the compound is acted upon.[56]

However, at this point Cheyne describes the nerves as 'bundles of solid, springy, and elastic threads whose extremity ends at the common sensory of the brain' rather than as tubes. Men who have the most elastic fibres have the quickest sensations, with sensations of pleasure being caused by a 'musical or commensurate touch' which is evident in hearing where the agreeable sensations of sonorous bodies are 'altogether harmonious'.[57]

A similar analogy is found in *The English Malady* (1733) where, having described the soul as being like a musician in a 'finely fram'd and well-tuned organ case' where the nerves are like keys, Cheyne goes on to say

> Or, in a more gross similitude, the Intelligent principle is like a Bell in a steeple, to which there are an infinite number of Hammers all around it, with Ropes of all Lengths, terminating or touching at every Point of the Surface of the Trunk or Case, one of whose Extremeties being pull'd or touch'd by any Body whatsoever, conveys a measur'd, and proportion'd impulse or stroke to the bell, which gives the proper sound.[58]

However, Cheyne's model clearly differs from the Cartesian animal machine since he argues that just as there are principles of gravity or attraction inherent in bodies (which the Cartesians deny) so there is an analogous principle of 'Charity' or love in the animal spirits which attracts its particles to each other. Cheyne is not really sure about the composition or even the existence of these spirits, but says that either there is an ethereal and subtle fluid in nature that links gross matter to pure spirit, or else we must suppose that the qualities of the spirits are innate to them and were 'impressed on them immediately by the first and supreme cause'.[59]

The likely composition of the animal spirits and their attractive principle are discussed more fully in *The English Malady* where Cheyne explicitly

draws attention to the relationship between the 'infinitely fine and elastick fluid or Spirit' that Newton speculated might cause gravity, and the intermediate, material substance that 'may make the cement between the human Soul and Body, and may be the Instrument or Medium of all its Actions and Functions'.[60] Newton initially made this speculation at the end of the General Scholium in the second and third editions of the *Principia* (1713, 1726), and went on to develop it in the *Optics*. In the first edition of 1704 Newton initally suggested that the sensations of musical tones, and those of colours, are caused by vibrations of different wavelengths striking their respective organs, a harmonious mix of sounds or colours being due to the proportion between their vibrations. This conjecture stemmed from a theory of consonance (the so-called 'coincidence theory') first popularised by Galileo and later developed in England by Robert Hooke and other natural philosophers.[61] In the second edition of 1717 Newton went on to suggest the existence of an incredibly fine, elastic and subtle medium that fills infinite space (which he likened to God's *sensorium*) and is responsible for gravity and electrical attraction as well as the transmission of both light and sound. Significantly, he thought that the vibrations of this medium could also be propagated through the 'solid, pellucid and uniform capillamenta of those nerves into the place of sensation' (in other words man's *sensorium*).[62] At the same time he conjectured that this or a similar medium serves to perform the actions of the soul, its motion first having been excited in the brain and then propagated from thence to the nerves and muscles, which then contract or dilate accordingly.

Although succinct, the relevant passages from these groundbreaking works were to have a significant influence, for example, on French music theory and natural philosophy.[63] At the same time they attracted the attention of British philosophers and physiologists like Cheyne who were seeking to explain mental functioning and nerve action in general, not just in relation to music. Most notably, they served as the starting point for David Hartley's 'musical' theory of the nervous system in his *Observations on Man* (1749). Here Hartley argued that the instrument of sensation and motion is a white medullary substance located in the brain, spinal marrow and nerves, and is the medium by which ideas are presented to the mind and by which ideas initiate bodily actions. When objects are impressed on the sensory nerves they excite isochronous vibrations (i.e. simple harmonic motion) in the ether which Newton thought may reside in gross bodies, including the pores of the nerves themselves. In turn these vibrations are communicated sympathetically to the particles of the medullary substance, whose motions, which Hartley says are like the oscillations of pendulums, are then propagated freely to the brain like the 'propagation of sounds along the surface of the water, which has sometimes been observed in still, calm nights'.[64] Hartley thinks it absurd to imagine that the nerves themselves move like musical

strings. Instead it is the infinitesimal particles of the medullary substance that transmit vibrations which somehow have the power of generating and raising ideas by association.

Returning to Cheyne, we find that he did not write about music perception as such, but at least in his earlier *Philosophical Principles of Natural Religion* (1705) he articulated his ideas on hearing in general. In fact there was nothing new about what he had to say, which simply reflected prevailing views. In brief, the crucial features of hearing start with the external ear, which collects the undulations of sound that are carried through the auditory passage to the drum, on which beating the four little bones in the barrel move the internal air, which 'according to its Degree of Motion, makes an impression on the Auditory Nerves in the Labyrinth and Cochlea'.[65] The auditory nerves are the immediate organ of hearing, and the different impressions they receive represent to the mind different sorts of sound.

This passage was copied verbatim by Richard Browne in the first edition of his *Mechanical Essay,* where he acknowledges Cheyne as his source on the ear.[66] (However, he does not follow the latter's Newtonian speculations about the substance of the animal spirits. His hydraulic model of the nerves is based on the secretion and ebb and flow of the spirits, which simply push the muscles into action.) In the later *Medicina Musica,* however, Cheyne's description of hearing is not enough because Browne feels it necessary to elaborate on musical sounds in particular, stating that a clear perception of music in the mind requires a 'more exquisite Configuration of the Ear, than is necessary for the Conveyance of simple Sounds'. (In some respects this is reminiscent of Willis' concept of 'musical ears' which depend on the brain's substance being suitably soft.) For Browne, those who lack a 'fine displaying of the Auditory Nerves' cannot form an idea of harmony, in the same way that a blind man cannot conceive of colours.[67]

We have already seen in an earlier section of this chapter how Browne advocates using contrasting styles of music (the allegro and adagio) to alter the movement of the animal spirits and thereby to give pleasing, ravishing sensations. However it is not entirely clear whether these bodily sensations are automatically felt by anyone who hears such music, or whether only those with the right kind of nerves are stimulated in this way. What is made explicit by Browne, however, is that the organ of hearing can be tuned and its distinguishing capacity refined, thus giving the soul a better perception of harmony, through 'frequenting the School of Music' (in other words practice makes perfect). At the same time by the application of theory we become more capable of judging the 'Truth and Exactness of the Composition', by which means we are able to treasure up in our minds clear and true ideas of every 'mystical Beauty and Embellishment in the Tune'. While vulgar ears miss such delicacies, the discerning ear enjoys 'every fine tremulous Oscillation', a pleasure which can also be increased by habituating ourselves to sing. By this exercise the organs (of hearing as well as the voice) will gain

greater strength and agility in their actions 'and thereby be adapted more nicely to modulate the Voice into a Tune'.[68]

Nicholas Robinson is also sure that there is more to musical perception than just hearing alone. In the first place, he is most emphatic that music's effect on the mind is not a straightforwardly mechanical operation of the kind that Descartes envisaged, who in his *Passions of the Soul* (1649, English translation 1650) had claimed that the sensible passions can be moved independently from the intellectual faculties. Instead he argues in his *New System of the Spleen* (1729) that there is a particular sense in musical sounds that delights the soul before it goes on to affect the body, while harsh 'inharmonial' sounds do nothing for the soul. He notes that each of the instruments of sensation differs in its structure, mechanism and modulation of the fibres. Being a committed Newtonian, he says that the nerves are made up of fibres which are suffused with a subtle 'animal aether of different elasticities, agreeable to the different springiness of the nervous fibres'.[69] In hearing, the drum tenses or relaxes according to the force of the waves of sound that strike it, motions which are communicated to the fibres of the auditory nerve via their connection with the drum and the auditory meatus. The drum relaxes to protect the ear from overly loud sounds, and tenses to capture whispers at a distance. However, it can contract or relax too much as a result of too much heat or moisture, phenomena which can explain the 'singing noises in the ear' that sufferers of the spleen, vapours or hypochondriac melancholy often complain of.[70] In the case of this latter disease, he suggests that musical sounds via the action of the auditory nerve may raise, exalt or depress the motion of the 'subtle fibres of the brain', which in turn may alter the irregular motions of the mind in a way that the choicest medicines fail to do.

At this point Robinson makes a clear distinction between the force of sounds, and harmony, 'which is reason in perfection'.[71] Just as words must be placed in a regular order to be understood, so must tunes comprise a rational system of sounds in order to be true. Indeed, 'to ask why we are pleased with Musick; is in Effect to ask, why we are pleased with Knowledge'.[72] He acknowledges that harmony, or the melody of sound can raise or depress the passions, but reaffirms that this can only occur when it moves the intellectual faculties first. There is, however, a strong physical basis to the mental effects of music:

> These excessive Elevations, and inexpressibly pleasing Raptures that affect the spirits of those remarkable for a fine Taste in Musick, all depend upon the Fibres, and are owing to a fine Displaying of the auditory Nerve upon the Tympanum, and other Parts of the Ear.[73]

Differences in the fibres of the brain and nerves may explain why some auditors are in raptures at a well-played consort while others sit by 'without the least emotion'. While a knowledge of the theory of music may help improve

musical judgement, it seems to be the physical differences in the ears of people that makes a few of them particularly able in this regard. Robinson goes on to conjecture that exquisite taste in music may also be correlated with geography, in that it seems to be most developed in southern climes where people are 'naturally' musicians. Indeed he suggests that this is 'the reason why Italy and Naples are so much caress'd by all those that are remarkable for a fine Taste in Music'.[74]

Twenty years passed before another English physician wrote at any length on music cognition, the relevant publication being Richard Brocklesby's *Reflections on Antient and Modern Music* (1749), which as we have already seen was intended to persuade doctors to incorporate music into their treatments for madness and related nervous diseases. Like all the authors discussed here, Brocklesby assumes that the animal spirits provide the essential link between body and mind, and that the movement of music can alter their motion to produce different effects. He says nothing, however, about the ear's anatomy or the action of the nerves. However, Brocklesby is like Robinson in his belief that Descartes' mechanical hypothesis is inadequate to explain music's operation on the bodily organs. Brocklesby claims that those who would reduce music's effects to the 'mechanical undulatory pulsation of the air, on the extremeties of the nerves' are simply wrong, not least because music excites commotion in the mind first, rather than the body.[75]

To support his case Brocklesby spends some time marshalling arguments to prove the mechanical hypothesis false, a system which he rightly says requires that the same quantity of motion in the vital and animal fluids is always maintained. For example, he points out that the heart's motion changes when the mind is affected with the passions of anger or love, leading to variations in the flow of fluids which cannot be admitted within the mechanical hypothesis. A further point of disagreement with the mechanists is that what he calls their 'Epicurean' theory of generation requires all organs of the body to be made simultaneously, something which must be impossible since no motion of any fluid can form all these at the same time.[76] By contrast, Brocklesby thinks the vital functions of all animals, including man, can only be accounted for with reference to a vital principle that needs reinforcing from time to time by the active cause which initially created them – a belief that he says was held by the 'Platonists of old':

> A spirit feeds [the world] within, and, infused throughout its limbs, a mind stirs the mass and mingles itself with the great body.[77]

Rather than speculating on the physical structure of the ear, nerves and brain and their role in music perception, Brocklesby instead takes the line that the mind has an 'inexplicable faculty' to be pleased or displeased with certain airs, and that musical sound gives pleasure in two ways. The first of these is music's capacity to exercise an 'internal sense' of taste which is highly developed in 'every class of the truly curious part of mankind' but which

is incomprehensible to 'vulgar minds'.[78] Unlike Browne, he says nothing about the possibility of refining this sense, one which depends on a certain law of the mind which can perceive uniformity within variety, added to a 'certain association of ideas', a concept which obviously has its origins with Locke. He says that the most affecting compositions of music are made up of diverse notes whose vibrations regularly coincide with each other, by which he apparently means the concords of the octave, fifth and third, but actually says these are called by musicians 'unison notes'.[79] Through the activity of perceiving the proportional relationships between these musical sounds the mind expands and contracts, and its images are heightened or diminished, as the sense of taste is exercised.

The second way that music gives pleasure arises from music's capacity to imitate nature exactly, particularly in the way that it

> breathes for the airs, tones, accents, sighs, and inflections of the voice and in a word every sound in nature which usually impresses certain sentiments and passions of the mind . . .

In fact music is more powerful than eloquence because it comprises 'natural sounds' which 'convey a universal expression and energy from the simple dictates of unbiassed nature'.[80] How this natural energy is actually communicated remains an open question, although as we have already seen Brocklesby regards the mechanical hypothesis as an inadequate explanation. Instead he considers how the mind 'superintends and actuates the vital and natural functions' produced in the body. On the one hand the temperament and complexion of the body (which the physician is adept at identifying by reading its outward signs) constitute a 'true index' to the moral habits of the mind, while on the other hand the habits of the mind influence the animal spirits and grosser parts of the body:

> For as hath been observed, nature herself has assigned to every emotion of the soul, its particular cast of the countenance, tone of voice, and manner of gesture. And the whole person, all the features of the face and tones of the voice answer, like strings upon musical instruments, to the impressions made on them by the mind.[81]

This concept of the body as a musical instrument played by the soul went back to antiquity, but as we have seen it was Descartes who first popularised the mechanico-musical model (where the nerves and animal spirits are the locus of mind–body interaction) that Cheyne, Browne and others took up in the eighteenth century.[82] Thus although Brocklesby rejected the mechanical hypothesis as such, he nevertheless accepted some of its metaphors. This is particularly noticeable in his fifth chapter, which focuses on the retardation of old age by the use of music. Brocklesby thinks it is the philosophical

duty of the physician to learn about the 'springs of life' and to try and discover the means of 'retarding the motion of some wheels of this complex machine' (i.e. the human body).[83] He specifically compares the body to a piece of clockwork, its life span being determined by the quantity of absolute motion contained within it, a period that can be extended by various, but mostly unused, means of slowing this motion down. One of the most significant causes of premature death 'in this busy world' is the waste of animal spirits which the mind uses in producing innumerable alterations on the body. It is therefore a priority to produce a fresh supply of spirits, or failing this to conserve existing spirits through the control of strong passions. This emphasis on the prolongation of life through the conservation or production of spirits suggests the influence of Francis Bacon, whose philosophy underwent a revival in the early part of the eighteenth century.[84]

Brocklesby is clear that for one reason or another most people will not take the right steps to cheat death. Indeed, historical evidence shows that it has only been a few 'philosophic and abstemious men' such as Democritus and Plato in antiquity and some 'mathematical philosophers' in the present who have achieved a very long life. At this point he explicitly mentions Bacon's *History of Life and Death* as a source of inspiration, which asserts that 'temperance and a Pythagoric life' is most conducive to longevity. Brocklesby himself notes that Plato (whom he cites at several points in his *Reflections*) and Pythagoras were both masters of music and geometry, suggesting that the use of music, and frequent attention to it, might prolong life. Since he has already demonstrated music's power to invigorate the spirits, he therefore proposes that it might be good for people pursuing this goal to put music to trial and to 'recreate their spirits every day with a piece of good music'.[85]

The tarantula and music

One ailment strongly associated with a musical cure that I have not yet discussed is tarantism, a disorder which Brocklesby, for example, associates with hysteria and therefore identifies it as a nervous disease.[86] Although it had been attracting learned attention long before, tarantism and its cure was first properly put on the intellectual map by the Jesuit Athanasius Kircher in his *Magnes, sive de arte magnetica* (1641).[87] In England the topic was initially taken up in the physician Walter Charleton's *Physiologia Epicuro-Gassendo-Charltoniana* (1654), but did not attract much attention again before Richard Mead's *Mechanical Account of Poisons* (1702/1745), which included an essay on the tarantula. This was very similar in content to an English translation of the Apulian doctor Giorgio Baglivi's 'De anatome, morsu & effectibus Tarantulae' (Of the Anatomy, the Bite, and the Effects of the Tarantula [1696]) which was published with Baglivi's *Practice of Physic* in 1704. According to Mead, the disease is local to Apulia, the hottest part of Italy, where

every year people supposedly bitten or stung by the tarantula rapidly become melancholic and slide into death unless a musician intervenes. Once the right kind of music is played (a version of the *tarantella*, a rapid dance form which like the spider takes its name from the city of Taranto), the victim dances frenziedly for many hours a day for several days, after which he or she returns to normal until the following year when the same pattern is repeated. Mead, following Baglivi, thought that the spider transmits poison in the form of inflammatory particles to the victim's nervous fluid, which is put into a ferment and therefore transmits irregular motions to the brain, causing mental disquiet. He explains that patients respond to different tunes because each has a particular tension of the elastic fibres of his or her brain and therefore requires specific musical vibrations to be relieved. Once the patient begins to respond to the right vibrations, the vigorous action of dancing leads to extensive transpiration that carries off the inflammatory particles and allows the spirits to return to their normal composition. Mead's conception of brain fibres that respond to specific musical frequencies may have influenced Robinson's discussion of people's varying reactions to music, which he thinks might depend on the structure of the brain's fibres.

Browne also takes up discussion of the tarantula in his chapter on music (where he refers the reader to Mead and Baglivi), and the subject comes up again in his treatment of dancing.[88] In his account, after the victim has been bitten by the spider they fall down as though in a fit of an apoplexy. They remain in this position until their spirits are enlivened by the 'sprightly strokes of an Allegro consort'. This mechanical alteration leads to a recovery of sensation and motion, an increase in the elastic force of the fibres, and more frequent and strong contractions of the heart that heat and rarefy the blood, a process which eventually leads to the influx of spirits into the muscles, and the patient starts dancing. Exactly how the poison is removed from the blood by this exercise is difficult to glean from Browne's description, which seems intent on blinding the reader with science. However, the gist is that the 'preternatural cohesions' generated in the blood by the poison dissolve as the blood itself becomes more fluid (it divides into smaller particles that move more rapidly) and circulates more freely. At the same time the 'Lentor [sluggishness?] produced by the malignity of the poison is rendered more fit to be carried off by the Cutaneous pores', in other words by transpiration. However ridiculous Browne's explanation might seem to us, the important thing for him was that the way rapid music evidently cured patients bitten by the tarantula by stimulating them to dance was a reason to suggest, by analogy, that music would also cure apoplexies and lethargies.

Published 20 years later, Brocklesby's brief account of tarantism is altogether more circumspect. Citing Baglivi and Mead, he concludes that the origins of the disease are unclear, the only certain thing being that it is cured through the action of music, and that although each person responds to a

different tune it is generally the 'briskest airs' that restore health by inciting people to dance in an 'ecstasic way'.[89] This observation comes after a discussion about the various temperaments of different nations, the relevance being that he is comparing the symptoms of women in south-east Italy (i.e. Apulia) who suffer from chlorosis and hysterical affections with those who suffer from tarantism (also in Apulia), which may or may not be caused by a sting or bite of a spider. In effect, this marks the beginning of a more sceptical attitude towards the tarantula in England, where by the end of the eighteenth century the whole phenomenon had come to be regarded as a likely fraud.[90]

The language of music and the nerves

In this chapter I have shown that music was a more significant topic in eighteenth-century medical discourse on the nervous system than has previously been thought. From one perspective, this nervous discourse provided a learned way of articulating how music can beneficially alter inner states, specifically the passions. As the example of Browne shows, the nerves can be visualised as the conduits for pleasurable feelings coursing throughout the body as appropriate music sympathetically moves and regulates the spirits, either by stirring them up or calming them down. (He is quite specific on the kind of music to be used in each context.) For the majority of my authors, such embodied pleasure cannot be separated from music's psychological impact on the soul and mind, as imagined variations in the structure and composition of the nerves and the brain serve to explain differences in cognitive functioning, including the exercise of memory, of attention and of musical taste. At the same time there is the suggestion (particularly in Browne) that the exercise of these inward faculties somehow changes the composition of the nerves, in a process of refinement. In sum, the general message of these medical texts is that music is good for health, the argument being underpinned by the most recent advances in natural philosophy as well as references to Plato and Pythagoras.

From another perspective, however, we can see that neurological discourse benefited from its association with music as much as the other way around. The very fact that music's effects can be experienced (and seen in others), that there is a distinct connection between spritely music, for example, and feelings of liveliness, serves to demonstrate the interaction between body and soul, which can therefore be known experimentally. More specifically, it is clear that natural philosophers found it useful to think about the body in musical terms, which functioned like an instrument with the nerves vibrating with varying degrees of sensitivity in response to external stimuli or to inner actions of the soul. In other words, my focus on music and the nerves in English thought opens a window onto eighteenth-century understandings of mind–body interaction, ideas which prove to be linked to broader philosophical debates about the composition

of matter and the operation of natural laws. As is well known, these debates were chiefly framed with reference to Cartesian and Newtonian physics, with most English physiologists rejecting Descartes' system as a whole even while favouring mechanico-musical models of the body. The striking thing about early eighteenth-century physiology is the way that Newton's speculations about the existence of a vital, dynamic ether which might serve as the medium for gravity and electricity as well as light and sound were immediately taken up, the idea being that this ether may be the same or similar to the substance of the animal spirits which are extremely active by nature. Thus although it was assumed that the workings of the human body were subject to the laws of physics, this did not rule out active matter.

Although I have concentrated on eighteenth-century ideas, it has been important to show continuities with earlier thinking about music and the causes of its effects. The idea that music moves the passions via the spirits, that there is an affinity between music's movement and the different passions, was already a commonplace by the time Bacon made this observation in one of his experiments in the *Sylva Sylvarum*. The concept of the animal spirits itself was a staple of Galenic medical theory even though this had little to say on music. Indeed Brocklesby looked back to Plato for the idea that music composes the spirits, and noted that the Pythagoreans had a habit of regular music-making to prolong life and maintain wellbeing. Another long-standing theme was the strong association between music and melancholy, and other diseases of the mind, a topic which had been addressed by Robert Burton, for example, in the early seventeenth century, and by Bright decades before that, in their respective treatises on melancholy. With all this evidence of long-established notions it is tempting to say that there was scarcely anything new or distinctive about Browne's *Medicina Musica* and Brocklesby's *Reflections*, or about the Edinburgh dissertations on music and sound which appeared over the next decades.

What we can say is that they were the first English medical texts to take the effects of music as their central subject, the aim being to explain music's therapeutic potential in natural philosophical terms. The key proves to be the restoration of balance or harmony within the mind itself and also between the body and mind, this equilibrium being achieved through deliberately stimulating the spirits into one or another kind of motion. Although the concept of health being a harmony between the body and soul was of ancient origin (and Brocklesby specifically invoked Plato to support this view), it does not seem to have been usual for doctors to apply these ideas in practice.

Notes

1. George S. Rousseau, *Nervous Acts: Essays on Literature, Culture and Sensibility* (Basingstoke: Palgrave, 2004), Anne C. Vila, *Enlightenment and Pathology: Sensibility in the Literature and Medicine of Eighteenth-Century France*

(Baltimore and London: Johns Hopkins University Press, 1998), Christopher Lawrence, 'The Nervous System and Society in the Scottish Enlightenment', in Barry Barnes and Steven Shapin, eds., *The Natural Order* (London: Sage, 1979), 19–40.

2. Anita Guerrini, *Obesity and Depression in the Enlightenment: The Life and Times of George Cheyne* (Norman: University of Oklahoma Press, 2000).
3. See, for example, Stanley W. Jackson, 'Force and Kindred Notions in Eighteenth-Century Neurophysiology and Medical Psychology', *Bulletin of the History of Medicine* 44 (1970), 397–410 and Theodore M. Brown, 'From Mechanism to Vitalism in Eighteenth-Century English Physiology', *Journal of the History of Biology* 7 (1974), 179–216.
4. For a preliminary discussion of music and the nervous system in Scottish Enlightenment thought, see Penelope Gouk, 'Music's Pathological and Therapeutic Effects on the Body Politic: Doctor John Gregory's Views', in Penelope Gouk and Helen Hills, eds., *Representing Emotions: New Connections in the Histories of Art, Music and Medicine* (Aldershot: Ashgate, 2005), 191–207.
5. Penelope Gouk, 'Music, Melancholy and Medical Spirits in Early Modern Thought', in Peregrine Horden, ed., *Music as Medicine: The History of Music Therapy since Antiquity* (Guilford: Ashgate, 2000), 173–194.
6. For the wider philosophical engagement with music, see Maria Semi, *Music as a Science of Man: The Characters of Musical Knowledge in Eighteenth-Century England* (Guilford, Ashgate: 2012).
7. For the use of musical models to understand mental functioning in the seventeenth century, see Jamie Croy Kassler, *Inner Music: Hobbes, Hooke and North on Internal Character* (London: Athlone Press, 1995).
8. Penelope Gouk, *Music, Science and Natural Magic in Seventeenth-Century England* (London and New Haven: Yale University Press, 1999), especially Chapter 7. See also Penelope Gouk, 'The Role of Harmonics in the Scientific Revolution', Thomas Christensen, ed., *The Cambridge History of Western Music Theory* (Cambridge: Cambridge University Press, 2002), 223–245.
9. See D.P. Walker, 'Medical Spirits in Philosophy and Theology from Ficino to Newton', *Arts du spectacle et histoire des ideés*, Société des Amis du Centre d'Etudes Supérieures de la Renaissance (Tours: Centre d'Etudes Supérieures de la Renaissance, 1984), 287–300; also Penelope Gouk, 'Raising Spirits and Restoring Souls: Early Modern Medical Explanations for Music's Effects', Veit Erlmann, ed., *Hearing Cultures: Essays on Sound, Listening, and Modernity* (Oxford and New York: Berg, 2004), 87–105.
10. There has been confusion regarding the identity of this Richard Browne because until 2005 the *Dictionary of National Biography* stated that *Medicina Musica* was first published in 1674 by the physician Richard Browne (1647/1648–1693/1694?). This proves to have been a ghost text; in fact the first edition appeared in 1727 at which time, according to his preface in the second edition, the author said he was still an apprentice (and therefore he was most likely born after 1700).
11. For more on Brocklesby, please refer to Chapter 6. For further biographical details, see William S. Curran, 'Dr Brocklesby of London (1722–1797): An 18th-Century Physician and Reformer', *Journal of the History of Medicine* 17.4 (1962), 508–521, C.S. Breathnach, 'Richard Brocklesby FRS FRCP (1722–1797): Physician and Friend', *Journal of Medical Biography* 6.3 (1998),125–127, and Margaret Ann Rorke, 'Music Therapy in the Age of Enlightenment', *Journal of Music Therapy* 38.1 (2001), 66–73.

12. Haller's Göttingen dissertation of 1752, *De partibus corporis humani sensibilibus et irritabilibus* was published in English in 1755. Brocklesby's article 'An Account of Some Experiments on the Sensibility and Irritability of the Several Parts of Animals', was published in the *Phil. Trans*. 49 (1755), 240–245. For further discussion of this article, see T. Brown, 'From Mechanism to Vitalism'.
13. Joseph Fenn Sleigh's *Tentamen physico-medicum inaugurale, de auditu* (Edinburgh, MD, 1753) and Edmund Somer's *Dissertatio physico-medica, inauguralis, de sonis et auditu* (Edinburgh, MD, 1783) discuss the anatomy of the ear but do not go on to consider nerve action. All these Edinburgh dissertations on sound, music and hearing were preceded by similar publications in Germany and France, notably Adam Brendel, *De curatione morborum per carmina et cantos musicos* (Wittenberg, MD, 1706), Michael Ernst Ettmüller, *Disputatio effectus musicae in hominem* (Leipzig, MD, 1714), J.W. Albrecht, *Tractatus physicus de effectibus musices in corpus animatum* (Leipzig, M.D.1734) and Joseph-Louis Roger, *Tentamen de vi soni et musices in corpus humanum* (Avignon, 1758). For the wider European context, see the excellent study by Jukka Sarjala, *Music, Morals and the Body. An Academic Issue in Turku, 1653–1808* (Helsinki: Finnish Literature Society, 2001), and also consult the bibliography in Werner Freidrich Kümmel, *Musik und Medizin. Ihre Wechselbeziehungen in Theorie und Praxis von 800 bis 1800* (Freiburg/ München: Verlag Karl Aber, 1977).
14. Odier, *Epistola physiologica*, 39–40.
15. See, for example, Jerimiah Wainewright, *A Mechanical Account of the Non-Naturals: Being a Brief Explication of the Changes Made in Humane Bodies* … (London, 1707), William Wood, *A Mechanical Essay Upon the Heart. In Three Anatomical Lectures* (London, 1729), Anon., *A Physico-Mechanical Essay on Improving the Corpuscular Philosophy* (London, 1733). For further details, see Brown, 'From Mechanism to Vitalism'.
16. Odier, *Epistola physiologica*, 9–10.
17. Browne, *Medicina Musica*, xiii–xiv.
18. Brocklesby, *Reflections*, 62 (wrongly paginated as 92)–63.
19. David Campbell, *Disquisitio inauguralis de musicis effectu in doloribus leniendis aut fugendis* (M.D. Edinburgh,1777), 5.
20. Campbell, op. cit., 43.
21. It wasn't until the end of the eighteenth century that physicians became far more concerned with music's pathological effects. See James Kennaway, 'From Sensibility to Pathology: The Origins of the Idea of Nervous Music Around 1800', *Jl. History of Medicine and Allied Sciences* 65.3 (2010), 396–426.
22. E. Ashworth Underwood, *Boerhaave's Men at Leyden and After* (Edinburgh, 1977), Rina Knoeff, *Herman Boerhaave (1668–1738), Calvinist Chemist and Physician* (Amsterdam: Koninnklijke Nederlandse Akademie van Wetenschappen, 2002).
23. Andrew Cunningham, 'Medicine to Calm the Mind: Boerhaave's Medical System, and Why it was Adopted in Edinburgh', in Andrew Cunningham and Roger French, ed., *The Medical Enlightenment of the Eighteenth Century* (Cambridge: Cambridge University Press, 1990), 40–66.
24. Nicholas Robinson, *A New System of the Spleen, Vapours, and Hypochondriack Melancholy: Wherein all the Decays of the Nerves, and Lowness of the Spirits, are Mechanically accounted for* (London, 1729), 26–27.
25. Brown, *De sonorum modulatorum vi in corpora humana*, 43.
26. Penelope Gouk, 'Music and Spirit in Early Modern Thought', in Elena Carrera, ed., *Emotions and Health 1200–1700* (Brill, 2013), 221–329.

27. Robinson, *A New System of the Spleen*, 79.
28. On sixteenth-century precedents, see Katherine S. Park, 'The Organic Soul', in C.B. Schmitt and Quentin Skinner, eds., *The Cambridge History of Renaissance Philosophy* (Cambridge, MA: Cambridge University Press, 1988), 464–484. For Bacon, see Gouk, *Music, Science and Natural Magic*, 163–166. On Willis, see Jamie Croy Kassler, 'Restraining the Passions: Hydropneumatics and Hierarchy in the Philosophy of Thomas Willis', in Stephen Gaukroger, ed., *The Soft Underbelly of Reason: The Passions in the Seventeenth Century* (London and New York: Routledge, 1998), 147–164.
29. Rousseau, *Nervous Acts*, 160–184.
30. Browne, *Mechanical Essay* (1727), 2–3.
31. Ibid., 4–6.
32. The first English work to explore this subject in depth was Thomas Wright, *The Passions of the Mind*, the second edition of which (1604) contains a new chapter on 'How passions are moved through music and instruments'. See also Penelope Gouk and Helen Hills, 'Towards Histories of Emotions', in Gouk and Hills, eds., *Representing Emotions*, 15–34.
33. The other non-naturals were air, food and drink, exercise and rest, sleep and wakefulness, and retention and excretion of bodily wastes. See, for example, Jerimiah Wainewright, *A Mechanical Account of the Non-Naturals: Being a Brief Explication of the Changes Made in Humane Bodies* … (London, 1707).
34. Brocklesby, *Reflections*, 29.
35. Francis Bacon, *Sylva Sylvarum* (London, 1626), experiment 114. A similar observation is made by Timothy Bright in *A Treatise of Melancholie* (London, 1586), 40–41.
36. Browne, *Medicina Musica*, 35–39.
37. Ibid., 44.
38. In fact Isaac Brown still explains melancholy in terms of black bile accumulating about the heart, 'where it breeds melancholy; and grief and sadness, which are thoroughly mental afflictions', Brown, *De sonorum modulatorum*, 31.
39. Brocklesby, *Reflections*, 33.
40. Ibid., 26.
41. Ibid., 34. See Iliad I §186.
42. Ibid., 34–35. On the word 'emotion', see Graham Richards, 'Emotions into Words – or Words into Emotions?' in Gouk and Hills, eds., *Representing Emotions*, 49–65, especially 53 and endnote 12.
43. *Histoire de l'Académie des Sciences* (Paris, 1707), 'Diverses observations de physique générale', sec. 1, 7–8, (Paris, 1708), 22–23. Brocklesby didn't need to have read the original French reports since they were summarised in an article published shortly before his *Reflections* was written: 'Surprising Instances of the Effects of Music in Acute Fevers, and for the Cure of the Bite of the Tarantula', *The Gentleman's Magazine* 13 (1743), 422–424. This review also refers to an article on the Tarantula in *Histoire de l'Académie des Sciences* (Paris, 1702), 20.
44. Brocklesby, *Reflections*, 49–50.
45. Ibid., 61.
46. Ibid., 64. Brocklesby quotes a passage from the seventeenth chapter of Willis's *Cerebri Anatome* (1664), which suggests that music can allay turbulent passions by enchanting the spirits in the breast, suppressing any disorders stirred up by them and moderating them 'as if to the rhythm and melody of a dance', (*velut ad tripudii numeros et modos componit*).

47. Brocklesby, *Reflections*, 63–64.
48. Campbell, 32.
49. Penelope Gouk, 'Some English Theories of Hearing in the Seventeenth Century: Before and After Descartes', Charles Burnett, Michael Fend and Penelope Gouk, eds., *The Second Sense: Studies in Hearing and Musical Judgement from Antiquity to the Seventeenth Century* (London: The Warburg Institute, 1991), 95–113.
50. Jamie Croy Kassler, 'Man – a Musical Instrument: Models of the Brain and Mental Functioning Before the Computer', *History of Science* 22 (1984), 59–92, Jamie Croy Kassler, *Inner Music: Hobbes, Hooke and North on Internal Character* (London: Athlone Press, 1995).
51. Thomas Willis, 'Two Discourses Concerning the Soul of Brutes', *The Remaining Medical Works* (London, 1683), 69–74.
52. Thomas Willis, 'The Anatomy of the Brain. The Description and Use of the Nerves', *The Remaining Medical Works*. *Five Treatises* (London, 1681), 117–119 and 143–144.
53. Marjorie Lorch, '"Fools at Musick" – Thomas Willis (1621–1675) on Congenital Amusia', in F. Clifford Rose, ed., *Neurology of Music* (London: Imperial College Press, 2010), 151–172.
54. Quotations from Willis, 'Anatomy of the Brain', 119.
55. Kassler, *Inner Music*, 43–45.
56. Cheyne, *Essay on Health and Long Life* (London, 1724), 144–145.
57. Ibid., 167.
58. Cheyne, *The English Malady*, 5.
59. Cheyne, *Essay*, 85.
60. Ibid.
61. On Galileo, see H. Floris Cohen, *Quantifying Music: The Science of Music at the First Stage of the Scientific Revolution* (Dordrecht: D. Reidel, 1984), for later English theories, see Gouk, *Music, Science and Natural Magic*, and Jamie Croy Kassler, *The Beginnings of the Modern Philosophy of Music in England: Francis North's* A Philosophical Essay of Music (1677) *with Comments of Isaac Newton, Roger North and in the* Philosophical Transactions (Aldershot: Ashgate, 2004).
62. Newton, *Opticks*, 2nd ed. (London, 1717), 328. This affinity between the animal spirits connecting body and soul (*spiritus)* and a universal medium mediating between God and his creation (*spiritus mundi*) was a fundamental principle of Renaissance neo-Platonic thought. See Walker, *Medical Spirits* and Gouk, *Raising Spirits and Restoring Souls*.
63. For Jean-Philippe Rameau's use of Newton's ideas, see Thomas Christensen, *Rameau and Musical Thought in the Enlightenment* (Cambridge, MA: Cambridge University Press, 1993).
64. Hartley, *Observations on Man*, 2 vols (London, 1749), I, 23.
65. George Cheyne, *Philosophical Principles of Natural Religion* (London, 1705), 274. See also Neil Ascherson, 'The Fourth Auditory Ossicle: Fact or Fantasy?' *The Journal of Laryngology and Otology* 92.6 (1978), 452–465.
66. Browne, *Mechanical Essay* (1727), 21–23. The quotation marks around this passage are removed in *Medicina Musica*, 32–33, and he no longer mentions Cheyne.
67. Browne, *Medicina Musica*, 33–34.
68. Ibid. On theories of hearing more generally, see Penelope Gouk and Ingrid Sykes, 'Hearing Science in Mid-Eighteenth-Century Britain and France', *Jl. History of Medicine and Allied Sciences* 66.4 (2011), 507–545.

69. Robinson, *New System of the Spleen*, 79–80.
70. Ibid., 138.
71. Ibid., 139.
72. Ibid., 140.
73. Ibid., 141.
74. Ibid., 143.
75. Brocklesby, *Reflections*, 17.
76. He seems to be referring to the theory of preformationism held by the Cartesians. Because the emergence of a baby from a seemingly undifferentiated egg or seed couldn't be explained in mechanistic terms, they supposed there must be an invisibly small version of the baby in the egg/seed which simply had to grow larger since all its organs etc. already existed in it.
77. This comes from the sixth book of the Aeneid and is Anchises' philosophising rather than a philosophical account of the world. I owe this attribution to Leofranc Holford-Strevens.
78. A likely source for Brocklesby's conception of this internal sense is Francis Hutcheson, *An Inquiry into the Origin of Our Ideas of Beauty and Virtue* (London, 1725). In fact taste had long been the subject of debate among French philosophers, not least among them Descartes. See Charles Dill, 'Music, Beauty, and the Paradox of Rationalism', Georgia Cowart, ed., *French Musical Thought 1600–1800* (Ann Arbor and London: U.M.I. Research Press, 1989), 197–210.
79. Brocklesby, *Reflections*, 14–15. Brocklesby has a lengthy footnote explaining how the vibrations of these notes are in proportional relation to each other. This is a version of the coincidence theory of consonance already mentioned above.
80. Brocklesby, *Reflections*, 16. Rousseau popularised the concept of music as a natural language of the passions at around the same time Brocklesby's *Reflections* was published, but the idea was already developed in the seventeenth century by the French minim friar Marin Mersenne (1588–1648); see David A. Duncan, 'Persuading the Affections: Rhetorical Theory and Mersenne's Advice to Harmonic Orators', in Cowart, ed., *French Musical Thought*, 149–175.
81. Brocklesby, *Reflections*, 17–18. He is using the term 'emotion' here to signify the outward signs of the soul's movements or actions rather than an inner feeling.
82. For the links between physiological theory and treatises on the visual and dramatic arts, see Joseph R. Roach, *The Player's Passion: Studies in the Science of Acting* (Newark: University of Delaware Press, 1985), 60–67.
83. Brocklesby, *Reflections*, 70.
84. This revival is reflected in the publication by Peter Shaw of *The Philosophical Works of Francis Bacon in Three Volumes* (London, 1733).
85. Brocklesby, *Reflections*, 74. This image of Plato and Pythagoras nourishing their spirits with music inevitably recalls Ficino's *De Triplici Vita* or *Three Books on Life* where he recommends a form of astrological music as a means of drawing down heavenly *spiritus*. See D. P. Walker, *Spiritual and Demonic Magic from Ficino to Campanella* (London: The Warburg Institute, 1958), also Gouk, 'Raising Spirits and Restoring Souls'.
86. For further discussion of tarantism, see Chapter 5 in particular.
87. For an introduction to the topic, see Henry E. Sigerist, 'The Story of Tarantism', Dorothy M. Schullian and Max Schoen, eds., *Music and Medicine* (New York: Henry Schuman, 1948), 96–116. Brocklesby appears to have consulted the 1745 edition of Mead's book. But note that a review of this work, including quotations from

the essay on the tarantula, also appears in *The Gentleman's Magazine* 15 (1745), 255–260.

88. Browne, *Medicina Musica*, 49–50, 59–60.
89. Brocklesby, *Reflections*, 60.
90. This contrasts with views in Spain, for example, see Pilar Léon Sanz, 'Medical Theories of Tarantism in Eighteenth-Century Spain', in Horden, ed., *Music as Medicine*, 273–292.

4

Le corps sonore: Music and the Auditory Body in France 1780–1830

Ingrid J. Sykes

Recent books on music and medicine emphasise the intricate connection between music and the brain rather than music's capacity to influence and interact with the body. Daniel Levitin, for example, acknowledges music's bodily effects, yet he always grounds his discussion within the issue of music's supposed close relationship with neural circuitry:

> Through studies of people with brain damage, we've seen patients who have lost the ability to read a newspaper but can still read music, or individuals who can play the piano but lack the motor coordination to button their own sweater. Music listening, performance, and composition engage nearly every area of the brain that we have so far identified, and involve nearly every neural subsystem.[1]

Such an approach is supported by major medical and scientific research on audition and the brain. One example is the recent 2011 study completed by Johns Hopkins University School of Medicine and National Institute on Aging linking hearing loss to dementia. Researchers found that 'seniors with hearing loss are significantly more likely to develop dementia over time than those who retain their hearing'. Investigators also suggest that there might be a 'common pathology' between hearing loss and dementia.[2] In his book, Oliver Sacks does acknowledge that music might be felt in the body as well as the brain: 'Listening to music is not just auditory and emotional, it is motoric as well: "We listen to music with our muscles", Nietzsche wrote. We keep time to music, involuntarily, even if we are not consciously attending to it, and our faces and postures mirror the "narrative" of the melody, and the thoughts and feeling it provokes.'[3] Sacks also infers that musical perception might be more than neuroscience. He writes: 'These new insights of neuroscience are exciting beyond measure, but there is always a certain danger that the simple art of observation may be lost, that clinical description may become perfunctory, and the richness of the human context ignored.'[4]

Sacks refers to an essential point here that can be made much more explicit in our auditory histories. That is, that sound and the body have always maintained a close relationship in the construction of self and selfhood.

There is a lot of evidence to suggest that in historical terms music was more carefully grounded in the human body than in the brain. This was not because doctors working in the period before the advent of neurology as a disciplinary field of medical practice had a poor understanding of the brain. Rather, it was because music was much more openly attached to broader debates on the role of the individual within new collective social and political structures. The expressive body, the musical body, was one of the most important resources in discovering and shaping a new form of secular self that would contribute to a healthy body-politic. Musicologists such as Daniel Chua and Richard Leppert have made a major contribution to reviving and reworking the body's direct role in the construction of musical meaning and the ways in which this might be reflected in historical time and space.[5] As Leppert explains: 'The body produces music, often from the depths of its interiority, as with singing and the exhalation of breath into wind-driven instruments. Whatever else music is "about", it is *inevitably* about the body: music's aural and visual presence constitutes both a relation to and a representation of the body.'[6] Both Chua and Leppert demonstrate that music's bodily presence was played out in society as a reflection of 'deep socio-cultural anxieties and antagonisms'.[7] Musical bodies were only able to express themselves within acceptable parameters of socio-political hierarchies of control.

In 1821, the doctor and surgeon Jean-Louis Pascal posed the questions:

> Is this sound a body which really exists in nature, and which would come to strike the ear, or is it simply a way in which the moving body is able to affect us? and in this case, would the sound only be the exercise of the ear applying the knowledge of the movement of the bodies?[8]

Jean-Louis Pascal's interest in the potential for sound to construct bodily movement during the nineteenth century was a central part of the debate over sound and self that had been operating in France since the late seventeenth century. Philosophers such as Nicolas Malebranche, Blaise Pascal and Bernard Lamy warned that society was losing its ability to listen. Poor use of the ear was, for Blaise Pascal, for example, a sign of man's folly. Kings surrounded themselves in loud and triumphant noises simply to scare people into submission. Intellectuals relied on a pompous tone of voice to over-promote reason. Parents gave their children bad advice in their career choices. Simple conversations were reduced to farce simply because people heard wrongly. 'It is better to say nothing,'[9] he advised, than to create the conditions for poor listening practice. For Blaise Pascal, an elevated form of listening provided the perfect counterfoil to such pointlessness

in life. It was the only act that might force the listener into an informed state of submission. 'Know then, proud man, what a paradox you are to yourself. Be humble, impotent reason! Be silent, feeble nature! Learn that man infinitely transcends man, hear from your master your true condition which is unknown to you. Listen to God!'[10] Listening in this sense was not simply an involuntary form of motoric reaction. It was grounded in the notion that individual hearing could actively construct a more healthy and compassionate society.

Anatomists and doctors provided the empirical proof that listening could create a more constructive social setting. In 1683, the surgeon Joseph Duverney famously dissected the ear into many different pieces.[11] A little earlier, Claude Perrault (1613–1688) described a world solely defined by the parameters of human audition.[12] Both Duverney and Perrault demonstrated that the human ear forced the individual to confront with a technical process that, in the words of the anthropologist Alfred Gell, 'was created by the agency of another person, the artist'.[13] This had the effect of positioning the listener as a subject in a world where others resided. During the Enlightenment, the human ear, through the intervention of medical practice, became *the* site where this experience of the individual and the collective took place. It was seen, in and of itself, to fulfil the zone of the constructive imagination, that very fragile state of being that might direct the human individual as a holistic being towards the social good. The Montpellier school of medical vitalists demonstrated that the relationship between audition and the constructive imagination could be expanded to include the entire body. While certain types of music were important within this discourse (good music produced good bodily responses and vice versa), overall, the application of auditory bodily activity should override concerns over musical convention and aesthetic taste. Of primary concern was to generate the movement of the auditory body, *le corps sonore*.

After the Revolution, anxieties over the nature of the body-politic as a whole caused the auditory body to swing into action as a practical solution. From 1800–1830, 80 patents for mechanical inventions built specifically for generating auditory bodily activity were released into the public domain by the Conservatoire des arts et métiers in Paris. At first glance, they appear to resemble musical instruments. Yet, on closer analysis, they push the boundaries of musical instrument design to a new extreme. These were not objects designed to create beautiful melodies or harmonies. They were technological interfaces with sophisticated sound systems built for the auditory body in its most expressive state of being. They were very different from the optical forms of communication, most famously, the Chappe telegraph, that were developed in France and patented during the same period. It was sound not vision that formed the basis of their articulation into space. Today, we can only imagine the sounds that such instruments created. Most, with the

notable exception of the *orgue expressif* of Grénié, were never made. Those few that remain such as *harpo-lyre* are now too fragile for use.[14]

A small selection of these inventions eventually became standardised tools for economic consumption and were the source of considerable national pride.[15] Yet it was their sense of sonic sophistication, most obvious at the beginning of the century, that gave them a particular kind of prestige. As we will see, this was closely related to the way in which sound in a sophisticated form was attached to an idealised form of modern citizen. Sonic devices enabled individuals to maintain their sense of social compassion by activating their auditory intelligence and sustaining their bodily health. These qualities, initially at least, were most important to a nation emerging from the instability of revolution. According to some doctors then, sound and its musical form of practice remained a critical element of the nation's social and political wellbeing.

Audition 1780–1830: *Le tremblement sonore*

In 1778 the French physician, Etienne-Louis Geoffroy, published a lengthy dissertation on the ear.[16] Geoffroy was the son of the famous French doctor and chemist Etienne François Geoffroy, whose work on chemical affinity had revolutionised the classification of botanical plants.[17] Geoffroy's work was eagerly awaited by the Royal Society of Medicine and the Academy of Sciences. At 53, Etienne-Louis was yet to acquire the celebrity standing of his father. He had built up a good medical reputation as a physician in Paris. In the natural sciences, he had commenced a global study of snails. It was his dissertation on the ear, however, that gave his career the boost that would make him famous, at least among his father's colleagues in the Parisian medical establishment. In 1779, the Royal Society of Medicine presented Geoffroy's exciting findings, most notably that Geoffroy had discovered binary hierarchy of animal intelligence based on the physiology of the inner ear.[18] At the top of the chain were those living organisms with the full set of auditory mechanisms in the inner ear, the semi-circular canals and the cochlea. These included men, quadrupeds and whales. In the category below were those organisms that had no cochlea but a vestibular apparatus and two or three semi-circular canals. These included birds, reptiles and fish.

In his dissertation, Geoffroy refuted previous theses that reiterated the ancient idea that deafness resulted from faulty eardrums. The test used to demonstrate this theory, based on a model of testing hearing from inside the head, proved nothing, he explained. More conclusive were his observations of the labyrinth, the part of the ear containing the semi-circular canals and the cochlea. These were the most sensitive parts, and 'intended only to receive it [sound] and to communicate the impression of it to the brain by means of the auditory nerve'.[19] Geoffroy concluded that though

the semi-circular canals were important for hearing, the cochlea 'must be stronger and more substantial'[20] because it received the force of the entire auditory sensation. He wrote:

> The organ of hearing is the only sense which can accurately measure its object. The eyes can indeed distinguish colours but they cannot make out precise degrees between their shades: it is the same for smell and touch. Hearing alone not only distinguishes sounds, but measures them so precisely that one can distinguish the tones, the semi-tones, and their different modifications. This is what gave birth to the art of singing, which is so natural to man that all peoples have had their music, and to harmony which flatters all Hearers even if they are not Musicians. If, like the auditory nerve, the retina had been divided into little cords or fibres of varying lengths, the eye would also be able to measure light, just as the ear measures and distinguishes sounds.[21]

Geoffroy considered hearing to be at the highest level of sensory human perception.

Geoffroy's work on hearing appeared just after the philanthropist and linguist Valentin Haüy began his work on sonic reform among the Parisian blind community.[22] Both posited the importance of hearing, albeit in different ways, as a possible solution to human social decline. As Sean Quinlan has pointed out, fears over degeneracy were widespread during the pre-revolutionary period culminating in the construction of numerous diseases diagnosed by doctors as nervous disorders or diseases of infertility.[23] Quinlan explains: 'In many ways, medical practitioners were providing a biological commentary on the perceived social disequilibrium of old regime society.' Yet he also explains that such concerns over degeneracy were the beginnings of a much longer movement that extended into the period after the Terror. This movement, which was heightened by the instability of revolutionary events, sought solutions to restoring the larger political economy of the nation-state itself through new 'private practices of self-control, rehabilitation and perfectibility'. Sound was important in this new movement of health and wellbeing. By 1802, the pathological anatomist and physiologist Xavier Bichat, associated with the Paris medical school, had demonstrated that the brain and body were separate systems of vital power. According to Bichat there were two independent nervous systems in the human body – animal life in the cerebrospinal system, and organic life in the vegetative.[24] He outlined the strict independence of the two systems, so that the brain and spinal chord and somatic nerves on the one hand, and the ganglia with their vegetative nerves and ganglia on the other, functioned autonomously, each with its own nervous power. Bichat's work had a major impact on perception of the senses in the first half of the nineteenth century in France with the sensualist philosophers and their critical associates such as Marie François

Maine de Biran and Victor Cousin arguing, as a result of his work, that the human brain connected to the sensory organs required a separate regime of health.[25] Such philosophers argued that since sensibility was the source of unstable vital phenomena exercising the mind would guard against the physical and mental dangers of the imagination. Yet Mathieu-François-Régis Buisson who had worked closely alongside Bichat, was deeply critical of his ideas. In his work, *De la division la plus naturelle des phénomènes physiologiques considerés chez l'homme*, Buisson argued that the division between *vie animale* (animal life) and *vie organique* (organic life) should be replaced by *vie active* (active life) and *vie nutritive* (nutritive life).[26] The *vie active*, instead of containing all the senses, focused only on touch and the use of sight and sound in tandem with exterior objects. The *vie nutritive* incorporated taste and smell which, as a reviewer of the work explained, 'only act on the tiniest molecules of the bodies, are capable of appreciating the most intimate nature of them, and are used to guide their choice'.[27] Buisson was keen to analyse the role of hearing within the anatomical system, something that Bichat appeared to consider secondary. Buisson's philosophy of hearing consisted on the one hand of passive reception of sonic waves (an awareness of sound without actual listening) and on the other a much more important *audition active* or *auscultation* (specific listening to sound).[28] A reviewer explained that this later form of hearing

> differs essentially from passive hearing in that the hearing exercise is an act of will and attention is paid to it, and it is this difference which is marked in ordinary language through the use made of the words *listening* and *hearing*. We cannot stop ourselves from hearing, but we only listen if we wish to. We listen in order to have a better understanding, and indeed we can sometimes listen without hearing, when, according to the popular expression, we lend an ear to recognise the sounds for which we thought we had received a first impression.[29]

Such a mode of sonic perception, Buisson believed, belonged to *vie active* which also included gesture, the movement of the head and the projection of the voice.

Buisson's work suggests that there was another theory of sensibility besides Bichat's operating after the Terror. While both active and passive elements could be affected by the mind and the imagination, certain sensory actions, gesture, active listening and voice, were acknowledged as fundamental to civilised human life, however dangerous they might at first appear. Jacalyn Duffin has described how Buisson's work became central to René Laennec's famous discovery of mediate auscultation in the clinical setting.[30] Laennec encountered Buisson at the Paris medical school and reviewed his thesis with favour despite Buisson's controversial status among the medical establishment at the time. The use of the stethoscope from around 1816 ensured that

Buisson's principles of active listening could be put to direct clinical usage. Laennec was able to build a diagnostic practice through associations between certain sounds in the body and the detection of organic lesions. In one sense, Laennec's work built on the pulse research of Bordeu. Both placed sounds leading to diagnosis, initially at least, above the disease itself in classification systems. But the enormous bodily scope of Laennec's sonic method (he analysed the sounds of the lungs as well as the heart) combined with the active intervention of Buisson's specific kind of auditory intelligence was entirely new.

Geoffroy and Buisson's work on active listening also aligned with other discussions during this period on the importance of the auditory body. Hearing the human body as a mode of concrete clinical diagnosis was combined with the idea that the auditory body could be propelled back into health again by activating itself. This was in close keeping with concerns over the instability of the body-politic after revolutionary events. The famous heart surgeon Marc-Antoine Petit was to reiterate the pivotal importance of sound on the body when he described its traumatic effects on his patients at the hospital of the Hôtel-Dieu in Lyon during the Revolution.[31] Petit, who taught Laennec, described how the noise of canon fire had permanently altered the bodily states of his patients, explaining that it had led them more rapidly towards death by complicating the nervous aspects of their condition. Petit wove such analysis into a broader discussion on the close link between revolution and bodily ill health. Petit depicted revolutionary activity as a kind of naturally occurring hearing process in society, which would inevitably take place among civilised people. The problem with revolution, though, was that bad sounds might ultimately prevail. Long-term social damage, he explained, might be the consequences of short-term revolutionary glory. This was because during such periods of instability a nation's sense of bodily equilibrium was compromised, 'every passion is in play; every soul is exalted: sensitivity doubles strength; energy is everywhere; and every man feels revulsion at the very idea of an injustice'.[32] Petit's understanding of the body-politic as a natural vacuum of carefully balanced sonic relationships was also expressed a year earlier in 1795 in an article in the *Journal de Rouen* entitled *L'orgue politique* ('The political organ'). Like Petit, the unknown author believed that revolution had altered though not permanently destroyed a nation's humane sound:

> A great nation that we want to regenerate is like an organ that we want to put back together. The artist does not break each pipe which makes disharmonious or discordant sounds: he sets it at the pitch that he desires, and, when he plays the first tune, he delights his listeners.[33]

If citizens could be made to use their bodies to reinstate sonic relationships a healthy body-politic could be restored.

Bodily listening was not then considered far-fetched as medical practice. It occurred as an important part of a broader 'biomedical programme of regeneration' that, as Quinlan suggests, moved 'from elite clinical theorists to a kind of "literary underground" of medical practice'.[34] The reinstatement of sonic relationships through a kind of self-inflicted form of bodily auscultation was advocated by the Montpellier doctor Etienne Sainte-Marie who reinstated the work of the mid eighteenth-century vitalist doctor, also of the Montpellier medical school, Joseph-Louis Roger.[35] In his *Tentamen de vi soni et muscices in corpore humano* published in 1758, Roger accused seventeenth-century natural philosophers of associating the effects of music with magic, explaining that the relationship between music and the body was much more empirically verifiable. This had to do with the sonorous capacity of bodily materials, particularly the nerve fluid in the nerves. In his preface to the 1803 French translation of the work, Etienne Sainte-Marie advocated musical practice as a serious form of bodily hygiene. 'Those who look upon music as a purely pleasurable art, will not believe in the beneficial effects on many illnesses that the author of this work attributes to it.'[36] He reiterated Roger's belief in the importance of the connection between the auditory and the bodily nervous system, *le tremblement sonore* (the sonorous trembling) and *le tremblement vital* (the vital trembling) explaining that auditory nerves 'are spread throughout the body, and dilate it [...] and awaken in it [feelings of] courage, love, charity, pity, joy, and the expansive passions'.[37] And, like Roger, he emphasised that certain illnesses of a nervous nature could be completely cured by rebalancing such a relationship. This included illnesses, Sainte-Marie explained, which were not in essence nervous, but which presented some sort of nervous element such as pulmonary phthisis as well as deeply embedded emotional illnesses that might result in suicide and nervous disorders such as hypochondria.

Treatment, Sainte-Marie explained, involved much more than listening to music. It involved action. 'A healthy body is not the state which is most conducive to the best effects of music. This art acts more vigorously on a body weakened by some illness.'[38] The mechanical effect of sound, the most natural form of exercise containing tiny movements ('which constitute in the organs life itself'[39]) could be fashioned into physical exercise: 'music is an exercise, and must be recommended to women and to people of letters, who lead a sedentary life'.[40] The healthiest members of the population were musicians, he wrote. 'We note that there are more old people among musicians than among other artists.'[41] This was because musicians ensured that there was continually vigorous energetic activity in their nervous system. Musicians' bodies were always warmed up since sonic energy was physically retained within the nerves. Sainte-Marie must have advocated Roger's analyses of different sounds and his terms of diagnostic treatment. Roger explained that music was useful: if the patient was a musician or if, in a state of health, he played music a lot; if he was not a musician but demonstrated

symptoms of an illness caused by the alienation of the spirit, the alteration of nervous fluid or the excessive tension of nervous fibrils that one recognises as phrenetic delirium; if there was no pain or inflammation; if the patient showed taste and aptitude for music in the middle of the illness; if they showed obvious emotional responsiveness to music; and finally, if there was resistance to normal pharmaceutical remedies.[42] While Roger was interested in specific sounds, the doctor Forgues, who presented his dissertation at Montpellier a year before Sainte-Marie's translation, explained that there were three main classification groups of sounds which had a physiological effect.[43] These were imitative sounds, sounds that had effect on memory and the particular language of sound itself. He agreed though, that sound offered man a powerful refuge from disease. It had the capacity to transport the entire self into another domain of existence.

The Montpellier vitalists were not the only medical authorities to advocate the auditory body. Jean-Charles Desessartz, doctor and professor of chemistry and pharmacy at the Faculty of Medicine in Paris from 1776 to 1778, bemoaned the abandonment of music as a mainstream form of medical practice. Desessartz was a leading expert on health problems relating to climate and had advised the government on the serious health effects created by seasonal changes as well as specific climactic irregularities.[44] 'Why is this art which produces such astonishing effects in healthy men and in sick men, abandoned by doctors today? Why would one no longer have recourse to it for sick people who do not respond to treatment from medications reputed to be the most effective?'[45] Desessartz recounted the case of a woman of 60 who had demonstrated a range of illnesses, catalepsy, convulsion, which had not responded to conventional treatment. Yet, after exposure to music, her condition began to improve. Such evidence suggests, Desessartz explained, that the status of certain conventional medical treatments as infallible destroys the use of successful treatments such as musical listening, which cannot be measured on such terms. Doctors are also too impatient to try such techniques, seeking a quick-fix solution to the problem. They are also afraid of being ridiculed. Yet, Desessartz explained, they often do not understand the proper procedure and care required for musical treatments.

Advocates of the auditory body, such as Desessartz, understood sound as an energetic substance that activated the body through the oscillation of fibres. Unhealthy bodies could be gradually coaxed into movement with music which resulted in cure, as Desessartz explained, *une crise salutaire* (a salutary crisis).[46] This was directly in keeping with miasmatic theories of disease, common among hygienists, which blamed contaminated air on bodily irregularities. Since auditory relationships constructed physical environments, sounds could be altered to purify them. As Desessartz emphasised, 'So, everything is matter, and matter in action: this is not an occult quality.'[47] Later writers on hearing were to stress more and more the way in which the

auditory body engaged in a dynamic way with its surroundings. This led to the replacement of theories on hearing function such as air implants used by Perrault and others during the eighteenth century, with much more mechanical explanations of hearing emphasising the impulsive and interactive auditory nerve.

Audition continued to be portrayed as a tool for personal transformation even though there was a definite shift towards the human body as auditory receptor and transmitter. Through bodily audition, the individual could engage in preventative and therapeutic health care, which would benefit the body-politic as a whole. This was not necessarily a repressive form of self-expression. Rather, it was designed to draw from the body the most potent source of vitalist power for social purposes. In discourses on bodily audition, emphasis was on experiment, sensitivity and patience in medical practice rather than surgical or pharmaceutical intervention. Doctors admitted that such diagnostic treatments were difficult to define yet there was consensus on their medical significance, just as at the end of the seventeenth century medical and scientific hearing research was again a powerful tool in proving the transformative potential of auditory biology. To use one's ears, and now one's entire auditory body, was not to control the imagination but rather to momentarily let it loose in an alternative frame of reference. This would shock the self into change and recalibrate the self into a more positive and outward emotional stance towards others. Such was the renewed importance of audition in medical circles that some, such as the military doctor Pascal, posited in 1821 that more obvious forms of human expression, such as the voice, were, in actual fact, merely reflex actions of hearing.[48] Pascal emphasised the sophistication of hearing and its pivotal effect on the way the body moved in space.

This theme continued in serious medical treatises on otology such as *De l'oreille* by the doctor Jules-Charles Teule, published in 1828.[49] While Teule was eager to bring back the fundamental relationship between hearing and the laws of acoustics, he nevertheless stressed the way in which hearing was pivotal to the sense of one's surroundings: 'We can also readily accept that the presence of a special hearing organ in a species presupposes a melody, a cry [...], as a means of establishing necessary relations between the individual and the species.'[50] It is during this period that doctors began to acknowledge the importance of binaural hearing, that is, the way in which two ears work together:

> it only requires observation to be convinced of this; taking the velocity of the sound into consideration, one can accept that perception takes place at exactly the same moment for each ear, and that the impressions transmitted to the cause of the feeling by the double organ of hearing, are identical or only differ in their intensity; this does not prevent them from being confused.[51]

Teule also explored the complex issue of how the ear assesses the source of a sound. He explains that

> the diversity of the directions of the shaking is communicated to the pulp of the auditory nerve. It is a product of education; it is indeed essential that, through multiple comparisons, the mind learns to grasp the connections which exists between the relative positions of the *corps sonore* ('sonorous body') and the ear, and of the diversity of the sensations of the ear.[52]

Teule explained that auditory education was important because sound could so easily disorient an individual by changes in its intensity. For Teule, the auditory body was best educated through music. Music was not presented as an art form but as a method for retaining biologically ingrained sonic values. The tonic, Teule explained, was the most important focus for the human *corps sonore*. Yet aspects of rhythm were also constructed directly by the body: 'It seems that the sentiment of the measurement stems from the actual organisation where one sees the movements of the circulation subjected to the power of the rhythm, and consequently, all of the organs [are] aroused periodically and consistently by the blood.'[53]

From these observations, Teule concluded that it was the deaf who were the most socially disadvantaged group. They lacked a *corps sonore*. This also explained why they became mute. The blind, however, could be classified as superior in intelligence to the everyday citizen, simply because they could hear at acutely sensitive levels:

> People born blind generally make a more reliable judgement than other men on objects for which knowledge has been gained through the ear; it is not rare for a blind person to recognise from the noise of a footstep, people from whom he has been separated for a long time.[54]

Overall, Teule demonstrated that the body consisted of a very real abstract set of sonic relationships, which were best enhanced by music. Music did not simply train the ear but grounded the entire human form in a spatial setting where it could best interact. Doctors reinforced the concept of hearing with humanity through a new set of physical parameters. These were overtly centred on the entire human body and grounded in a specific understanding of the biological nature of the *corps sonore*. The auditory body fitted neatly with broader medical codes of social improvement, which stressed individual hygiene and self-improvement. The appearance of machines designed specifically for the auditory body suggests that the medical concept took on a definitive form of technical culture that was intended for the private sphere. Such objects, then, were invented for use in the domestic home, but also, institutions such as schools for young children and the disabled, which

sought to break down barriers of social division. An analysis of the characteristics of such machines allows us to analyse closely, however, exactly how the auditory body was designed to work within these modern private settings and assess the public significance of such designs. After all, such individual activities were inextricable from the body-politic. Individuals were encouraged to express themselves sonically in the most elaborate and complex ways possible in order to safeguard their wellbeing. As we will see, the sonic sophistication of the actual auditory machine was pivotal in this process. The human body could only become truly auditory in nature if it was shaped by an instrument of equivalent sonic capacity.

Nineteenth-century communication objects and the auditory body

Patents for the auditory body that were published between 1800 and 1830 were grouped according to the standard sound propagating materials for musical instruments: string and air. Even this single step towards categorisation is confusing, however. The string instruments all elaborate on traditional harp, piano and violin design but some are such distorted and mixed versions of these models that the traditional prototype is almost entirely unrecognisable. The same dilemma occurs with the air or wind instrument models. Traditional instrument designs such as the flute, horn and organ are manipulated to force wind into creating strange acoustical sonorities far from the expected. Yet this group too contains such unusual shapes none of which resemble the instruments we know today. In one sense, such objects are the industrial 'hardware' products of the acoustical theories of Lagrange, Laplace and Monge. They demonstrate principles of acoustics by manipulating materials in a variety of different ways. Yet all were constructed with the human body at their centre. They were not mechanical music boxes or scientific apparatus. They were human-centred machines that inspired emotional and corporeal health as much as pure, rational science.

New designs for harp instruments reflect medical attempts to activate and strengthen the auditory body through a much more accurate and penetrating acoustical sensation. Sébastian Erard's famous chromatic harp with eight pedals was patented during this period.[55] Mechanisms such as a toothed wheel operated by a foot pedal were added so that the body might be more actively employed for the purposes of attaining a sound that is 'purer and more intense'.[56] The 1802 harp of Michel-Joseph Ruelle relied on a variety of mechanical devices that could be manipulated by the performer in order to achieve such a result. He described his own design for a mechanical peg to keep the string tight giving an accurate note, and reinforced the harp with iron cladding: 'The mechanism is indestructible', he boasted, 'when used by experienced hands'.[57] There were also mechanisms that

allowed the performer to manipulate the speed of sound production: the 'pathétique' (prolonging the sound with slow pedal movement) and 'agitato' (agitated sound through fast pedal movement). The *harpe d'harmonie* (harp of harmony) designed by Thory increased the size of the instrument to seven feet and includes a number of new sonorous devices: a keyboard producing a combined piano/harp effect, a drum and Chinese bells.[58] Keyser de l'Isle's *harpe-harmonico-forté* added 34 strings strung across the front of the instrument supported by an extra column.[59] Like the Thory harp, the overall aim of the instrument was to enhance resonance using radical mechanical means. Other additions and improvements included the coordination between pedals and levers by Mérimée as well as smaller mechanical improvements by Plane and Gilles' long-string lever.[60]

Inventors distorted, reordered and replaced the different components of the piano during this period. The most obvious and famous of these designs was the piano-harmonica of Tobias Schmidt, which added a huge pedal-operated bow above the strings of the piano.[61] Bowing the piano, reviewers noted, allowed the human ear time to adjust to mixtures of sonorities. By manipulating the instrument in such creative ways, they adapted the small, square and quiet piano to the much more demanding physiological characteristics of the active auditory body. The piano by Charles Côte positioned the keyboard directly over the vibrating table.[62] The human body was therefore fully immersed in a much more harmonious sound. The pianos of Thory, Erard, Cluesman Pleyel and Dietz were experiments in creating maximum resonance within a compact space.[63] Thory relied on a particular string shape and a forked bridge while Erard, Cluesman and Dietz refined the hammer mechanism. Ignace Pleyel's piano included an expanded base for extra resonance, while Triquet placed a similar attachment above the vibrating table.[64] The piano mechanism itself was made much more fluid and immediate by Klepfer-Dufaut and Blanchet et Roller.[65] The Blanchet et Roller design relied on the nut of the hammer to push it into action rather than an added pivot. The most famous piano designer of the period, Erard, experimented with new string designs and the shape and form of the vibrating table in dramatic ways. These included the *forté-piano d'une forme et d'un mécanisme particuliers* (cylindrically-strung piano with the strings moveable by foot) and the *forté-piano ayant la forme d'un sécretaire* (piano in the shape of a secretaire with a double row of augmented strings also moveable by foot).[66] Eulriot's *piano de forme elliptique* (elliptical piano) involved the use of an unusual heart-shaped double-string design. Erard designed a way of regulating the temperature within the vibrating table through a series of metal bars placed between the strings.[67] His design also had a double set of strings operated with the pedal giving added harmonies. Jean-Baptise Wagner designed a transposing piano with a moveable keyboard stabilised by a 'wedge' as well as a sixth pedal that produced added harmonies.[68] Pleyel's *piano unicorde* (unistring piano) was designed around the acoustical phenomenon of the single

vibrating cord.[69] The focus on the material of the string was also present in Erard's ingenious piano mechanism, *forté-piano à son continu* (piano with a continuous sound), which included a sustaining mechanism that secures the hammer to the string via a toothed or rotating wheel.[70]

Overall, harp and piano instruments were transformed into complex acoustical systems emphasising dynamic aspects of the living body: circulation, vibration and pulsation. The auditory body could be set in motion by either plucking (as in the case of the harp) or hitting the string (as in the case of the piano). Each method achieved equally effective results. Violin makers who concentrated on bowing, of course, experimented with copper and wire strings, string length and mechanisms for maintaining string tension.[71] The resonating case of the violin was tackled in a lengthy patent by Chanot who provided a marked fingerboard for facility of learning, and dramatic modifications of the 'f' hole next to the lower strings of the violin for better resonance.[72] Yet the large harp was most suited to the auditory body because its upright structure most closely reflected the physical and acoustical power of the vibrating human form. The combination of the upright harp and the keyed piano were behind the famous upright piano design of Erard's *forté-piano ayant la forme d'une sécretaire*. Pfeiffer's *harmomelo* anticipated Erard's design and simply attached a harp to a set of keys.[73] Pfeiffer explained that 'For a long time, we have sought to compose a stringed instrument in a perpendicular position, in order that it can be played with a keyboard; we have always found that the strings tightened in this position produce a stronger, more full, and pleasanter sound than those tightened horizontally.'[74] Although the instrument was patented as one imitating the piano, it was strung like a harp inside its case and also included a harp mutation that was added to enhance volume and timbre. The importance of the harp was most obviously displayed in Dietz et Second's *clavi-harpe*, which was again, a kind of keyboard-operated harp.[75] The patent concludes that 'The keyboard of this instrument produces, by means of a suitable mechanism, the very same effect as is obtained with the fingers plucking [the strings of] the harp.'[76]

The auditory power of the harp was also a central feature in the development of guitar instruments. Mougnet boasted that his *guitare-lyre* emitted sounds that rivalled 'those of the harp'.[77] Some of these, such as the *guitare-harpe* of Levien, were designed to be portable as well as powerful. Others simply increased the number of strings or adapted the guitar design in order to emulate the harp, for example the *décacorde*, and guitar design of Lacoux, which ran the grain of the wood alongside that of the string. He explained:

> I obtain, through the analogue placement of the fir veins, a sound which, instead of being over emphasised, as is a criticism of the guitar, and resulting in confusion, [the sound] becomes, by vibrating, more round, more harmonious, and closer to the beauty of the sound from the best harps.[78]

The *lyre-organisée* of Led'huy used a relatively small-sized instrument body but with many strings.[79] It had 15 strings divided into three parts: the bass, the middle range, which also had the option of being muted, and the upper range, which was vibrated through a keyboard mechanism. The inventor explained that 'As to *the touch,* it requires much experience and a well-exercised hand to be able to obtain from the keyboard these soft and velvety sounds which please the delicate ear, and which are so capable of inducing emotion.'[80] Franck's *guitarion* had a stand and was bowed like a cello.[81] Finally, the enormous *harpo-lyre* of Salomon included a kind of mechanical amplifying box described as a '*corps sonore* or pedestal' operated by pedals (see Figure 4.1). The instrument was 'already much superior' to ordinary guitars 'by its size and its shape' and therefore created 'at least twice as much sound and a more satisfying harmony'. The *corps sonore* addition was added to enhance the auditory body and could be modified by the human performer. Salomon explained that it 'encloses a mechanism from which is produced the *crescendo*, the *diminuendo and the tremolo*, plus a bass drum effect using four pedals'.[82]

Vital substances of the auditory body could also be activated through the action of breathing. A number of machines focused on manipulating airflow through new instrumental shapes and the addition of keys and slides. The more elaborate brass and wind instruments of today, such as the horn and trumpet of Schmittschneider and the brass instruments of Halary, evolved

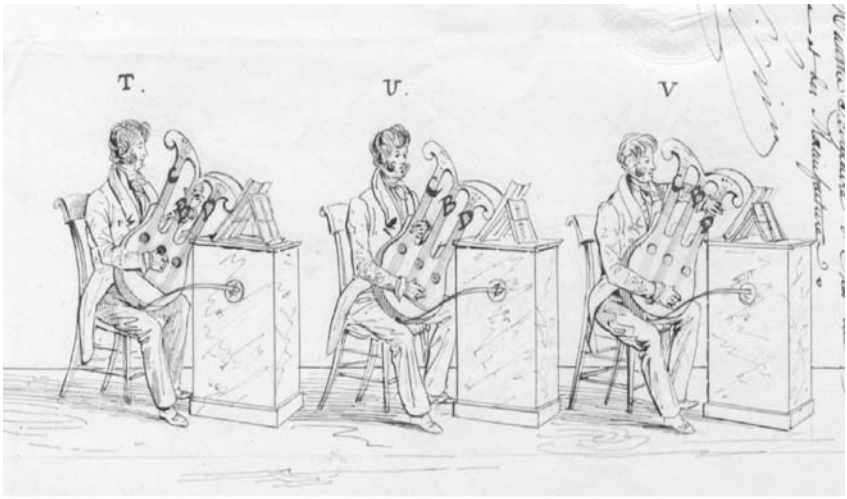


Figure 4.1 Jean-François Salomon, Brevet d'invention de 5 ans, instrument de musique, appelé par l'auteur Harpo-Lyre (1829), Cote du dossier: 1BA3120, Source: Archives INPI, Paris.

during this period.[83] Others allow the performer extra choices in altering air flow. The *flûte traversière* of Delavena has a detachable key mechanism which leaves the player with a simple wooden tube.[84] The slide mechanism, which we find today only in the trombone, was applied to the horn and trumpet and even the organ.[85] The *piano éolien* of Keyser substitutes metal strips for keys but is set in motion by air blown into a tube.[86] The most sophisticated of these new instruments was the *orgue expressif* of Grénié, a model of which was placed in the Paris Conservatoire in 1816. Both women and men had access to the instrument. Women, whose bodies were considered to contain large amounts hydrogen (and thus required access to normal air)[87] were allowed special permission to enter the male-only division of the building in which the organ was located, to have special classes.[88] This instrument allows the volume of the reeds to be manipulated by regulated wind pressure. This is achieved through the use of a double-bellows system, which regulates the air and comes into immediate contact with the pipes.

Musical aides designed to develop the auditory body were also patented. Among these were the metronome which developed from a clock to its triangular box shape.[89] Tuning products included the octagonally shaped metal device that emitted a perfect 'A' when struck and placed between the teeth, and a portable mechanical keyboard resembling a fully fledged instrument in itself.[90] Even page turning, which might interrupt the smooth expression of auditory bodily activity was addressed. The page turner, adaptable to all music stands (including keyboard), was a mechanical device operated by foot that enabled reading from the printed score without stopping to turn the page.[91] The musician interacted much more smoothly with the printed score via better printing procedures,[92] the development of reusable manuscript paper which worked like a modern 'whiteboard',[93] and a manuscript-transposing device.[94] De Serre's elaborate educational device, the Chiroplaste, facilitated the musical reading process by indicating the name of the notes over the keys.[95]

Musical culture as demonstrated by these patents cannot be understood without reference to the auditory body. As serious medical tools, mechanical musical instruments were designed specifically for the human auditory body in action. They were intended to enhance vital fluids activating the nerves and preventing and healing irregularities in flow that might result in disease. Later in the century, doctors began to warn of the effects of over-using the auditory body. Musicians were considered to be most in danger of hysterical illnesses or nervous disorders as well as other related diseases such as infertility, digestive disorders, anaemia and heart palpitations. The Hungarian ear, nose and throat specialist Maurice Krishaber (1836–1883) wrote: 'No class of society is exposed so frequently to nerve disorders in general, and more particularly to cerebral disorders. Cephalalgia, migraine, light-headedness, vertigo, insomnia, sensory disturbances, general irritability, hypochondria, and melancholy, are phenomena that we observe in musicians.'[96] Krishaber

explained that this was not simply due to the powerful effect that music might have on the nervous body. It was also the result of chronic physical overuse in musical practice. Krishaber warned that many musicians were putting themselves at risk by excessive practice times. Their auditory bodies were cramping up in response causing blood clots and haemorrhoids. Women organists who practised organ pedalling to excess caused uterine haemorrhages making them susceptible to infertility. He also suggests that there may be a connection between the overuse of wind instruments and pulmonary phthisis. Krishaber consolidated these theories on the nervous body in his book *De la névropathie cérébro-cardiaque* outlining a neuropathic disease affecting the nerves of sensation and the heart. Such a disease marked by tachycardia, vertigo, hyperesthesia and sense illusions marked the end of the auditory body as a mode of disease prevention.[97] The dangers had outgrown the benefits. The auditory body in the era of Charcot and Freud was most definitively a source of medical concern and deep-seated social anxiety.[98]

During the early nineteenth century, the auditory body had also begun to transform the urban landscape in new and often startling ways. Prior to the Revolution, the constructive imagination of the listening was grounded in the individual or group who sought to connect with another realm of experience. Now, it began to be embedded in the technical apparatus of the landscape itself. Industrial France with its multiple sonic machines and spaces resembled an auditory body that was constantly in a state of renewal through frequent and powerful sonic encounter.[99] Such a cultural approach was critical to France's slow but steady path to economic advancement throughout the nineteenth century. It enabled inventors to refine acoustical technologies to an extremely high degree and inflect public spaces with auditory characteristics in creative ways. There were, of course, dangers to such an approach. If the auditory body was to become the social norm then those who would determine sonic law would have unprecedented power. Yet a society built on the constructive imagination of listening would undoubtedly have the edge over others. This was the reasoning of scientists, instrument makers, salon owners, doctors and politicians who pledged their interests in the sonorous French nation-state.[100]

Music had a dramatic and powerful bodily presence in early nineteenth-century France. Anxieties over a degenerative nation-state ensured that music as manifested in the movement of the auditory body would take centre stage in society. While such appearances were designed to embed hierarchies of power and authority, they were also meant to facilitate individual agency and communication in certain spheres of control. By encouraging auditory bodily activity, individuals could play an important role in building social cohesion by taking responsibility for their own bodily activities of musical expression. Hearing was not, in itself, an action that came from fear or anxiety. Rather, it was a tool that had been proven to be constructive

and transformative in the most positive and practical sense. Hearing became bodily in the early nineteenth century quite simply because it had been constructed during the Enlightenment as a holistic space where the entire physical and emotional self could develop and change for the better. The auditory body, like the auditory zone, was, indeed, very fragile. Yet its fragility rested not on its proximity to a negative form of the imagination but rather on a much more forward-looking and fluid imaginative ethos that would ultimately result in renewal and reform. Music's positive role as a holistic, vital tool of the body demands further attention in our histories. It is only through such analyses that we will begin to understand and acknowledge its true capacity to shape the human condition.

Notes

1. Daniel Levitin, *This is Your Brain on Music: The Science of a Human Obsession* (Penguin: Plume, 2006).
2. http://www.hopkinsmedicine.org/news/media/releases/hearing_loss_and_dementia_linked_in_study.
3. Oliver Sacks, *Musicophilia: Tales of Music and the Brain* (Basingstoke: Pan Macmillan, 2007), xi.
4. Oliver Sacks, *Musicophilia: Tales of Music and the Brain* (Basingstoke: Pan Macmillan, 2007), xiii–xiv.
5. Daniel Chua, *Absolute Music and the Construction of Meaning* (Cambridge, MA: Cambridge University Press 1999) and Richard Leppert, *The Sight of Sound: Music, Representation and the Body* (Berkeley: University of California Press, 1995).
6. Leppert, *The Sight of Sound*, xx.
7. Ibid.
8. 'Ce son est-il un corps réellement existant dans la nature, et qui viendrait frapper l'oreille? Ou bien n'est ce qu'une manière dont le corps en mouvement pouvant nous affecter? Et dans ce cas, le son ne serait-il que l'exercice de l'oreille appliqué à la connaissance du mouvement des corps.' Jean-Joseph Pascal, *De l'ouïe considérée dans ses rapports avec l'intelligence et la voix* (Paris: Didot le Jeune, 1821), 13.
9. Blaise Pascal, *Pensées*, trans. A.J. Krailsheimer (London: Penguin, 1995), 187. Krailsheimer's translations are primarily based on the text, Pascal, *Œuvres completes*, L'Intégrale, (Paris: Seuil, 1963).
10. Blaise Pascal, *Pensées*, trans. A.J. Krailsheimer (London: Penguin, 1995), 187.
11. Joseph-Guichard Duverney, *Traité de l'organe de l'ouïe* (Paris: Estienne Michallet, 1683).
12. Claude Perrault, *Essais de physique; ou, Recueil de plusieurs traitez touchant les choses naturelles*, 2 Vols (Paris: Jean Baptiste Coignard, 1680).
13. Alfred Gell, *Art and Agency: An Anthropological Theory* (Oxford: Clarendon Press, 1998), 51. See also the important work done by Veit Erlmann on these two figures in *Reason and Resonance: A History of Modern Aurality* (New York: Zone, 2010).
14. Models remain in the Musée de la musique, Paris.
15. Ingrid Sykes, 'Music and the Commodification of Sound: Advertising Acoustics in France 1800–1830', in Bruno Blondé, Eugénie Briot, Natacha Coquery and

Laura Van Aert eds., *Retailers and Consumer Changes in Early Modern Europe: England, France, Italy and the Low Countries* (Tours, France: Presses Universitaires François-Rabelais, 2005), 125–138.

16. Etienne-Louis Geoffroy, *Dissertations sur l'organe de l'ouïe, 1. De l'homme, 2. Des reptiles, 3. Des Poissons* (Amsterdam, Paris: Cavelier, 1778).
17. See Emma Spary, *Utopia's Garden: French Natural History from the Old Regime to the Revolution* (Chicago: Chicago University Press, 2000), 197–198.
18. *Histoire de la Société Royale de Médecine*, année 1776 (Paris: Philippe-Denys Pierres, 1779), 95–97.
19. 'Destiné uniquement à le recevoir et à en communiquer l'impression au cerveau, par le moyen du nerf auditif', Geoffroy, *Dissertations*, 30.
20. 'D être plus forte et plus considerable', *Dissertations*, 39.
21. 'L'organe de l'ouïe est le seul de tous les sens, qui peut mesurer exactement son objet. Les yeux distinguent bien les couleurs, mais ils ne peuvent établir des degrés fixes entre leurs nuances: il en est de même de l'odorat et du tact. L'ouïe seule, non seulement distingue les sons, mais les mesure avec tant d'exactitude que l'on est parvenu à distinguer les tons, les demi-tons, et leurs différentes modifications. C'est de là qu'est né l'art du chant, qui est si naturel à l'homme, que tous les peuples ont eu leur musique, et que l'harmonie flatte tous les Auditeurs, sans qu'ils soient Musiciens. Sans doute que si la rétine eût été partagée, comme le nerf auditif, en petites cordes ou fibrilles de différente longueur, l'œil pourrait aussi bien mesurer la lumière, que l'oreille mesure et distingue les sons.' *Dissertations*, 38–39.
22. See Ingrid Sykes, 'Sounding the Citizen Patient: The Politics of Voice in Post-Revolutionary France', *Medical History* 55.4 (2011), 479–502.
23. Sean Quinlan, 'Physical and Moral Regeneration After the Terror: Medical Culture, Sensibility and Family Politics in France, 1794–1804', *Social History* 29.2 (May 2004), 139–164.
24. Xavier Bichat, *Recherches physiologiques sur la vie et sur la mort*, 3rd ed. (Paris: Brosson, 1805).
25. Edwin Clarke and L.C. Jacyna, *Nineteenth-Century Origins of Neuroscientific Concepts* (Berkeley, 1987). For a close reading of Bichat's work, see Elizabeth A. Williams, *The Physical and the Moral: Anthropology, Physiology, and Philosophical Medicine in France 1750–1850* (Cambridge, MA, 1994). The debate on sensualism is examined in Jan Goldstein, *The Post-Revolutionary Self: Politics and Psyche in France, 1750–1850* (Cambridge, MA 2005).
26. Mathieu François Regis Buisson, *De la division la plus naturelle des phénomènes physiologiques considérés chez l'homme* (Paris, 1802).
27. 'qui n'exerçant leur action que sur les molécules les plus ténues des corps, sont à portée d'en apprécier la nature intime, et servant à éclairer sur leur choix', Premier Extrait, 'De la division la plus naturelle des phénomènes physiologiques considérés chez l'homme par M. Fr. R. Buisson', *Bibliothèque Médicale ou Recueil Périodique: D'extraits des meilleurs ouvrages de médecine et de chirurgie* 1.1 (Paris, 1803), 26–44. Buisson's work was reviewed alongside Bichat's *Recherches physiologiques sur la vie et la mort*.
28. Second Extrait, 'De la division la plus naturelle des phénomènes physiologiques considérés chez l'homme par M. Fr. R. Buisson', *Bibliothèque Médicale ou Recueil Périodique: D'extraits des meilleurs ouvrages de médecine et de chirurgie* 1.1 (Paris, 1803), 160–182.
29. 'diffère essentiellement de l'audition passive par cet acte de volonté qui en commande l'exercice, par l'attention qui l'accompagne, et c'est cette différence qui

se trouve marquée dans le langage ordinaire par l'emploi qu'on y fait des mots *entendre* et *écouter*. On ne peut s'empêcher d'entendre, mais on n'écoute que parce qu'on le veut. On écoute afin de mieux entendre, et bien plus on peut quelquefois écouter sans entendre, lorsque, suivant l'expression vulgaire, on prête l'oreille pour reconnaître des sons dont on croyait avoir reçu une première impression,' Second Extrait, 'De la division la plus naturelle des phénomènes physiologiques considérés chez l'homme par M. Fr. R. Buisson', *Bibliothèque Médicale ou Recueil Périodique: D'extraits des meilleurs ouvrages de médecine et de chirurgie* 1.1 (Paris, 1803).

30. Jacalyn Duffin, *To See with a Better Eye: A Life of R.T.H. Laennec* (Princeton: Princeton University Press, 1998).
31. Marc-Antoine Petit, *Essai sur la médecine du coeur* (Lyon: Garnier, 1806), 138.
32. 'toutes les passions sont en jeu; toutes les âmes sont exaltées: la sensibilité double les forces; l'énergie est partout; et tout homme s'indigne à la seule idée d'une injustice', in Marc-Antoine Petit, ed., *Essai sur la médecine du coeur* (Lyon: Garnier, 1806), 119.
33. 'Une grande nation qu'on veut régénérer est comme un orgue qu'on veut remonter. L'artiste ne brise pas chaque tuyau qui rend les sons faux ou discordants: il le met au ton qu'il désire, et, quand il touche le premier air, il enchante ses auditeurs', *Journal de Rouen*, le 28 pluviose an IV in Michelle Biget, *Musique et Révolution française* (Paris: Les Belles Lettres, 1989), 221.
34. Quinlan, 139–164.
35. Joseph-Louis Roger, *Traité des effets de la musique sur le corps humain* edited and translated from the Latin text by Etienne Sainte Marie (Paris: Brunot, 1803). See Etienne Sainte-Marie's later work on natural medicine, *Nouveau formulaire médical et pharmaceutique* (Paris: Rey et Gravier, 1820).
36. 'Ceux qui regardent la musique comme un art purement agréable, ne croiront pas aux effets avantageux que l'auteur de cet ouvrage lui attribue dans un grand nombre de maladies.' Sainte-Marie in Roger, *Traité des effets*, vii.
37. 'Se répand dans tout le corps, et le dilate [. . .] et y réveille le courage, l'amour, la bienfaisance, la pitié, la joie, les passions expansive,' Sainte-Marie in Roger, *Traité des effets*, x–xi.
38. 'La santé n'est pas l'état le plus favorable aux effets de la musique. Cet art agit plus vivement sur un corps affaibli par quelque maladie.' Sainte-Marie in Roger, *Traité des effets*, xxii.
39. 'Qui constituent dans les organes la vie elle-même', Sainte-Marie in Roger, *Traité des effets*, xiv.
40. 'la musique est un exercice, et on doit la recommander aux femmes et aux gens des lettres, qui mènent une vie sédentaire', Sainte-Marie in Roger, *Traité des effets*, xiii.
41. 'On observe parmi les musiciens plus de vieillards que parmi les autres artistes', Sainte-Marie in Roger, *Traité des effets*, xvii–xviii.
42. Roger, *Traité des effets*, 252–253.
43. V. Forgues, *De l'influence de la musique sur l'économie animale* (Montpellier: Martel, 1802).
44. See, for example, Desessartz, Résultats des observations faites dans plusieurs départements de la République, sur les maladies qui ont régné pendant les six premiers mois de l'An VIII (Paris, Huzard, An VIII).
45. 'Pourquoi l'emploi de cet art, qui produit des effets si étonnants dans l'homme en santé et dans l'homme malade, est-il abandonné aujourd'hui par les médecins? Pourquoi n'y aurait-on pas encore recours dans des maladies qui

éludent l'action des médicaments vantés comme les plus énergiques?' Jean-Charles Desessartz, *Réflexion sur la musique considérée comme moyen curatif* (Paris, 1802), 3.

46. Ibid., 3.
47. Ibid., 19.
48. Pascal, *De l'ouïe considérée*, 32–34.
49. Jules-Charles Teule, *De l'oreille: essai d'anatomie et de physiologie, précédé d'un exposé des lois de l'acoustique* (Paris: Gabon, 1828).
50. 'On admettra facilement aussi que la présence d'un organe spécial de l'audition dans une espèce suppose un chant, un cri [...], comme moyen d'établir les rapports nécessaires de l'individu à l'espèce.' Jules-Charles Teule, *De l'oreille: essai d'anatomie et de physiologie, précédé d'un exposé des lois de l'acoustique* (Paris: Gabon, 1828), 219.
51. 'Il suffit pour s'en convaincre d'observer, qu'eu égard à la vélocité du son, on peut admettre que la perception a lieu rigoureusement au même instant pour chaque oreille, et que les impressions transmises à la cause du sentiment par le double organe de l'ouïe, sont identiques ou seulement différentes dans leur intensité, ce qui n'empêche pas de les confondre.' Jules-Charles Teule, *De l'oreille: essai d'anatomie et de physiologie, précédé d'un exposé des lois de l'acoustique* (Paris: Gabon, 1828), 221.
52. 'La diversité des directions de l'ébranlement communiqué à la pulpe nerveuse auditive. Elle est un produit de l'éducation; il est indispensable, en effet que, par des comparaisons multipliées, l'esprit apprenne à saisir la liaison qui existe entre les positions relatives du corps sonore et de l'oreille, et de la diversité des sensations de l'ouïe. ' Jules-Charles Teule, *De l'oreille: essai d'anatomie et de physiologie, précédé d'un exposé des lois de l'acoustique* (Paris: Gabon, 1828), 223.
53. 'Il semble que le sentiment de la mesure dérive de l'organisation même où l'on voit les mouvements de la circulation assujettis à l'emprise du rythme, et par suite tous les organes excités par le sang d'une manière périodique et régulière.' Jules-Charles Teule, *De l'oreille: essai d'anatomie et de physiologie, précédé d'un exposé des lois de l'acoustique* (Paris: Gabon, 1828), 232.
54. 'Les aveugles de naissance portent généralement un jugement plus certain que les autres hommes sur les objets dont on acquiert la connaissance par l'oreille; il n'est pas rare qu'un aveugle reconnaisse au bruit de la marche les personnes dont il était séparé depuis longtemps.' Jules-Charles Teule, *De l'oreille: essai d'anatomie et de physiologie, précédé d'un exposé des lois de l'acoustique* (Paris: Gabon, 1828), 236.
55. 'Brevet d'invention 919, 13 juillet 1809, Pour une nouvelle harpe sur laquelle on peut faire les dièses et les bémols, Aux sieurs Erard frères, à Paris', in *Description des machines et procédés specifiés dans les brevets d'invention, de perfectionnement et d'importation* X (Paris, Madame Huzard/Imprimerie Nationale, 1825). 287.
56. 'plus pur et plus intense', 'Brevet d'invention 64, 17 mars 1799, Pour un mécanisme particulier, destiné à tendre les cordes de harpe, aux sieurs Ruelle et Cousineau, père et fils, à Paris', in *Description des machines* II, (Paris, 1818), 37–41.
57. 'Le mécanisme est indestructible [...] s'il se trouve dans les mains exercées', 'Brevet d'invention 125, 20 juillet 1802, Pour une nouvelle mécanique de harpe, à plans inclinés paraboliques, et à renfo cemens acoustiques, inventée par Michel-Joseph Ruelle, mais dont la jouissance a été cédée au sieur Cousineau', in *Description des machines* II (Paris, 1818), 169–172.

58. 'Brevet d'invention 685, 7 novembre 1815, Pour une harpe d'harmonie, Au sieur Thory, à Paris', in *Description des machines* VIII (Paris, 1824), 366.
59. 'Brevet d'invention 344, 9 juin 1809, Pour une harpe-harmonico-forté au sieur Keyser de l'Isle, à Paris', in *Description des machines* V (Paris, 1823), 85–86.
60. 'Brevet d'invention 898, 11 juin 1818, Pour un perfectionnement ajouté à la harpe, Au sieur Mérimée', in *Description des machines* X (Paris, 1825), 227–229, 'Brevet d'invention 912, 24 novembre 1813, Pour une nouvelle mécanique de harpe, Au sieur Plane, à Paris', in *Description des machines* X (Paris, 1825), 268–269; 'Brevet d'importation 1690, 7 décembre 1814, Pour un mécanisme applicable aux harpes ordinaries, Au sieur Gilles, à Paris', in *Description des machines* XIX (Paris, 1830), 124–126.
61. 'Brevet d'invention 144, 13 juillet 1803, Pour un instrument nommé piano-harmonica, au sieur Tobias Schmidt, facteur de pianos, à Paris', in *Description des machines* II (Paris, 1818), 242–250.
62. 'Brevet d'invention 2088, 23 mars 1827, Pour un piano à clavier placé sur les cordes, Au sieur Côte, facteur de pianos, à Lyon, département du Rhône', *Description des machines* XXIII (Paris, 1832), 245–248.
63. 'Brevet d'invention 652, 8 septembre 1815, Pour des piano-fortés carrés à six octaves, cinq pédales et tambour guerrier, Au sieur Thory, à Paris', in *Description des machines* VIII (Paris, 1824), 219; 'Brevet d'invention 975, 20 octobre 1809, Pour la construction d'un forté-piano en forme de clavecin, Aux sieurs Erard frères, fabricans de forté-pianos, à Paris', in *Description des machines* XI (Paris, 1825), 70–71; 'Brevet d'invention 2238, 30 octobre 1827, Pour un piano qui diffère des pianos connus par la position des chevilles et des étouffoirs, Au sieur Cluesman (Jean-Baptiste), facteur de pianos, à Paris', in *Description des machines* XXV (Paris, 1834), 17; 'Brevet d'invention 2790, 2 février 1827, Pour un piano de forme et de construction nouvelles, muni d'un nouveau mécanisme, Au sieur Dietz fils, facteur de pianos, à Paris', in *Description des machines* XXIX (Paris, 1836), 331–332.
64. 'Brevet d'invention 2434, 13 septembre 1828, Pour un sommier prolongé s'adaptant également aux pianos carrés et à queue, Aux sieurs Pleyel (Ignace) et compagnie, fabricans de pianos, à Paris', in *Description des machines* XXVII (Paris, 1835), 41–43; 'Brevet d'invention 2884, 28 septembre 1827, Pour un piano à sommier isolé, Au sieur Triquet, facteur de pianos, à Paris', in *Description des machines* XXX (Paris, 1836), 203–204.
65. 'Brevet de perfectionnement 1665, 31 janvier 1824, Pour un nouveau mécanisme à échappement qui s'adapte aux forté-pianos, Au sieur Klepfer-Dufaut (Henri), facteur de pianos, à Lyon', in *Description des machines* XIX (Paris, 1830), 5–7; 'Brevet d'invention 2478, 10 février 1829, Pour un nouvel échappement applicable aux pianos droits et aux pianos verticaux, Aux sieurs Blanchet et Roller, fabricans de pianos, à Paris', in *Description des machines* XXVII (Paris, 1835), 188–190.
66. 'Brevet d'invention 1333, 31 janvier 1812, Pour un forté-piano d'une forme et d'un mécanisme particuliers, à sieur Erard frères, à Paris', in *Description des machines* XIV (Paris, 1827), 295–297; 'Brevet d'invention 1332, 31 janvier 1812, Pour un forté-piano ayant la forme d'un sécretaire, Aux sieurs Erard frères, à Paris', in *Description des machines* XIV (Paris, 1827), 292–294.
67. 'Brevet d'invention 2866, 2 juin 1825, Pour un piano de forme elliptique et à deux tables d'harmonie, Au sieur Eulriot (Etienne), facteur de pianos, à Paris', in *Description des machines* XXX (Paris, 1836), 144–146.

68. 'Brevet d'invention 1380, 15 novembre 1820, Pour des procédés de construction d'un nouveau piano, Au sieur Wagner (Jean-Baptiste), luthier, facteur de pianos, à Arras, département du Pas-du-Calais', in *Description des machines* XV (Paris, 1828), 61–66.
69. 'Brevet d'invention 1808, 17 novembre 1825, Pour un piano à une corde, appelé piano unicorde, Aux sieurs Pleyel, père et fils aîné', in *Description des machines* XXI (Paris, 1831), 65–67.
70. 'Brevet d'invention 1334, 4 février 1812, Pour un forté-piano à son continu, Aux sieurs Erard frères, à Paris', in *Description des machines* XIV (Paris, 1827), 298; 'Brevet d'invention 1602, 10 fèvrier 1819, Pour un appareil appelé sostenente, Aux sieurs Mott (Julius-César), Mott (Isaac-Henri-Robert), et compagnie', *Description des machines* XVIII (Paris, 1829), 18–24.
71. 'Brevet d'importation 1177, 31 décembre 1810, Pour des procédés de fabrication de cordes en cuivre et en fer, à l'usage du forté-piano et autres instrumens de musique, Par M. Pleyel (Ignace), à Paris', in *Description des machines* XIII (Paris, 1827), 49–56; 'Brevet d'invention 2050, 9 mars 1827, Pour une nouvelle méthode de faire des cordes harmoniques sans noeuds et d'une seule longeur pour chaque instrument, Aux sieurs Savaresse et Compagnie, fabricans de cordes harmoniques, plaine de Grenelle, près Paris', in *Description des machines* XXIII (Paris, 1832), 138–141; 'Brevet d'invention 1259, 25 avril 1822, Pour un mécanisme propre à fixer les chevilles des instruments de musique à corde, nommé fixateur, Au sieur Legros de la Neuville, à Paris', in *Description des machines* XIV, Paris, 1827, 41–42; 'Brevet d'invention 1428, 12 juin 1823, Pour une cheville à frein, dont l'effet est de maintenir, dans leur accord et dans leur tension, les cordes de violins, basses et guitarres, Aux sieurs Brouet (Henri-Victor), mécanicien Clément (Jacob), luthier, tous deux à Paris', in *Description des machines* XV (Paris, 1828), 315.
72. 'Brevet d'invention 1391, 11 décembre 1817, Pour des procédés de construction des instrumens de musique à cordes et à archet, tels que le violon, l'alto, la basse et la contre-basse, Au sieur Chanot (François), officier du génie maritime, à Paris', in *Description des machines* XV (Paris, 1828), 161–179.
73. 'Brevet de perfectionnement 466, 19 septembre 1806, Pour un instrument de musique imitant le forté-piano appelé harmomelo, Au sieur Pfeiffer et compagnie, à Paris', in *Description des machines* VI (Paris, 1824), 266–270.
74. 'Depuis longtemps on a cherché à composer un instrument à cordes dans une position perpendiculaire, pour le jouer en clavier, et toujours on a trouvé que les cordes tendues en cette position produisent un son beaucoup plus fort, plus plein, et plus agréable que celles tendues horizontalement', in *Description des machines* VI (Paris, 1824), 266.
75. 'Brevet d'invention 964, 18 février 1814, Pour un instrument de musique appelé clavi-harpe, Aux sieurs Dietz et Second', in *Description des machines* XI (Paris, 1825), 15–17.
76. 'Le clavier de cet instrument produit, au moyen du mécanisme qui y correspond, absolument le même effet que les doigts en pinçant de la harpe.' in *Description des machines* XI (Paris, 1825), 17.
77. 'Brevet d'importation 1799, 6 octobre 1825, Pour un instrument de musique portativ nommé guitare-harpe, Au sieur Levien (Mordaunt), professeur de musique à Londres', *Description des machines* XXI (Paris, 1831), 43–45; 'Brevet d'invention 464, 13 août 1811, Pour une guitare-lyre, qui présente plusieurs

avantages sur les guitares faites jusqu'à ce jour, Au sieur Mougnet, luthier, à Lyon, départmenet du Rhône', in *Description des machines* VI (Paris, 1824), 263.

78. 'J'obtiens un son qui, au lieu d'être trop en dehors, comme on le reproche à la guitare, et de sortir avec confusion, devient, en vibrant, plus rond, plus harmonieux et plus rapproché de la beauté du son des meilleures harpes, par le placement analogue des veines de sapin'; 'Brevet d'invention 1962, 15 décembre 1826, Pour une guitare a dix cordes appelée décacorde, Aux sieurs Lacote, luthier et Carully, compositeur de musique', in *Description des machines* XXII (Paris, 1832), 258–259; 'Brevet d'invention 2426, 28 novembre 1829, Pour une guitare perfectionnée, dans laquelle les veines de la table sont en travers, Au sieur de Lacoux, à Paris', in *Description des machines* XXVI (Paris, 1835), 377.
79. 'Brevet d'invention 237, 21 novembre 1806, Pour un instrument de musique dans le genre de la lyre-guitare, appelé lyre organisée, Au sieur Led'huy, à Coucy-les-Châteaux', in *Description des machines* IV (Paris, 1820), 45–47.
80. 'Quant au *toucher*, il exige une grande habitude et une main bien exercée pour pouvoir obtenir du jeu du clavier ces sons doux et veloutés qui plaisent à l'oreille délicate, et qui sont si propres à émouvoir.' in *Description des machines* IV (Paris, 1820), 47.
81. 'Brevet d'invention 2928, 28 fèvrier 1831, Pour un nouveau système de guitare appelé guitarion, Au sieur Franck (Maximilien), artiste, à Paris', in *Description des machines* XXX (Paris, 1836), 372–373.
82. 'renferme un mécanisme au moyen duquel on obtient le *crescendo*, le *diminuendo* et le *tremolo*, plus un effet de grosse caisse, au moyen de quatre pedals'; 'Brevet d'invention 2483, 19 mars 1829, Pour un instrument de musique appelé harpo-lyre, Au sieur Salomon (Jean-François), professeur de musique à Besançon, département du Doubs', in *Description des machines* XXVII (Paris, 1835), 201–204.
83. 'Brevet d'invention 1222, 13 décembre 1821, Pour un cor d'harmonie, et pour une trompette-trombone, Au sieur André-Antony Schmittschneider, à Paris', in *Description des machines* XIII (Paris, 1827), 286–290; 'Brevet d'invention 1849, 24 mars 1821, Pour des instruments de musique à vent et à clef, Au sieur Asté dit Halary (Jean-Hilaire), professeur de musique et facteur d'instruments métalliques à vent, à Paris', in *Description des machines* XXI (Paris, 1831), 197–202.
84. 'Brevet d'invention 1752, 23 juin 1825, Pour un mécanisme qui s'adapte à la flûte traversière, Au sieur Delavena, marchand-luthier, à Lille, département du Nord', in *Description des machines* XX (Paris, 1830), 120–121.
85. 'Brevet d'invention 892, 18 mai 1818, Pour un nouveau cor et une nouvelle trompette', in *Description des machines* X, (Paris, 1825), 213–214; 'Brevet d'invention 150, 6 décembre 1803, Pour des moyens de construire des orgues, aux sieurs Philippe et Frédéric Girard frères, à Paris', in *Description des machines* II (Paris, 1818), 265–271.
86. 'Brevet d'invention 2981, 24 novembre 1830, Pour un piano sans cordes, avec l'addition d'un moyen proper à en prolonger le son, Au sieur Pape (Henri), facteur de pianos, à Paris', in *Description des machines* XXXI (Paris, 1836), 192–193; 'Brevet d'invention 2649, 11 septembre 1829, Pour un instrument de musique appelé piano éolien, Au sieur Kayser, à Strasbourg, département du Bas-Rhin', *Description des machines* XXVIII (Paris, 1836), 273–275.

87. On the theory, 'Sur la différence de masses dans les deux sexes,' see Antide Magnin, *Notions mathématiques de chimie et de médecine ou Théorie de feu* (Paris: Fuchs, 1900), 195–199.
88. 'Brevet d'invention 701, 22 janvier 1816, Pour des orgues expressives, Au sieur Grénié', in *Description des machines* IX (Paris, 1824), 53–66. Voir 'L'orgue expressif, Rapport à monsieur l'Intendant général de l'Argenterie, des Menus Plaisirs et Affaires de la Chambre du Roi par l'Inspecteur Général', 28 November 1816, CHAN AJ/37 Archives de l'Ecole royale de musique et de déclamation, des Conservatoire impériaux, nationaux ou royaux de musique, ou de musique et de déclamation, à Paris (1784–1925)/3.
89. 'Brevet d'invention 696, 14 septembre 1815, Pour une espèce de chronomètre en usage dans la musique, Au sieur Maelzel', in *Description des machines* IX (Paris, 1824), 15–16; 'Brevet d'invention 1813, 24 novembre 1815, Pour un instrument appelé métronome perfectionné, Au sieur Bien-Aimé Fournier, horloger, à Amiens, département de la Somme', *Description des machines* XXI (Paris, 1831), 91–95; 'Brevet d'invention 2852, 9 mai 1829, Pour des perfectionnemens apportés dans la construction du métronome à l'usage de la musique, Au sieur Maelzel, mécanicien, aux Etats Unis, faisant élection de domicile à Paris', in *Description des machines* XXVIII (Paris, 1836), 80–82.
90. 'Brevet d'invention 2417, 17 janvier 1829, Pour un nouveau diapason appelé typotone, au sieur Pinsonnat, contrôleur de garantie de la marque d'or et d'argent, à Amiens, département de la Somme', *Description des machines* XXVI (Paris, 1835), 344–345; 'Brevet d'invention 2829, 18 mai 1830, Pour un instrument appelé accordeur, Au sieur Salomon (Jean-François), professeur de musique à Besançon, département du Doubs, faisant élection de domicile à Paris', in *Description des machines* XXX (Paris, 1836), 66–67.
91. 'Brevet d'invention 1496, 3 juillet 1823, Pour un mécanisme appelé tournefeuille, Au sieur Puyroche, de Genève', in *Description des machines* XVII (Paris, 1829), 26–27.
92. 'Brevet d'invention 2918, 10 novembre 1827, Pour une boite mélotachygraphique servant à fondre les planches propres à la gravure de la musique, Au sieur Petitpierre, ingénieur-mécanicien, à Paris', in *Description des machines* XXX (Paris, 1836), 340–341; 'Brevet d'invention 478, 28 novembre 1801, Pour des procédés propres à imprimer la musique avec la presse typographique, Aux sieurs Duplat et George, à Paris', in *Description des machines* VI (Paris, 1824), 309.
93. 'Brevet d'invention 1051, 24 janvier 1820, Pour des cartelles à l'usage de la musique, Au sieur Ferdinand Adrien, à Paris', in *Description des machines* XI (Paris, 1825), 306–307.
94. 'Brevet d'invention 2878, 10 novembre 1830, Pour un appareil en forme de pupitre de musique, appelé transpositeur musical, Au sieur Leullier, à Paris', in *Description des machines* XXX (Paris, 1836), 192–194.
95. 'Brevet d'importation 964, 12 mars 1819, Pour un mécanisme appelé chiroplaste, Au sieur Galliani et Serré, à Paris', in *Description des machines* XI (Paris, 1825), 23–26.
96. 'Aucune classe de société n'est exposée aussi fréquemment aux troubles nerveux en général et aux troubles cérébraux tout particulièrement. La céphalalgie, la migraine, les étourdissements, le vertige, l'insomnie, les perturbations sensorielles, l'irritabilité générale, l'hypochondrie, la mélancolie, sont les phénomènes que l'on observe chez eux.' in Maurice Krishaber, 'Musicien

(Hygiene des)', *Dictionnaire encyclopédique des sciences médicales* edited by Dechambre, Deuxième Série, Tome 11 (Paris: Masson, 1875), 129–132.

97. 'Maurice Krishaber, *De la névropathie cérébro-cardiaque* (Paris: Masson, 1873).
98. See James Kennaway's work, in particular, his article, 'Musical Hypnosis: Sound and Selfhood from Mesmerism to Brainwashing', *Social History of Medicine* 25.2 (2012), 271–289.
99. Ingrid Sykes, 'Music and the Commodification of Sound: Advertising Acoustics in France 1800–1830', Bruno Blondé, Eugénie Briot, Natacha Coquery, and Laura Van Aert, eds., *Retailers and Consumer Changes in Early Modern Europe: England, France, Italy and the Low Countries* (Tours, France: Presses Universitaires François-Rabelais, 2005), 125–138.
100. Important figures involved in promoting French sound culture at this time include Aristide Cavaillé-Coll the organ builder, Léon Foucault the physicist, François Arago the scientist and politician, Charles Dupin the engineer and Théodore Lachez the architect.

5

Music Therapy in Eighteenth-Century Spain: Perspectives and Critiques

Pilar León-Sanz

Introduction

From the perspective of the history of ideas, the first three decades of the eighteenth century in Spain marked the transition from traditional practices to the development of new perspectives and interpretative models. In the field of the theory of music, this period was noteworthy because of the proliferation of composers and theorists, particularly music treatise writers and physicians, who believed that music played a key therapeutic role in sickness and health, in accordance with ideas that linked the practice of music to aesthetic and technical theory. Studies on music, which until then had been theoretically associated with physics and mathematics, and, on a practical level, to religious worship, the upper classes or the expression of popular sentiments, began to focus on the pleasure and enjoyment music delivers. Moreover, issues discussed within the theory of music gradually shifted from a focus on the physical and mathematical sciences towards the liberal arts.

We might argue that historical research into the influence of music on humans was carried out in parallel in the area of musicology on the one hand and in the history of science and medicine on the other.[1] In this chapter, I will circumvent this duality by presenting some of the most representative musicology treatises from the first third of the eighteenth century in Spain, in the context of medical and other scientific studies. This chapter takes three approaches: first, to show how the treatises on music presented new scientific doctrines, particularly in physics; second, to examine pertinent medical questions, which will allow us to contrast the medical theories articulated in the music treatises with medical knowledge of the period. To do this, I will review the survival of Galenic doctrine and the introduction

of the fibrillar and fluid models, which associate the neurological system with music. Indeed, as Jessica Riskin points out, empirical knowledge in the eighteenth century did not involve a simple and impassive adherence to facts, but was an activity associated with sensitivity.[2] Third, to observe the continuity or change in the critiques of music therapy throughout the eighteenth century and the relationship between music and medicine.

Given the number and excellence of composers and music treatise writers at that time, and the impossibility of examining all of them, I will focus on the work of only three authors, all of whom played a key role in the development of modern science in Spain: Tomás Vicente Tosca i Mascó (1651–1723), who wrote the *Tratado de la música especulativa y práctica* (1710); Pedro de Ulloa (1663–1721), author of *Música universal* (1717); and Benito Jerónimo Feijoo y Montenegro (1676–1764), whose comments on music in his *Teatro crítico* (1726) gave rise to one of the most important controversies on the influence of music on health, which continued until the nineteenth century. All three were *novatores*, the word used to designate thinkers and scientists from the end of the seventeenth and beginning of the eighteenth centuries. The term *novator* was used to describe the supporters of new scientific ideas, particularly in the fields of physics, mathematics and medicine. The *novator* movement extended to other European countries and was decisive in leading Spain towards more enlightened attitudes in the mid-century.[3] In the eighteenth century, a substantial amount of Spanish production in print was classified as 'controversial'. In medicine, the debates were based on the challenge to the Galenic medical system. Greater importance was given to experience than to speculation or the exegeses of the texts of classical authors, although in practice both arguments were liberally used.

Tomás Vicente Tosca (1651–1723), the son of the physician and professor of the Faculty of Medicine in Valencia, Dr Calixto Tosca de los Ares, was one of the most famous exponents of the *novator* movement in Valencia.[4] He was awarded degrees of master in arts and doctor in theology at the University of Valencia, and in 1678, was accepted into the Congregation of the Oratory.[5] There, he produced treatises on mathematics, architecture, theology and the theory of music. Outstanding among his works are the *Compendio matematico* (1707–1715) and the *Compendium philosophicum* (1721), both widely read in Italy, Germany and other European countries. His *Tratado de la música especulativa y práctica* (1710) was later included in the *Compendio matemático*. As we shall see, Tosca believed in the therapeutic effects of music when used as a supplement to drug prescriptions.

The distinguished mathematician and master cosmographer of the *Supremo Consejo de las Indias*, the Jesuit priest Pedro de Ulloa (1663–1721)[6] was also an important music theoretician. In 1717, he published the treatise *Música universal* or *Principios universales de la música* (Imprenta de Música de Bernardo Peralta, Madrid). Ulloa applied mathematical methods to the study

of questions on the technique and practice of music, not solely to the evaluation of scales and intervals. However, his marked radicalism is compatible with openness to sensitivity.

The writings of the Benedictine Benito J. Feijoo (1676–1764) also influenced Spanish political and intellectual life in the first half of the eighteenth century.[7] His work shifts between a cautious rejection of tradition and the Spanish Baroque, and a prudent acknowledgement of the values of modern European culture. Feijoo dealt with medical matters and contributed in his writing to the disputes of the physicians of the period. For example, in Oviedo in 1725, he published for a general readership the *Aprobación apologética del escepticismo médico del Doctor Martínez* in which he claimed that science did not need the works of Aristotle, but should be based on attentive observation and repeated practice.

A year later, Feijoo explained his ideas on music in the first volume of his *Teatro crítico* (1726–1740, 9 vols.) and, in 1742, *Cartas eruditas y curiosas* (1742–1760, 5 vols.) (Discurso XIV: *Sobre la música en los templos*;[8] *Carta:* 'En repuesta a una objeción musical').[9] One of his fundamental points was his recognition of the expressive capacity and moral influence of music. His sensitivity allowed him to recognise the expressive capacity and the influence, also moral, of music. Though not highly original, Feijoo's work was valuable because of its 'capacity to shake sleepy Spain with just the right amount of energy permitted by the intellectual climate of the reign of Philip V, and, very tactfully and realistically, invite it to live in European time, without renouncing its past, but by distancing itself without a sense of inferiority'.[10] Feijoo lived most of his life during the zenith of Baroque culture but, as he died in 1764, he did see the stylistic evolution that led to the formulation of Classicism.

Tosca, Ulloa and Feijoo are leading figures in early eighteenth-century culture. They strove to destroy invalid social myths and defeat scientific inertia, opening the way to innovative tendencies. They wrote at a time of a troubled intertwining of theories, a time when definitions and theoretical proposals were being revised, when medicine and philosophy still converged.[11] In addition to these writers, we have to consider that, as I point out elsewhere, in Spain in the eighteenth century there were numerous physicians and scientists who were writing on melotherapy and tarantism.[12] These works reveal the application of music to ailments supposedly of nervous origin, such as choreas and those caused by a tarantula bite. These studies were produced in the second half of the eighteenth century, so it is interesting to explore continuities and discontinuities with reference to these sources.

A physical definition of music

The writings of Tomás Vicente Tosca and Pedro de Ulloa highlight the shift in emphasis from mathematical acoustics to physics. Tosca defines music

as a 'physical-mathematical science that deals with harmonic sounds'.[13] For Ulloa, music is the 'faculty that, comparing the geometric reason of a sound with that of another heard successively and the harmonic reason of sounds heard simultaneously, prescribes certain determined precepts to arrange and practice them'.[14] However, Tosca and Ulloa are open to contemporary directives, as seen in the fact that their acoustics are not mathematical, but physical. The former explains hearing as the vibration of the eardrum caused by the surrounding air: 'Air moved with a tremulous motion impels and moves the eardrum with such a movement.'[15] He differentiates in the sound an active part, which corresponds to what the sound produces, and a passive part, identified with its reception:

> Sound, considered actively, is the sound when it is born from the sonorous body which becomes passive when it is received in the hearing organ [...] what I am saying, then, is that, considered actively, it is the tremulous movement of the air; and passively it is the tremulous movement of the eardrum.[16]

All of this suggests that Tosca contributed to the theory of music and its effects with a conception of the objective and subjective aspects of hearing.

Tosca was aware of the vibratory basics of intensity and tone, an issue related to medical theory. Regarding this quality, he notes that 'the sharp or high sound comes from the fact that the vibrations of the air are more frequent [...] and, on the contrary, the low sound means that the vibrations are less frequent, and that there is more time between one and another'.[17] Consequently, Tosca points out that tone cannot be confused with the speed of transmission ('the low sound arrives at the ear at the same speed as the sharp, as experience shows'), nor with intensity.[18] Both Tosca and Ulloa link the phenomenon of resonance with vibratory movement.[19] Ulloa refers to it as the influence of music on the human body: 'it is undeniable that by tuning two strings of a guitar to the same sound, even though not immediate, playing one is echoed by the other [...] the shiver felt in all parts of our body on hearing one sound or another may be reduced to this type of movement'.[20]

From a medical perspective, it is interesting to observe that Tosca applies undulatory movement to sound, deploying the analogy of the movement of ripples produced in the water when a stone is thrown into a pond. He signals that the perception of the distance of the source of a sound is related to the circular trajectory of the activating movement, which weakens the intensity of the wave with an increase in the radius:

> The first is perceived because the sound formed at a distance is slower when it reaches the ear: we perceive the distance from the sounding body through its speed; the second because the vibrations are formed in the

> air in a circle at the centre of which is the sounding body which forms them, and there is no doubt that the further these vibrations go from the centre the greater they are, and consequently a smaller portion of the circle affects the sense that is furthest and a greater portion to that which is closer.[21]

In general, we can conclude that the explanation of the phenomenon of sound based on the concept of vibration and undulatory movement, together with the phenomenon of resonance will facilitate the mechanical explanation of the perception of music and the assimilation of the action of music on fluids, following the fibrillar model.

Theory of the action of music on the human body

When they explain the effects of music on human beings, these authors, despite their rationalism, support the empirical as the basis for truth, although they do differ in their justification of the expressive capacity and general influence of music. For example, Tosca sees no need to appeal to classical legends, 'as when examined they seem unbelievable',[22] in order to acknowledge the diverse expressive capacity of each modal scale. He finds auditory experience to be enough: 'Some tones cause sadness, others happiness; some move us to devotion, others to anger and others like passions.'[23] He thus proposes an acoustic and physiological basis to explain tonal influence and diverse sensorial impressions brought about by melodies. In agreement with the acoustic theory we have seen, Tosca states that 'there is no doubt that the movement of the most subtle fibres of which the brain is composed cause different movements in the animal spirits, and among these, different passions and ailments of the soul'.[24]

Moreover, he believed that sound vibrations could excite the nerves or cerebral fibres, in relation to the music's tone:

> When a tone is played or sung, the fibres of the brain move with the tiniest quiver, which is transmitted by the organ of hearing. Those that move most sensitively are those which, due to their tension and arrangement are most fitted to the tone heard, and some tones especially move some and others. Those that move the fibres, upon which the spirits depend, cause happiness and make for happiness; those which excite the movement of the fibres which move sad and melancholy spirits, cause sadness.[25]

This explanation coincides with the approaches of physicians such as Martín Martínez (1684–1734), one of the most important anatomists of the early eighteenth century, Martínez innovative medical ideas were defended

by Feijoo. This physician, in his book *Anatomia Completa del Hombre* (1728), explains that the vibration of the fibres in the membranous tunics altered their 'tension' and, consequently, was 'sufficient to lead the impulses of sensitive objects'.[26] As Martínez Vidal points out,[27] the network of peripheral nerves was like a spider's web which, on the slightest contact, transmitted any impulse it felt by means of the vibration of its fibres, from one extreme to the other, and neither the distance nor the 'obliquities, deviations and colligations' that the nerves have in their itineraries were obstacles to this action.[28] The vibratory model was described by iatromechanic authors such as Borelli or Baglivi, who believed in a fibrillar model: the nerves, sensitive fibres, which were easily irritated, communicate to the brain those jolts caused by any turbulence.

The Italian physicians Giovanni Alfonso Borelli (1608–1679) and Giorgio Baglivi (1668–1707) also influenced Spanish theories and practice. Baglivi, a leading iatrophysicist, markedly influenced the Spanish physicians who wrote about music therapy in the eighteenth century.[29] He attributed an important physiological role to solids: he was the first to attribute equal or greater relevance to solids than to fluids in all organic functions. Life consisted, in his opinion, of movements between the solid and liquid parts of the body, which should be 'continuous, regular and balanced'.[30] He ascribed to solids the properties of contraction and elasticity that are related to irritability. He also acknowledged, but to a lesser degree, the elasticity of liquids.[31] This concept is of radical importance in understanding the effects that music produces. The structures of the organism would be affected, mechanically, by the impulse of musical vibrations which then modify the elasticity of its fibres.

Baglivi differentiates between two types of fibres: the fleshy fibres which make up muscle tissue and the membrane fibres which form the membranous parts. Like other Baroque treatise writers and as a result of the dynamism typical of the period, Baglivi focused mainly on the study of muscle function, the nervous system and the circulatory system. Importantly for our purposes, he carried out a broad study of the nervous system's dura mater, whose role was to expel the 'nervous fluid' produced by the 'cortical glands in the brain' so that it would spread all over the body through the marrow fibres. This fluid was very delicate and elastic.[32] The undulatory theory of music proposed by Tosca connects with the idea of the neural circulation, the so-called *suco nérveo* or fluid which runs through the nerves, one of the theories developed in the early seventeenth century to understand nervous transmission through the human body. The Spanish author who best defined this doctrine was the above-mentioned Martín Martínez.[33]

The vibration of music, by varying the elasticity of the fibres, causes 'irritation' that is transmitted from fibre to fibre in a wave-like way. This

explanation of the actions of music lasted throughout the eighteenth century.[34] Thus, the Sevillian physician Bonifacio Juan Ximénez de Lorite (–1794),[35] states in 1776 that 'the sound of music [is] a vibration, which the plucked strings excite in the intermediate air, and gives the organ of hearing such an impulse that, spreading throughout the system of nerves, can agitate them at the same speed of the sonata'.[36] At the end of the century, Francisco Xavier Cid (c. second half of the eighteenth century, and one of the most important physicians in the study of tarantism) and Pedro F. Doménech y Amaya (1755–1833) justified the transmission of the nervous impulse produced by sound to the entire body.[37] Indeed, Dr Domenech, in a message sent to the Real Academia de Madrid, claims that 'the tremulous and vibratory movement communicated by our chest to the vocal instrument, which, by immediately touching the eardrum, extends its movement to the brain by means of the auditory nerve, so that the perception of sound can excite that part where the common sensory system is situated'.[38] This explanation differs very little from that formulated by Tosca at the beginning of the century.

The influence of sensibility and of music aesthetics

Music treatises from the beginning of the eighteenth century offer variations on the classical theories which attributed to musical modes the power to induce sentiments or states of mind. But, in general, they err when giving a physiological explanation of these effects. Referring to the aesthetic pleasure drawn from music, Tosca says:

> In music, natural philosophy and mathematics are joined and together give a pleasing example to the understanding and delicious recreation to the senses: by reducing different conflicting voices to harmony it makes a chain which sweetly imprisons the senses and, with the tasteful mixture of its harmonies, makes the bland savoury, and the bitter sweet.[39]

Tosca drew a precise correlation between the different modes and the sentiments that would be produced by the melodies corresponding to each tone.[40]

> The first tone is appropriate to express happy, pious and modest affairs. The second is fitting for lyrical verse. The third moves harshly and is proper to complaints and difficult things. The fourth is sad, suitable for tears. The fifth is lively and appropriate for festive matters. The sixth is also lively and sweet and useful for expressing states of gladness and devotion. The seventh is irate and moves to like passions. The eighth is solemn, for grave and serious matters. The ninth is for gentleness. The

> tenth is for onerous things. The eleventh for dancing and the like. The twelfth moves to anger and indignation and is proper to warlike issues.[41]

In contrast, Ulloa, quite imaginatively, instead of referring to the modes, attributes precise characteristics to the intervals; he connects the expressive properties of the music to the rising or falling relationship between two sounds. For the major third, he claims that 'when rising it is pleasing, when falling it causes some sadness'. The contrary happens with the minor. The fourth has different properties depending on the placing of its semi-tone: 'If it has a major semi-tone at the start, rising, it weeps; if in the middle it is cheerful; and if at the end, it dances'; the opposite occurs if the tone falls. The perfect fifth in all its types would present 'beauty and gala, but when falling they all show some sadness'. The major sixth would, in his opinion, be a harsh interval, the minor gentle.[42] Ulloa explains the influence of music on affections through the notion of a resonant harmony that 'stirs up the outer air and gives it harmonious movements', thus impressing the imagination, which, in turn, 'stirs up the humours which, mixed with the inner air, finally leads man to where he is meant to go. It is in this way and not in any other that harmony immediately and decisively moves the affections.'[43] As each sound produces in the listener its own vibration, deriving from a different acoustic frequency, Ulloa believes that the influence of music is exquisitely individual.

He argues further that the figures, tones and rhythms are at the service of delight and pleasure. In one style or another, diverse expressive intentions motivate the choice of modal tones (as the composers of plainchant had always claimed), the different sounds and their rhythmic order: 'Having chosen the most proportionate tone, discussions would become more animated, noting that as the states of sadness, weeping, tiredness and the like demand slow notes, on the contrary, those of delight, happiness, indignation, etc., demand swift ones.'[44]

These physicians point out that sounds do not have the same effect on everyone and that the action of music on human beings is twofold: on the one hand, it has a direct influence on the whole body (humours and tissues) which is involuntary and mechanical, the effect of vibrations; and, on the other, it acts through the soul which receives the sounds through the ear and moves the passions. As I have argued elsewhere,[45] Cid explains that music acts on three levels in the organism. The first would be 'a pure and simple mechanical effect'; 'the second effect of music on man is in the soul'. The soul perceives the sound and, if it is agreeable, is pleased, and if it is not, 'it communicates to the body the sad effects of the species that displease it'. 'The third effect of music on man is to move the passions and agitate the parts where they are rooted.'[46] Thus we see that musicians and physicians do not clearly define the separation between the body and soul. However, 'harmony or modulated sound have a great power and rule in man, both to

move the affections and to impress a certain virtue on his organs by moving or affecting them in some way, thus reproducing the feelings conveyed or immediately conserving and increasing them'.[47]

Everyone feels the effect of music, not merely those who are ill. For Domínguez Rosains,[48] for example, the command of music on passions

> is shown in the emotional effects in temples and theatres, as the same system of humours and solids are found in one and the others: the same movements of the fibres are to be found in the healthy and the frail, the diverse postures we see in one, in proportion to the passions, should also be seen in the others, as I see no reason to believe the contrary, when the same humours, the same mechanical order of the parts, and the same way of behaviour and wounding depend on music.[49]

Music is a true means of communication. Ulloa associates musical figures with the expression of states of mind and of passions.[50] But he gives each of them a specific meaningful quality. He believed, for example, that pauses were particularly effective in transmitting questions and answers as well as states of mind, resolved in affective sighs: 'Sighs can be reduced to this figure, when the quavers and semiquavers, whose pauses are therefore called sighs, express tearful states.' The rise in melody 'expresses the exaltation or high-places or sublime things', while the descent transmits 'servitude, humility, depression, etc.'.[51]

Feijoo brings up an innovative point when he questions the traditional relationship between modes and sentiments because, as he notes, 'the greatest musicians are very much in disagreement on designating the tones that produce specific sentiments'.[52] However, he does acknowledge the influence of the *tessitura* or tonal transposition, 'because the same music in lower voices is more religious and serious and transported to higher ones, losing some of its majesty, gains a touch of gay vivacity'.[53] 'Music' – he says elsewhere –

> according to the variations of the melody, induces several different feelings in the soul, some good and some bad. With one we feel moved to sadness, with another to joy, with another to clemency, with another to cruelty, with one to strength, with another to pusillanimity, and so with all the other inclinations.[54]

For him, therefore, sensitivity requires both physical and moral appreciation.

In the times of the *Teatro crítico*, the introduction of chromatism to the so-called altered notes allowed for greater possibilities of expression. Feijoo, however, opposed the subtleties of the new scale. This was an issue on which the thinkers of antiquity, especially Plato, agreed. They also believed that the

use of the subtle intervals of the chromatic and enharmonic genres was pernicious. Feijoo dissented from this opinion because he believed that 'the changes the voice makes in singing in tiny intervals, as they have some sort of effeminate softness, that leads to vices and immorality, also produce a similar feeling in the spirit of the audience, producing confusing images on their imagination which represent no good thing'.[55] For Feijoo, musical sensitivity is allied to the intellective function, so he privileges the effect of the literary text in its musical expression on the listener. Thus he considers as a primordial aesthetical norm that 'the singing be appropriate to the meaning of the lyrics'.[56] But he also points out that 'musicians of all genres of compositions often sin by defect or by excess against this, one of the most cardinal rules'.[57]

Following a secular tradition, Feijoo observes the influence of music on both, the individual, and social affective and moral spheres, a key issue in understanding the controversies he provoked. For him, 'the most pleasant and delightful music of all is that which induces sweet tranquillity in the Soul, gathering it into itself, and raising it, let us say, with an ecstatic rapture above its own body, so that thoughts can take flight towards divine things'.[58] Feijoo, backed by testimonies from antiquity,[59] directed more than one diatribe against the influence of profane, theatrical and dance music on religious music. This situation, in his opinion, was a grave problem in his time because 'not only was the music of the theatre conserved in the theatre, but also the music proper to the theatre moved to the temple'.[60] His complaints were profound and reiterated. On the one hand, he claimed that 'the cantatas which are now heard in the church are, in their form, the same as those on the stage. They are all composed of minuets, recitals, little arias, allegros and finally a type they call grave, and very little of that so as not to be bothersome.'[61] On the other, he pointed to their harmful effects: 'What well-conditioned ears could, in sacred songs, bear those love trills, those lascivious inflections against the rules of decency and even of music, which the demon taught to players and they to other singers?'[62] Multiplying the examples, he wonders

> what can he who hears on the organ the same minuet he had heard in the Sarao do but recall the lady with whom he danced the previous night? Thus the music, which should carry the spirit of the listener away from the earthly temple to the heavens, moves him from the church to the feast. If he who hears is ill disposed, either by temperament or by habit, then his imagination will not stop there.[63]

The monk correctly considers that an opera aria accentuates individual pathos and opens more intimate and subjective paths to musical expressivism.

In the same way that Plato complained about the influence of oriental music in Greece and saw in stylistic change the risk of a psychological change in the people, Feijoo lamented the spread of Italian music among the people of Spain.[64] He thus declared: 'When I remember the ancient seriousness of Spain, I have to admit that it has decreased so much that we now only like *tararira* music; it seems that the acknowledged gravity of the Spaniards has been reduced to merely walking stiffly in the streets.'[65] However, Feijoo thought that the use of certain musical instrumentals (the organ, the harp, the spinet virginal, among others) was appropriate in temples.[66] But, in contrast, he disapproved of the introduction of the violin, because it seemed to him that 'its squeals, although harmonious, are squeals, and excite a childish vivacity in our spirits [...] especially at this time, when those who compose for violins study to make the compositions so high that the player almost hits the bridge with his fingers'.[67] This criticism is essentially a result of his attitude towards contemporary music, as the violin had become extremely popular at the time. His denunciation of the violin led to a very public controversy with the musician from Salamanca, Juan Francisco Corominas.[68]

To assess Feijoo's position, two assumptions must be taken into account: the expressive capacity of the art of music and the evolution of musical styles. His opposition to these practices was, as we have seen, well argued, but his points were weaker when he tried to make a generalised criticism of the musical art of the time, as art implies stylistic evolution. His writings provoked the reactions of a series of maestros who were legitimately striving to express their religious sentiments using different stylistic criteria, as was the case of the above-mentioned Corominas.

The music therapy theory

Ideas about music therapy are present in the works we are analysing, although none of the authors proposed any innovations to current practice. Tosca's 'modern' approach is limited to claiming proof of the therapeutic effects of music: 'to proceed with this with success it is necessary to study repeatedly what effect is created by what tone in different ailments and to observe in each genre of music what humour it moves with more singularity and what effects it causes in men according to their different temperaments'.[69] Moreover, as noted above, his good sense limited the musical remedy to a mere supporting action for drugs. Tosca, Ulloa and Feijoo follow tradition when they recall the effects of dance against the bite of the tarantula, or tarantism, one of the main ailments for which music has been used since antiquity. Tosca considers the practice 'quite vulgar and well-known', attesting to its widespread use. The description of the doctrine on tarantism faithfully follows the rule established in earlier works: 'when those who are infected by this venom hear the music, they feel the need to jump

and dance and, with the agitation of the unaccustomed and violent movements they make, the pestilent venom which otherwise would end their lives evaporates in sweat'.[70]

However, it is surprising that, despite the painstaking fibrillar explanation offered by Tosca on the action of music on the body and the wave-like transmission of sound, he refers to a humoral Galenic theory when he speaks of the healing mechanisms of music. He insists that music is good in the case of illness,

> first because, as illness is the confusion and perturbation of the humours and as some sounds move a humour more than others, there is no doubt that said sounds can but move him and incite a contrary movement to that which was the cause of the damage. Second, because the bad humours will be easier to expel with the movement that music extrinsically communicates to them, assisting the faculty of the medicine with the supplied drug.[71]

This description contrasts with other medical theories of the period. Baglivi, for example, sustains his iatromechanical concept when he explains that music acts on the organism by means of the 'waves' that move from the ear to the brain and then to the blood and other tissues:

> music reaches the liquid bodies and the solids, and so, in a very intense way and through percussion also reaches the subtle fibres of the brain and the liquid of the nerves and passes the separation of the spirit and produces an momentary explosion and agitation which can hardly be attributed to drugs.[72]

This explanation was reiterated by most Spanish physicians in the eighteenth century. Several differences may be observed, however. One is that Baglivi limits his experience of the therapeutic application of music to Tarantula victims, whereas the Spanish physicians of the later eighteenth century generalised the recommendation of music therapy, which led to the development of a music therapy theory.[73]

Interestingly, physicians who speculate on music therapy frequently quote from Feijoo.[74] This is perhaps due to the fact that, together with his reservations about and criticism he directed towards the curative examples attributed to ancient music that he believed 'to be mostly and principally fables',[75] he accepted the truth of two well-known stories that occurred in France, where music was used as a therapy for victims of fevers, because the practice were endorsed by the Academy of the Sciences in Paris.[76] In addition, he believed that music was a useful sedative: the patient 'perhaps will like music and perhaps music will allow him to get to sleep better than all the pharmaceutical sleeping pills'.[77] Both possibilities for the use of music

(fever-reducing and hypnotic) were supported by Spanish physicians who put forward music as one of the so-called 'universal remedies', that is, among those which could be applied in a general way with good results and without side effects.[78] Music, Doménech claims, 'is a proper and real medicine' because 'medicine' may be defined as 'anything that alters or may alter our nature'.[79]

At this point, I would like to comment briefly on the technical explanation of the use of music in ailments that affect the 'nerves', one of the most effective uses of music therapy. In 1776, Ximénez de Lorite commented that 'music has the power to cure many illnesses, particularly those which affect the moving and sensitive parts of the machine: that is, the nervous system'.[80] The justification for this medical practice is based on Baglivi's pathological theory. For him, illness was the result of an imbalance between the movement of liquids and solids in the body. Music helps restore the proportion because it manages 'to remove atony and moderate spasms'.[81] Let us look at this in more detail: Cid considers that the positive effects of music arise from the action of the vibration on 'the thickness of the humours and the weakness of the fibre' which would lead to paralysis, of 'weakness in certain parts', of 'drowsiness due to the obstruction of vessels', of 'cachexia', etc. The relief achieved 'will be very certain, even more so if some movements or dance appeared'.[82] The mechanical influence deriving from the vibratory movement of the music induces 'the strength that communicates with the nerves'.[83]

This mechanism for action also applies to other cases, such as tarantism or gout, for which earlier literature also recommended music.[84] In the case of gout, Cid explains that the stiffness and pain in the joints is produced 'when the nerves are debilitated by long inactivity as occurs in fearful pain, or by instillation of the gouty humour into the sheaths of the tendons, and into the joints, which thickens to such a degree that it cannot be resolved by ordinary drugs'.[85] Music would reverse this situation because it can lessen the density of the gouty humour, in the same way that it acts against the venom of the tarantula, as the venom is a coagulant.

At the end of the seventeenth century, the mechanistic theory also explains the influence of music on passions and feelings. The mechanical action of music would act systematically on the whole body, specifically on the ear. As Domenech and Amaya explain, 'it is evident and well-known that sound is communicated by means of sounding or sounded particles that float in the atmosphere'.[86] As these particles spread, they create a vibratory movement like that seen in water and are 'subject to the laws of reflection and refraction'. In this manner, they transmit 'the mechanical movement of the fibres, which the soul, between entrancement and distraction, focuses upon, thus erasing the feeling of pain, filling the place of sadness with a soft vibratory undulation, communicated from the ear to the brain'.[87] In other

words, it acts through the brain, 'immediately on the soul' which is 'what suffers the principal attack of sensations: in pain, in sadness, in afflictions and distressing sighs' produced by diverse ailments.

Conclusion

In the early years of the eighteenth century, the assessment of physicians' experience led to a reconsideration of the classical theories on the action of music. Thus the authors discussed here considered the traditional relationships between states of mind and musical modes as stereotypes. The music treatises of the early eighteenth century contributed to the assimilation of new medical-scientific doctrines in Spain. The writings of Tomás Vicente Tosca and Pedro de Ulloa show the evolution from mathematical to physical acoustics. In both cases, the sound phenomenon is based on the concept of vibrations that affect fluids and, above all, a fibrillar model – an explanation that overlaps with the iatromechanical approaches of contemporary physicians.

The medical references in music treatises serve to highlight the influence of the expressive capacity of music on the human body. There were numerous explanations of the theory of the influence of music. However, I focus on an idea common to musicians and physicians, developed in the professionals' treatises. We must not forget that the continuity of the theory of the action of music was influenced by the scientific academies and societies because of the circulation of medical reports around Europe.[88] Over time, the majority of physicians who recommended melotherapy agreed with the mechanicist explanation. But, together with this response, we find a psychological interpretation of the expressive capacity of the intervals, chords, rhythms and other musical elements. The treatise writers explained their individual perspectives on music and its influence on the affections and passions, although they did not fully formulate a clear distinction between its physical and psychological actions.

In the case of Feijoo, his doctrine supports the theory of the expressive power of the art. In it, he found arguments on which he based his ideas on the differences between religious and secular music. Echoing classical thinkers, principally Plato, he associates musical chromatics and its subdivision into tones and semitones, typical of the period, with passions and states of mind and characters. This period of controversy would, on a speculative plane, challenge instrumental music, which was gaining strength in temples and concert halls with a defence of plainchant, described as 'the diatonic procedure, more proper and suitable than any other to calm the soul [...] and induce tranquillity and peace'.[89] We have seen the most characteristic points of theoretical studies in music therapy in these eighteenth-century authors: on the one hand, the tendency to form systems, and, on the other,

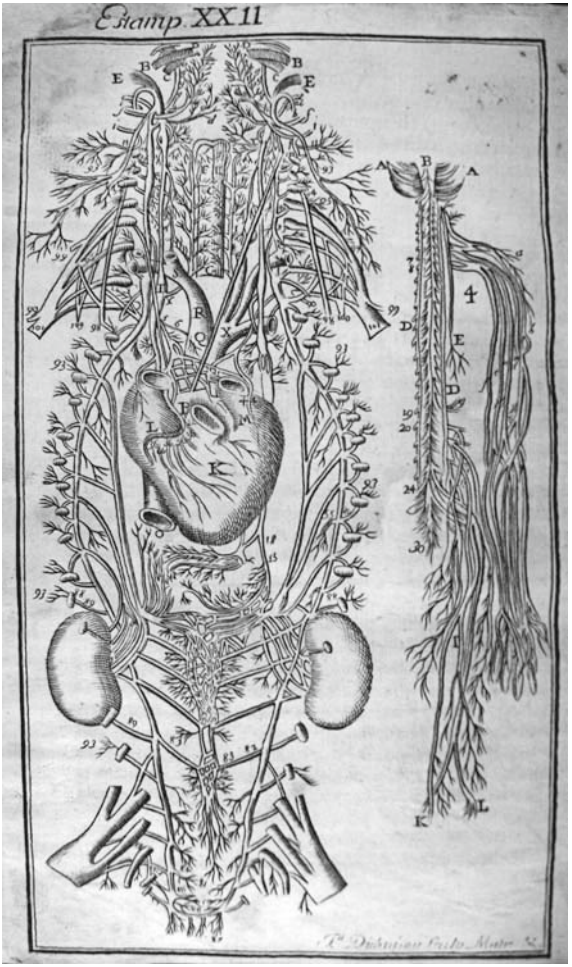


Figure 5.1 M. Martínez *Anatomía completa del hombre* (1764)
The anatomists of the early eighteenth century explained that the network of peripheral nerves was like a spider's web which, on the slightest contact, transmitted any impulse it felt by means of the vibration of its fibres. The picture shows 'the eighth pair of nerves in the brain, the intercostal and the main spinal cord' by M. Martínez (1764) *Anatomía completa del hombre, con todos los hallazgos, nuevas doctrinas y observaciones raras hasta el tiempo presente, y muchas advertencias necesarias para la cirugia: segun el methodo con que se explica en nuestro Theatro de Madrid* (Madrid: Imprenta de la Viuda de Manuel Fernández), p. 588–9.

their determination to 'experiment', try out and thus to measure and evaluate the forces of nature. In this way, the Age of Enlightenment became a period of trial and error and, at the same time, one of fundamental and decisive construction (Figure 5.1 and Figure 5.2).

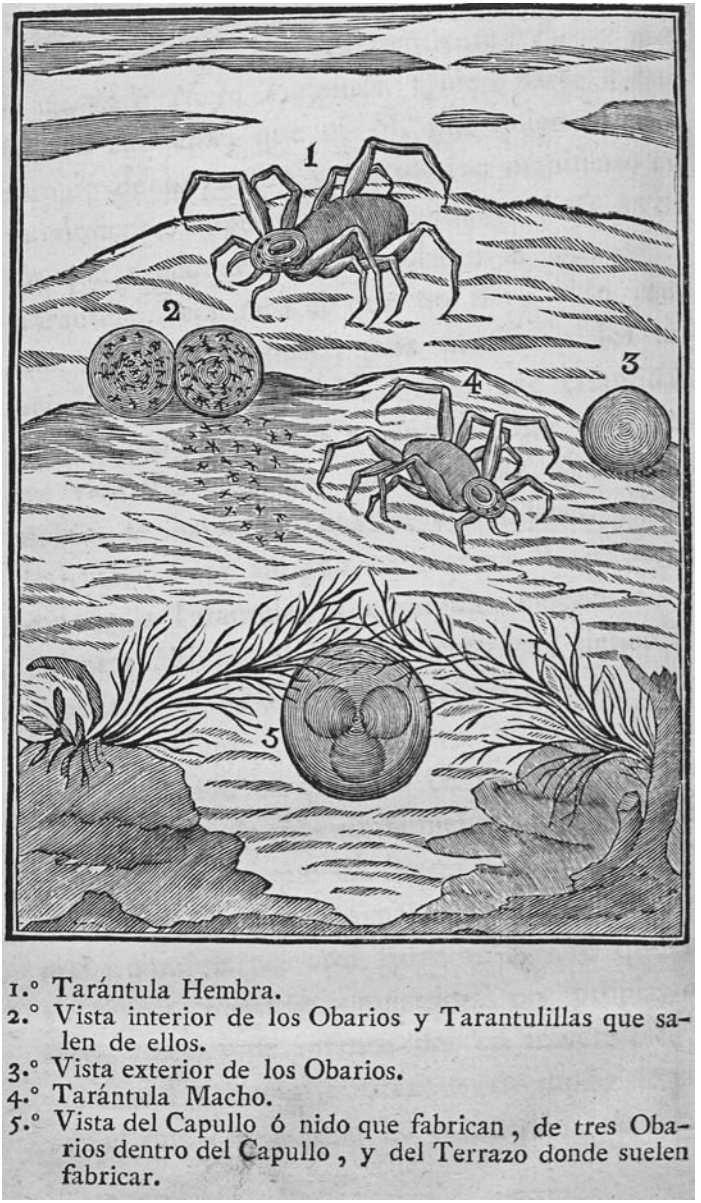


Figure 5.2 F. X. Cid, *Tarantismo observado en España* (1787)
In Spain in the eighteenth century there were numerous physicians and scientists who were writing on melotherapy and tarantism. The picture is included in the book *F. X. Cid (1787) Tarantismo observado en España . . . y su curación por la música con el modo de obrar de esta, y su* aplicación *como remedio de varias enfermedades*. (Madrid: Imprenta de González, 1787).

Notes

1. Penelope Gouk, 'Music's Pathological and Therapeutic Effects on the Body Politic: Doctor John Gregory's Views', in P. Gouk and H. Hills, eds., *Representing Emotions: New Connections in the Histories of Art, Music, and Medicine* (Aldershot, Hants, England; Burlington, VT: Ashgate, 2005), 192.
2. Jessica Riskin, *Science in the Age of Sensibility: the Sentimental Empiricists of the French Enlightenment* (Chicago: University of Chicago Press, 2002), 1.
3. Information on *novator* movement, see J.M. López Piñero, *Joan de Cabriada i la introducció de la ciència mèdica moderna a Espanya* (València, Consell Valencià de Cultura, 1994).
4. For more information on this author, see F.J. León Tello, *La teoría española de la música en los siglos XVII y XVIII* (Madrid: Consejo Superior de Investigaciones Científicas, 1974), 45–73, V. Navarro, 'Tosca, Tomás Vicente', in J.M. López Piñero et al., *Diccionario histórico de la ciencia moderna en España* (Barcelona, Península, 1983), 368–371. There is a contemporary biography written by G. Mayans y Siscar, *Vita Thomae Vicenti Toscae* (1754).
5. The Oratory was founded in Rome in 1575 by St Philip Neri as a society of apostolic life of Catholic priests and lay brothers who lived together in a community bound together by no formal vows but only by the bond of charity.
6. For more information on this author, see F.J. León Tello, *La teoría española de la música en los siglos XVII y XVIII* (Madrid: Consejo Superior de Investigaciones Científicas, 1974), 74–88, V. Navarro, 'Ulloa, Pedro', in J.M. López Piñero et al., *Diccionario histórico de la ciencia moderna en España* (Barcelona, Península, 1983), 382.
7. There is substantial literature on Benito J. Feijoo's ideas regarding musical issues. See A.M. Moreno, *El Padre Feijoo y las ideologías musicales del XVIII en España* (Orense: Instituto de Estudios Orensanos Padre Feijoo, 1976), F.J. León Tello, *La teoría española de la música en los siglos XVII y XVIII* (Madrid: Consejo Superior de Investigaciones Científicas, 1974), 162–190.
8. B.J. Feijoo, *Teatro crítico universal* (Madrid: D. Joaquín Ibarra, Real Compañía de Impresores y Libreros, 1726, 1778), 1, 1–52, 285–309. There is an eighteenth-century English translation of part of these texts: B.J. Feijoo, *Three Essays or Discourses on the Following Subjects, a Defence or Vindication of the Women, Church Music, a Comparison Between Antient and Modern Music*, trans. J. Brett (London: T. Becket, 1778).
9. B.J. Feijoo, 'In Response to a Musical Objection', in *Cartas eruditas y curiosas, Carta I* (Madrid: Imprenta Real de la Gazeta, 1742 and 1777), 1, 193–195.
10. G. Stiffoni, 'Introducción', in B.J. Feijoo, ed., *Teatro crítico universal o Discursos varios en todo género de materias, para desengaño de errores comunes* (Madrid: Castalia, 1986), 39. Trans. mine.
11. A general vision of this Spanish period, from the historical science point of view: J.L. Barona, J. Moscoso, J. Pimentel, eds., *La Ilustración y las ciencias: Para una historia de la objetividad* (Valéncia: Universitat de Valéncia, 2003).
12. P. León-Sanz, *La Tarantola Spagnola. Empirismo e tradizione nel XVIII secolo* (Besa: Editrice Lècce, 2008), P. León-Sanz, 'Medical Theories of Tarantism in Eighteenth-Century Spain', in P. Horden, ed., *Music as Medicine* (London: Ashagte, 2000), 273–292, P. León-Sanz, 'Literatura médica española sobre musicoterapia en el siglo XVIII', *Nassarre* 7.2 (1991), 73–155.
13. T.V. Tosca, *Compendio mathematico: en que se contienen todas las materias mas principales de las ciencias, que tratan de la Cantidad*, 2nd ed. (Madrid: Impr. de A. Marin,

1727), 2, 338. About the Tosca's theory of music, see F.J. León Tello, *La teoría musical del padre Tosca* (Valencia: Sucesor de Vives Mora, 1971). A comprehensive analysis of this work in F.J. León Tello, L*a teoría española de la música en los siglos XVII y XVIII* (Madrid: Consejo Superior de Investigaciones Científicas, 1974), 45–73. All translations from the primary sources are mine.

14. P. de Ulloa, *Musica universal, o Principios universales de la musica* (Madrid: Imprenta de musica, por B. Peralta, 1717), 1–2. A detailed analysis of this work is found in F.J. León Tello, *La teoría española de la música en los siglos XVII y XVIII* (Madrid: Consejo Superior de Investigaciones Científicas, 1974), 74–88.
15. Tosca, *Compendio matemático*, 2 vols, 12.
16. Ibid., 342–343.
17. Ibid., 345.
18. Ibid., 349–352.
19. Ibid., 375.
20. Ulloa, *Musica universal*, 45–46.
21. Tosca, *Compendio matemático*, 2 vols, 352.
22. Ibid., 340.
23. Ibid., 463.
24. Ibid., 463.
25. Ibid., 463–464.
26. M. Martínez, *Anatomia completa del hombre: con todos los hallazgos, nuevas doctrinas y observaciones raras hasta el tiempo presente, y muchas advertencias necessarias para la cirugia segun el methodo con que se explica en nuestro theatro de Madrid* (Madrid: Imprenta de Bernardo Peralta, 1728), 28.
27. A. Martínez Vidal, *Neurociencias y revolución científica en España: la circulación neural* (Madrid: Consejo Superior de Investigaciones Científicas, 1989), 105.
28. M. Martinez, *Anatomia completa del hombre*, 29. See also A. Martínez Vidal, 'Los supuestos conceptuales del pensamiento médico de Martín Martínez (1684–1734): la actitud antisistemática', in *Llull boletín de la Sociedad Española de Historia de las Ciencias* (1986), 9, 127–152.
29. León-Sanz, *La Tarantola Spagnola*, 33–34.
30. G. Baglivi, *Opera omnia*, 4th ed. (Venetiis: Apud Gasparum Girardi, 1738), 165. About this physician: J.J. Girona, 'La medicina de Baglivi', *Archivo Iberoamericano de historia de la Medicina* 6 (1954), 427–592. See also M.D. Gremek, 'Baglivi Georgius', in Ch. Coulston Gillispie, ed. *Dictionary of scientific biography* (New York: Scribner's Sons, 1970), vol. 1, 391–392.
31. J. Girona, *La Medicina de Baglivi*, 508.
32. Ibid., 514–517.
33. A. Martínez Vidal, *Neurociencias y revolución científica en España*, 145.
34. The action of the sounds in the ear and its passage through nerves to the brain is described by several physicians. For example: B. Dominguez Rosains, *Disertación médico medico-práctica en que se demuestra la música ser remedio de muchas enfermedades* (Archive Real Academia de Medicina de Sevilla, 1766), 14, B. Ximenez de Lorite, *Historia natural de la tarántula. Los prodigiosos fenómenos de su puntura, la peculiar idea de la música con que se cura y el mecanismo con que obra* (Archive Academia de Medicina de Sevilla, 1776), 50, V. González y Centeno, 'Disertación Físico Médica. Oración inaugural. Sobre el influjo que tiene en la salud humana el ímpetu violento 23 de Octubre de 1788', in *Memorias de la Real Sociedad de Sevilla* 7 vols (Sevilla, 1798), 400–401, P.F. Domenech y Amaya, 'Observación de un picado por la tarántula', in *Memorias de la Real Academia Médico-práctica de Barcelona* (Madrid, 1798), 146.

35. For more information on this physician and his work, see León-Sanz, *Literatura médica española sobre musicoterapia en el siglo XVIII*, 73–155 and León Sanz, *La tarantola Spagnola*, 80–95.
36. Ximénez de Lorite, *Historia natural de la tarántula*, 50.
37. For more information on these physician and their work, see León-Sanz, *Literatura médica española sobre musicoterapia en el siglo XVIII*, 73–155 and León-Sanz, *La tarantola Spagnola*, 110–127, and 152–168.
38. Doménech y Amaya, Observación de un picado por la tarántula, 148.
39. Tosca, *Compendio matemático*, 2 vols, 337.
40. Ibid., 67–69.
41. Ibid., 464.
42. Ulloa, *Música universal*, 40.
43. Ibid., 46.
44. Ibid., 60.
45. P. León-Sanz, ed., 'Evolution of the Concept of Emotion in Medicine: A Music-Therapy Approach', in A.M. Gonzalez, ed., *The Emotions and Cultural Analysis* (Burlington, VT: Ashgate, 2013), 69–95.
46. F.X. Cid, *Tarantismo observado en España con que se prueba el de la Pulla, dudado de algunos y tratado de otros de fabuloso y memoria para escribir la Historia del insecto llamado Tarántula, efectos de su veneno en el cuerpo humano [...] y su aplicación como remedio de varias enfermedades* (Madrid: Imprenta de González, 1787), 259–265.
47. Cid, *Tarantismo observado en España*, 265.
48. For more information on this physician and his work, see León-Sanz, *Literatura médica española sobre musicoterapia en el siglo XVIII*, 73–155 and León Sanz, *La tarantola Spagnola*, 68–72.
49. Domínguez Rosains, *Disertación médico médico-práctica en que se demuestra la música ser remedio de muchas enfermedades*, 4–5.
50. Ulloa, *Musica Universal*, 61.
51. Ibid., 62.
52. Feijoo, *Teatro crítico universal*, 40.
53. Ibid., 439 and 41.
54. Ibid., 11.
55. Ibid.
56. Ibid., 34.
57. Ibid., 35.
58. Ibid., 19.
59. Ibid., 1–2.
60. Ibid., 4.
61. Ibid., 6.
62. Ibid., 10.
63. Ibid., 5.
64. Feijoo agrees with other Spanish musicians such as Pablo Nassarre (1664–1724) on this point. Similar debates occurred in other places, as we see in D. Alsop, 'Strains of New Beauty: Haendel and the Pleasures of Italian Opera, 1711–1728', in R. Porter and M.M. Roberts, ed., *Pleasure in the Eighteenth Century* (Basingstoke: Macmillan, 1996), 133–163.
65. Feijoo, *Teatro crítico universal*, 24.
66. Ibid., 44.
67. Ibid., 43.

68. In 1726, the musician Juan Francisco Corominas wrote the *Aposento Anti-Crítico desde donde se ve representar la gran Comedia que en su Theatro Crítico regaló al Pueblo el RR. P.M. Feijoo, contra la Música Moderna y uso de los Violines en los Templos, o carta que en defensa de uno y otro escribió…* (Salamanca: Imprenta de la Santa Cruz). Martín Martínez supported Feijoo by writing the *Carta defensiva, que sobre el primer tomo del Theatro Critico Universal, que dió a luz el Rmo. P.M. Fr. Benito Feijoo* (Madrid: Imprenta Real, 1726). In this manner, Martínez reciprocated the support he had received previously from Feijoo.
69. Tosca, *Compendio matemático*, 2 vols, 489.
70. Ibid., 488.
71. Ibid., 463.
72. Baglivi, *Opera Omnia*, 640.
73. P. León-Sanz, *Teoría de la acción terapéutica de la música en la medicina del siglo XVIII, Nasarre*, 9 vols (1993), 1, 79–117.
74. For example F.X. Cid quotes the *Cartas eruditas*: Cid, *Tarantismo observado en España*, 1 vol, 281–283, and also Doménech y Amaya, *Observación de un picado por la tarántula*, 146.
75. Feijoo, *Cartas eruditas y curiosas*, *Carta XLIV*, 1 vol, 375. However, Feijoo repeatedly discussed the Biblical story of David and Saul, 'Feijoo, Teatro crítico universal', *Discurso VI*, 110–111, 'Cartas eruditas', *Carta I* 4 vols, 16–17.
76. The two stories are well known because they are often quoted in the eighteenth-century music therapy books. In the first, a famous musician was ill with fever and he recovered only when he spent ten days listening to music by Bernier (Feijoo, Cartas eruditas y curiosas (1742–1777), 'Maravillas de la música y cotejo de la antigua con la moderna', *Carta XLIV* 1 vol, 8, 376), The other is about a dance teacher from Alés who, in the midst of a high fever, fell into a sleep and awoke 'with a terrible frenzy'. Only violin music calmed him, after which he fell asleep again and awoke cured (Feijoo, Cartas eruditas y curiosas, 'El deleite de la música', *Carta I* 4 vols, 49, 22.
77. Feijoo, *Teatro crítico universal*, Discurso X: 'Paradojas médicas', 8 vols, 251.
78. León-Sanz, *La tarantola Spagnola*, 57–58.
79. Doménech y Amaya, *Observación de un picado por la tarántula*, 146.
80. Ximénez de Lorite, *Historia natural de la tarántula*, 46. Most of the physicians discussed here supported this idea.
81. Doménech y Amaya, *Observación de un picado por la tarántula*, 161.
82. Cid, *Tarantismo observado en España*, 317–320.
83. Ibid., 320.
84. León-Sanz, *Medical Theories of Tarantism in Eighteenth-Century Spain*, 273–292; León-Sanz, *Teoría de la acción terapéutica de la música en la medicina del siglo XVIII*, 79–117.
85. Cid, *Tarantismo observado en España*, 304.
86. Doménech y Amaya, *Observación de un picado por la tarántula*, 146.
87. Ibid., 149.
88. León Sanz, *La tarantola Spagnola*, 21–23.
89. Marquis of Ureña (G. de Molina y Zaldívar, 1785) *Reflexiones sobre la arquitectura, Ornato y Música del Templo: Contra los procedimientos arbitrarios sin consulta de la Escritura Santa, de la disciplina rigurosa y de la crítica facultativa* (Madrid: Imp. de J. Ibarra), 398. This remark is part of a commentary on the work of Benito J. Feijoo written at the end of the eighteenth century.

6

'Subsiding Passions' and the Polite Arts of Healing: Music and Images of the Medical Profession in 'Moderate Enlightenment'

Aris Sarafianos

Introduction

Richard Brocklesby's *Reflections on Antient and Modern Music* (1749) is a landmark publication in the modern history of music therapy, whose remit, however, extends into a broad area of biomedical concerns. The author was one of the most successful physicians of late eighteenth-century London with an extensive and distinguished clientele. Although his work has, until recently, been largely ignored, it had, in its time, made various original contributions in medical, physiological and environmental debates.[1] Brocklesby was also involved in projects of political and social reform, not least through his membership in the Society of Constitutional Reform that aimed at improving the system of representation, and, to Samuel Johnson's dismay, he remained a deist throughout his life.

This period of progressive politics was preceded, however, by another more cautious phase during which Brocklesby, a medical upstart of Irish descent, had, after a thorough training in Edinburgh (1742) and Leiden (1745), settled in London looking for polite patronage and cultural embellishments. Brocklesby soon attracted the attention of such influential physicians as Richard Mead, and, by the time he came to publish his treatise on music, he had already become member of the Royal Society and regular contributor to its *Philosophical Transactions*. This is the period from which Brocklesby's treatise on music dates, and it forms part of the same effort to establish a professional reputation.

In this sense, the *Reflections* is indeed a work of polite medicine, and provides a guide to music therapy that is fully inscribed within the established aesthetics of the time. The subject, however, was, despite its respectability in ancient, medieval or Renaissance medical literature, rather overlooked

among Brocklesby's contemporaries. It was perhaps the unconventionality of Brocklesby's choice of topic that determined the book's little direct impact on contemporary discussions. Almost half a century later, the writer of Brocklesby's detailed obituary for the *European Magazine* could not even get the title of the book right, admitting his ignorance about its date of publication, but he shrewdly placed the book 'amongst [the doctor's] early literary amusements'.[2] And yet much of what Brocklesby had suggested in this little book would soon acquire wide currency and become highly typical of the age.

In this essay, I argue that Brocklesby's study reflects the emerging centrality of music and the arts at large within the period's medical thought. The book aimed to gentrify and aestheticise medical discourse, but, still more importantly, it reveals the broader importance of physical languages in liberal criticism and aesthetic discourse. In the first half of the essay, I show that Brocklesby's medical therapies promoted mild styles of music and quietist economies of sensory stimulation as bio-political technologies with a social purpose. This mission was deeply divisive in that, on the one hand, it promoted the sensibility and lifestyles of the polite classes, while, on the other, facilitating the professional aggrandisement of a small elite of polished doctors. In the rest of the essay, I demonstrate how Brocklesby's aestheticisation of medical discourse via music found its fitting expression in the art of painting intended for Brocklesby's immediate circle of intimate friends. The intense dialogue between Raphael's *Vision of St Cecilia* and Barry's portrait of *Christopher Nugent, MD*, constitutes a unique visual example of the profound affinities between old philosophical notions of 'human music' and modern approaches to medicine. Building upon older as well as contemporary cultural resources, I suggest that Barry's portrait produced a rare kind of *medical sensibility* and *professional image*, providing, together with Brocklesby's book, eloquent case studies of the way in which the profession's languages of analysis, as well as its public and ethical image, changed in accordance with musical paradigms.

Sensations of the mind and the passions of health

Brocklesby's physiology of musical perception is a militant example of medical animism set against iatromechanical models and notions of 'mere mechanism'.[3] For leading variations of animism such as Georg Stahl's medical pietism, mind and body were holistically treated as an 'organic' unity in which the soul acted as a wilful agent of organisation of all physical processes.[4] Likewise, Brocklesby declared the organism to be the organ of what he called 'an intelligent and active principle' – his alternative terminology for the more common term 'soul' or 'mind', which are thus treated as medical realities. Brocklesby's anti-mechanical frame of thinking may not at first sight seem to tally with the kind of medical materialism, which, as Penelope

Gouk and James Kennaway have amply shown, ushered in a growing interest in the physiological operation and anatomical localisation of hearing, sound and music.[5] Yet, his soul principle is very much rooted in the body, embedded in the body's physical functions and material relations with the environment.[6] The treatise gives priority to the impact and functional role of the mind in the maintenance of bodily health, but this mind retains its centrality as the sensitive centre of therapeutic intervention precisely because it is in dialogue with the body and speaks the same language with it. Brocklesby was keen to reinstate the heterogeneity and primacy of the mind, but he was also obliged to accept the planes of interference between the mind's materiality and the material vicissitudes of the body. The result was a complex compromise, a borderline kind of polite materialism – or, rather, a *rarefied type of sensationism* – that sought to show adequate respect towards theological abstractions, while accelerating the process of mapping the intricate relations between mind, body and matter.

In this context, the mind emerges as in itself a sensorial phenomenon: it is the site of a higher music, namely, the harmony of animal spirits, and it marks out a singular environment of affective equilibrium. The mind is also treated almost as a higher type of sensory organ, unusually sensitive to the effects of external aestheses, including music itself. Moreover, it is now subject to its own type of sensations, the 'passions'. As part of the famous six non-naturals of traditional Hippocratic medicine, the 'passions' had preoccupied physicians for a long time, but in Brocklesby's perspective, the significance of emotions is dramatically raised, insofar as they are now treated as no less than 'sensations of the mind'. Moreover, these singular types of 'inner' sensations do not come out of nowhere: they are, in fact, internal modifications of external sensations, affecting the body in ways as medically meaningful as proper sensations. The passions produce their 'effects upon the body', flowing outwards from the inside. However, their consequences are as drastic as those produced by material sensations flowing inwards from the external environment. Indeed, the dramatic physical effects of the passions depend on the force and frequency with which they are experienced in the mind, for, according to Brocklesby, 'the organs of the body are under a sort of mechanical necessity to keep pace with the sensations of the mind'.[7]

Brocklesby offered a detailed account of the medical profile of every passion with adverse implications for the body and mind. These passions had one property in common: they were all excessive phenomena, which entailed equally dramatic effects on the body. Like ancient writers before him, Brocklesby specifically focused on 'every turbulent passion of the mind' – including 'anger, grief, excessive joy, enthusiasm in religion or love, the panick of fear and such like'.[8] Excessive joy, for example, caused 'convulsions, involuntary tears, swooning away, and even in other cases death itself', whereas darker emotions like anger caused 'haemorrhagies,

convulsions, palsies, inflammations, fevers, watchings and deliria'.[9] In his separation of emotional states into healthy and morbidly excessive, Brocklesby tried to take appropriate distances from extreme forms of quietism in ancient Stoicism or Epicureanism, implying that ancient physicians may have gone too far in guarding quietness: their conviction that every 'perturbation of mind' also 'induced a particular bodily disorder' was clearly excessive.[10] Nonetheless, Brocklesby did not exactly succeed in adhering to his criticisms of ancient medicine. His 'distempers of mind which influence the body' include various emotional states of manifestly modest intensity, thus proclaiming his genteel allegiance to classical approaches to health.

Brocklesby's aversion towards economies of affective intensity is characteristic of contemporary cultures of politeness, which tended to associate such extreme phenomena with 'vulgarity'.[11] This quietism was also deeply rooted in contemporary medical cultures. As Andrew Cunningham has shown, seventeenth-century 'irenical theology' played a formative role in the quietist medical ideals of prominent medical men, including Boerhaave and his quest of 'anything which calms the mind'.[12] Such irenical trends did not only address the individual patient's needs for 'inner calm' and 'imperturbability of spirit', but also social and professional purposes such as to quieten social discord and 'avoid sectarianism'.[13] Brocklesby's quietism was nicely aligned with his medical animism,[14] as well as reasserting the enduring popularity of ancient medicine's most valued tenets. Following a long tradition of Hippocratic medicine, Brocklesby's theory of disease treated disorders as the product of plethora, i.e. excess accumulations of 'morbid matter'. To subdue such accretions the practice of therapy consisted of a wide range of evacuative techniques designed to 'remove' and 'reduce' the 'morbid load', in order to re-establish the necessary peace and balance. Brocklesby's aesthetic therapy was thus shaped as another form of evacuation. Yet his shift of focus to the study of affects required crucial adjustments of medical perspective, bringing into sharp focus the question of sensory economy and its role in the management of life and identity.

To be sure, Brocklesby recognised 'music's power' to stimulate emotional responses in antithetical ways, or, as he put it, 'to raise, and allay joy and grief, by turns'.[15] He also accepted music's role in calibrating bodily function, according to the contrasting needs of everyday life. This is the case of the Pythagoreans, who famously 'played energetic tunes' in the morning to urge them perform the active duties of life, while employing 'pleasing strains of good music', in the evening, to relieve their fatigue.[16] Brocklesby also marveled at 'Mr. Stanley's' famous music experiment on an infant, whose spirits were, by turns, raised to excess, allayed to sadness, and restored to a pleasant balance by equal changes in musical measures.[17]

In accordance with emerging forms of material sensationism, Brocklesby's model of music therapy, therefore, acknowledged, in principle, the sensorial power both of intensities reduced and intensities heightened. In reality,

however, music therapy is employed, throughout the treatise, as a tranquilising regimen intended to *minimise* the disorders of tension. In other words, Brocklesby was of necessity aware of music's capacity to energise, but he did not actually believe in the curative properties of amplified forms of sensory stimulation. On the contrary, rising stimulation was another word for tension, and tensions were seen as the opposite of healthful ease. The primary purpose of music was, therefore, to 'penetrate into the most secret affections of the soul, and produce such agreeable commotions in them, as to abolish all discord'.[18]

Mild music and medical quietism: Politeness and the inverted economies of sensibility and stimulation

This is the context of medical philosophy in which music became a sensitive issue, subject to subtle rules of operation so that the desired curative outcomes might be reached. This brought into focus a lengthy discussion about the possible effects of music on the body and their relation to the various styles of musical composition. In the first place, music ought to operate in such a way as to preserve or restore the ancient rule of quietist medicine: systemic balance. As Brocklesby put it: 'To preserve perfect health of body, and a sound state of the animal nature in us [. . .] it is necessary, that the superintending faculties of the mind be for the most part well-balanc'd, without an undue bias from any particular affection.'[19] From this, Brocklesby proceeded to another directly economical rule, namely, the importance of minimal intensity and quietness for the maintenance of this equilibrium. Balance and economy are, in effect, interlinked: music restores the healthy balance insofar as it is conceived to 'allay the inordinate passions' which generate 'disquiet and anarchy within'.[20] Accordingly, his medical philosophy revolved around the ambition to 'induce an harmonious economy of the subsiding passions',[21] which sooths and 'maintains [the] blissful union' of body and mind.[22]

For the civil audiences that Brocklesby had in mind, there was at his time only one kind of music that could accomplish this unique soporific and homeostatic ideal. He may have acknowledged the well-documented therapeutic effects of rhythm or 'brisk' and dynamic styles of music in strictly specified cases, such as tarantula afflictions,[23] but he generally privileged the 'sweet ecstasies' of harmony, 'melodious strains' or 'just' and 'elegant' compositions, which were perfectly fit to 'lull in pleasing slumbers' the 'turbulent senses'.[24]

With the exception of the final section, Brocklesby's treatise does not dwell on detailed technical descriptions of the precise type of music, which he considered therapeutic. However, his book is based on a firm distinction between three basic orders of music, which corresponded to three different scales of intensity and orders of biological properties. According to this scheme,

'sprightly airs of music' rank low in curative importance, because they act by 'raising', almost inordinately, the spirits; then follow 'chromatic and graver strains', which 'sink' the spirits to melancholy, and, finally, at the top of the medical scale, Brocklesby placed 'pleasanter music', which 'removes' the sadness and restores the balance.[25] This last order of stylistic composition marks Brocklesby's ideal of therapeutic music in that it 'solaces the mind', 'sooths the passions' and forges 'that blissful union, which gives sole relish of every enjoyment . . . '[26] In fact, the vast majority of disorders – regardless of their manic or depressive symptomatology – are treated by the same sedative regimen: patients ought to be 'charmed' to the ideal state of 'repose by soft and soothing strains of distant music'.[27] In other words, *the primacy of medical quietism* in Brocklesby was coextensive with the invocation of existing forms of genteel entertainment, and, in turn, refocused attention to aesthetic issues of *style* and *manners of artistic composition*.

Prescriptions of 'melodious charms of just composition' abound in every instance, underlining not only the mildness of the expected cure, but also the participation of the listener's *aesthetic imagination* in the cure. In order to 'alleviate' their disorderly affections, patients are to be 'charmed', almost cheated, into health 'with soft and solemn sounds'.[28] Moreover, the gentility of Brocklesby's chosen style of therapeutic music is well attuned to the fineness of the target organ – the mind. While ordinary medicines operate on the grosser parts and humours of the body, through shock and awe in order to effect the intended evacuations, Brocklesby's music addresses itself to more refined and sensitive organs, which demand 'a much more agreeable application' and a 'most delicious cordial against [. . .] inquietudes and defects'.[29]

Music thus encapsulated the bonds between quietism and sensitive refinement, medicine and mind or the imagination. These linkages are best illustrated in maniacal cases. Brocklesby noticed that, in certain types of frenzies and manias, most drastic therapies of evacuation had little effect without an exorbitant, almost superhuman increase of the dosage and violence of purgatives. Such 'stronger irritations' were inevitable, because, in maniacal cases, the disruption of the healthy union of mind and body suspended the 'mind's attention' to the body, and de-sensitised it to the ordinary intensities of therapy. Conversely, once the mind's ties with the body are restored, the proper order of sensitivity is re-established. The sensitivity of body organs depends on the presence of the mind, and 'the powers of music' have the critical mission to restore this presence.[30] By soothing the mind momentarily, music thus enables the creation of a short-term interval in the mind's cycle of delirium, so that the proper medicines, by which 'the material offending cause may be evacuated'. can be administered more effectively.[31] The role of music in Brocklesby's medicine of depletion and discharge reaches here its ultimate, quite literal conclusion: musical harmony facilitates the efficiency of evacuations, insofar as the mind participates in

the stool. And music is thus not just an effective remedy in its own right, but it also increases dramatically the efficacy of other medicines.

Yet, the important point in this therapeutic conception is that music increases the efficacy of medical action because, by returning the mind to the body, it increases the *sensitivity* of the body and its responsiveness to therapy. In other words, if the mind/body complex was made insensitive by over-stimulation, then music cures by reducing the need for *stimulation*, precisely because it increases the *sensibility* of the body. Music, therefore, acquires a central role in re-sensitising the entire frame, while reducing the potency of the stimulating cause. In this sense, Brocklesby's music applications presupposed a special type of affective bonding between aesthetic subject and object. As such, I would argue, they unlock a crucial aspect about the organisation of politeness in the emerging cultures of sensibility. In other words, Brocklesby's model illustrates well the fact that *the polite ideal of refinement historically erupted at the point where the desire for a sharpened sensibility met the economy of reduced stimulation*; or, in the parlance of Brocklesby's contemporaries, where the evidence of an exquisite sensibility was exclusively staked on the appropriation of extra-fine sensations. I suggest, therefore, that this is the reason why the ruling polite society safeguarded the sensorial economy of low-intensity *stimulation* as its most precious achievement: it was its superior claim to and proof of a gentrified and sublimated *sensibility*.

Hence, it is not surprising that Brocklesby's book actively engaged with a wider range of issues than simply music therapy. In fact, Brocklesby's turn to medical music is fully aligned with ongoing civilising processes in the wider social field. Departing from a holistic new theory of sensation, Brocklesby's approach soon enabled the appearance of new sensory continuities and unities between the different arts, and, ultimately, between art, modern lifestyles and life, more broadly. In this context, it was no coincidence that, by way of analyzing the minutiae of music therapy, Brocklesby ended up dealing with the entire spectrum of artistic and living activities, raising wider issues of life management and significant social and professional divisions.

Music, painting, life: Polite economies of wellbeing and the split genealogy of modern bio-politics

By choosing harmony over tension Brocklesby's treatise participated in the heated debates of his time over the optimal intensity of aesthetic experience across the arts. The physiological minimalism of his music aesthetics was, indeed, built on existing patterns of polite criticism applicable to a wide range of different arts. Central notions in Brocklesby's narrative such as 'inner sense' or 'uniformity amidst variety' are clear indicators of similar interactions.[32] Moreover, his writings translate in music the same aesthetic ideals that the father of art history, Johann Joachim Winckelmann, would soon place at the summit of visual experience, notably through a quietist

biomedical sensibility identical to Brocklesby's. Such common ideals include the notions of harmony, 'simplicity', 'ease', 'quiet repose', 'symmetry of parts'[33] or 'unity of design'.[34] What is more these aesthetic attributes were so framed as to be applicable to the entire spectrum of sensorial stimulation. Brocklesby was, in fact, explicit about the broad and expanded scope in which his polite therapy operated. Indeed, as the physician noted, in the pursuit of health:

> not music only, but whatever is harmonious and agreeable to the other senses, may probably conduce; such as delightful and extensive prospects of nature, elegant buildings, fine paintings and refreshing odors, to say nothing of the inciting sensations of touch and taste, the benefits of which are sometimes outweighed by indulgence in them, beyond the limits of just proportion, which may be termed a kind of universal harmony[35]

Brocklesby was convinced of the synaesthetic passages involved in the operation of the senses. And he concluded that 'it is in music as in painting', precisely because 'before a taste for either is formed by study and culture, our minds are transported with the first impulses of sense'. Clearly, it was the primary materiality of sensation in Brocklesby's system that enabled free mobility and exchange between various realms of aesthetic experience. In the same sense, the 'strong' initial 'pleasures of every sense' and 'a good natural capacity' became, in Brocklesby, the elemental physical forces with which new bridges are built between different vital activities.[36]

Indeed, Brocklesby's originality consists in extending the application of polite rules across the entire range of stimuli, whether aesthetic or simply environmental, including, ultimately, the very structure of everyday life and living experience in its totality. Brocklesby's motto 'it is in music as in painting' may have encapsulated the sensorial identity between music and painting that Brocklesby was keen to forge, but, in fact, the far broader rule 'it is in art as in life' was perhaps the most far-reaching implication of his treatise. In Brocklesby's own words, the 'transition from our taste of art to real life is quite natural and easy', and, naturally enough, therefore, the same medico-aesthetic rules apply 'in life as much as in art'.[37] As a result, those artists, musicians and virtuosi, who give in to 'the florid manner of painting' or 'the amorous and soft strains of music' are liable to surrender to 'the gaudy and luscious' in 'real life', too. Even more crucially, by doing so, they incur 'the greatest inconveniences' to the health of artists and public alike, rather than 'promoting the desirable ends in the polite arts'.[38] Is it any wonder that such ends would, therefore, be increasingly understood as coterminous with those of the arts of self-preservation?

It was through similar routes, I suggest, that politeness would become a matter of life and death, opening up the senses, affects and styles to the

expansive logic of living. Actually, Brocklesby devoted one whole chapter to the implications of his music thesis for the management of life as a whole. Chapter V developed the theme of the optimal preservation of life, which Brocklesby viewed as inextricably tied up with the polite regulation of sensorial and affective regimens. In this section, the enemies of politeness are directly presented as enemies of life. Such enemies include everything that is novel, both in form and intensity. The particular excesses against which Brocklesby pontificated are unmistakably excesses we have come to identify with modernity and its discontents, including new regimes of production, consumption and urban experience. Speed, rapid change, the 'hurry of social life' and the 'busy world', as well as phenomena of mass commercial culture, which he condemned through the phraseology of 'fashionable taste', 'the public liking' or 'affectations of popularity', are all trademark dissipations associated with modern life.

For Brocklesby's quietism, these modern forms of extreme intensification of experience impose a life-threatening system of conditions, especially insofar as, for him, there is but one principal cause of decay and premature death: the 'great waste and dissipation of the animal spirits'.[39] To counter exhaustion, therefore, the physician evolved a sensory regimen for the stabilisation of vitality, which included drastic austerity, spending cuts, and conservation of vital resources. Thus Brocklesby's ideal physician ought to develop methods with which he could 'regulate our constant expence', 'superfluous waste' and 'unnecessary profusion', while restraining the activity of those 'corroding cares' that excite and fatigue.[40] This method is rightly called 'a frugal economy', since it explicitly advocates the 'conservation' of 'a proper stock of animal spirits, which are chiefly exhausted by inordinate passions, an excess of natural evacuations, excruciating bodily pains, and such like causes'.[41] It is in this context that the arts, and music, in particular, are recruited 'to divert the course of the spirits, and to maintain them in their just poise and movement'.[42] Quite expectedly, therefore, there was no place for *modern* music among the techniques of cure favoured by Brocklesby: compared to the simplicity, rhythm and harmony of ancient music, modern music was found to be riddled with excessive degrees of 'intricacy', 'obscurity' and incoherence, i.e. 'numerous sub-divisions of notes', multiplied 'quavers' and unnecessary 'slurs', which were bound to confuse and, ultimately, exhaust the organism.[43]

There is no more telling exemplification of Brocklesby's *medical ideal of conservation* than his detailed comparisons between clockworks and organisms. The animal system, as he put it, 'may be compared to a piece of clockwork, which, from the composition and make of its internal parts, is capable of no more than a determinate quantity of absolute motion, before it will stop intirely by the laws of mechanism'. It naturally follows from this that 'if the velocity of the motion is retarded, consequently the time will be longer; and if the weights may be increased, it will take a shorter time to run

down'.[44] Hence, the business of every wise physician is to find the means of continuing a given proportion of motion for longer, i.e. a way of 'retarding the motion' of the mechanism. To put it somewhat differently, 'if the same quantity of motion upon the whole were carried on with a less degree of velocity', then the organism would continue for longer. And conversely, if the mechanism does not slow down, the springs of vitality would 'wear out and destroy the whole frame in a shorter time'.[45]

It would seem that Brocklesby's model of minimal activity as the optimal biological economy was a form of reaction to modernity as a whole. Yet, I would suggestthat this economic anxiety over exhaustion was by itself a fundamentally modern phenomenon. At the peak of modernity's reign in late nineteenth century, for example, the literature of nervous disease, mental hygiene and degeneration was rife with attacks on modern life and its apotheosis of rapid change and sensory overdrive, which fuelled the same kind of fears of exhaustion evident in Brocklesby.[46] What is even more explicitly modern, however, is the fact that such an economical turn, operated, from the start, within a *divided field*, where counter-models of affective experience made their own strong appearance. Remarkably enough, one of Brocklesby's closest friends, Edmund Burke, was responsible for a physically challenging and explicitly heterodox sensory economy of pain, labour and violent *stimulation* placed at the very opposite end of Brocklesby's polite regimen of acute *sensitisation*.[47] But it is still more striking that, almost a century and a half later, the same fierce battles over the optimal economies of stimulation in art and in life were still carried out through vocabularies and rhetorical schemes almost identical to Brocklesby's and Burke's.

As a result, the genealogical significance of this mid-eighteenth-century moment for the formation of the terms and conditions of discussions and conflicts over art and life during the high-modern era is critical. Walter Pater, another central thinker on the synaesthetic logic of sensation, marks a telling point of reference in the evolution of similar schemes in late-nineteenth-century culture. Especially, the way in which he drew on Brocklesby's rhetoric of animal motions in order to reach the very opposite conclusions from those of Brocklesby's minimalism, is indicative of the cultural sway, scope and resilience of such bio-economical approaches to sensation. In his 'Conclusion' (1873), Pater's physical notion of life was again based on a calculus of time and vibrations, only this time his proposed scheme was blighted by the shadow of death: 'We have an interval',[48] then we cease to be, and within this interval 'a counted number of pulses only is given to us of a variegated, dramatic life'.[49] Pater agreed with Brocklesby that 'our chance lies in expanding this interval', but he suggested the opposite way of doing just that, namely 'in getting as many pulsations as possible into the given time'.[50] In the era of high modernity, a new form of life enhancement is invented, where the interval is stretched and extended by multiplying and accelerating rather than retarding and reducing the vital

pulses available: sensations and emotions are primary materials spun fast to the point of 'a quickened, multiplied consciousness', where new, yet equally physical perceptions of time and longevity appear.[51]

If, for Brocklesby, the specific quantity of vital motion with which a given organism is endowed is in inverse proportion to the velocity of motion with which this organism conducts his business of living, then, for Pater, longevity is measured by the opposite criterion – the number of pulses squeezed in the shortest space of time. And, more biologically speaking, the quantity of the given stock of animal spirits is, in Brocklesby, in inverse proportion with the velocity of their wastage, namely, the intensity of sensations experienced and emotions expressed. In Pater, by contrast, the direct proportionality of the two is re-established: what makes life both real and long is the speed and force of experience. Pater's regimen of affective experience is, therefore, both an appropriation and a complete reversal of Brocklesby's economy of sensory diet. To indulge great passions which give us a quickened sense of life, instead of suppressing inordinate passions in the hope of retarding the progress of life; 'to burn with a hard flame and maintain this ecstasy',[52] rather than regulating the expense and allaying the passions; and, finally, to move swiftly anticipating a place where the greatest number of vital forces unite in their purest energy, instead of staying away from possible spaces of intensity: this is the other side of *modern bio-politics*, whose logic of operation is united by a common concern for an economical management of life, yet riven apart by competing economical ideals of stimulation and wellbeing. To be sure, there were various quietists of Brocklesby's cast in Pater's time and the conflict between tension and repose (and many variations, besides) continued well into the twentieth century and its artistic avant-gardes. But economy seems to be the great unifier of art and life, and the best lubricant of this 'quite natural and easy [...] transition from our taste to real life'.[53]

Divisive 'harmonies': Biological economy, class and profession

Brocklesby's genteel quietism of conservation was evidently part of a long-standing historical antagonism at the centre of modernity's evolution. Nevertheless, part of the reason why such models of minimal activity and physiological discipline proved so resilient is that they were highly appealing to genteel or other aspirant circles in their pursuit of cultural distinction and social division. Put in a different way, I would propose that such fiscal regulations of biological activity were political events, serving widely as technologies of the subject.

Historians of music have shown how the properties of musical harmony and consonance promoted by Brocklesby had since the Renaissance a normative social agenda.[54] In Brocklesby's time, they reflect broader anxieties regarding the increasing cultural presence of lower social groups: against

the 'unpolished' manners of such contingents, polite men pitted their own equally embodied strategies of 'soft power'. Indeed, Brocklesby identified the target audiences of his medical ideal of quietude with explicit, if quite unpleasant, political candor: music therapy was, as he underlined, unequivocally addressed to those with exquisite sensibilities, and, particularly, those who are placed 'in a superior rank of the various classes of mankind' in opposition to the 'vulgar herd of mankind' who could 'never be hoped to acquire any benefit from it'.[55] Brocklesby's medical thinking was organised by various class-specific parameters: first, he firmly considered his ideal of preventive medicine and music therapy as far too novel and elevated to be accessible by 'the greatest part of mankind'. This is because it involved complex long-term calculations that would require an intellect, far-reaching enough in its grasp of 'the future prospect of a prolonged life', to enable it to 'forego the pleasures' arising from 'each passing fancy' or immediate gratification.[56] Moreover, even when people may be convinced about the benefits of such a project, the rank and file suffered from a lack of will power and moral resolve, which prevents them from committing to such an intricate scheme of action.The high discipline with which Brocklesby associated music therapy and medical prevention was manifestly restricted to the select few: 'The necessary precautions against death are [...] too complex to be practiced but by a few, in comparison of the bulk and multitude of men.'[57]

Brocklesby's music therapy also raised serious issues of taste, sensibility and their social distribution: the very implementation of his proposed treatment for the prolongation of life required a sophisticated sensibility in the patient and the physician alike. His course of regimen modelled on music dictated accuracy and gentleness, as well as smooth transitions by slow degrees between the different phases of the treatment, so that 'all chasms' are studiously avoided. The treatment's success relied upon the ability of doctor and patient to collaborate efficiently in order to divert the ordinary course of nature's operations by 'insensible degrees and the gentlest efforts that can be attended with the effect proposed'.[58] Such aesthetic sophistication and discipline could not again be reasonably expected from the bulk of mankind, who cannot be trusted to be 'consistent with themselves, in any scheme of action'.[59]

To Brocklesby's delight, ancient authority was in ample agreement with his divisive notion of music medicine: 'the charms of music', as Quintilian noted, 'did not equally affect common people with those of a more refined taste'.[60] Likewise, Brocklesby's social division of health raised again the socialised, or, rather, openly bio-political nature of taste. As he underlined, the body and mind are healed 'by the charms or influence of sound', in proportion to an internal capacity of perception (an 'inner sense') which was at the core of taste formation, yet 'so incomprehensible to vulgar minds'.[61] The vulgar minds Brocklesby had in mind included the majority of artists, musicians and the public, who were, indeed, in this period busy

crafting and consuming their own 'popular', 'brisk' and excessive types of sensational art.[62]

I suggest, therefore, that such texts as Brocklesby's should be read within the context of a fierce socio-political struggle for the senses of the public. Brocklesby's rhetoric represented a critique against radical forms of modernity, sustained by a self-styled elite of embattled liberal men and bourgeois reformers. The upwardly mobile aspirations of this group were staked in a proactive rapprochement with the manners and taste of the ruling classes against the sensory economies of the marketplace, including a rising and anti-canonical aesthetic fringe within it.

Moreover, this struggle over conflicting bio-aesthetic economies had its own professional ramifications, as well. Brocklesby's adoption of music therapy expresses a clear ambition to increase the social status of the medical profession through the replacement of traditional therapies of blisters and evacuations by more civilised techniques of music and spectacle. Music therapy reflected the physician's exquisite taste and cultivation, offering a unique tool of ingratiation into the higher echelons of polite society. Hence it provided a singular advantage in the professional competition among medical men. In the entrepreneurial environment of contemporary medicine, Brocklesby was rightly aware that mildness, civility and manners as well as medical theatrics played a vital role in making or breaking the reputation of a physician in polite society.[63] Civility included, as Brocklesby knew, the techniques a physician would employ in the process of handling the patient, which, in their turn, played a vital role in the therapeutic process because they affected the patient's imagination: as he explicitly put it, 'the power of the patient's imagination is able in many cases to remove certain diseases'.[64] The practicing physician should, therefore, 'raise and beget a bias in his patient's mind in favour of himself'.[65] In an early statement of the power of the placebo effect in medical interventions, Brocklesby underlined the importance of doctor/patient relations, and especially the almost 'magical' ability of a person, such as the commanding physician, to affect another person's healing process.[66] It is precisely the physician's impression of 'confidence' and charisma on the patient's imagination that makes drugs work, while, without it, 'medicines be may long administered [...] in many cases to little purpose'.[67] This process is explicitly described as an 'effect': earning the patient's 'admiration' or 'bias' is not a process based on reason or rigorous practice, but it is rather conceived as an affective course of persuasion and suggestiveness, involving forces germane to the imagination.

These forces included theatrical techniques of self-presentation, showmanship, dress, manners and artifice, but Brocklesby's originality lay in the fact that he replenished the techniques available to medical men by adding the artful deployment of music therapy as well. With this additional instrument in his hand, the civil physician could continue to charm patients, trick the sick mind, and enchant by a sort of artistic and elevated magic.

If, as Brocklesby explained, the charisma for showmanship decided the crucial distinctions, made daily by patients, between a 'successful' physician they trust and an 'incompetent' colleague they dismiss,[68] then Brocklesby wisely deployed music in order to add surplus value to his practice and make further inroads into elegant society at the expense of other less 'qualified' colleagues. In other words, Brocklesby's music therapy was best placed to promote an elite professional project, distinguishing and dividing genteel physicians from others with fewer polite credentials.

Medicine resumes here its status as an art, and, suitably enough, music served as a technique of choice for the augmentation of medicine's persuasiveness. In various ways, Brocklesby's treatise is situated precisely at the point where *medical practice* (as envisioned by specific sectors of medical men) begins to shade into *musical performance*; or to put it differently, where the art of the physician intertwines with the practice of musicians. This convergence defined new forms of medical sensibility and new images of the medical profession. And if, in Brocklesby's case, taste and the imagination played such a crucial role in music therapy, visual imagination also supplied the ground for an equally close and culturally productive alliance between medicine and music.

Medicine's languages of music: Human music, human life and visual translations

There is no better example of this rapprochement between musicians and physicians in the eighteenth century than James Barry's unusual portrait of the physician Christopher Nugent, MD (1772, Victoria Art Gallery, Bath, Figure 6.1). The picture is based upon another singular picture from the Renaissance, Raphael's St Cecilia altarpiece, which depicts the musical ecstasy of music's patron saint (1513–1514, Pinacoteca Nazionale di Bologna, Figure 6.2). Barry was a very good friend of Brocklesby's and Burke's, while Nugent himself was Burke's father-in-law and Barry's intimate friend. Barry was, in the same period, painting the portrait of his patron and benefactor Edmund Burke, commissioned by their 'common friend' Brocklesby,[69] and he was no stranger to the serious cultural, social and historical connotations of music, as amply shown in the painting of *Orpheus* from his series 'The Progress of Human Knowledge and Culture' (1777–1783, Royal Society for the Encouragement of Arts, Manufactures and Commerce).

In Barry's portrait, the sitter's association with music is achieved through various veiled references, whose main target audience is the intimate circle of cultivated friends gathered around Edmund Burke and his family, including Sir Joshua Reynolds, Samuel Johnson, Brocklesby and others. The painting presupposed a certain familiarity with the expanding field of music theory and its various cultural and scientific extensions into medicine. It also required the knowledge of Raphael's St Cecilia, and the ability to

Figure 6.1 Portrait of Christopher Nugent M.D. (1715–1775) by James Barry (1772)

associate the distinctive pose of the reflecting physician in Barry's portrait with St Paul's pose of demure reflection in Raphael's work. The picture was indeed known to the British polite public, not least because Bologna, where it was held, was one of the standard stops in the Grand Tour itinerary. Actually, it had already entered the tour guides of Italian antiquities and art collections, when Joseph Addison wrote his landmark guide. As Addison noted, the city of Bologna was 'esteemed the third in Italy for pictures', and, among them, Raphael's work was ranked by Addison as one of the 'three rarities' that 'pleased' him 'more than any other shows of the place'.[70] Addison was charmed by what he called 'something wonderfully divine in the airs of this picture',[71] and, a little later, in 1722, another famous guide to the Grand Tour, Jonathan Richardson's *Account*, highlighted the magical 'je ne sais quoi' present in the work that 'puts it [...] on a level almost with any' other picture among Raphael's more mature masterpieces.[72]

Richardson's account is additionally significant in that it underrated the importance of the central figure of St Cecilia – deemed by him as rather 'hard, and not elegantly drawn' –, praising instead 'the airs and attitudes' of the surrounding figures.[73] Yet, it was Barry, who completed this shift of attention away from the main persona of the picture, elevating in its place the status of St Paul on the left. Barry had seen, studied and admired the picture during his own Grand Tour. He singled out St Paul as emblematic

Figure 6.2 Raphael, St Cecilia Altarpiece (1513–1514)

of Raphael's superior ability in the depiction of 'the middle walk' of religious characters, 'that of apostles, philosophers, and such like', and praised the figure for its 'spiritual and beautifully elevated' character.[74] In this context, the choice of St Paul's attitude for the pose of Barry's beloved friend was a deliberate gesture intended to confer upon the sitter both distinction and depth of meaning. What the intricate nuances of this meaning may be, require a closer look into Raphael's painting and its dense iconography.

Raphael's picture is a highly sophisticated work, whose intricate iconography is entangled with subtle debates on music, religion and philosophy. As Thomas Connolly has shown, all the figures in the painting – from Cecilia, at the centre, to Paul and John the Evangelist, on the left, and Augustine and Mary Magdalene, on the right – are intimately connected with music and its various religious, mystical, and affective connotations. St Cecilia holds an organetto, whose pipes are about to fall to the ground, and turns her head towards the upper part of the painting, where the sky suddenly opens up to a choir of singing angels representing 'divine music' (*musica mundana*). The painting's foreground, where a jumble of various disused and broken instruments lie scattered, symbolises the lower order of instrumental or 'earthly music' (*musica instrumentalis*), and forms a stark contrast to the upper realm of divine music. Such a sharp division of visual space has encouraged scholars to see in this scene an elemental contradiction between good and bad, heavenly and earthly music, and, by implication, *heavenly* and *earthly love*, or *earthly* and *divine life* as a whole.[75]

The figure of St Paul, which concerns us here, has been seen as epitomising this polar conflict. His sceptical look upon the bundle of broken instruments in the foreground, enhanced by his dismissive comments on earthly music made in his epistles to the Corinthians (which he is depicted to hold in his left hand in the shape of two folded pieces of paper), have emblematised this dualist antithesis. St Paul had indeed employed the division of earthly and divine music in order to show the primacy of Christian love and soulful emotion in religious instruction as well as in leading a genuinely Christian life. It was in this context that St Paul had admittedly denounced the lifelessness of instrumental music, emphasising instead the power of divine music and divine love: 'Though I speak with the tongues of men and of angels, and have not charity, I am become as sounding brass or a tinkling cymbal' - like 'things', that is, 'without life giving sound' (Epistle I, Chapter XIII, 1 and 7).

In spite of the dualistic explanations that this phrase has given rise to, I would argue that St Paul's rhetoric is more conciliatory towards earthly music, and by extension towards words and language in the propagation of the spirit of Christianity. St Paul's epistles were intended to reconcile passionate divisions in the early Christian congregation in Corinth, split as it were around the issue of the proper means of conveying the Christian message. Though highlighting the importance of love and affect in the transmission of the Christian word, St Paul also recognised the value of a clear and crisp

cognitive content in religious preaching. In fact, he went so far as to argue that there are 'so many kinds of voices in the world, and none is without signification' (Chapter XIII, 10), a statement which seems to offer liberal support to the idea that that there is in the world a plurality of means of religious expression. Readjusting his music metaphor to the new scheme, St Paul eventually sanctioned instrumental music, stressing that 'lifeless' instruments, whether pipe or harp, should 'give' no 'uncertain sounds', but rather 'distinction in the sounds' they produce. Only then, that 'which is piped or harped [may] be known' (Chapter XIII, 7). This need for clear knowledge that people could understand was symbolised by instrumental music and it was, for St Paul, as important as any other mystical or spiritual power emblematised by divine music.

Likewise, I would suggest that Raphael's picture, and his rendition of St Paul, in particular, encapsulate this same drive towards inclusion. Faithful to the spirit of his epistles, St Paul in this picture performs the role of an intermediary of the polar conflict between divine and earthly realms, represented in the upper and lower parts of the picture. This is further corroborated by the way in which Raphael's picture alludes to neo-Platonist notions of 'Musica Humana', a concept central in the kind of Christian neo-Platonism zestfully embraced by Raphael's patrons and friends.[76] The writings of the leading neo-Platonist of the time, Marcilio Ficino, sum up the most prevalent uses of the term 'Musica humana'. Meant as the internal music of the human body, human music was, for neo-Platonists, the imitation of divine music. Further still, it was present in the human mind due to its divine origin, and it accounted for the inborn feeling of harmony in humans. Harmony, in particular, as the supreme order of the celestial spheres offered the ideal prototype for the operation of all terrestrial and human phenomena, including the interior harmony of the human soul, and the more dynamic harmony between soul and body, or organism (microcosm) and the environment (macrocosm). The very notion of 'spirits', which remained for centuries the main operational target of physicians such as Brocklesby or George Cheyne in their struggles to re-harmonise soul and body, was used by neo-Platonists in precisely these terms: as an organic medium exceedingly sensitive to the divine music of the cosmic soul, spirits served the role of connecting the human soul with the body, and the human organism with the cosmos.[77] Thus the language of music and harmony acquired various biomedical ramifications, while also serving the metaphysical aims of divine transcendence.

In the light of similar repertoires available to Raphael and his patrons, St Paul's figure seems well-designed to act as a symbol of 'human music' and 'human love', or, what is more, human life as a whole, bridging rather than aggravating the polar contradiction between earthly and celestial existence. This is how the patroness of Raphael's picture, Elena Duglioli, had, in fact, seen St Paul when she described him as the human epitome of the divine

person, who speaks 'with the sole language of [his] *life*', namely, with 'the language that creates *a true and fully sounding harmony* in the view of God and of his creation (author's italics)'.[78]

Raphael's St Paul visualises this well-wrought chain of semantic equivalences between language, body, music, love, life, as well as their different stages of religious ascent. Indeed, as recent interpretations of Raphael's work have pointed out, the picture was designed to represent the importance in Christianity of notions of individual change and personal transformation across different states of being – spiritual, affective and ethical.[79] Rather than polarity or condemnation, therefore, the lives of Raphael's saints dramatise the theme of conversion as a passage from earthly life, in the lower part of the picture, to human, and, then, to divine existence in the distant upper part.[80] In the tradition of mystical theology from which Raphael's picture amply drew, various types of music thus came to encapsulate the different ethical states of an individual's soul: the numerous gradations of religiosity in human life were emblematised by the various modulations of music.[81] St Cecilia is the only person in Raphael's picture, who seems to have just achieved to hear the music of heaven, while still holding in her hand the organetto, a mingled symbol of church and world. The other saints have visibly not yet managed to establish contact with the divine realm of *musica mundana*.[82] Especially St Paul, who is still immersed in the mixed affects and struggles of human life and human music.

These are the mingled, yet charged connotations of a cultural icon like St Paul that Barry meaningfully readjusted to provide a fitting prototype for the depiction of an eighteenth-century medical man like Nugent. In hitting on this idea, he was of course assisted by important historical shifts in the medical profession, which was, during this period, increasingly drawing on the mingled metaphors of music to project an equally mixed, yet elevated public image of itself. Brocklesby's book and Barry's picture were, I would suggest, crucial parts of this process, which saw the profession's repertoires of physiological or therapeutic analysis as well as its public and ethical image, change in accordance with music paradigms. Brocklesby's book, in particular, is singularly important not only because, as earlier shown, it simply exploited music as a complex instrument of therapy and life prolongation, but rather because, in the process of doing so, it reformatted the very language and labour of medicine as a music-related practice.

The usage of the word 'composition' and its grammatical derivatives throughout Brocklesby's treatise conveys well this interweaving of music and medicine. The term is indeed used to re-conceptualise pathological symptoms as well as healing processes as in themselves music-related phenomena: mental afflictions are described as 'discomposures of the mind',[83] and recovery proceeds as these 'affections of the mind' are 'composed' by music.[84] Such 'compositions' of general mood also involve deeper and more literal types of physiological and material compositions: hence, music 'composes

the irregular motions of the animal spirits'.[85] The healing process is, for Brocklesby, conceived as a form of biological 'composition',[86] but it follows that music, the product of composition in its own right, is also a composer, actually 'the best composer of a fancy unsettled'.[87] Moreover, the doctor's actions were also subject to a similar music vocabulary: the physician, who subscribes to 'composition' therapies, is himself a composer – an organ tuner. Such is the case of 'the polished Celsus, the Roman Hippocrates', who employed music therapy for his patients in order to 'compose the gloomy images that disturb the fancy;'[88] or of the Pythagoreans, the leading music theorists of antiquity, who, acting as self-healers, used the melodious strains of 'just composition' to 'compose their cares, after the fatigue of the day'.[89]

These are all physicians in the role of musicians, whose undertaking to 'retune' or 'recompose' the human frame also implies that the whole body is now increasingly treated as a music instrument. This was not an assumption unique to Brocklesby. It was actually George Cheyne's seminal work *The English Malady* that had already dealt with the human body in terms so explicitly musical. The soul or brain, was, according to Cheyne, 'a skilful musician playing on a well tuned instrument' – the body: 'so long as the instrument is in due order, so long is the music perfect and complete in its kind. As it weakens or breaks, the harmony is spoiled or stopped.'[90] Brocklesby would use an identical metaphor to describe the influence of the mind on 'the whole person', including his features, tone of voice and movements, which 'answer like strings upon musical instruments' to the mind's 'impressions on them'.[91] The epistemic and ontological extensions of similar repertoires run deep. In a way highly reminiscent of Elena Duglioli's or Raphael's mystical reflections on the subject, such metaphors promoted an understanding of life and health as in themselves modes of music and harmony. Cheyne again fleshed out the close identity of life, health and harmony: the soul, or, in Cheyne's speak, the 'self-motive and self-active, the intelligent and free-willing principle', which is present in the embryo from the very instant of its conception, is pre-ordained to wait until such time as the 'organs [are] completely finished, to *play off the music and harmony*, it was originally designed for' (author's italics).[92]

With Cheyne the chain of uses to which the similitude of music was subject, is thus completed: life itself is a type of music and harmony, the highest vital principle is a type of musician, and the body and nerves are musical instruments. The entire universe in which a physician thus operated is a universe of music and sound in a way that probably made it unavoidable that medical men could, somewhere in the field of professional imagination, re-emerge as composers, musicians, conductors or music instructors. And, if these languages of music had been genealogically connected with mystical and religious speculation, then their medicalisation in the eighteenth century gave them a distinctly concrete tenor, bordering at times on an inevitable, if, at times, *fatalistic kind of materialism*. In Cheyne and

Brocklesby, bodies and soul are indeed bound up by the same material fate: even the musician, the 'intelligent principle' itself and its animal spirits, are, ultimately, all 'substances'[93] – 'subtil' and fine types of 'matter'.[94] As Cheyne repeated, the functions of life 'can never be performed [...] without proper instruments' and 'must necessarily require bodily organs'.[95] It is in the nature of the human condition that 'the musician' of the immaterial soul is restricted by organised matter; at least for 'as long as the present union between the soul and body lasts',[96] or, as Brocklesby put it, so long as the immaterial principle 'is imprisoned in the body'.[97]

Cheyne and Brocklesby's music medicine is rooted into the old tensions between *musica humana*, *musica mundana* and *earthly music*. This is, I would suggest, the mixed environment in which Brocklesby's or Cheyne's animism operated, compounding religious notions of afterlife with dogged engagements in material life; or, mystical invocations of divine existence with pragmatic views on optimal wellbeing, and, finally, aesthetic refinement with the wretchedness of human mortality. Their encounters with this realm of conflicting calls and practices produced a rare kind of *medical sensibility* and *professional image*, which is best captured in Barry's portrait and its complex dialogue with Raphael's Cecilia.

'Musica humana' and human medicine: Love and the ethical image of the medical profession

In his portrait of Nugent, Barry clearly treated his sitter as a man of reflection: he is shown in a scholar's gown, seated in a chair, and holding a book in his hand that bears his name in hand-writing, a clear reference to Nugent's only publication, his *Essay on Hydrophobia*. The book together with Nugent's right hand and the right half of his head are the only illuminated areas of the canvas, thus underlining further the sitter's erudition and standing among a select fringe of cultivated men.[98] Nugent's body forms a robust mass rendered in a broad and simplified handling that resembles the treatment of Raphael's St Paul's, and adds monumentality to the picture. The abstract dress, together with the generalised setting and the diluted medallion format used for the head's profile, are effective techniques for the additional conferment of gravitas and timeless nobility on the sitter.

The composition is in fruitful dialogue with contemporary reforms in portraiture, associated with Sir Joshua Reynolds's images of scholars, artists and philosophers such as his portrait of *Oliver Goldsmith* (1772, National Gallery of Dublin).[99] Yet, Barry projected complex professional ambitions in a portrait which has rightly been described as a technically impressive 'tour de force of rich painting'.[100] Barry's thick impasto creates richly textured, varied and highly individualised areas of flesh that supersede the softly modeled and polished surfaces of Reynolds's portraits of Goldsmith and Johnson. Impressive effects of tactility and material presence are thus achieved, almost

against Barry's will: his 'over attention' to material detail indeed contrasts dramatically with his regular castigation of anatomical particulars and other similarly 'inferior things', characteristic of minds 'little enough to relish such things'.[101] Barry's radical investment of labor in the texturing of Nugent's head runs counter to his advocacy of academic abstraction,[102] and it endows his picture with a strong sense of compulsive energy. This excess of personal engagement is what produces the marked individuality of the sitter, as well as that quality in the portrait which has regularly been described as 'intimate' or 'sympathetic'.[103]

The intensity of Barry's pictorial labour represents, I would suggest, a bond between sitter and painter, which indicates that the picture was built as an object of love from one devoted friend to another. Indeed, expressions of 'love' and 'affection', whose emotional tenor supersedes the formulaic terms of contemporary letter-writing, abound in Barry's correspondence with Nugent and Burke's family.[104] Moreover, a year before his portrait was painted, Nugent had welcomed Barry's painting *Medea* (1772) (now lost) with a poetic eulogium, praising publicly his friend's merit, his special affinity to the 'dignity' of Raphael, Michelangelo and Titian, and his prospects for a 'long descending fame'.[105] Barry's portrait of Nugent was an appropriate way of returning the compliment to the amiable physician, underlining with the choice of St Paul's pose Nugent's persona as the living epitome of love. In other words, this picture was, at the same time, a labor *of* love, and a visual discourse *on* love – namely, a picture on the ways in which the loving and loved were visually and socially constructed, not least through music associations. But love, in this precise sense, was not an independent passion, nor a personal affair between Nugent and Barry. Rather, it is a social ideal that defined the nature of cultural exchanges within Burke's network of close friends.

Barry, in particular, was a beneficiary of the network's affection, and he knew only too well the crucial role that affection played in upward mobility and the fulfillment of potential: his three-year Grand Tour to Italy had only been possible through the annual stipend of 40 pounds that Edmund and his friend William Burke had secured. While in Italy, Barry's correspondence with the 'family' is a real monument to the importance of cultivating and solidifying affective bonds through recurrent and effusive expressions of mutual love, admiration, friendship and trust. When William Burke assured Barry that 'we all and one love you and esteem you with one voice and heart',[106] he was not exaggerating the sense of affective unity characterising the 'family'. In this circle, love and trust were *cultural modalities*, which marked out calculable investments in exceptional merit and promise, and Barry had already displayed ample proof of both.[107] In this context, his pictures for the Burke family, including Nugent's portrait, form a crucial part of the tribute he paid to the affective textures of cultural kinship characterising the social circles that backed his early career.

It is also in the same environment that Nugent's very profession as a doctor held a special place: it arguably assumed an emblematic significance as the most supreme manifestation of the qualities of trust, charity and sensibility that Barry's circle valued so highly. Another example among Barry's pictures for the family, this time a copy of Eustache Le Sueur's *Alexander and his Doctor* (National Gallery, 1648–1649), summarises the point. The picture, which shows the sick Alexander drinking the potion prepared by his trusted doctor, in spite of slanderous information he had received that his physician would poison him, was highly esteemed in Burke's circle. Barry's correspondence is rife with proof of the desperate urgency with which the Burkes sought to secure a copy of this picture.[108] For Barry's patrons, Le Sueur's painting emblematised the triumph of the values of love and confidence, since it reasserted their power in the sensitive field of doctor/patient relations; in a field, that is, where life and death themselves are frequently at stake. For Nugent, in particular, the picture would conceivably have a further, almost iconic importance, since it could efficiently propel the kind of *humane medical identity* he sought to project.

Barry's decision to configure Nugent's pose in the form of Raphael's St Paul underlines precisely these connections between medicine, love and humanity. In this guise, I would, therefore, argue, Nugent's figure was visually handled to represent the *humane* physician as the servant both of *human music* and *human medicine*; or, rather, as *the guardian of human music* (i.e. the music of life) *as the highest and most ethical form of humane physic*. The common expression of thoughtful introspection in Nugent's and St Paul's pose is crucial in extending these very connections. St Paul's melancholic expression is explained by the object of his gaze, the broken instruments in the foreground which serve as symbols of the vanities and earthly enticements of the flesh.[109] As Connolly has suggested, St Paul's introspected gaze towards them signals a gaze 'to the depths of degradation that the vanities imply, to which divine love willingly descended so that it might raise and transform us'.[110] Nugent's experience as a physician presupposed a similarly dramatic dive into the depredations of disease and decay, attending to human bodies as ravaged as these broken instruments in Raphael's picture. Nugent, in the persona of Raphael's St Paul, thus indicates the struggle of physicians, who daily descend into the dark realms of suffering bodies with the intention of raising patients to the higher realms of health and harmony. As a dedicated professional, Nugent's labour of health was also a labour of love, especially because it was tied up with secular forms of salvation such as medicine. Pater again encapsulated the doctor's dilemma: 'we are all under the sentence of death but with a sort of indefinite reprieve'.[111] Squeezed between the two polar realms, Nugent's figure, like St Paul's, reveals the Sisyphus-like labor of repairing damaged instruments in the knowledge that they will be ultimately wrecked. This inalienable relation to human finitude rendered medical work a rather melancholic or, even, tragic activity, which could only

be mitigated through love and humanity; or, differently put, through an oblivious dedication in extending indefinitely the finite harmony of health.

The various connections of harmony and music with ethical and medical issues were fully known to Barry and Nugent. In fact, the physician's poem dedicated to Barry's *Medea* had already celebrated the power of music stimuli to *civilise* the passions, even the most savage ones. Nugent had indeed seen in Barry's work a superior attempt to depict how, under the influence of music, all 'rough heroes harmonise into men'.[112] On his part, Barry himself also showed a distinct interest in music and its effects, and he expatiated on the theme of music's civilising force, when he painted *Orpheus*, the first picture of his Royal Society cycle. In this painting, Orpheus is depicted with a lyre in his hand in the compound form of a legislator, divine, philosopher, poet, and, of course, musician. However, Barry took a rather conservative view of music's influence and he, accordingly, felt obliged to deny that the civilising influence of Orpheus was the result of 'mere inarticulate sound', or 'mere musical business'.[113] In spite of admitting that 'unisons, harmony and what not' exercise a potent physical power on the nervous system, he sought to explicitly constrain 'its powers and impressions [...] no farther than the nerves', whilst leaving 'to other arts the understanding and the passions'.[114] In accepting that instrumental music affects the lower realm of the senses, without, nonetheless, reaching the higher intellectual processes, Barry sided with the increasingly defensive camp of moral philosophers and academic idealists, who were fiercely opposed to the advances of sensory materialism. In this regard, Barry's position clearly contradicted the holistic approach promoted by Brocklesby or Cheyne, who praised the medical as well as the mental and emotional co-implications of un-vocalised sound and 'natural music'. However, despite such constrictions, Barry was still able to successfully capture in his portrait the compound affinities between Nugent's medical work and 'natural' music.

The skilful musician and the good physician: The doctor's method, fingers and hair

The ultimate confirmation of Barry's deliberate endeavour to fashion Nugent as a skilful musician of human life and health was provided by the physician's own writings. These contain meaningful references to music repertoires comparable to Brocklesby's or Cheyne's. Firstly, Nugent employed a kind of anatomo-physiological model, which placed fibres and their mechanical motions at the centre of his thought. This model was closely tied up with established descriptions of nerves and fibres as vibrating strings and chords,[115] and, by implication, with the extremely productive imagery of the human body as a stringed instrument.[116] For Nugent, each animal fibre or string is liable to an almost infinite variety of spasms, and, in turn, each disease is a specific type of morbid vibration, which has its own

frequency and tune, depending on 'the very sorts of vibrations with which the first stimulated and convulsed fibres are themselves infected'[117] by an external stimulus. Such morbid motions gradually set the whole human instrument in motion as they are transmitted across the various plexuses of nerves and fibres, 'catching and communicating morbid spasmuli from one to another'.[118] Curiously, from one string to another, the motion is amplified rather than weakened, and the spasmuli of each string multiply and increase. The morbid vibration reverberates throughout the entire organ(ism), it forms swellings and inflammations, which ultimately reach the nervous system, exacerbating the disease with nervous afflictions such as manias, obsessions and other frights.[119]

In this representation of the body as a complex stringed instrument endowed with the ability to reverberate with sounds and motions to its thinnest fibre and string, music could, in principle, play an important role in maintaining the health of both mind and body. But, Nugent did not touch upon the issue of music therapy, although, as I argue, music organised his holistic image of the body and its fibrilar operations. Nevertheless, he did make a strategic use of an example from the realm of music, and, what is more, at the critical point where he attempted to elucidate the phenomenon of the communication of motion at a distance. Even though most of Nugent's descriptions of the transmission of morbid motions involved contact and contiguity between fibres or nerves, the writer was also interested in the morbid propagation of more distant motions. Phenomena readily communicated by some to others such as yawning, 'laughing', 'crying' or more 'complicated spasmodic emotions' including 'hysterics' and 'unreasonable panics' meant that 'similar spasms are communicated, at a distance, from one set of fibres to another'.[120] This is, as Nugent called it, a 'real Fact'.[121] Such phenomena had a mysterious tendency to be transmitted en bloc from the environment straight to the body of innocent 'lookers on', and Nugent could not find any other model of explanation for this phenomenon than the music laws of consonance and unison: 'the latent intercourse of spasmodic affections between the distant nerves of these persons' obeyed the logic of the synchronised motion 'between two, or more, distant strings tuned in unison'.[122] In this way, Nugent confirmed what was implicit throughout his book, namely, that the fibres-and-nerves-body is like a string instrument, which gets ill and gets better, according to the laws of music vibrations. And, if health is, for Nugent, a matter of regular motions, and disease of irregular ones, then therapy is a process of tuning the dissonant organ of the body back into consonance, namely, a process of literal recomposing.

When he chose the figure of St Paul for Nugent's pose, Barry had imbibed such affinities between his sitter's medicine and music, translating them in an innovative visual scheme of his own. In this way, Barry provided a visual equivalent to the emerging profile of the physician as a skilful musician

and 'composer' of the body's musical instrument, implicit, as shown earlier, in various medical writings of the time. Further still, Barry shrewdly highlighted those aspects of the sitter's appearance that would make similar associations unavoidable: is there, for example, a more potent visual symbol of the kind of skill necessary to 'musicians' of such string instruments as the human body, than hands and fingers? Barry's emphasis on the representation of the physician's hand is more than suggestive, especially as it marks a radical departure from Raphael's understated depiction of St Paul's hand. Indeed, Barry removes his sitter's hand from St Paul's tight grip on the chin, and opens it in a way that allows him to bring into full view three of Nugent's fingers. At the same time, the repositioning of the figure's hand now coincides with the compositional centre of the picture itself. Furthermore, the careful anatomical depiction of each of Nugent's elongated fingers presents areas packed with meaning, in accordance with contemporary habits of representation that treated hands and fingers as vehicles of complex philosophical ideas. In fact, Barry's treatment of the hand veers to an almost mannerist emphasis on the winding outline of the fingers as well as the knotty articulation of their bones, while the swirling lines and swivelling strokes of paint with which the hand is modelled is another tour-de-force of visual energisation. These fingers are, indeed, evocative sites of virtuosity, the place where the manual skill of the painter rushes to meet the dexterity and wisdom of the physician's hands. Better still, the painter's skill sets up a vivid dialogue with the elevated image of another profession, the physician in the guise of the guardian of human music and life.

Such a subtle and coded refashioning of the image of the medical profession according to the music paradigm had one last bio-moral dimension, which Barry's portrait did not fail again to grasp. As already demonstrated, Brocklesby's treatise had set up a framework in which a series of smooth passages could be performed: on the one hand, physic's affiliation with music therapy helped Brocklesby to raise the question of life's prolongation, while, on the other, it also allowed him to articulate clearly the importance of the physician's manners and appearance in effecting the harmony necessary for this prolongation. Barry's portrait, I would suggest, captures these affinities very satisfactorily via its presentation of the physician as a robust example of ageing. In this way, Barry's picture establishes Nugent's status as an *icon* of life prolongation, and, simultaneously, it presents a visual, almost living proof of the truth of his medical stance and counsel.

Hair becomes a major signifier in this enterprise. In Nugent's portrait, Barry depicted a long, profuse and complexly patterned hair, painted in broad, dry strokes, with a marked crusty quality. The thick application of white paint produces an area of singular material density, silhouetted and further amplified by linear incisions done by the rear end of the brush, thus creating the effect of moist and dazzling plaster. The importance of

Barry's investment in this motif, in the context of a portrait of a physician of fibre-medicine like Nugent, cannot be overestimated. The physiology of nerves and fibres to which Nugent subscribed treated hair as a health indicator, because hair was seen as an outward extension of the body's fibres. Cheyne's physiology is a presiding example of this continuity between the state, texture and qualities of hair and the properties of nerves and fibres. The Bath physician argued at length the value of this continuity in the medical assessment of the organism's health. The following extract is a wonderful instance of hair criticism as a medical and diagnostic tool:

> The Hair seems to be only some of the fleshy fibres lengthened outwards and hardened, at least they seem to be of the same kind and nature, with the other fibres, consist of a great many lesser filaments, contained in a common membrane, and are solid, transparent and elastic. And as the hairs are in strength, bulk, and elasticity, so generally the fibres of the body are . . .[123]

In the same spirit, Cheyne argued the case for the need to restore 'the tone and elastic force' of fibres during the therapeutic process. The necessary medical aim 'to crisp up, wind up, and contract the fibres of the whole system' was again compared to hair treatment: diseased or weakened fibres are 'much like the case of hair that has lost its buckle', which could, 'by art', be 'hardened, stiffened, and reduced in some degree to a greater firmness and proper figure'.[124] The name of this art is exercise, and its stimulating effects on the fibres' 'innate power of contraction'[125] is amazingly associated with 'the constant buckling of hair'. By buckling, physicians 'confirm' and 'settle' the internal parts of fibres and nerves to these positions which 'makes them retain the form and figure we design'.[126] The comparison was not metaphorical, but analogical: hair styling and fibrilar configuration, buckling of hair and exercise of fibres, are actually contiguous practices implemented on bodily components, which were themselves perceived as co-extensive. Likewise, it is not coincidental that one of Nugent's favorite terms for the description of systems and networks of nerves was 'plexus of nerves'[127] – i.e. etymologically speaking 'braids', or 'plaits' of nerves[128] – which brings us back to Cheyne's buckles, a term, which, in his time, still meant 'curls' – 'to fasten or retain in curl'.[129]

In this framework, Barry's special emphasis on 'buckles' of hair, including, in this case, Nugent's curls was a medical sign of vigour and stimulation proper to a physician that understood well the importance of fibres and the motions of strings in the maintenance of health. It was this medical ideal of living fibres that Barry translated into this visually dazzling plexus of crisp, yet shiny and moist material filaments of paint comprising Nugent's hair. As earlier shown by Brocklesby's aestheticised medicine, the taste as well as

health of physicians was a unique tool of patient persuasion and medical efficiency. Fully aware of the connections between music cultures, medical humanity and success, Barry shrewdly depicted the doctor as a robust and healthy man of age, who, in spite of old age, is ready to dedicate himself to his patients.[130] In this way, Barry extended and completed Nugent's cultural characterisation: the doctor is presented as a man of human music, human love as well as humane medicine, but also he is now himself a healthy subject and a healthy product of his own medicine for the prolongation of health.

Coda

The constellations of concepts and practices surveyed in this essay were cultivated within relatively controlled environments of fringe groups of learned men. Soon enough, however, such formations would enjoy a much wider (and unrefined) field of dissemination. The mutations that they underwent as they exited the tightly-knit circles of cultural kinship, to enter the expansive field of the marketplace and its heteroclite audiences and drives, are both impressive and revealing.

The notorious medical practice of James Graham, 'the emperor of quacks' in the 1770s and 80s, is emblematic of this process: his work has recently attracted serious scholarly attention precisely because it seems to emblematise succinctly the far-reaching readjustment of medicine into the new era of spectacle and mass consumption. However, the materials from which he manufactured his 'eccentric' medical practice were by no means unheard of. It has been rightly noted that, despite their extravagance, the hyperboles of Graham, were all deeply rooted into practices otherwise 'highly typical of his age':[131] actually, there is no better demonstration of the point than the way in which his practice fed systematically upon the kind of earlier medical perceptions analysed in this essay.

There are various angles from which this may be seen. In the commercial arena of Graham's multimedia shows and lectures, for example, the persona of the physician was again catapulted centre-stage, although Brocklesby's or Nugent's image of the physician as an object of love and trust, was, in the case of Graham, transformed into the doctor as an exhibitionist impresario and sex promoter. Graham's spectacles and self-fashioning clearly drew from Brocklesby's ideas about the medical power of imagination and suggestion, and, like Barry, he understood the crucial role of the physician's self-presentation and health in medical success. However, the aggressive way in which he ushered into the public realm his personal health as the ultimate litmus test for the efficacy of his therapies was another manifestation of the outré kind of personal showmanship, compelled by the new mass medical marketplace that he helped to put into existence.

Also, Brocklesby's music therapy provided a useful precedent that assisted Graham to evolve his powerhouse of synaesthetic cures. Sounds, lights and smells but also music and the visual arts played a crucial role in this new medicine.[132] Music, in particular, was situated by Graham in a clearly polite framework of quietist and irenical aspirations, typical of Brocklesby's moderate Enlightenment: the 'softness', 'gentle emotions' and 'harmony' of music were treated as best adapted to Graham's medical purposes of 'soothing and harmonising the mind'.[133] Moreover, extending Brocklesby's project of medical gentrification even further, music was, for Graham, the best technique for the kind of gentle healing supported also by Brocklesby: Graham's 'easy' and 'elegant' cures and treatments of 'beautiful precision and simplicity' were again deliberately employed by the showman to avoid the 'shock', 'pain' and 'confinement' of traditional cures.[134] If, however, Brocklesby targeted the fine sensibilities of the new polite elite, the entry of Graham's aesthetic medicine into the expanded field of the marketplace meant various modifications, which aimed to cater for the new multiplicity of target audiences, including the 'radical chic fringe of the bon ton'.[135] This had a drastic effect on the fate of Brocklesby's polite economies of aesthetic affects. Though he did not reject existing quietist ideals, Graham's 'electrical and aetherial' cures represent a distinct attempt to modernise and revitalise the ultra-soporific ideals of classical medicine, still adhered to by Brocklesby's music therapy. To this effect, Graham forged new sensory blends that represent an interesting meeting of polite medicine with rising sublime ideals. New affective hybrids, such as Graham's concept of 'passionate harmony', acted as stimulants to classical medicine, completing its much-needed adjustment to the excessive parameters of modern culture.[136]

But Graham's aesthetic therapy was neither sublime,[137] nor, of course, classical or polite in the traditional sense of the terms: his 'double vision' and penchant for paradoxical blends of sensations represent a new eclectic assemblage of stimuli designed to reach out to the broadest scope of market forces. Such blends reflected or, better still, embodied the market's dissonances and irreducible pluralities by embedding them into the minutiae of physiological operations. Concurrently, a project of *hybridisation* and *electrification* of fine sensations took place, propelled by the kind of commercial modernity that Brocklesby had feared and opposed.[138]

Graham's heterogeneous sensory compounds, including those in which music was now asked to operate, stand as historical monuments to what happens to the regulated bastions of politeness as they enter the unforgiving environment of medical entrepreneurship and health consumption. Graham's commercial re-engineering of Brocklesby's politeness identified a point of accumulation of sensory improbabilities characteristic of the Marketplace. In the process, a new totality of sensation and a new *market sensibility* were discovered, whose un-beautiful but also un-sublime excesses remain little explored.

Notes

1. For biographical details and a first assessment of Brocklesby's treatises, see William C. Curran, 'Dr. Brocklesby of London (1722–1797): An Eighteenth Century Physician and Reformer', *The Journal of the History of Medicine* (October 1962), 509–521, esp. 514. For more on Brocklesby, see also Chapter 3.
2. 'The Memoirs of the Late Richard Brocklesby, M.D., F.R.S.', *The European Magazine and London Review for May 1798*, vol. 33, 296.
3. Richard Brocklesby, *Reflections on Antient and Modern Musick with the Application to the Care of Disease* (London, 1749), 23, see also 17–25.
4. Johanna Eyer-Kordesch, 'Georg Ernst Stahl's Radical Pietist Medicine and its Influence on the German Enlightenment', in Andrew Cunningham and Roger French, ed., *The Medical Enlightenment of the Eighteenth Century* (Cambridge, MA, 1990), 67–87, esp. 70 and 80.
5. James Kennaway, 'Stimulating Music: The Pleasures and Dangers of "Electric Music," 1750–1900', *Configurations* 19 (2011), 191–211, esp. 192–197, and Penelope Gouk and Ingrid Sykes, 'Hearing Science in Mid-Eighteenth-Century Britain and France', *Journal of the History of Medicine and Allied Sciences* 66.4, 507–545, esp. 523–524.
6. Brocklesby, *Reflections on Antient and Modern Musick*, 27.
7. Ibid.
8. Ibid., 36.
9. Ibid., 31.
10. Ibid., 30 and 29.
11. Ibid., 39.
12. Andrew Cunningham, 'Medicine to Calm the Mind: Boerhaave's Medical System, and Why it was Adopted in Edinburgh', in Cunningham, ed., Ibid., 40–66 (46).
13. Ibid., 48.
14. Ibid., 47–50, 51. See also French, Ibid., 91 and Kordesch, Ibid., 67.
15. Brocklesby, *Reflections on Antient and Modern Musick*, 37.
16. Ibid., 44–45.
17. Ibid., 36–37.
18. Ibid., 11.
19. Ibid., 26.
20. Ibid., 46, 71–72.
21. Ibid., 11.
22. Ibid., 65
23. Ibid., 58–60.
24. Ibid., 61. See also 29–30.
25. Ibid., 37.
26. Ibid., 65.
27. Ibid., 44.
28. Ibid., 36.
29. Ibid., 65.
30. Ibid., 63.
31. Ibid., 64.
32. Ibid., 80.
33. Ibid., 78.
34. Ibid., 79.

35. Ibid., 65.
36. Ibid., 79.
37. Ibid., 74.
38. Ibid.
39. Ibid., 71.
40. Ibid., 71–72.
41. Ibid., 72.
42. Ibid., 73.
43. Ibid., 77–78.
44. Ibid., 70.
45. Ibid., 69–70.
46. Max Nordau's *Degeneration* (1892) and the huge literature built around it, is iconic in this respect.
47. I have explained the maximal physiological mechanics of Burke's theory of the sublime in several publications. See, for example, 'Pain, Labour, and the Sublime: Medical Gymnastics and Burke's Aesthetics', *Representations* 91 (2005), 58–83.
48. Walter Pater, 'Conclusion', in Charles Harrison, Paul Wood and Jason Gaiger, ed., *The Renaissance: Studies in Art and Poetry* in Art in Theory: 1815–1900 (Oxford: Oxford University Press, 1998), 828–830.
49. Ibid., 829.
50. Ibid., 830.
51. Ibid.
52. Ibid.
53. Ibid.
54. Penelope Gouk, 'In Search of Sound: Authenticity, Healing and Redemption in the Early Modern State', *The Senses and Society* 2 (2007), 303–328, here 307–311.
55. Brocklesby, *Reflections on Antient and Modern Musick*, 70–71.
56. Ibid.
57. Ibid.
58. Ibid., 70–71.
59. Ibid., 71.
60. Ibid., 40.
61. Ibid., 16.
62. Ibid., 74.
63. See, for example, Roy Porter, 'William Hunter: A Surgeon and a Gentleman', in Roy Porter and William F. Bynum, eds., *William Hunter and the Eighteenth-Century Medical World* (Cambridge, MA: Cambridge University Press, 1985).
64. Ibid., 32–33.
65. Ibid., 33.
66. It is remarkable that still today such processes involving patients' expectations and anticipations, especially as modulated by the doctor's 'reputation, charisma or convictions', are seen to act as 'self-fulfilling prophecies of medical recovery', and are seriously studied as markers of the mind's physical influence on the body. Philippa Perry, 'The Placebo Effect is Present in Every Medical Intervention', 21 March 2013, guardian.co.uk.
67. Brocklesby, *Reflections on Antient and Modern Musick*, 33.
68. Ibid.

69. Letter from Edmund Burke to James Barry, 9 July 1774 in James Barry, *The Works of James Barry*, vol. I (London: Cadell and Davies, 1809), 232.
70. Joseph Addison, *Remarks on Several Parts of Italy in the Years 1701, 1702, 1703* (London: Tonson, 1718), 333.
71. Addison, *Remarks*, 333.
72. Jonathan Richardson, *An Account of Some of the Statues, Bas-Reliefs, Drawings and Pictures in Italy* (London, 1722), 34.
73. Ibid.
74. Barry, *Works*, 431.
75. Jurg Meyer zur Capellen, *Raphael: A Critical Catalogue of his Paintings* (Landshut, c. 2001), 125–132, Oscar Fischel, *Raphael*, vol. 1, trans. Bernard Rackham (London: Kegan Paul, 1948), 247.
76. For this hypothesis, see Stanislav Mossakowski, 'Raphael's "St. Cecilia," An Iconographical Study', *Zeitschrift fur Kunstgeschichte* 31 (1968) 1–26, Konrad Oberhuber, *Raphael: The Paintings* (Munich: Prestel, 1999), 211–214.
77. Mussakowski, 'Raphael's "St. Cecilia," ' 4, 7–10.
78. Quoted in Oberhuber, *Raphael*, 212.
79. Thomas Connolly, *Mourning into Joy: Music, Raphael, and St Cecilia* (New Haven and London: Yale University Press, 1994).
80. Ibid., 258–261.
81. Ibid., 255–256.
82. Ibid., 256.
83. Ibid., 28.
84. Ibid., 62.
85. Ibid., 34, 26.
86. The term has markedly economical connotations in that it is always found next to such soporific terms as 'allaying' or 'reducing' motions and passions.
87. Connolly, *Mourning into Joy*, 41.
88. Ibid., 62.
89. Ibid., 45.
90. George Cheyne, *The English Malady or a Treatise of Nervous Diseases of All Kinds* (London: Strahan, 1733), 69. See also 95.
91. Brocklesby, *Reflections on Antient and Modern Musick*, 18–19.
92. Ibid., 92.
93. Ibid., 68.
94. Ibid., 70, 75, 80.
95. Ibid., 53.
96. Ibid.
97. Ibid.
98. Nugent was a highly esteemed founding member by the members of Samuel Johnson's Literary Club.
99. Desmond Shawe-Taylor, *Genial Company: The Theme of Genius in Eighteenth-Century British Portraiture* (Nottingham: University Art Gallery, 1987), 57.
100. Ibid.
101. Letter from James Barry to Edmund Burke, 16 August 1766 in *Works*, 50.
102. John Barrell, *The Political Economy of Painting from Reynolds to Hazlitt* (New Haven and London: Yale University Press, 1986).
103. William Pressly, *The Life and Art of James Barry* (New Haven and London: Yale University Press, 1981).

104. See, for example, letter from William Burke to James Barry, 26 October 1765, *Works*, vol. 1, 27–28, James Barry to Edmund Burke, 20 December 1765, *Works*., 34–36, James Barry to Edmund Burke, 16 August 1766, *Works*., 49–52. In 1766, Nugent sought to reassure the painter that 'I wish you as well and love you as much as if I had told you so twice every week since I saw you last' in a letter from Edmund Burke to James Barry, 13 May 1766, *Works*, 54–55.
105. Christopher Nugent, 'To Mr. Barry on his Medea…', *Works*., *Morning Post and Daily Advertiser*, 16 September, 1777.
106. Letter from William Burke to James Barry, 26 October 1765 in *Works*, 27.
107. William Burke spoke on behalf of the family when he expressed his 'too well grounded hopes' that Barry would one day become 'a credit to [his] country'. See *Works*.
108. See, for example, Letter from William Burke to James Barry, 23 March 1766 in *Works*, 42–43.
109. Connolly, *Mourning into Joy*, 244.
110. Ibid.
111. Pater, 'Conclusion', 830.
112. Christopher Nugent, 'To Mr. Barry on his Medea', *Works*.
113. James Barry, *An Account of a Series of Pictures in the Great Room of the Society of Arts, Manufactures, and Commerce, at the Adelphi* (London: Cadell and Walter, 1783), 42–46.
114. Barry to Burke, 16 August 1766, *Works*, 50.
115. The prevalence of fibre-medicine and fibre-anatomies of the kind adopted by Nugent have been well explained by Hisao Ishizuka, ' "Fibre Body": The Concept of Fibre in Eighteenth-Century Medicine, c. 1700–1740', *Medical History* 56.4 (2012), 562–584.
116. Christopher Nugent, *Essay on Hydrophobia* (London: James Leake, 1753), 62–66.
117. Ibid., 163.
118. Ibid., 159.
119. Ibid., 159–166.
120. Ibid., 163–164.
121. Ibid., 164.
122. Ibid., 163.
123. Cheyne, *The English Malady*, 100.
124. Ibid., 114.
125. Ibid., 178.
126. Ibid.
127. Nugent, *Essay on Hydrophobia*, 62–64.
128. 'Plexus, n.', Oxford English Dictionary.
129. 'Buckle, v.', Section 'Divisive "Harmonies": Biological Economy, Class and Profession', Oxford English Dictionary.
130. Letter from Dr. Nugent to James Barry, 15 September 1769 in *Works*, 145–146.
131. Roy Porter, 'Graham, James (1745–1794)', *Oxford Dictionary of National Biography*, Oxford University Press, September 2004, Online ed., January 2006.
132. For detailed analyses of the Temple of Health and Hymen shows, see Lydia Syson, *Doctor of Love: James Graham and his Celestial Bed* (London: Alma Books, 2008), 69–105 and 161–195.
133. James Graham, *The General State of Medical and Chirurgical Practice* (London: Almon, 1779), 55–64.

134. James Graham, *A Short Inquiry into the Present State of Medical Practice* (London: J. Walter, 1776), 9, 13, 15, 26–27.
135. Roy Porter, 'The Sexual Politics of James Graham', *British Journal for Eighteenth-Century Studies* 5 (1982), 199–206, especially 199.
136. Graham, *General State*, 66–67.
137. Peter Otto, *James Graham as Spiritual Libertine in Libertine Enlightenment: Sex, Liberty and Licence in the Eighteenth Century*, Peter Cryle and Lisa O' Connell, eds. (London: 2003), 204–220.
138. Porter, 'Sexual Politics', 204.

7

Music as a Tool in the Development of Nineteenth-Century Neurology

Amy B. Graziano and Julene K. Johnson

Introduction

Music has become an increasingly popular topic in neuroscience research over the past two centuries. The roots of the current interest in music and the human brain can be traced back to the second half of the nineteenth century, when neurology emerged as a medical specialty (although there were a few observations prior to the nineteenth century). Several prominent, nineteenth-century neurologists used music as a tool to help understand brain function, just as they used a reflex hammer and other clinical tools. Music was used, in particular, to examine the varieties of higher cognitive functions in patients with aphasia who had difficulty with speaking or understanding language after brain damage. Early scholars were fascinated by the paradox that some patients who were unable to speak were able to sing the text of songs. This simple observation inspired neurologists to explore music function in more depth in order to better understand aphasia and also to develop ideas about higher cognitive functions and emotion. The initial observations about music in persons with aphasia appear to be mostly by 'chance', and more systematic evaluations of music abilities were not done until the later nineteenth century.

The majority of early research about music and the brain was conducted by neurologists at a time when the field of neurology was developing and there was an intense interest in understanding the relationship between brain and behaviour, primarily in clinical populations. Although a few philosophers, ethnomusicologists and psychologists also participated in this nineteenth-century dialogue, neurologists dominated the pioneering work about music and brain. This chapter will examine how music was used as a tool to understand ideas about the brain in nineteenth-century neurology literature, how that tool grew into a separate clinical syndrome and how the study of music in neurology influenced ideas about music itself.

Pre-nineteenth-century observations of singing in aphasia

Although the majority of interest in music and brain occurred during the nineteenth century, there were several earlier observations about music in persons with loss of speech. There exist at least two pre-nineteenth-century observations about music abilities in persons with acquired language disorders. In 1745, Olof von Dahlin (1708–1763), a Swedish Enlightenment era poet and writer, recounted a story from a local priest about a farmer who had right-sided hemiplegia and loss of speech after a stroke but could sing the text and melody of a familiar song.[1] Dahlin published the case report in the *Swedish Academy of Science Journal*.[2] In 1770, the German physician Johann August Philipp Gesner (1738–1801) described an abbot who was not able to sing songs after he developed a sudden onset of loss of speech. The abbot also had difficulty reading and reciting longer Psalms, but he was able to recite a prayer. Gesner did not expand upon his observation of the impaired ability to sing songs, but it appears that he was considering how the loss of speech affected a variety of memorised texts, such as prayers, Psalms and song texts. Gesner published the details of this case in a chapter about aphasia (*Die Sprachamnesie*) in his five-volume monograph.[3] Following these brief observations, it appears that there was relatively little work focused on music and loss of speech until the mid-nineteenth century. However, additional research of the pre-nineteenth-century aphasia literature is needed to determine whether or not there are additional instances in which music was discussed.

Setting the stage

In order to better understand how music entered into the discussions of aphasia during the nineteenth century, it is important to consider a broader historical context of studies of brain and behaviour during this time. Although scholars considered ideas about brain and behaviour in ancient times, the nineteenth century was an important time for the development of modern theories about this topic.[4]

Prior to the nineteenth century, Cartesian dualist philosophy dominated thinking about the brain and mind. Dualism proposed that the mind and body are separate substances. While the body is physical, the mind is a non-physical substance that cannot be divided. Studies of brain damaged patients in the early 1800s and the concept of phrenology, with the work of Franz Joseph Gall (1758–1828) and colleagues, led to questions about the independence of brain and mind. While many modern scholars criticise Gall for a lack of scientific basis to his studies, others point out that Gall set the stage for the many important observations that emerged several years later during the mid-nineteenth century.[5] Gall did not study patients with an acquired loss of speech but, instead, studied the bumps and protrusions on the skull

of highly musical persons, including professional musicians and composers. Gall localised the music faculty (*Tonsinn*) in a specific location of the brain, which was in close proximity to the area for language.[6]

Debates about localisation of brain function dominated much of early nineteenth-century discussion about the brain. The localisationists argued that specific parts of the brain controlled specific functions, while the holists argued that thinking involved the whole brain. For example, Pierre Flourens (1794–1867) and others, representing the holist perspective, argued that the amount, and not locus, of brain damage correlated with behaviour. Jean-Baptiste Bouillaud (1796–1881) and others, representing the localisationist viewpoint, argued that specific parts of the brain controlled specific behaviours: if one specific part was damaged, it would affect a specific behaviour. Because language was the most obvious cognitive deficit after damage to the brain (e.g. stroke or epilepsy), the study of loss of speech (aphasia) became a central focus in the localisation debate.

Although almost all of the clinical varieties of aphasia had been described before 1800,[7] it was the French surgeon and anatomist Paul Broca's (1824–1880) seminal publications about the neuroanatomic correlate of the loss of language in the early 1860s that helped revolutionise thinking about the localisation of brain function.[8] As Whitaker (1998) and others point out, Broca was not the first to link the frontal lobes with speechlessness, but the political and scientific climate in the early 1860s was ripe for Broca's observations – the French Anthropological Society, which was founded by Broca in 1859, was debating the cerebral localisation of specific mental functions in the early 1860s. Broca's cases provided important neuropathological evidence for the clinical patterns. Broca's work ultimately inspired a more in-depth study of aphasia.

Broca presented autopsy evidence of a patient to the Anthropological Society that linked the loss of speech with the frontal lobes. The aphasic patient known as 'Tan' (a nickname referring to the only word the patient could verbalise) had been transferred to the Bicêtre hospital and examined by Broca. Six days later, he died, and the autopsy revealed a large lesion in the left frontal lobe. Broca 'submitted this as evidence that supported the theory of localisation' and argued that the patient lost 'the faculty of coordinating the movements appropriate for articulate language', which was independent of intelligence.[9] Shortly thereafter, Broca had the occasion to study another patient (Lelong) with a clinical presentation similar to 'Tan'.[10] This patient was also found to have a lesion in a similar brain location. Broca did not appear to examine music abilities in either of these patients. However, there is a brief mention of music in one of his presentations. He reflected on music in his discussion about memory for words and whether or not various mental faculties are independent from one another. As recorded by Dr J. Parrot, Broca remarked:

> As for me, I do not consider memory to be a simple faculty, nor even a complex faculty, but rather a state or, if you will, a property belonging to each of our faculties and unevenly developed in each. Each faculty has its memory, which is more or less complete and has nothing to do with other memories. I do not know whether there are brains that are well enough balanced to remember everything equally well. I quite doubt that, and I must say I have never known one. Many a one who can sing an opera score from beginning to end without missing a single note, after a single hearing, is unable to learn by heart ten lines of prose.[11]

Thus, Broca questioned whether or not a person with an exceptional music memory could also have the talent for memorising prose, thereby suggesting the relative independence of different mental faculties. This excerpt shows that early aphasia researchers were not only interested in language, but also in broader questions about brain and behaviour. It is likely that the interest in examining music in persons with loss of speech evolved out of discussions of broader questions such as this.

Occasional mention of music in the Paris language debates of 1865

Music was also occasionally mentioned during the 1865 debates about the localisation of language during the meetings of the French Academy of Medicine (*Académie Impériale de Médecine*) in Paris. Riese considered these debates to be the 'climax of the early history of aphasia'.[12] These debates were published in the 1865 edition of the *Bulletin de l'Académie Impériale de Médecine* in a series titled 'Discussion su la Faculté du Langage Articulé'. The discussion centred on an 1865 manuscript by Marc Dax (1771–1837) that summarised over 40 cases with the loss of speech and a left-hemisphere lesion.[13] The debates included a number of influential French physicians, including Bouillaud, Armond Trousseau (1801–1867), Jules Baillanger (1809–1890), Pierre Briquet (1796–1881), Jean-Pierre Bonnafont (1805–1891), Alphonse Guérin (1816–1895), and others. Bouillaud and Trousseau each discussed music in the context of musicians with aphasia.

Bouillaud discussed a 50-year old man with loss of speech and difficulty writing (aphasia and verbal agraphia) who was able to compose a new tune and write down the composition using music notation.[14] There is mention in a footnote that Bouillaud's wife played the new composition and remarked that there were no mistakes, thereby implying that the composition made sense musically and probably followed standard harmonic rules of common practice music. The patient was also able to sing, or 'modulate his voice', as Bouillaud described it. Bouillaud remarked that the ability to write music notation contrasted with the impairment in writing text and also provided

evidence for the 'preservation of other intellectual faculties' (*conservation des autres facultés intellectuelles*). Thus, consideration of non-verbal abilities, such as music, helped shape early ideas about preserved and impaired functions in aphasia during these Paris debates. Bouillaud (1865)—taken out the other parenthetical references, shouldn't this one be taken out too?—described another patient (Case 9, Madame V) who had complete loss of speech and right hemiplegia and was unable to read or write verbal text, music notation or numbers.[15] However, she was able to sing a familiar song and also play a familiar song on the piano. Bouillaud noted that the memory of some things ('*la mémoire de certaines choses*') remained. In an earlier lecture, Bouillaud also discussed how different types of coordinated movements are required for speaking, writing, drawing, painting and playing a musical instrument.

Also in this series, Trousseau studied a musician with loss of speech and loss of ability to play the piano in 1865.[16] Several decades earlier in 1837, Trousseau published a book with a student about chronic laryngitis and diseases of the voice.[17] It is not known if Trousseau's earlier interest in the voice motivated his later studies of loss of speech. In 1865, Trousseau provided two explanations for the loss of speech: (a) loss of memory for words or (b) loss of coordination of the movements needed for articulation of speech.[18]

Thus, both Bouillaud and Trousseau used observations of music abilities (e.g. writing notation, composing, singing and playing a musical instrument) in persons with loss of speech to understand the impact of loss of speech on coordinated movements. Their thinking about music did not figure prominently in these early debates about speech, but music did provide examples of ways in which coordinated movements for non-verbal functions (e.g. playing the piano) could remain preserved. They also speculated that different thinking abilities might involve different memory systems.

It is not known how commonly music was considered in persons with loss of speech during the mid-nineteenth century. It is possible that music was used as a tool in clinical examinations but was not included in the published case histories. In 1866, the French psychiatrist Jules Falret (1824–1902) hinted that it was already known that some patients with loss of speech could sing the text of songs, while others could not. In the fifth volume of the well-known *Dictionnaire encyclopédique des sciences médicales* he wrote,

> These diverse manifestations of human thought can equally be conserved or destroyed in aphasics, separately or simultaneously. Song, the intermediary between a scream and spoken language, can persist even in aphasics who have almost completely lost the use of speech; but it is necessary to distinguish, among these instances of the retaining of song, two very distinct categories. Certain individuals, in effect, although unable to speak words in the usual manner, have kept the ability to hum them [words] with the help of some words or monosyllables which remain with

> them; there are others, on the other hand, who can truly pronounce, in song, words which they are incapable of pronouncing through normal speech.[19]

In the same chapter about music, drawing and calculation, Falret referred to a patient observed in 1836 by Louis-Jules Behiér (1813–1876), a Professor of Clinical Medicine at the Hôtel Dieu:

> Professor Behiér told me about a very interesting example of the first category that he observed in 1836 and recorded in his memory for internal prizes. It concerned a patient afflicted with syphilis, who was in a true aphasic state, equivalent to those recently observed instances. Like M. Broca's patient, he could only say the syllable *tan*. He tried to express his thoughts by using this syllable, supplemented by gestures where his speech was insufficient. And so! This patient, who could no longer speak, very distinctly sang the *Marseillaise* and the *Parisienne* without articulating each of the words, instead modulating his breaths, again using that same monosyllable, *tan, tan, tan*, repeated indefinitely.[20]

Thus, Falret was aware of two common patterns of singing in aphasia: those who could sing with the words and those who could only sing the melody. Falret not only refers to this case observed by Behiér, but also observations by John Hughlings Jackson (1835–1911) and Trousseau, who referred to Charles Lasègue's (1816–1883) observation of a musician with aphasia who could write down music phrases that he heard.

Singing and emotional language

Just across the English Channel and during the 1860s and 1870s, John Hughlings Jackson, who is regarded as the founder of British neurology, also included music in his discussions about language and loss of speech. Jackson provided one of the earliest explanations as to why the ability to sing could remain preserved in persons with aphasia. Over the course of several publications, Jackson developed his ideas about the difference between intellectual and emotional language. He considered music to be a part of emotional language, which often remained preserved in aphasia. Jackson credited the British philosopher Herbert Spencer (1820–1903) and his essay 'The Origin and Function of Music' (1857) for helping him solidify his ideas about the distinction between emotional and intellectual language. In his 1866 publication in *The Lancet*, Jackson quoted Spencer, who wrote:

> All speech is compounded of two elements, the words and the tones in which they are uttered – the signs of ideas and the signs of feelings.

> While a particular set of articulations express the thought, a particular set of vocal sounds express the more or less of pain or pleasure which the thought gives. Using the word cadence in an unusually extended sense as comprehending all modifications of voice, we may say that *cadence is the commentary of the emotions upon the propositions of the intellect*.[21]

Spencer's differentiation of ideas and feelings of speech were expanded by Jackson in his discussion of intellectual and emotional language. In 1866, Jackson described his observations of speechless patients who could swear when they became 'vexed' under the influence of emotion. Jackson was clear to say that this behaviour was a 'sign of the state of feeling' and not of intellectual language – the words are not parts of speech and do not convey meaning. Jackson also drew from the thinking of Max Müller (1823–1900), a German-born philologist who lived in England, who stated, 'Language begins where interjections end', and Robert Gordon Latham (1812–1888), an English philologist who discussed the importance of propositions for language. Because Jackson considered singing to be a type of emotional language, the preserved ability to sing in the context of aphasia provided evidence that emotional language could remain preserved when intellectual language was impaired.

In 1866, Jackson described a woman with loss of speech who could sing a familiar song using the syllables 'lor', 'deah' or 'me' (but not the original song text). Jackson remarked, 'She varied her voice properly', meaning that she correctly sang the melody, and, 'It would be safer to call these fragments "sounds" rather than words, as they are but rage and tatters of talk'.[22] This case was an example of a patient using emotional language in the context of singing when intellectual language had been lost. Jackson further developed his ideas about music and intellectual language in his series of three papers titled *On affections of speech from disease of the brain*, which were published between 1878–1879. In this series, Jackson also linked singing to automatic speech and recurring utterances in his explanations as to why persons with aphasia could sing words they could not otherwise speak.[23]

Asymbolia and music

Music was also considered by Carl-Maria Finkelnburg (1832–1896) when he formed his ideas about asymbolia, an impairment in the ability to use or comprehend symbols or signs after acquired brain damage. Finkelnburg coined the term 'asymbolia' and discussed his ideas during the 21 March 1870 meeting of the Society of the Lower Rhine in Bonn, Germany.[24] During this meeting, Finkelnburg reviewed five patients, including two with autopsies, and argued that the syndrome of aphasia expanded beyond loss of speech. He felt that it was important to consider additional cognitive

functions, such as the comprehension, reading and writing of verbal material. He also considered several non-verbal faculties, such as the comprehension of music notation, understanding of monetary value and the use of symbols in rituals and social events. Thus, Finkelnburg believed that symbols provided other opportunities for the expression of ideas and should, therefore, be considered in the evaluation and study of aphasia.

During the 1870 meeting, Finkelnburg presented the case history of a 36-year-old teacher (Case III) who was 'moderately skilled' in playing the violin. Immediately after a 'very strenuous and tiring practice session', the teacher noticed difficulty with finding words and a left arm spasm. He later noticed that he had difficulty reading and writing music notation (music alexia and agraphia) and playing both the violin and piano. He was, however, able to 'play melodies by ear' on the violin. Several months later, he died, and an autopsy revealed lesions in the right hemisphere, including the corpus striatum and the junction of the Isle of Reil (insula) and the 'anterior gyrus of the central lobe'. During his presentation, Finkelnburg noted the importance of this case and highlighted the impairment in the ability to read music notation as a newly identified type of deficit in symbolic function:

> There are two symptoms of importance in this patient: first of all, the paralysis was on the left side which is rare in victims of aphasia; and correspondingly the lesion was found exclusively in the right hemisphere. Second, however, the loss of another symbolic function runs parallel to speech and writing loss: namely, the comprehension of musical notes, that is, of visual signs that do not correspond to material objects but rather to acoustic sensations for which tonal sequences are learned. Here we see, in addition to problems of word formation, a new type of disruption of symbolic usage.[25]

In this excerpt, Finkelnburg suggested a parallel between writing speech and writing music and also reading speech and reading music. He made an interesting proposal that the understanding of music notes relates, not to a material object (like many other symbols), but to an 'acoustic sensation' (*akustische Empfindungsweisen*), which was previously learned.

Expansion of interest in music

Finkelnburg's 1870 discussion of music reading and writing, as well as Bouillaud's and Trousseau's earlier discussions of musicians with aphasia, marked an expansion of interest in music beyond singing. German and French neurologists began to investigate different aspects of music, such as melody, rhythm, music reading and music writing, and how these fit

within the context of aphasia. While Finkelnburg's 1870 case involved music impairment, others looked at music preservation in the context of aphasia. For example, Adrien Proust (1834–1903), father of writer Marcel Proust, discussed a musician with aphasia, who had lost the ability to both speak and to write text yet who could still write music.[26] Like Finkelnburg, who had suggested that the syndrome of aphasia be expanded beyond the loss of speech, Proust felt that music symptoms were a part of the clinical syndrome of aphasia. By 1888, Hermann Oppenheim (1858–1919) described how investigation of music preservation and impairment would complete the understanding of aphasia.[27] Oppenheim assessed several music skills in one patient at the Charité Hospital in Berlin, including singing, naming intervals and chords, reading and writing music, and playing an instrument from notation and from memory.[28]

In order to look at these various elements of music, neurologists continued to expand their interest in studying patients who were musicians. They soon discovered that brain damage could affect music abilities in highly complex patterns. Investigations of different music elements led to ideas about the mental representation of music and neurologists began looking at how music cognitive processing paralleled language cognitive processing.

Development of diagrammatic models of music processing

Nineteenth-century neurologists used diagrammatic models to describe cognitive processing, in particular, processing of language. Some models were designed first and then tested using patients, others were designed based on observations of patients. Diagrams consisted of 'centres', where processing of sensory information took place, and 'pathways', that connected centres and allowed information to flow from one centre to another. Carl Wernicke (1848–1905) proposed a language model in 1874 that was adapted by Ludwig Lichtheim (1845–1928) in 1885. Other prominent nineteenth-century neurologists who designed language models include Basinsky, Spamer, Charcot and Ballet.[29]

In the late 1870s through the 1880s some neurologists in Germany and France began to include music in discussions of diagrammatic models for language. In 1877, Adolf Kussmaul (1822–1902) included a single pathway for the perception of music in his language model. This music pathway was connected to the pathway for perception of language but not directly connected to any processing centres.[30] In an 1885 publication, Jean-Martin Charcot's lectures from 1883 to 1884 included discussion of music processing. Charcot (1825–1893) described his diagrammatic model for language and how music was processed in a similar way, with centres and pathways parallel to those for language.[31] However, he did not draw a specific model for music, or include music in his diagrammatic language model.

In 1888, August Knoblauch (1836–1919), a neurologist working in Heidelberg with William H. Erb, went a step further. Instead of discussing music processing as part of a language model, he proposed a distinct model for the processing of music.[32] His model was based on Lichtheim's language model, with the same centres and pathways found in Lichtheim's model, but in Knoblauch's model they were music-specific centres and pathways. Knoblauch designed his diagram after observing a patient who was unable to speak (aphasia) but who could sing a song text. He intended for the model to be tested through observations of subsequent patients (Figure 7.1).

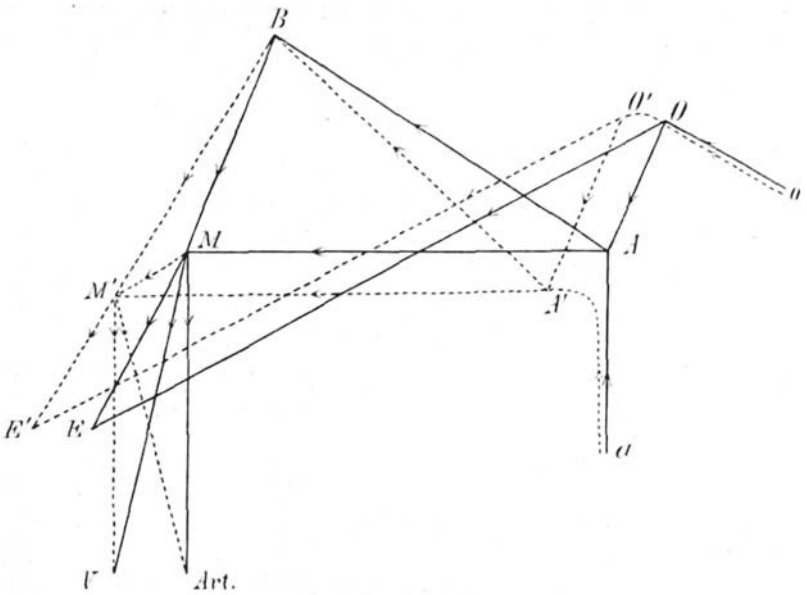


Figure 7.1 Knoblauch's (1888) diagrammatic model of music (dashed lines) overlaid on Lichtheim's (1885) diagrammatic model of language (solid lines). Letters represent centres and pathways, for example, B is the centre for ideas (connection point between language and music model), M′ is the motor centre for tones, A′ is the auditory centre for tones, E′ is the motor centre for writing music notation, O′ is the visual centre for reading music notation, a is the auditory nerve, etc.

Knoblauch's model is complex, involving multiple levels of centres and pathways, all interconnected.[33] For the most part, the music centres and pathways are not involved in language, although each language centre and pathway has a parallel music counterpart. He predicted that his music model would interact with Lichtheim's language model in two ways, one of

which was a connection between the motor centre for tones and the motor centre for speech, allowing for the singing of a text. In Knoblauch's model, music is seen as a higher level, cognitive process distinct from, but similar to language. Instead of using music as a tool to understand language function, or looking at music symptoms as part of the aphasia syndrome, Knoblauch was investigating music as a separate cognitive system related to language.

Classification systems

By the 1890s, deficits in the processing of music became recognised as a clinical syndrome, named 'amusia'. The term 'amusia' had been coined by Knoblauch as part of his proposed model for music processing.[34] Knoblauch used the term to describe one specific impairment in music ability, among several impairments that resulted from lesions to different pathways or centres in his model. Within three years of Knoblauch's publication, others adopted the term and used it globally, as the umbrella classification for any impairment in music ability due to brain damage. As a result of recognising a separate clinical syndrome for music impairment, several neurologists designed classification systems for different types of 'amusias'. Knoblauch (1888) was the first; he proposed ten distinct music disorders. Knoblauch based these disorders on classifications of aphasia and predicted how each would arise given a specific lesion or lesions to different parts of his model, which was a schematic for brain function. As was common in aphasia literature, Knoblauch distinguished between motor disorders (impairments in production of music) and sensory disorders (impairments in perception of music).

Richard Wallaschek (1860–1917) built on Knoblauch's ideas by proposing seven music disorders (with several sub-categories), each of which paralleled an acknowledged type of aphasia.[35] He also grouped music disorders into motor or sensory categories. Wallaschek, a musicologist rather than a neurologist (and one of the founders of comparative musicology, which developed into ethnomusicology), had a strong interest in aphasia case studies.[36] He predicted amusia syndromes based on observations of real patients from aphasia literature; he gave case-study examples for all but one of his disorders.

Soon after Wallaschek's 1891 paper on amusia, two French neurologists each published an article on amusia. Both Dr Brazier and Paul Blocq (1860–1896) included a classification scheme for amusia.[37] Blocq was a well-known neurologist who worked with Charcot in Paris, but it is difficult to identify Dr Brazier (there was an Edmond Brazier, who wrote a thesis about the esophagus in Paris in 1879, but it has not been confirmed that he is the Brazier who wrote this article). As had Knoblauch, Brazier and Blocq both distinguished between motor and sensory impairments.

Both listed sub-categories under sensory amusia and under motor amusia. Brazier believed that amusia disorders could appear with aphasia or as an independent syndrome.[38] Blocq defined amusia as a type of language disorder, with all language disorders grouped under the heading 'Asymbolia'.[39]

Following Knoblauch's lead, subsequent writers on amusia adopted specific German and French terms to describe various impairments in music ability. These terms were based on aphasia terminology. Knoblauch's term 'amusia' (*Amusie*) referred to a specific motor impairment. By 1891, Wallaschek was using the term 'amusia' as a broad classification for any music impairment. Subsequent authors also used the term in this way. Other commonly used terms included 'note deafness' or 'tone deafness' (*Tontaubheit* – inability to understand written or aural music) and 'note blindness' (*Notenblindheit* – inability to understand/read music notation) to refer to sensory disorders. Music alexia was another term for note blindness. The term 'note deafness' was first used by Grant Allen (1878)—, who was a writer, not a neurologist.[40] Allen used 'note deafness' to refer to a congenital disorder rather than an acquired impairment due to brain damage. Another common term was 'music agraphia' (inability to write music).

The following table outlines the classifications of amusia made by Knoblauch, Wallaschek, Brazier and Blocq. Knoblauch identified four additional disorders, not listed in the table, but did not give them names.

Knoblauch 1888	**Wallaschek 1891**	**Brazier 1892**	**Blocq 1893**
Amusia	Motor amusia		
Note deafness	Sensory amusia/ Tone deafness	Sensory amusia/ Tone deafness	Sensory amusia
Paramusia	Paramusia	Motor amusia	Motor amusia
Paragraphia	Music agraphia		Music agraphia
Note blindness	Music alexia	Note blindness	Music alexia
	Music amimie	Amusia for instruments	Music amimia

In order to diagnose amusia as a clinical syndrome, neurologists had to test patients to assess whether or not they exhibited impairments in music abilities. In his 1888 publication, Knoblauch suggested a systematic and standard assessment of music abilities in patients, both for perception and production of music. He felt this would better document music impairments. He did not offer specific tests or discuss how to assess music skills but he did discuss which skills should be assessed. Hermann Oppenheim conducted the first comprehensive music assessment in a neurologic patient.[41] Oppenheim described tests he used to assess specific skills in a patient who had lost the

ability to play his instrument (trombone). Oppenheim's tests were not, however, a standard set of tests used on multiple patients. In a comprehensive summary of amusia literature prior to 1895, Edgren noted that there was 'not much attention to developing tests'. As a result, the examinations are 'rather random and better viewed as a curiosity'.[42] In 1898, Bastian included several questions about music ability in his battery of questions to assess language functions.[43] It was not until the early twentieth century that standardised tests to assess music abilities were developed.[44]

Mental representation and processing of music

Discussion of different music impairments led to speculation about mental representation for music. A particular type of amusia could impair one way of thinking about music but leave other ways intact. A common approach was to classify mental images, or representations, for music into three types: auditory, motor and visual. Charcot discussed these as three ways of mentally representing language and included a fourth that used all three types to represent language.[45] Charcot implied that there are also four types of music thinkers, parallel to the four language types. Brazier described these three types as people who could hear music mentally (auditory) in the absence of an auditory stimulus, play/sing music mentally (motor) and read music mentally (visual) without looking at music notation.[46]

Wallaschek went a step further in his speculation about the three 'listening types'.[47] For each of the three ways of representing music, Wallaschek described two separate processes for mental representation: tone representation (*Tonvorstellung*), the perception/processing of individual elements of music (pitch, intervals, chords), and music representation (*Musikvorstellung*), the perception/processing of music on a higher, holistic level that combines individual elements. When listening to individual music elements (tone representation), a visual type would imagine the written notation, but when listening to an entire piece of music (music representation) a visual type would imagine images of landscapes, pictures or scenes. A motor type would associate music with movements needed to play an instrument (if listening to music elements – tone representation) or with more general body movements (if listening to an entire piece – music representation). A sound type would associate music with sound itself, rather than with a movement or visual image.

The three listening types can be traced to Théodule Ribot (1839–1916), a French psychologist, who was a close colleague of Charcot's and whose work influenced Charcot's ideas about aphasia.[48] Both Brazier and Wallaschek referenced Ribot, and Wallaschek may have met him at a conference in 1892 in London, which they both attended.[49] Ribot proposed that different types of people had different ways of conceptualising ideas: *Type concret, Type visual*

typographique and *Type auditif*.[50] Charcot, Brazier and Wallaschek borrowed this way of classifying mental representation of ideas and, particularly with Brazier and Wallaschek, applied it to music.

Wallaschek, as a musicologist rather than a neurologist, also applied his ideas to music criticism and music philosophy. In addition to classifying amusias and discussing mental representation for music, he adapted Jackson's ideas about music and emotional language. Wallaschek, like Jackson, argued that singing is an expression of emotion and dissociated from intellectual language. Based on observations of patients who could sing song texts in the context of aphasia, he argued that emotional language and intellectual language are separate brain processes. Wallaschek then applied this line of reasoning to the validity of nineteenth-century programme music.[51] Wallaschek was a critic of programme music (instrumental music that portrays non-musical meaning without using words, such as Berlioz's *Symphonie Fantastique,* that narrates a story about a young composer, or Smetana's tone poem *The Moldau*, that describes scenes connected with the Moldau river that runs through Smetana's homeland). Wallaschek argued that a programme is an expression of intellectual thought or language, while music is an expression of emotions; therefore, since these two types of thinking are separate, it is impossible to perceive both the programme and the music at the same time. As he stated in a music criticism piece,

> . . . communicating a program for orchestral compositions entirely misses the psychological apparatus, because a program is directed to the understanding of specific representations, thus to the intellectual side of our mental lives, which is actually physiologically separated from the emotional side.[52]

Thus, Wallaschek took ideas about music that developed within the study of aphasia and applied those ideas to music criticism. Wallaschek appears to be unique in his role as a musicologist involved in neurology issues.

Discussion

Music played an important role in the development of neurology as a medical discipline. Neurologists observed patients to study how different cognitive functions were affected by brain damage, with language being the most commonly studied function. Thus, early neurologists focused on the clinical syndrome of aphasia. By the 1860s music was used as a tool to look at one aspect of aphasia – how patients with aphasia, who could not produce words in conversational speech, could produce words in the context of singing. In the 1860s and 1870s neurologists expanded their

investigations to include other music abilities, such as reading and writing music. Music impairments or preservations came to be seen as part of the complex of symptoms making up aphasia, rather than a single tool (singing) to investigate language symptoms.

Once different music abilities were investigated, it became apparent that music was a complex cognitive system involving perception and production of music – playing, singing, writing, reading, memory, etc. In 1888, Knoblauch's diagrammatic model presented music as a distinct cognitive system, separate but related to language. Knoblauch's model predicted various impairments in music ability and he coined the term 'amusia', which led to classification systems for different types of amusias in the 1890s. By the early 1890s, amusia was recognised as a distinct clinical syndrome, with its own complex of symptoms, although the different types of amusia disorders remained parallel to aphasia disorders.

During the nineteenth century, music first served as a tool to investigate the symptoms of aphasia and then developed into a tool to help delineate a clinical syndrome specifically involving the processing of music (i.e., amusia). Although not commonly discussed in the history of neurology literature, music was an important part of the development of nineteenth-century neurology.

Notes

1. O. Dahlin, 'Berättelse om en Dumbe, som kan siunga', (On a mute who can sing), *Swenska Wetenskaps Academiens Handlingar* 6 (1745), 114–115.
2. A translation into English is found in: Julene Johnson, Amy Graziano and J. Hayward, 'Historical Perspectives on the Study of Music in Neurology', in F. Clifford Rose, ed., *Neurology of Music* (London: Imperial College Press, 2010), 17–30.
3. J. Gesner, 'Die Sprachamnesie', *Sammlung von Beobachtungen aus der Arzneygelahrtheit und Naturkunde* vol 2 (Nördlingen: CC Beck, 1770), 107–182.
4. A.L. Benton and R.J. Joynt, 'Early Descriptions of Aphasia', *Archives of Neurology* 3 (1960), 205–222, H.A. Whitaker, 'Neurolinguistics from the Middle Ages to the Pre-modern Era': Historical Vignettes', in B. Stemmer and H.A. Whitaker, eds, *Handbook of Neurolinguistics* (San Diego: Academic Press, 1998), 37–79.
5. P. Eling, *Reader in the History of Aphasia: From Franz Gall to Norman Geschwind* (Amsterdam: John Benjamin's Publishing Company, 1994), H.A. Whitaker, 'Neurolinguistics from the Middle Ages to the Pre-modern Era': Historical Vignettes', in B. Stemmer and H.A. Whitaker, eds, *Handbook of Neurolinguistics* (San Diego: Academic Press, 1998), 37–79.
6. F.J. Gall, *On the Functions of the Brain and of Each of its Parts: With Observations on the Possibility of Determining the Instincts, Propensities, and Talents*, trans. Winslow Lewis (Boston: Marsh, Capen & Lyon, 1835).
7. Benton and Joynt, 'Early Descriptions of Aphasia'.
8. Stanley Finger, *Origins of Neuroscience: A History of Explorations into Brain Function* (New York: Oxford University Press, 1994), F. Schiller, *Paul Broca: Explorer of*

the Brain (Oxford: Oxford University Press, 1992), Eling, *Reader in the History of Aphasia*, Witaker, 'Neurolinguistics from the Middle Ages'.

9. Paul Broca, 'Perte de la parole: ramollissement chronique et destruction partielle du lobe anterieur gauche du cerveau', *Bulletins de la Societe d'anthropologie* 1.2 (1861), 235–238, Paul Broca, 'Remarques sur le siège de la faculté du langage articulé, suivies d'une observation d'aphémie (perte de la parole)', *Bulletins de la Société d'anatomie (Paris)* 2.6 (1861), 330–357.
10. Paul Broca, 'Nouvelle observation d'aphémie produite par une lésion de la troisième circonvolution frontale', *Bulletins de la Société d'anatomie (Paris)* 2.6 (1861), 398–407.
11. J. Parrot, 'Atrophie complète du lobule de l'insula et de la troisième circonvolution du lobe frontal avec conservation de l'intelligence et de la faculté du langage articulé – Observation par M. le Dr. Parrot', *Bulletin de la Société Anatomique de Paris* 8 (1863), 372–401, trans. in Eling, *Reader in the History of Aphasia*, 53.
12. Walter Riese, 'The Early History of Aphasia', *Bulletin of the History of Medicine* 21 (1947), 322–334.
13. Anne Harrington, *Medicine, Mind, and the Double Brain: A Study in Nineteenth-Century Thought* (Princeton, New Jersey: Princeton University Press, 1987).
14. J.-B. Bouillaud, 'Discussion sur la faculté du langage articulé', *Bulletin de l'Académie Impériale de Médecine* 30 (1865), 724–781.
15. Bouillaud, 'Discussion sur la faculté du langage articulé'.
16. A. Trousseau, 'Discussion sur la faculté du langage articulé', *Bulletin de l'Académie Impériale de Médecine* 30 (1865), 647–657 and 59–75.
17. A. Trousseau and H. Belloc, *Traité pratique de la phthisie laryngée*, de la *laryngite chronique et des maladies de la voix* (Paris: J.-B. Baillière, 1837).
18. Trousseau, 'Discussion sur la faculté du langage articulé'.
19. J. Falret, 'Aphasie, aphémie, alalia', in A. Dechambre, ed., *Dictionnaire encyclopédique des sciences médicales*, vol. 5 (Paris: Asselin 1866), 5, 605–642, here 605.
20. Falret, 'Asphasie', 605.
21. Herbert Spencer, 'The origin and function of music. *Fraser's Magazine*, 56, 396–408 (1857), 406.
22. John Hughlings Jackson, 'Clinical Remarks on Emotional and Intellectual Language in Some Cases of Disease of the Nervous System', *The Lancet* 87 (1866), 174–175, here 175.
23. Johnson et al., 'Historical Perspectives'.
24. D.C. Finkelnburg, 'Niederrheinische Gesellschaft in Bonn', *Berliner klinische Wochenschrift* 7 (1870), 449–450, 460–462, R.J. Duffy and B.Z. Liles, 'A Translation of Finkelnburg's (1870) Lecture on Aphasia as 'Asymbolia' with Commentary', *Journal of Speech and Hearing Disorders* 44 (1979), 156–168.
25. Finkelnburg, 'Niederrheinische Gesellschaft', 450, translation in Duffy and Liles, 'A Translation of Finkelnburg's', 161.
26. Adrien Proust,'De l'aphasie', *Archives générale de médecine* 19.6 (1872), 147–166, 303–318, 653–685.
27. Hermann Oppenheim, 'Ueber das Verhalten der musikalischen Ausdrucksbewegungen und des musikalischen Verständnisses bei Aphatischen', *Charité-Annalen* 13 (1888), 345–383.

28. Oppenheim, 'Ueber das Verhalten'. See also A.B. Graziano, A. Pech, C. Hou, J.K. Johnson, 'Hermann Oppenheim's Observations about Music in Aphasia', *Journal of the History of the Neurosciences* 21 (2012), 1–16.
29. F. Moutier, *Aphasie de Broca* (Paris: G. Steinheil, 1908).
30. A. Kussmaul, 'Die Störungen der Sprache: Versuch einer Pathololologie der Sprache', in H. von Ziemsson, ed., *Handbuch der speciellen Pathologie und Therapie*, vol. 13, 182 (Leipzig: Verlag von F.C.W. Vogel, 1877). See also Julene Johnson and Amy Graziano, 'August Knoblauch and Amusia: A Nineteenth-Century Cognitive Model of Music', *Brain and Cognition* 51 (2003), 102–114.
31. D. Miliotti, *Lezioni cliniche dell'anno scolastico 1883–1884 sulle malattie del sistema nervoso* (Milan: Vallardi, 1885). See also Julene Johnson, M. Lorch, S. Nicholas and A. Graziano 'Jean-Martin Charcot's Role in the Nineteenth-Century Study of Music Aphasia', *Brain* 136 (2013), 1662–1670.
32. A. Knoblauch, 'Ueber Störungen der musikalischen Leistungsfähigkeit infolge von Gehirnläsionen', *Deutsches Archiv für Klinische medecin* 43 (1888), 331–352.
33. Julene Johnson and Amy Graziano, 'August Knoblauch and Amusia: A Nineteenth-Century Cognitive Model of Music', *Brain and Cognition* 51 (2003), 102–114.
34. Knoblauch, 'Über Störungen der musikalischen Leistungsfähigkeit'.
35. Richard Wallaschek, 'Über die Bedeutung der Aphasie für den musikalischen Ausdruck', *Vierteljahrsschrift für Musikwissenschaft* 7 (1891), 53–73, Richard Wallaschek, 'Die Bedeutung der Aphasie für die Musikvorstellung', *Zeitschrift für Psychologie und Physiologie der Sinnesorganie* 6 (1894), 8–32. For more discussion of Wallaschek, see Chapter 8.
36. Amy Graziano and Julene Johnson, 'Richard Wallaschek's Nineteenth-Century Contributions to the Psychology of Music', *Music Perception* 23.4 (2006), 293–304.
37. Brazier, Dr., 'Du troubles des facultés musicales dans l'aphasie. Etude sur les representations mentales des sons et des symboles musicaux', *Revue philosophique dirigee par Ribot* 34 (1892), 337–368, P. Blocq, 'L'amusie', *Gazette Hebdomadaire de médecine et de Chirurgie* 8 (1893), 86–90.
38. Brazier, 'Du troubles des facultés musicales'.
39. Blocq, 'L'amusie'.
40. Allen, G. (1878). Note deafness. *Mind*, 3, 157–167.
41. Oppenheim, 'Ueber das Verhalten', Graziano et al., 'Hermann Oppenheim's Observations'.
42. J.G. Edgren, 'Amusie (musicalische Aphasie)', *Deutsche Zeitschrift für Nervenheilkunde* 6 (1895), 1–64, here 5.
43. Henry Charlton Bastian, *A Treatise on Aphasia and Other Speech Defects* (London: HK Lewis, 1898). See Marjorie. Lorch, 'Examining Language Functions: A Reassessment of Bastian's Contribution to Aphasia Assessment', *Brain*, 136 (2013), 2629–2637.
44. C. Seashore, *Manual of Instructions and Interpretations of Measures of Musical Talent* (Chicago: C.H. Stoelting, 1919).
45. Miliotti, 'Lezioni cliniche'.
46. Brazier, 'Du troubles des facultés musicales'.
47. Richard Wallaschek, 'Die Bedeutung der Aphasie für die Musikvorstellung'.
48. Lorch, 'Examining Language Functions'.

49. A. Macdonald, 'The International Congress of Experimental Psychology, Held in London, August, 1892', *Science* 20 (1892), 288–290.
50. Theodule Ribot, *Les Maladies de la mémoire* (Paris: Baillière, 1881), 'Enquête sur les idées générales', *Revue Philosophique* 32 (1891), 376–388.
51. Richard Wallaschek, 'Über Programm-Musik,' *Die Zeit* (27 March, 1897), 202–203.
52. Wallaschek, 'Über Programm-Musik,' 202.

8

Origin Stories of Listening, Melody and Survival at the End of the Nineteenth Century[1]

Alexandra Hui

> Art does not surpass nature, but it makes the best of nature a part of daily life.
>
> Wallaschek, 'On the Origins of Music'[2]
>
> Was macht Moses?
>
> Ernst Mach to Eduard Kulke[3]

The standard narrative of the capital cities of the *fin de siècle* presents a cultural and political anxiety rapidly nearing a flash point. The art and the music, cultural historians say, reflect crises of identity that resulted in either a retreat to the past, into the mind or an all-out attack on tradition.[4] Politics similarly struggled with an identity crisis of sorts as the expanding franchise of liberal democracy gave voice to radical groups on both the right and the left. We are told, perhaps a bit whiggishly, that this pervasive political anxiety and impotence of the European powers set the stage for the eventual explosions of violence in the first half of the twentieth century.

Recent work by historians of science, however, presents an alternative characterisation, at least to describe the sciences of the *fin de siècle*. From physics to psychology, there was no crisis. In fact, the *fin-de-siècle* period was one of optimism and energetic anticipation.[5] Much like for the arts, it was a period of great creativity but unlike the standard narrative of the arts, without the anxiety. And yet the worlds of art, music especially, overlapped extensively with the worlds of science.[6] Given this extensive interaction between scientists and musicians, how might historians reconcile the discrepancy of optimism?

This chapter is an effort to do so. I explore points of contact between the world of science and the world of music. Certainly the socio-political tensions of *fin-de-siècle* Vienna were evident to the individuals examined: Ernst Mach, Eduard Kulke and Richard Wallaschek.[7] Their intellectual work can

be understood to be, in part, a response to their cultural context towards rather unexpected ends. Kulke's musical aesthetic and Wallaschek's ethnomusicological programme, when examined in relation to the evolutionary and psychophysical framework established by Mach, promote an equality of music tastes and music cultures. All experiences of music were valid. There was no wrong way to receive or generate music. In a period of increasingly shrill extremism that eventually exploded into social and political upheaval, such calls for moderation and equality might be understood as a path not taken.

Neither Eduard Kulke nor Richard Wallaschek are particularly well known these days. They are of interest to scholars because they reinforce narratives about *fin-de-siècle* Jewish cosmopolitan culture, early ethnomusicological trends, or the musical milieu generally. Much of the historiographical work on Ernst Mach has focused on his physics, his work on the shock waves of supersonic projectile motion especially, and his philosophy. His phenomenology, which Mach insisted could be reconciled with experimental science, drew the ire of Max Planck and Albert Einstein. Mach's eventual historicism, that is, his belief that ideas were specific to time and place, directly informed the Logical Positivist movement that developed in the twentieth century. Mach's extensive engagement with the music world has been completely neglected.[8]

The permanence of the ideas of these three men is to some extent beside the point. I am much more interested in how they interacted, what they talked and argued about, and the consequences of this engagement for their respective intellectual developments. All three were developing a new understanding of listening that was psychophysical and evolutionary and therefore individual and historicist and bound to musical aesthetics. By psychophysical, I refer to the approach employed by several natural scientists in the nineteenth century that was based on the assumption of a direct and measurable relationship between physical stimulation and psychical sensation.[9] Examining Mach, Kulke and Wallaschek's work within a framework of the psychophysical and evolutionary theories of their time reveals connections and correlations. A Hebrew Bible story becomes relevant to a series of experiments involving rubber tubes stuck in one's ears, which becomes the support for an argument that tribal war dances were critically important to the development of modern music. In the end Mach, Kulke and Wallaschek, each in their own way, arrived at positions of historical and cultural relativism. Ultimately, a search for origins was also a search for equality, equality of sensations, perspective and cultures.[10]

Mach, Kulke and Wallaschek pursued their respective studies of individual musical aesthetics as the music world was experiencing both tonal and political destabilisation. The Viennese music world was, during this period, witnessing a series of events that fuelled a shift in musical aesthetics generally. This shifting aesthetics of music, especially with respect to Wagner's

music, is a central part of this story.[11] There were also significant challenges to the aesthetic traditions of the European music world of the first half of the century such as new tuning systems and new sounds; not even the concert A was fixed. The new tones and new harmonies – and their appeal – threatened to undermine both the conception of sound sensation as universal as well as Western musical aesthetics as the most fully evolved.

In Vienna especially, the so-called War of the Romantics was particularly heated. Composers, musicians and music critics formed allegiances based on both style and larger, more philosophical beliefs about musical aesthetics. Johannes Brahms, Robert and Clara Schumann, and the violinist Joseph Joachim made up one such cluster in Leipzig. The music critic Eduard Hanslick was their mouthpiece. In the other corner, Weimar, calling themselves the *Neudeutsche Schule* was Richard Wagner, Anton Bruckner and, for a time, Franz Liszt. Much of the early criticism of the *Neudeutsche Schule* attacked the new florid composition and performance styles. The harmonies of Wagner's chords were jarring. The excesses of Liszt's virtuosic performances were tacky. The response by Wagner and his followers initially consisted of simply mocking the Leipzigers' conservatism, calling them a 'musical temperance society'.[12] These attacks from the Weimar group, however, would sometimes turn viciously political, in turns anti-Semitic and nationalist.

The politicised racialist discourse threading its way through music circles at this time, especially prominent in the large cities of Central Europe, must also be noted.[13] Much of this was fuelled by the introduction of a scientific concept of race hierarchy, rendered possible through the application of Darwinian evolutionary theories to culture; and successful because it reinforced pre-existing cultural assumptions about race and class. The music traditions of Jews and Gypsies had long been dismissed as the menacing product of Orientalist 'others'.[14] With increasing nationalism and anti-Semitism in the second half of the nineteenth century, this sense of menace became sharper and more antagonistic. Most notoriously, the writings of Wagner suggested that the proponents of autonomism in music were nothing more than a conspiratorial cabal devoted to promoting 'Judaised' music culture. The virulence of the racialised, anti-Semitic rhetoric in relation to music, invoking evolutionary theory as needed, cannot be ignored as part of the cultural context and indeed becomes central to the story being told here.

Mach had met Kulke in 1863 at the Café Griensteidl in Vienna. A number of musicians and music critics were engaged in a lively discussion on the nature of musical tones. Mach had spent the summer at the Vienna Physical Institute performing a series of psychophysical experiments on sound sensation with Joseph Popper. Unsurprisingly, he was intrigued by the musicians' debate and, upon being noticed listening in, was invited to join the discussion. Mach later explained that he chose to side with Kulke due to his more

sober and *wissenschaftlich* position.[15] From then on the two men saw each other almost daily until Mach received an appointment in Graz and later Prague. Mach wrote to Kulke, 'So we are both fit! You as a musical physicist. I, as a musician.'[16] The friendship and intellectual exchange that grew from this chance encounter lasted until Kulke's death in 1897.[17]

Kulke was the descendent of several generations of respected Talmudic scholars. He had studied mathematics and physics but, upon arriving in Vienna in 1859, devoted his energies to writing music criticisms, short stories and plays. Of the nearly 2000 published writings by Kulke, nearly 300 were these latter stories and plays, both humorous and tragic. These writings have been described as middle-brow ghetto tales in the tradition of Leopold Kompert.[18] His portrayal of German-Jewish folk life, most especially the distinctiveness of Moravian village life, would eventually earn him the honour of a collection of his ghetto tales being published by the Institut zur Förderung der israelitischen Literatur, which was devoted to producing works that offered Jews 'divine interesting and attractive reading for their leisure hours'.[19]

In his eulogy to Kulke, Mach noted that Kulke was often torn between living a life familiar from his youth and desiring to be 'treated no more specifically Jewish than specifically Christian, but only human'.[20] Indeed, Mach noted, Kulke infused many of his writings with the theme of the Jew in strange cultural surroundings. He once declined further academic training since it would have required he be baptised. Kulke had felt this would have been a betrayal of his faith, a sacrifice he was unwilling to make. Mach ended his eulogy with a description of his friend's great courage to oppose injustice. When the occasion called (and it no doubt often did), Kulke defied the 'raw anti-Semitism' of the arts, a standard far too few men followed.[21]

Extensive literature by both historians and musicologists examines the changing treatment of Western music's others at the end of the nineteenth century. Increased exposure to non-Western touring musical ensembles and field recordings newly possible due to the invention of recording and replay technology fuelled both popular and scholarly interest in external others.[22] This is perhaps best seen in the proliferation of new disciplines of comparative musicology and field ethnomusicology.

There was also a growing interest in folk music. This reflected a parallel interest in internal others, the non-Christians of Europe. Extending the work of Edward Said, musicologist Philip Bohlman has shown that the European preoccupation with musical others was an act of imagining its own selfness.[23] The folk song became the object upon which much of this perpetual juxtaposition of European selfness and internal otherness was imposed.[24] Further, Bohlman presents Vienna as the site of much of this conflict between selfness and otherness. There is, of course, extensive cultural and intellectual study of Jews in *fin-de-siècle* Germany and the Austro-Hungarian Empire and the identity construction of internal others more generally.[25]

I note these analyses in order to highlight that at the centre of the swirling music world of the increasingly brittle, anti-Semitic Vienna were Kulke and Hanslick, both Jews.

Wagner, for example, smarting from Hanslick's criticisms of the Viennese performance of *Lohengrin*, published a revised version of 'Das Judenthum in der Musik' in 1869. In this version, Wagner additionally singled out Hanslick for attack, criticising Hanslick's concealed Judaism, supposedly manifest in his writings, as anti-German. This essay is often cited as a flashpoint in the history of German anti-Semitism. Music and politics were deeply entwined in *fin-de-siècle* Vienna.[26]

It is thus a bit surprising that Kulke, who identified so strongly with his Jewish origins, surrounded himself with Wagnerians. He was friends with Franz Liszt, knew Hans von Bülow, Peter Cornelius and Anton Bruckner. Kulke had met Wagner on at least one occasion and had, in 1876, attended the inaugural Bayreuth Festival.[27] Kulke described his aesthetic heresy (*ästhetische Ketzerei*) as traceable to the 1854 performance of *Tannhäuser* in Prague. Kulke was at the time studying mathematics at the Prague Polytechnic and had no higher training in aesthetics. The opening chords were so beautiful. Kulke became at that moment an instant and enthusiastic supporter of Wagner's music. Friends and colleagues mocked him. They declared it impossible for a person of taste and education to find Wagner's music beautiful because it was not acoustically possible for it to be beautiful.[28] And yet, Kulke insisted, he knew that it was possible that *he* found *Tannhäuser* beautiful. All the scholars of the world, he exclaimed, would be unable to prove his own feeling to be otherwise.[29]

In 1863, the year that he first met Kulke, Mach was performing a series of psychophysical experiments in the hope of locating the mechanism of accommodation in hearing. Accommodation in hearing is the phenomenon by which an individual's deliberately altered attention resulted in a changed aural experience. Mach liked to demonstrate the phenomenon with the example of a short chord progression (Figure 8.1). The listener would hear the same chord progression differently depending on which tone of the chord the listener chose to focus on.[30] Another example would be the changed experience of a symphonic piece as the listener shifted their attention from the entire orchestra to focus just on the cellos. Note that Mach was relying on music to demonstrate the accommodation phenomenon – to do his science – from the very start. I have argued elsewhere that music was a proxy scientific language for Mach, a consequence of his constant and uninhibited engagement with the music world.[31]

Mach had initially believed that the ear, in response to actively changed attention, differentiated tone pitch through the contraction of various ear muscles (the tensor tympani and stapedius being the most likely). This was not unlike Hermann Helmholtz's physiological sign theory for vision except that, for Mach, the critical step was the *active* alteration of attention by the

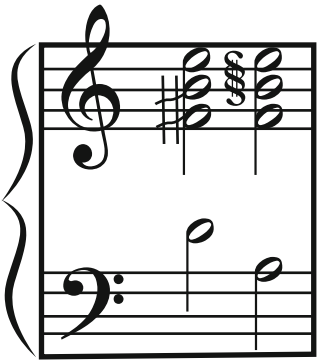


Figure 8.1 Chords for demonstration of accommodation phenomenon

listener.[32] A psychological change (altered attention) caused a physiological change (altered sensation): accommodation in hearing as Mach understood it was thoroughly psychophysical.

But he hoped the mechanism of accommodation was physiological, in which case it would be observable in experimental subjects. In the early 1860s he developed a series of experiments to do just that. First he needed to prove that sound waves behaved analogously to light, equally reflected and absorbed (and subsequently transmitted) by the eardrum.[33] He placed an assistant with a long rubber tube in his ear in another room. Then, from a position where the assistant couldn't see him, Mach very softly sang a constant tone while moving the other end of the tube back and forth relative to his ear. According to the assistant, the tone was loudest when Mach's end of the tube was near his (Mach's) ear. Mach's ear was amplifying the sound by reflecting additional sound waves. In a related experiment, Mach stuck each end of a tube in each of his own ears. Then, while singing a tone softly, he would pinch off the tube in the middle. He noticed a decrease in volume when the tube was pinched, presumably because his pinching had reduced the sound waves being reflected back and forth by his eardrums through the tube.[34]

In the summer of 1863, he was able to mobilise these findings in a new set of experiments performed in collaboration with Joseph Popper-Lynkeus and his students at the Vienna Physical Institute. The experimental subject (usually Mach) placed a vibrating tuning fork in his mouth and the end of a rubber tube in one of his ears. The other end of the tube was placed in the experimental observer's ear. As the tuning fork vibrated, sending sound waves both through the air and the subject's jawbones to their ossicles, the subject would slowly change his attention from the fundamental, or ground tone to various harmonic overtones sounded by the tuning fork. For the experimental subject, the phenomenon of accommodation was

at work: he could hear the overtones coming through strong and distinct from the fundamental tone as he changed his attention from one overtone to the next. But the observer, listening to the sound waves transmitted by the subject's eardrum through the rubber tube, heard no change in volume. Accommodation in hearing appeared to only be subjectively observable.

In an 1865 public lecture, 'Die Erklärung der Harmonie', Mach elaborated on the role of attention in an individual's subjective experience of music.[35] He turned to the piano to illuminate his point. An individual would hear the harmonic sequence of two different chords voiced the same (all tones the same loudness) in succession differently depending on which tones – the roots of the chord that changed or the upper tones that remained unchanged – they directed their attention towards. It was therefore, Mach explained, the art of music composition to guide the listener's attention. This was often done, for example, through the technique of voicing portions of the chords to bring out certain tones over others.

There was also, he continued, an art of hearing, which was not the gift of every person.[36] Only through extensive practice could one develop the ability to further differentiate a single tone into its fundamental tones and harmonic overtones. These overtones, Mach explained in a clear reference to Helmholtz's work on tone sensation, played an important part in the formation of musical timbre as well as the consonance of sound. Attention, in collaboration with the accommodation mechanism, enabled the individual to distinguish harmonic overtones, the root of Western harmony. Mach suggested that Western musical aesthetics both shaped and were the product of the accommodation mechanism of hearing. What might this say about individual tastes in music? What might this say about Kulke's aesthetic heresy?

Kulke's diaries suggest that Josef Popper-Lynkeus and Kulke were also close. They met regularly, sometimes daily. In July 1870, Popper-Lynkeus was reviewing Kulke's draft of a play, *Don Perez*, giving feedback on its tragic plot. According to Kulke's diary entry, they also discussed natural laws and causes. Following this entry Kulke noted a comparison between what he termed aristocratic and democratic aesthetics:

> Monarchin = Drama höchsten Kunstform
>
> Demokratin = alle Kunstformen gleichen Rang

Under a monarchy, drama was the highest form of art. In a democracy, all forms of art were of equal rank.[37]

To complete the intellectual triangle: Kulke and Mach were, through a series of letters in 1872, discussing variations of accents and languages. This led Mach to inquire: 'How is it that we do not hear exactly what the [Ancient] Greeks have heard, for example, what the Slavs still hear? Is this merely due to attention?'[38] Pondering this a bit more, Mach exclaimed that a history of

the evolution of melody, harmony and rhythm would be terribly interesting. This exclamation was likely a needling of Kulke, who had written a short pamphlet on the evolution of melody but refused to publish it (more on this shortly). In a later letter Mach continued with questions on the role of geographical location in accenting – what if a person were to move to a different place? And again, he wanted Kulke's opinion on a development theory of melody. Then he asked why the Germans and the Slavs phrased their melodies differently.[39] Kulke replied that the question was a historical one as well as a case for a further application of Darwinian evolution to the arts.[40] So, as Mach was experimenting on the role of attention in the sensory perception of sound and Kulke was exploring political systems tolerant of all musical tastes and artistic forms, they were both also questioning the extent to which musical aesthetics were, much like physiological attributes, subject to variation, inheritance and local conditions.

At the end of this exchange Mach included the postscript, 'Was macht Moses?' What's Moses up to? Or rather, how's it going with Moses? Kulke had begun working on a poem, 'Moses before Pharoah'. He would turn this into his 'Korah' play, an examination of Korah's rebellion against Moses. According to the books of Exodus and Numbers, Korah was one of the wealthy leaders of the Levites and a cousin of Moses and Aaron. He envied Moses and Aaron their priestly honours as well as the faith their followers put in their leadership over his, despite his wealth. He organised the neighbouring Reubenite tribe to conspire and rebel against Moses. Through clever campaigning and financial influence, Korah was able to convince 250 followers to speak openly against Moses' leadership of the people. Moses, upon hearing the accusations made against him, prayed to God for guidance and asked Him to show the Israelites whom He considered worthy of serving as His priests. The following day, Korah and his 250 followers, their families, and their belongings were swallowed by a fiery opening in the earth. Shocked, additional Israelites criticised what had happened to Korah under Moses' leadership. God smote all 14,700 of them with plague. The story of Korah the traitor is interpreted, both in the Hebrew Bible and the Qur'an, as a parable of mistaken interpretation of prophecy. Korah had foreseen that the prophet Samuel was his descendent and believed that he would not be punished for his treachery. Instead he was indeed punished for his imprudence but his sons were spared.

Kulke had sent the original 'Moses before Pharoah' poem to Franz Liszt in the hopes that the composer would turn the work into an oratorio. Liszt demurred, claiming to lack the ability to compose philosophy and politics in music, doubting whether it could be successfully accomplished by anyone.[41] Kulke eventually sent a copy of the finished 'Korah' play to Mach for feedback. Over the course of several more exchanges in the 1870s, Mach and Kulke discussed ideas of religious belief, especially in regards to the masses' belief in miracles.[42] Kulke had explained to Mach, that he believed Moses

was more of a man of instinct than thought. Korah, in contrast, took a more theoretical than practical point of view.[43] Kulke described how this point of view might have informed Korah's understanding of the prophecy. He included a particularly moving line from his play. Korah says: 'Death does not come to me, I go to him. I cannot live among you any more.'[44]

I'd like to push this a bit. Moses was a survivor, by instinct. His abilities and his leadership overcame trials to preserve his people (his species?) for generations to come. Korah, in this scenario, was selected out of the population. He could not live among the Israelites any more. According to Kulke, Korah took ownership of this fact, going to Death rather than waiting for Death to come to him. This agency over one's selection, this was not Darwinian evolution.

During the second half of the nineteenth century, there was a resurgence of support for Lamarck's law of inherited acquired traits.[45] If geographically and disciplinarily diverse, the neo-Lamarckism movement was unified in its beliefs in the shortcomings of the Darwinian evolutionary mechanism of natural selection. Lamarck's *directed* inheritance of acquired traits eliminated the unceremonious loss of unfit individuals in the struggle for existence. Essentially, neo-Lamarckism was appealing because it allowed individuals to control their own destiny; it was moral.[46]

Many intellectuals, Mach, for example, had read Lamarck before they read Darwin's *Origin of the Species*. As a consequence, Lamarckism informed their understanding of Darwin. Some – again, Mach is a good example – even expanded Lamarck's definition of acquirable traits to include psychical traits as well as physiological ones. Mach cited the work of Ewald Hering on the inheritance of memory. Hering argued that if Fechner's psychophysical correlation (that the physical and the psychical were simply two different manifestations of the same event) was true, then psychical traits should be just as inheritable as physical traits. Memory, he explained, was the unifying function of organised matter. Hering claimed that this suggested that, 'the development of one or more highly organised animals represents a continuous series of organised recollections concerning the past development of the great chain of living forms'.[47]

This Hering/Lamarckian theory of inheritance can be seen in Kulke's writings on the evolution of melody. Kulke had apparently written much of the text of *Über die Umbildung der Melodie: Ein Beitrag zur Entwickelungslehre* in the 1860s but it was only after extensive prodding by Mach that it was published in 1886.[48] While Kulke described his work as an application of 'Darwinian' theory he was also, perhaps only, thinking of the Hering/Lamarckian theory of inheritance. Clearly accepting of the theory of inheritance of ideas, even of collective cultural memory, Kulke wanted to test the applicability of evolutionary theory to musical melody.

To illustrate the evolution of melody, Kulke worked backwards. He began with the Andante movement of Beethoven's Symphony in C Minor (no. 5). When reduced to its dotted-sixteenth note motif, the Andante

movement was also the motif of a traditional *Bauerntanz* (a country dance) (Figure 8.2):

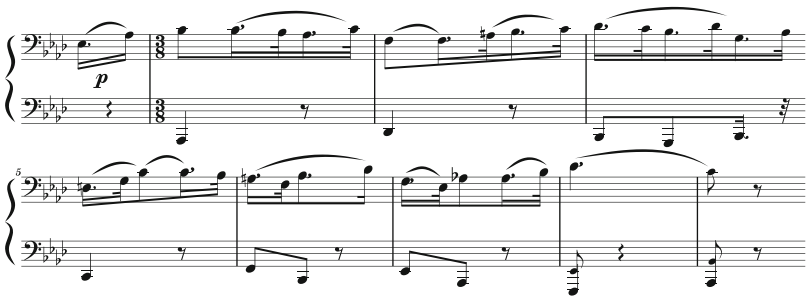


Figure 8.2 Theme from Andante movement of Beethoven's Symphony in C Minor. Kulke, *Über die Umbildung der Melodie*, 4

Kulke then further reduced this passage and noted that the theme was in fact a compound of two different components – physiological and psychological. He did not expand on this point but it should be noted that he understood musical aesthetics to be psychophysical.[49] Kulke then proceeded to address the repetition of the two-bar theme of the first two (complete) bars, which was paralleled in the third and fourth bars. A further reduction of the theme eliminated the strict symmetry but maintained the dotted-sixteenth motif. This dotted-sixteenth could then be extrapolated out for the full eight bars. In this form, Kulke explained, the Andante theme, was finally, or rather, originally, the *Bauerntanz* (Figure 8.3):

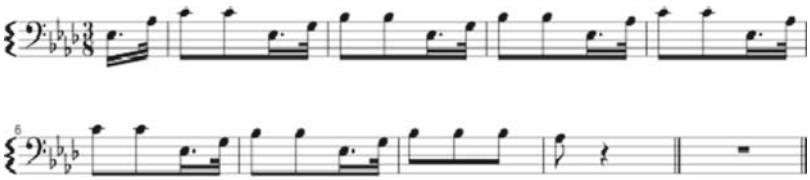


Figure 8.3 Kulke's example of the *Bauerntanz* motive similar to theme of Andante movement of Beethoven's Symphony in C Minor. Eduard Kulke, *Über die Umbildung der Melodie*, 7

Kulke performed several more similar analyses with Mozart's Piano-Violin Sonata in G Major and Lanner's 'Pester Walzer'. His work had, he believed, validated not only the application of Darwinian evolution to *geistige* structures but to melody in particular.[50] Kulke's analyses were, admittedly, a bit clumsy, as he seemed to believe that by demonstrating similarities of rhythm and melody he was demonstrating evolution. By all appearances,

Kulke simply reduced famous melodies to rhythmic approximations of older, traditional ones. This certainly suggested that some sort of melodic and harmonic development had occurred, but did not provide an explanation of how or why this development occurred. The mechanism of natural selection was nowhere to be found. Kulke had in fact presented very little that appears Darwinian but one can see elements of a Hering/Lamarckian conception of the inheritance of acquired ideas in Kulke's work. The melodies – the ideas – themselves were the individual organisms undergoing evolution. Certainly Kulke's work reflects a historicist conception of musical aesthetics but by so explicitly articulating musical aesthetics in evolutionary terms (both Darwinian and Hering/Lamarckian) it is clear that he also understood musical aesthetics to be psychophysical. So his efforts are notable for his goals if not his success in achieving them. And it is significant that Kulke repeatedly referred to his efforts as the application of evolution to melody and that, ultimately, he understood musical aesthetics to be evolutionary.

So did Mach. He had understood aesthetics to be evolutionary from very early on. In 1867 Mach had presented a lecture titled, 'Why Has Man Two Eyes?' in which he first addressed the question as a physiological one in which the two eyes were required for depth perception. But his discussion soon turned to a survey of the different visual aesthetic traditions of ancient cultures. Mach stated: 'Change man's eye and you change his conception of the world. We have observed the truth of this fact among our nearest kin, the Egyptians, the Chinese, the lake-dweller.'[51] He was suggesting that changing physiology – the changing of the sight organ itself – explained the variety of visual aesthetic traditions throughout time and place.

Later, in the 1880s, echoes of Hering's ideas about the transmission of psychical traits can be found in Mach's discussions of the development of knowledge. Mach described the humble beginnings of knowledge as the *halbbewusst* (half-conscious) and automatic *unwillkürlich* (instinctive habit of mimicking and forecasting facts in thought, of supplementing sluggish experience with the swift wings of thought at first only for their material welfare).[52] He explained that these 'primitive psychical functions' were rooted in the 'economy of the organism', like sense of motion or digestive abilities, and that such acts formed the basis of current scientific thought.[53] Humans as a species gained their knowledge through the experience of both its individuals and the species as a whole. The successful communication of this knowledge allowed for individual organisms' experiences to be preserved and inherited by subsequent generations. It was this successful communication, this 'economy of thought', which became Mach's central goal for science: 'economically arranged experience'.[54]

This economically arranged experience of the human race did not, however, explain the variation in individual aesthetics among them. He claimed that human notions of beauty could very well be different if their physiology was different. With that, Mach asserted that conceptions of beauty could be

modified by culture 'which stamps its unmistakable traces on the human body'.[55] Eternal beauty was a mistaken assumption. Had not in the recent past, Mach noted, all musical beauty been restricted to a five-toned scale? He concluded:

> To deny the influence of pedigree on psychical dispositions would be as unreasonable as to reduce everything to it, as is done, whether from narrow-mindedness or dishonesty, by modern fanatics on the question of race. Surely everyone one knows from his own experience what rich psychical acquisitions he owes to his cultural environment, to the influence of long vanished generations, and to his contemporaries. The factors of development do not suddenly become inoperative in post-embryonic life.[56]

Refined abilities, such as, say, musicality or musical taste, were subject both to psychical dispositions and one's cultural environment. Hearing was historicist.

At the end of the above passage, Mach cited the work of Richard Wallaschek, describing it as a sound and sober view. Like Kulke, Wallaschek had Moravian origins. He too was a music critic in Vienna, though after Kulke had already passed away. He habilitated in both law and philosophy. Mach was one of the examiners for the latter *Habilitation*, which Wallaschek published in 1886 under the title *Ästhetik der Tonkunst*. After a decade of bouncing from Freiburg to London, he was made an extraordinary professor of psychology and musical aesthetics at the University of Vienna. He also taught musical aesthetics at the conservatory of the Gesellschaft der Musikfreunde and wrote music criticism for the weekly *Die Zeit*. By refusing to commit to a side in the late nineteenth-century Wagner–Brahms feud of Vienna, Wallaschek was a rarity. He instead attempted to negotiate a treacherous middle ground, drawing on Brahms' great advocate, Eduard Hanslick's formalism in his own aesthetic theories and being generally complimentary about Wagner's compositions.[57]

Historians and musicologists consider Wallaschek's appointment to the University of Vienna to confirm the arrival of the new discipline of comparative musicology. Indeed, in his 1893 treatise, *Primitive Music*, he treats 'the importance of ethnology for the science of art' as an accepted fact.[58] Wallaschek's writings suggest that he understood the application of ethnology to music to consist of a careful combination of music history, 'theoretical observation' and evolutionary theory.[59] These 'theoretical observations', an aggregate of his own observations as well as those of other scholars, examined contemporary, European composers and musicians as well as those of 'primitive' cultures.

Beginning with the assumption that musicality was originally much more closely connected to everyday life, Wallaschek explained that, because

primitive music was the most similarly connected to everyday life, the examination of the music of primitive cultures would provide critically important insights into the history of music.[60] Not that, as Wallaschek was careful to note, primitive cultures were less musical or had less musical potential. All individuals were born with the same degree of musical ability. It was, besides training, a 'lack of examples and the social necessity of coming up to their level', that shaped individuals' demonstrated musical abilities.[61] Astonishing in his cultural relativism, Wallaschek further explained that more highly gifted individuals were 'the outcome of sudden favourable combinations, not the climax of a continual line leading up to them [...] the capacity for [art] is not a whit greater in the present generation than during former times'.[62]

Wallaschek's theory of the origin of music and musicality is a hybrid of the theories of Darwin, Wallace and Spencer.[63] Certainly some form of natural selection operates on the musical talent of individuals as well as determining the development of musicality at all. The question asked by many, including Wallaschek and Mach, was how musicianship developed despite it lacking an immediately apparent evolutionary advantage. Wallaschek turned to Spencer's suggestion that higher order organisms simply eliminate their competition rather than expend energy in constant competition. As a consequence, according to Spencer, higher order organisms have a surplus energy to devote to, say, activities. Wallaschek pushed this further, insisting that such a surplus energy was not a happy accident but rather an indication of how perfectly well adapted the organism was. The fact that the energy was a surplus, with no immediate applications, indicated that the organism had completely fulfilled its duty.[64]

This natural selection process did not, however, according to Wallaschek, fully account for the speed at which musicality and music itself has developed. Here he turned to the work of Alfred Russel Wallace.[65] Wallace credited imitation, memory, observation and reason for the formation of instinct in animals. Natural selection would, for example, operate on the birds that didn't imitate the other birds taking wing at the first sign of a predator. Wallaschek pointed out, however, that musicality does not confer the same qualities of survival on an organism like an instinct to not stand in front of an open-mouthed predator. Here Spencer was reintroduced: with their surplus energy primitive tribes engaged in war dances and pantomime (primitive drama). These activities were dependent on a high degree of natural rhythmic sense (the time sense that was the psychological root of music for Wallaschek) and performed together such that the tribe acted as *one body*.[66] Through this group act of imitation, the individual members of the tribe further develop their rhythmic sense and musicality. Simultaneously, the rhythms lent themselves to certain tones and intervals, fostering the development of musical melody. Harmony and scales would follow. Natural selection, Wallaschek claimed, was perfectly adequate to explain the origin and development of music.[67]

Compared to Mach and Kulke, Wallaschek offered a far more complete and detailed understanding of how natural selection would determine the origin and development of musicality and music. I would argue, however, that his understanding was a direct extension of their efforts to reconcile individual experiences of sound with an evolutionary and psychophysical understanding of the world. Through imitation, individual listeners recreated their experience again and again until they heard what they wanted to hear and generated the sounds they wanted to make. Individuals could actively alter their body to change their aural experience. The group act of a war dance or pantomime – let's call this culture – left its imprints on the body and on the music. Running Kulke's clock in reverse, through enough repetitions, the village's *Bauerntanz* became a Beethoven symphony.

Wallaschek's understanding of 'the examples and social necessity' that informed the development of musical ability was thoroughly psychophysical. He insisted that no influence on musicality could be purely internal or absolutely external. To both draw upon and affect its surroundings, such a quality would need to be both internal and external. Referring to Mach, Wallaschek suggested stepping out of this circular trap by acknowledging that internal and external events and processes to be correlative and inseparable.[68]

A bit tongue in cheek, he presents Wagner's inspiration for his *Der fliegende Holländer*: a sea voyage from Riga to Le Havre. Now certainly, Wallaschek continued, thousands have taken a similar voyage and not written such an opera. Wagner's work clearly did not owe its origin solely to external influence.[69] Another example, a more serious one, illustrating the development of music over time rather than a single piece: early in his career, Wallaschek explained, Wagner struggled against the popular 'easy-going style of the Italian opera' or the 'pomposity of Meyerbeer'.[70] *Das Liebesverbot* and *Die Feen* were failures. Wagner was not well suited to his environment. When he eventually capitulated to the tastes of the masses with *Rienzi*, he was essentially out-competed.[71] Wagner's appropriation of the pejorative *Zukunftsmusik* (music of the future) levelled at his work proved prescient.

By the 1870s Wagner was deemed a genius by contemporaries (the Brahms-Hanslick-Schumann team excepted).[72] His devoted followers, Wallaschek continued, were of the sincere opinion that 'in him not only music but the whole world in general had reached its climax'.[73] From this great height nothing new could be created; decline was inevitable. Wallaschek scoffed at this. Attempts to predict the future were futile, foolish even. Five thousand years of continuous innovation and creativity suggested that production had not simply come to a stop in 1883 with Wagner's death. Music was made '*for* us and [was] consequently subject to all changes *in* and *through* us'.[74] Music only obtained absolute perfection in the present.

So this all sounds very Spencerian. The individual most fit to its environment, subject to changes in it, survived. Several scholars have traced the late nineteenth-century use of evolutionary ideas by novelists, philosophers,

historians and anthropologists.[75] Musicologist Bennet Zon finds a similar impulse in the music world, most especially in Victorian conceptions of musical genius.[76] Zon presents changing descriptions of and explanations for Wagner's musical genius in order to trace increasingly Spencerian conceptions of musical genius; the Victorian belief that survival indicates fitness indicates genius. Wallaschek's discussion of Wagner is just one of many that Zon cites as an example of the use of evolution as metaphor.[77] I would like to push Zon's claim a bit further. Wallaschek's study of primitive music seeks to explain not only the instances of musical excellence in individual composers and performers but musical ability in humans generally. While Zon is correct in his suggestion that Spencer's evolutionary theory, by focusing on the survival of the individual, better lends itself to biographies of genius, Wallaschek appears in his work to be much more interested in the development of traits in whole populations, even species. Wallaschek is more of a Darwinian than Zon credits.

I split hairs here because, in employing a Darwinian focus on populations rather than individuals, Wallaschek moves beyond analogy to actual historical claims. He summarises his claims, stating that

> tribes which know how to keep time, which are accustomed to *play* at war and at hunting, associate more easily, act better in case of need, and, since association accounts for something in the struggle for life, such tribes are better prepared for it; for this purpose the musical faculty is developed and trained.[78]

Musicality developed in the human population through a combination of natural selection and imitation. This was not analogy, according to Wallaschek's understanding of the evidence. This was how it happened. These processes could still be seen in the present in primitive societies.

Let us return now to Kulke's aesthetic heresy. From the fact – the fact the *he* found it to be beautiful – of the beauty he found in 'Tannhäuser', Kulke came to the understanding that not all musical tastes were the same. Clearly his critics found Wagner abhorrent. Tastes varied. Which taste then, Kulke asked, was correct? Drawing on his initial direct experience of 'Tannhäuser' as beautiful, as well as careful study of philosophy and aesthetics, Kulke arrived at his aesthetic principle: equality of sensations (*Gleichberechtigung der Empfindungen*). His posthumously published two-volume work, *Kritik der Philosophie des Schönen*, was devoted to demonstrating this principle.

It was in the introduction to this work that Kulke described his devotion to Wagnerian aesthetics. Given the anti-Semitism Wagner held and encouraged, it is a little baffling that Kulke would dedicate this same work to Popper-Lynkeus, who had, since the 1880s been an increasingly vocal Zionist.[79] Similarly, Kulke dedicated his 1890 book, *Richard Wagner und Friedrich Nietzsche*, a discussion of Nietzsche's dramatic break with Wagner

as well as the fanaticism of Wagner's followers, to Hanslick of all people. What is to be made of this? Was Kulke guilelessly unaware of the currents of anti-Semitism in which he waded? Likely not. Recall Mach spoke of Kulke's unflinching willingness to speak against inequality and injustice. Above all, he believed in the equality of sensations, individual tastes.[80]

Indeed Kulke was critical of both the blind followers of aesthetic authority and those that would hold up the tastes of the majority as determinative of correctness. Kulke described the principles of authority and the principles of majority as opposites in battle, unable to defeat the other, unable to assert themselves, and therefore both wrong. Authority and majority 'are overwhelmed by the victorious Principle of Individuality, i.e. from the Principle of Equality of Sensations'.[81] To subordinate one's own feelings under another was tantamount to the abandonment of one's very identity. To refute an individual's aesthetic judgment was impossible and therein laid its great strength.[82]

I think we can now bring back Wallaschek's declaration that music was made '*for* us and [was] consequently subject to all changes *in* and *through* us'. I believe this captures perfectly the psychophysical nature of his, Mach's, and Kulke's historicism. Musical experience was determined by time, place and the individual doing the listening. Music survived *through* the bodies of listeners. Changes in those bodies changed the music, or at least the perception of it. If the organism, its environment and the way in which it perceived its environment were all in flux then the only just position to take was one of equality. At the end of the nineteenth century, in the face of a cultural totalitarianism awash with chauvinism, anti-Semitism and racism, Mach, Kulke and Wallaschek agreed: all sensations, perspectives and cultures were valid and equal.

Notes

1. I have previously examined portions of the material in this chapter of my book, *The Psychophysical Ear: Musical Experiments, Experimental Sounds, 1840–1910* (Cambridge, MA: MIT Press, 2012), and recent article, 'Changeable Ears: Ernst Mach's and Max Planck's Studies of Accommodation in Hearing', in Alexandra Hui, Julia Kursell and Myles Jackson, eds., 'Music, Sound, and the Laboratory during the Nineteenth and Twentieth Centuries', *Osiris* 28 (2013).
2. Richard Wallaschek, 'On the Origin of Music', *Mind* 16 (July 1891), 63, 388.
3. Ernst Mach, *Letter to Eduard Kulke* (Washington, DC: Smithsonian Institution Libraries, 22 October 1872).
4. Michael Roth, *Rediscovering History: Culture, Politics, and the Psyche* (Redwood City, CA: Stanford University Press, 1994), Carl Schorske, *Fin-de-Siècle Vienna: Politics and Culture* (New York: Vintage Books, 1981), Debora Silverman, *Art Nouveau in Fin-de-Siècle France: Politics, Psychology, and Style* (Berkeley: University of California Press, 1989).
5. Francesca Bordogna, *William James at the Boundaries: Philosophy Science, and the Geography of Knowledge* (Chicago: The University of Chicago Press, 2008), Deborah

Coen, *Vienna in the Age of Uncertainty: Science, Liberalism, and Private Life* (Chicago: The University of Chicago Press, 2007), Suman Seth, *Crafting the Quantum: Arnold Sommerfeld and the Practice of Theory, 1890–1926* (Cambridge, MA: The MIT Press, 2010).

6. Alexandra Hui, Julia Kursell and Myles Jackson, eds., 'Music, Sound, and the Laboratory From 1750–1980', *Osiris* 28 (2013), Myles Jackson, *Harmonious Triads: Physicists, Musicians, and Instrument Makers in Nineteenth-Century Germany* (Cambridge, MA: The MIT Press, 2006), Doug Kahn, *Noise, Water, Meat: A History of Sound in the Arts* (Cambridge, MA: The MIT Press, 1999), Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham, NC: Duke University Press, 2003), Emily Thompson, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900–1933* (Cambridge, MA: The MIT Press, 2002).
7. For more on Wallaschek, please refer to Chapter 7.
8. Mach's use of music in his search for the accommodation mechanism in hearing was not simply a consequence of the musical milieu. Mach deliberately employed music in his psychophysical experiments not simply as sound but as music. But Mach did not simply borrow music for his psychophysical experiments. He also offered up his findings to the music world. He wrote about sound sensation more generally for a musical audience, in musicology journals and encyclopaedias.
9. Gustav Fechner's *Elemente der Psychophysik* (Leipzig: Breitkopf und Härtel, 1860) is considered to be the first articulation of psychophysical monism. He argued that the distinction between the corporeal world and the *geistige* was only a matter of perspective and linguistic convention. The same event, depending on one's perspective could be either objective (physical) or subjective (psychical) but it was the same event.
10. This is a contrasting, though I would argue complementary, argument to that advanced by Alexander Rehding in 'The Quest for the Origins of Music in Germany Circa 1900', *Journal of the American Musicological Society* 53 (2000), 345–385.
11. See David C. Large and William Weber, eds., *Wagnerism in European Culture and Politics* (Ithaca, NY: Cornell University Press, 1984), Celia Applegate and Pamela Potter, eds., *Music and German National Identity* (Chicago: The University of Chicago Press, 2002).
12. Richard Wagner, *Ueber das Dirigiren* (Leipzig: C.F. Kahnt, 1870).
13. See Jacques Le Rider, M*odernity and Crises of Identity: Culture and Society in Fin-de-Siècle Vienna*, trans. Rosemary Morris (New York: Continuum, 1993), Schorske, Fin-de-Siècle Vienna.
14. See Edward Said, *Orientalism* (New York: Pantheon Books, 1978) for a general but thorough discussion of the West's construction of 'the Orient' as 'other'. See also Philip Bohlman, 'The Remembrance of Things Past: Music, Race, and the End of History in Modern Europe', Ronald Radano and Philip V. Bohlman, eds., *Music and the Racial Imagination* (Chicago: The University of Chicago Press, 2000), 644–676, Julie Brown, 'Bartók, the Gypsies, and Hybridity in Music', Georgina Born and David Hesmondhalgh eds., *Western Music and its Others: Difference, Representation, and Appropriation in Music* (Berkeley: University of California Press, 2000), 119–142.
15. Ernst Mach, Forward to Eduard Kulke's *Kritik der Philosophie des Schönen* (Leipzig: Deutsche Verlagactiengesellschaft, 1906), x–xi.

16. Ernst Mach, Undated (likely early 1860s) letter to Eduard Kulke, Smithsonian Institution Libraries, Washington, DC.
17. Between holdings at the Deutsches Museum Archive in Munich, Germany and the Smithsonian Institution Libraries in Washington, DC, over 80 letters and notecards remain of the correspondence between Mach and Kulke, spanning from 1865–1895.
18. Jonathan Hess, *Middlebrow Literature and the Making of German-Jewish Identity* (Redwood City, CA: Stanford, 2010).
19. N.G. Ein Wort, 'Sowohl im Interesse des Judenthums, als der jüdischen Literatur-Gesellschaft', *Jüdisches Volksblatt* 2.40 (1855), 157–158, 157 quoted in Hess, 114.
20. Ernst Mach, Forward to Eduard Kulke's Kritik der Philosophie des Schönen, xi–xii.
21. Ibid., xiii.
22. Béla Bartók, 'Why and How Do We Collect Folk Music? And Some Problems of Folk Music Research in East Europe', Reprinted in Benjamin Suchoff, ed., Béla Bartók Essays (Lincoln, NE: University of Nebraska Press, 1997), Claude Debussy, *Debussy on Music*, trans. Richard Langham Smith (New York: Knopf, 1977).
23. Philip Bohlman, 'Composing the Cantorate', 188.
24. Ibid., 190–191.
25. See Le Rider, *Modernity and Crises of Identity*, David Myers, *Resisting History: Historicism and its Discontents in German-Jewish Though*t (Princeton: Princeton University Press, 2003), Schorske, *Fin-de-Siècle Vienna*, Marsha Rozenblit, *The Jews of Vienna, 1867–1914: Assimilation and Identity* (Albany: State University of New York Press, 1984), and *Reconstructing a National Identity: The Jews of Habsburg Austria During World War I* (Oxford: Oxford University Press, 2001).
26. The original version was published in the *Neue Zeitschrift für Musik* and therefore especially stung the Leipzig music world, which had lost Mendelssohn only three years prior. Beyond an outcry from the faculty of the Leipzig Conservatory, however, there was little reaction to the piece. It is also commonly understood that the character of Sixtus Beckmesser in Wagner's 1868 opera, *Die Meistersinger von Nürnberg*, embodying several conventional, ugly Jewish stereotypes, was intended as a cruel caricature of Hanslick.
27. Bayreuth, with the completion of the Bayreuth Festspielhaus in 1876, hosted an annual performance of Wagner's monumental cycle *Der Ring des Nibelungen* and opera *Parsifal*. Attending the Bayreuth Festival quickly became, and continues to be to this day, a pilgrimage of sorts for Wagner admirers. It was the Bayreuth Festival, especially the inclusion of *Parsifal*, which prompted Nietzsche's disillusionment and very public break with Wagner. See Friedrich Nietzsche, *Der Fall Wagner* (Leipzig: Verlag von C.G. Neumann, 1888).
28. Kulke, *Kritik der Philosophie des Schönen*, vii–viii.
29. He noted that if he had only known his Kant at this time, he could have jettisoned all these criticisms with Kant's aesthetics.
30. The exercise consisted of listening to the two chords. Then, Mach would ask the listener (or reader) to focus their attention on the top notes of the chords as they were played again. The listener would find that the chords sounded different from the previous time. Mach would then ask the listener to focus their attention on the bottom notes of the chords as they were played one last time. Again, the individual's aural experience would have been changed by their altered attention. Ernst Mach, 'Bemerkungen über die Accommodation des Ohres', *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften* 51 (1865), 343–346. This same chord example was used in Mach's 1865 lecture 'Die Erklärung der Harmonie'.

31. See Hui, *The Psychophysical Ear*, and Hui, 'Changeable Ears'.
32. Helmholtz's sign theory of vision (which was based on Lotze's) was highly empiricist. He posited that the eye muscles would contract in order for the individual to spatially locate an object in the area of clearest vision (basically, the movement of the eyeball in order to look at something). Over time, the association between specific muscle contractions and specific locations in space became fixed, to be unconsciously referred to by the individual for the rest of their life.
33. Ernst Mach, 'Zur Theorie des Gehörorgans', *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften* 48 (1863), 289.
34. Mach later revisited this experiment and concluded that it was more likely that the pinching created reflected waves in the tube and that the interference of these waves with the original ones was what in fact led the weakening of the volume of the sung tone in his ears. Ernst Mach, 'Über einige der physiologischen Akustik angehörige Erscheinungen', *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften* 50 (1864), 345.
35. Ernst Mach, 'Die Erklärung der Harmonie', reprinted in *Populär-Wissenschaftliche Vorlesungen* (Leipzig: J.A. Barth, 1896).
36. Mach, 'Die Erklärung der Harmonie', 37.
37. Eduard Kulke, entries from July, 1870, Tagebuch, 5. Held at the Wienbibliothek im Rathaus, Vienna, Austria.
38. Ernst Mach, Letter to Eduard Kulke, 30 May 1872, Smithsonian Institution Libraries, Washington, DC.
39. Ernst Mach, Letter to Eduard Kulke, 22 October 1872, Smithsonian Institution Libraries, Washington, DC.
40. Eduard Kulke, Letter to Ernst Mach, 26 October 1872, Deutsches Museum, Munich, Germany.
41. Franz Liszt, Letter to Eduard von Liszt, 23 January 1876 (letter 182), *Letters of Franz Liszt*, vol. II, collected and edited by La Mara, trans. Constance Bache (New York: Scribner's Sons, 1894), 292–293, see also Franz Liszt's letter to Eduard Kulke, 23 January 1876 (letter 183), 293–294.
42. Ernst Mach, Letters to Eduard Kulke, 7 March 1873, 20 March 1873, 5 August 1873, and 30 September 1873, Smithsonian Institution Libraries, Washington, DC.
43. Ernst Mach, Letter to Eduard Kulke, 30 September 1873, Smithsonian Institution Libraries, Washington, DC.
44. Eduard Kulke, Letter to Ernst Mach, 8 January 1873, Deutsches Museum, Munich, Germany.
45. According to Lamarck, changes in the environment would prompt new 'wants' in an organism. This organism, acting on its wants, would change its behaviour. Through the repetition of this changed behaviour, the organism would alter its body to the point of acquiring new physical and physiological traits. These newly-acquired traits could then be passed on to its offspring.
46. The term 'neo-Lamarckism' was in fact popularised in the 1890s by George John Romanes' description of an increasingly polarised difference of opinions between the neo-Darwinists and neo-Lamarckians. Peter Bowler, *Evolution: The History of an Idea* (Berkeley: University of California Press, 1989/2003), 236–238.
47. Ewald Hering, 'On Memory as a General Function of Organised Matter', translated and reprinted in Samuel Butler's, *Unconscious Memory*, 2nd ed. (New York: E.P. Dutton, 1911), 80–83.

48. Eduard Kulke, *Über die Umbildung der Melodie: Ein Beitrag zur Entwickelungslehre* (Prague: J.G. Calve'sche K.K. Hof- und Univ.-Buchhandlung, 1884).
49. Ibid., 5.
50. Ibid., 15.
51. Ernst Mach, 'Why Man has Two Eyes?' Thomas McCormack trans., *Popular Scientific Lectures* (Chicago: Open Court Publishing Company, 1898), 82.
52. Ernst Mach, 'Die Ökonomische Natur der physikalischen Forschung', *Almanach der Kaiserlichen Akademie der Wissenschaft* 32 (1882), 298.
53. Ibid., 298–299.
54. Ibid., 304. Notice that according to Mach, there was a deliberateness required to economically convey knowledge to the next generation. It was not necessarily materially rooted in the memory of a nerve substance of the organism as argued by Hering.
55. Ernst Mach, 'Ueber die physikalische Bedeutung der Gesetze der Symmetrie', Lotos. *Zeitschrift für Naturwissenschaften* 21 (1871), 144. I have argued in my book that tracing Mach's discussions of the origins of sound sensation reveals that he was thinking in a historicist manner about the formation of knowledge as early as 1863, much earlier than credited by historians and philosophers of science.
56. Ernst Mach, *The Analysis of Sensations and the Relation of the Physical to the Psychical*, trans. C.M. Williams from the 5th (1897) German edition (New York: Dover Publications, 1886/1959), 309.
57. Ästhetik der Tonkunst drew extensively on Eduard Hanslick's formalism, employing the belief that beauty in music was abstraction to measure music itself and composer. On this basis, Wallaschek attacked Wagnerian opera as too sectarian and full of content to be beautiful. Wagner's music was, according to Wallaschek, the culmination but also the regression of the genre. See Sandra McColl, 'Positivism in Late Nineteenth-Century Thought About Music: The Case of Richard Wallaschek', *Studies in Music* 26 (1992), 34–47, Sandra McColl, 'Richard Wallaschek: Vienna's Most Uncomfortable Music Critic', *International Review of the Aesthetics and Sociology of Music* 29.1 (1998), 41–73.
58. Richard Wallaschek, *Primitive Music: An Inquiry into the Origin and Development of Music, Songs, Instruments, Dances, and Pantomimes of Savage Races* (London: Longmans, Green, and Co., 1893), v. Primitive Music was published in German in 1903 under the title *Anfänge der Tonkunst* and is often cited by that title and date.
59. Ibid., 277.
60. Ibid., 278–279.
61. Ibid., 279.
62. Ibid., 280.
63. Wallaschek and Spencer actually got into a small spat over their respective theories of the origins of music. Spencer locates the origins of music in language, citing song (human song, not animal song like Darwin, from whom Spencer distinguishes himself) as the first outgrowth of music. Wallascheck noted that song and spoken word came from different parts of the brain (citing studies of persons with aphasia). Spencer countered that Wallascheck misunderstood him. Wallaschek said, no he didn't. See Herbert Spencer, 'The Origin of Music', *Mind* 15.60 (1890), 449–468, Richard Wallaschek and James Cattell, 'On the Origin of Music', *Mind* 16.63 (1891), 375–388, Spencer, 'On the Origin of Music', *Mind* 16.64 (1891), 535–547, Wallaschek, *Primitive Music*, 253–356.
64. Ibid., 273.

65. Alfred Russel Wallace, *Darwinism: An Exposition of the Theory of Natural Selection with Some of its Applications* (London: Macmillan, 1889).
66. Wallaschek, *Primitive Music*, 275–276. Mach cites Wallaschek's researches on this in Analysis of Sensations.
67. Wallaschek, *Primitive Music*, 295.
68. Ibid., 267.
69. Ibid., 267.
70. Ibid., 285.
71. Ibid.
72. Wagner, for one, described his genius as follows: 'When I am alone, and the musical fibres within me vibrate, and heterogeneous sounds form themselves into chords when at last springs the melody which reveals to me my inner self: if then the heart in loud beats marks the impetuous rhythms, and rapture finds vent in divine tears through the mortal, no-longer-seeing eyes – then do I often say to myself, what a fool you are not to remain always by yourself.' Richard Wagner, quoted in M. Brown, *A Day with Wagner* (London: Hodder and Stoughton, 1911), 24–25. Quoted in Bennet Zon, 'From Great Man to Fittest Survivor: Reputation, Recapitulation and Survival in Victorian Concepts of Wagner's Genius', *Musicae Scientiae* Special Issue (2009–2010), 420.
73. Wallaschek, *Primitive Music*, 286.
74. Ibid., 287.
75. See Michael Howe, *Genius Explained* (Cambridge, MA: Cambridge University Press, 1999), Large and Weber, *Wagnerism*, Dean Simonton, *Origins of Genius: Darwinian Perspectives on Creativity* (Oxford: Oxford University Press, 1999), Andrew Steptoe, *Genius and the Mind: Studies of Creativity and Temperament in the Historical Record* (Oxford: Oxford University Press, 1998), Marc Weiner, *Richard Wagner and the Anti-Semitic Imagination* (Lincoln, NE: University of Nebraska Press, 1995), Bennet Zon, *Music and Metaphor in Nineteenth-Century British Musicology* (Farnham, Surreyt: Ashgate, 2000).
76. Bennet Zon, 'From Great Man to Fittest Survivor: Reputation, Recapitulation and Survival in Victorian Concepts of Wagner's Genius', *Musicae Scientiae*, Special Issue 2009–2010, 415–445.
77. Bennet Zon, 'From Great Man to Fittest Survivor', 418–419.
78. Wallaschek, *Primitive Music*, 295.
79. See Josef Popper-Lynkeus, *Fürst Bismarck und der Antisemitismus* (Vienna: H. Engel, 1886).
80. Likely this was the reason Hanslick accepted the dedication. Kulke wrote to him: 'The fact that you have accepted the dedication of this book is an honour for me but also an honour for you, because the returns on the one as on the other side a testimony of spiritual freedom. You are an enemy of Wagner's art work, I am a supporter of the same. And yet I may boast myself to please me your sympathy. Why is that? I'm perhaps not daring premise when I deduce this from a negative characteristic that we have both in common, namely, the lack of fanaticism.' Eduard Kulke, *Richard Wagner und Friedrich Nietzsche* (Leipzig: Verlag von Carl Reissner, 1890), v–vi.
81. Kulke, *Kritik der Philosophie des Schönen*, 342.
82. Ibid., 343.

9

Physical Distortion, Emotion and Subjectivity: Musical Virtuosity and Body Anxiety

Wiebke Thormählen

> In Liszt the most formidable physical forces meet the most sensual tenderness; the most impossibly complex mechanics of the body abut the most tender secrets of the soul, the most violent battles adjoin the sweet dreams of the innermost emotions.[1]

In the second quarter of the nineteenth century, the pianist Franz Liszt was at the centre of a rising cult of the musical virtuoso, a cultural phenomenon that was at once highly fashionable and highly contested. Descriptions of the pianist's performances typically painted him as an amalgam of paradoxes, resolved only by imagining him separated into multiple personae. Liszt astounded his listeners' eyes with displays of the physically impossible, simultaneously soothing their breathless astonishment with heart-rending sentimental expression. His performances presented a spectacle for the eye as much as the ear, falling somewhere between art and entertainment. This dichotomy, emerging across Europe in the early nineteenth century, separated the virtuous man of knowledge from the charlatan. In the German lands the dichotomy was particularly pronounced in the field of music. Whereas works of literature and painting shielded the audience from witnessing the mechanics of creation first hand, in music before the age of mechanical reproduction, the audience generally witnessed the visual spectacle of its mechanical creation.[2] In the wake of German idealism around 1800, this necessity for the visual led some to demand that expression be separated from the mechanics of its production. This demand, however, had deeper roots: the mechanics of performance drew attention to a single person's skills and therefore placed the performer's ego on stage. Yet a performer's physical presence, the subjectivity suggested in it, and his/her physiological feats, distracted from the higher truths that idealist philosophers and artists believed art must convey.[3]

This separation of the ego into a lower order of the physical (self-contained and self-referential and therefore incapable of higher meaning) and a higher order represented by the mind resonated across cultural and scientific discourses. Norbert Elias discussed the problematic status of the body as part of the 'secular tendency in the history of Western societies towards the formation of the notion of the body as a private self-enclosed entity'.[4] He demonstrated that strict limitations were imposed on the exposure of body parts and on the performance of particular bodily functions. Elias elaborated on the class divide that came into play as codes of physical conduct were first instituted among the upper echelons of society and gradually percolated downwards. As awareness of these distinctions became more widespread, corporeality became increasingly taboo among the middling classes.

In Germany as in other European countries the middle classes made up the audience that supported the relatively recent institution of the public concert. This meant that the classes most aware of and concerned with the presentation of the body were also those that reacted with such frenzy to the virtuoso. Concert culture, particularly in large cities, provided the means for the virtuoso to become a mystical cult figure. Here the virtuoso was presented at a distance from the audience; no longer was he a member of the audience in the manner of his predecessor, the travelling virtuoso performer of the late eighteenth century, who had first reached audiences in new locations via introduction at the intimate, sociable and conversational salons of affluent music lovers.[5]

In the nineteenth century, this distance between audience and virtuoso was key because the virtuoso's popularity flourished not in spite of his audience's awareness of the transgressions that he performed in his physical display but rather because of it. Placing the virtuoso – and the body's exertions in the act of performance – at a distance theatrically framed the problematic role of the body. Yet more than highlighting the body's complicated status in the display of social class and education, this spectacle framed anxieties over the role of the body in the display of and, more so, the creation of character, emotion and subjectivity.

That the body became particularly problematic and the virtuoso, in turn, particularly popular in German society, resonates strongly with medical perceptions of the location of emotions in the early nineteenth century.[6] Around 1800 Haller's neurological approaches to human sensation and, ultimately, to human emotion came under the influence of idealist philosophies. As a result, the emotions were gradually expunged from the body and their status as material processes redefined to make them cognitive sensations.[7] Joining the realm of ideas, reason and logic, the redefinition of the emotions as a matter of the mind purged the last vestige of subjectivity from the body, relegating physical existence to a supporting instead of a generative role. Descriptions of the virtuoso and of musical performers

generally, however, betray that such clear-cut separation of mind and body as the controlling force and its mechanical supplement was literally difficult to stomach for a middle-class audience, whose members experienced their emotions as sense perceptions and articulated them with reference to the body. Caricatures of Franz Liszt, for instance, seemingly pictured the pianist's body as having a variety of lifelines that were not necessarily commanded by the mind as one central force. The controversy of the body's independence led to the portrayal of the virtuoso as a madman or one who had sold his soul to the Devil, leaving only a body void of its central commander – the mind – behind. Verbal reports, particularly of Niccolo Paganini, conjured forceful images of madness. They pathologised his body's apparent sovereignty over his mind.[8] But as the pathological portrayal of the virtuoso made its way into verbal and visual images, gradually their represented body took on myriad layers of meaning, mirroring the virtuoso's changing socio-cultural status from the representation of virtue and of the aspiration to virtue to the displacement of the middle classes' anxiety over physicality.

Portraying character and physicality in the early nineteenth century

The physical eccentricity of Liszt's performances was described and caricatured in the mid-nineteenth century with an unprecedented frequency. These portrayals attempted to make sense of his doubtless staggering performances by portraying his performing persona variously as machine or as a multiplicity of agents with his arms seemingly as independent as Medusa's snaking hair. Frequently, Liszt appears larger than the piano in these caricatures, conquering the instrument with his all-embracing powers.[9] Yet what is most striking is the dynamism and movement in these caricatures, which does not appear in images of other virtuosi from Liszt's rival Sigismond Thalberg to the first quintessential Romantic virtuoso, Niccolò Paganini. In these images Liszt's figure commands the space with the distortion of his body, his limbs engaged in acts of balance that can only be sustained in movement, not stasis. His feet are stamping, his over-long arms circling through the air while his torso sways between them. His head lolls from side to side and back and forth giving at once the impression of instability and of an unfathomable coordination and coherence (see Figure 9.1).

These depictions of extravagant physical movement were foreign to eighteenth- and early nineteenth-century caricatures of musicians. In these the virtuoso does not appear as an object of satire. Caricatures of music-making such as those by James Gillray and Thomas Rowlandson mocked music-making's sociability and its function as a marker of social class. These caricatures captured a wide spectrum of incompetence from the

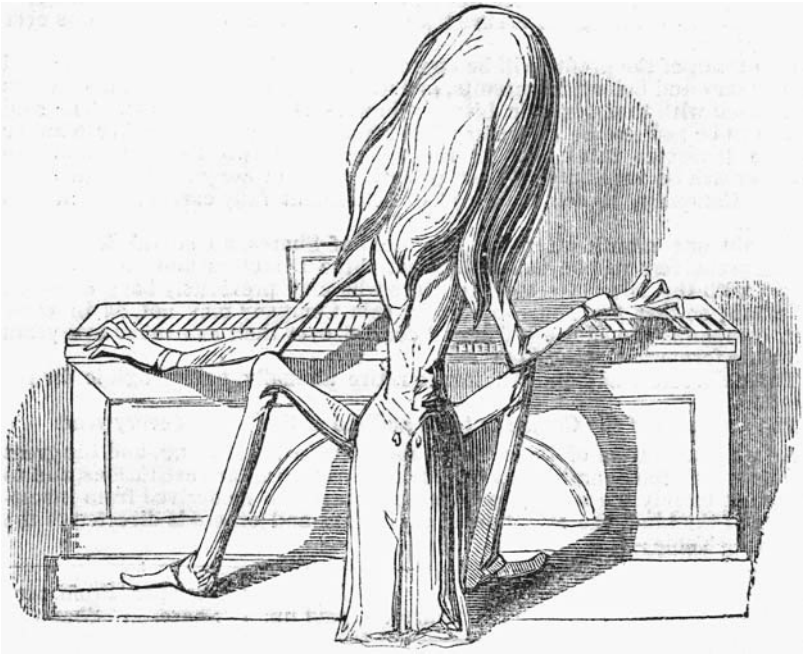


Figure 9.1 Caricature of Franz Liszt

foot-stomping, time-keeping fiddler accompanied by his short-sighted colleague to the sausage-fingered cellist incapable of accommodating the instrument among his mass of limbs. The images portray the mayhem and noise of turgid rather than agile performance. In these portrayals any physical distortion is more often than not caused by such mundane needs as trying to see the sheet music and is entirely extraneous to musical expression even in its widest sense.

Prior to the fashion for caricatures of musical virtuosi in the public press around the mid-nineteenth century, portraits of musical virtuosi visually immortalised them by indicating their social and cultural standing and significance. Eighteenth-century portraits displayed the musicians away from their usual activity of performance, reinforcing their standing as men of honour. This form of portrayal replicated notions of the virtuous man as one outstanding in his noble character and moral virtues.[10] An engraving depicting Pietro Locatelli (1695–1764) by Cornelis Troost, used as the frontispiece for the violinist's *L'Arte de Violon* first published in Amsterdam in 1733, literally put Locatelli into the frame, portraying his status rather than capturing the activity that led to his renown (see Figure 9.2). His virtuosity on the violin is referenced only in a wider sense by the placement of a curtain

Figure 9.2 Portrait of Pietro Locatelli

as a veil over a section of the portrait's oval frame; the theatrical curtain was commonly used in eighteenth-century portraits to reference the subject's performance in the widest sense of achievement.[11] Several books are placed in front of Locatelli to symbolise learning; the only reference to his actual profession is the scroll that is identifiable as a score. Yet, this signifier is particularly pertinent as a contemporary vision of the virtuoso since Locatelli, in contrast to many of his contemporaries, was famous purely as a violinist, not as a musician in a wider sense.

The Italian-born and widely travelled virtuoso violinist Giovanni Battista Viotti (1755–1824) was portrayed by Giovanni Trossarelli using similar

signifiers in the early nineteenth century. Like Locatelli he is portrayed as a man of letters and a virtuous character by Trossarelli's positioning of the violinist in an ornate chair at a writing desk, quill in hand. Although his position suggests that he is captured in the act of composing he is gazing at the viewer, not at the score that he is in the process of composing. Instead, the score portrays an artistic greatness that lies in composition, not in virtuoso violin performance. His learned artistic status is powerfully referenced by the imposing classical pillars that are placed centrally in the background covering as much space as Viotti himself, and by the theatrical curtain draped across the pillars.

Despite the stillness of these portraits, physicality played a vital role in the portrayal of social standing, character and virtue. But while Liszt's caricatures portrayed significant information about the picture's subject through the semblance of physical movement, in portraits across the eighteenth and nineteenth centuries this information was purveyed through a frozen pose. Exactly what was captured in the stillness, however, changed considerably. Around 1810 Lambert jeune engraved images of eighteenth-century violin virtuosi for reproduction in François Fayolle's *Notices sur Corelli, Tartini, Gaviniès, Pugnani et Viotti* which betray clearly the influence of Lavaterian physiognomic concepts.[12] Lambert grossly exaggerated the 'Italian' noses of both Gaetano Pugnani and Giuseppe Tartini (see Figure 9.3). He drew, perhaps, on the idea that a person's character (and with it his social standing) is manifest in the shape and proportions of his face, a theory popularised by Lavater's widely translated *Physiognomische Fragmente*. Lavater considered the Italian nose to be 'large and energetic', describing 'the open, breathing nostril [as] a certain token of sensibility, which may easily degenerate into sensuality'.[13] A comparison between Fayolle's image of Pugnani and other images of the violinist fashioned in the mid- to late eighteenth century betrays Fayolle's indebtedness to the portrayal of character through Lavaterian features. He portrays Pugnani's grandeur in a nose so hooked that it almost appears to caricature Lavater's idea that 'noses which are arched near the forehead are capable of command, can rule, act, overcome, destroy'.[14]

In the mid-nineteenth century, naturally, portraiture was still the most prestigious way to pay tribute to a virtuoso's status and grandeur, and portraits of Liszt noticeably reference his cultural status and his social identity.[15] The prominent Austrian painter Josef Kriehuber, for instance, created two lithographs of the pianist in 1838 to celebrate Liszt's sojourn in Vienna.[16] While these used external markers such as his attire to signal social class and cultural distinction, neither these lithographs nor a further one that he created in 1846 any longer portray grandeur through actual physical features, instead playing with posture and gaze. The 1846 lithograph shows Liszt sitting at a desk, his right hand resting on an open score while his left cheek rests on his left hand formed into a loose fist. His line of vision

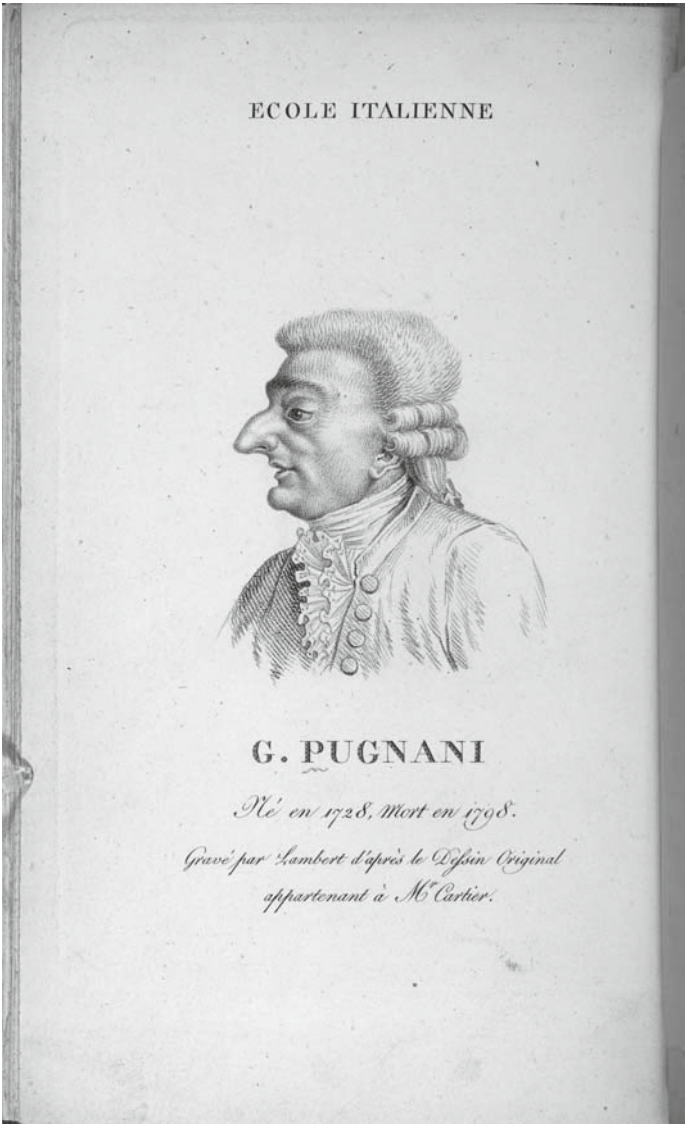


Figure 9.3 Portrait of Gaetano Pugnani

leads to the ground, yet his gaze extends into the unknown that is the infinite realm of his imagination. His artistry is referenced by these unseeing, yet far-sighted eyes coupled with a tantalising half-smile (see Figure 9.4). The latter is achieved by a faint movement in the cheeks. The expression

Figure 9.4 Portrait of Franz Liszt

created thereby appears to celebrate theories of expression that followed Charles Bell's successful *Essays on the Anatomy of the Expression in Painting*.[17] Bell analysed the action of certain muscles following his theory that humankind was distinguished from animals by their many and various

facial muscles whose complex actions allowed men to express their passions. Bell went so far as to claim that these motions of the face not only expressed but were also instrumental in *generating* emotions.[18] Here Bell presented his intervention in ongoing debates on the location, generation and function of categories of feeling and on the relationship of these feelings and sentiments to subjectivity and – by logical extension – to questions of creativity. For what Bell's essentially design-theological argument amounts to is that 'normal' humans ought to display the same physical reactions to emotion-inspiring events, yet it also raised the significance of artistic activity as humans could inspire particular sentiments and emotions in themselves by exercising the body in particular ways. Not only was it each person's duty to use the special physical arrangements of divine contrition for their pre-ordained purpose of communicating emotion, but Bell's theories – and those of some of his contemporaries – potentially placed new onus on the educational role of those arts that involved physical motion.[19]

With respect to the arts and to music-making in particular, this new role of physicality far surpassed the display functions of the eighteenth-century cult of sensibility. There, physical stasis had expressed sentiments and signified refinement yet was essentially a conscious contortion of the body in accordance with a cognicised emotion,[20] whereas now the physical expressions themselves were the emotions, in a chain of events that placed the recognition and conceptualisation of these emotions as the concluding step. As such, physical motion, not stasis, captivated the spectator and needed to be captured in a pictorial manifestation of emotions. What is more, it was the depiction of emotion through this motion that now signalled a person's achievement, taste and aspiration. As such, portraits of musical virtuosi of the early nineteenth century reflected general changes in the conceptions of body, mind and emotions, rather than indicating changing perceptions of the musical virtuoso per se, and it is surely indicative of a conscious attempt to elevate controversial virtuosi through a visual display of their refinement in these portraits. Yet, in so doing, these portraits nevertheless reference an increased significance of physical motion in the display of subjective qualities.

The changing perception of physicality emerges similarly from verbal descriptions of virtuosi. Mid-eighteenth-century descriptions certainly paid attention to technical prowess detailing this with reference to certain physical attributes. 'His intonation was pure, his trill beautiful, his breath control extraordinary and his throat very agile', wrote the theorist and flute virtuoso Johann Joachim Quantz of the castrato Farinelli in Friedrich Wilhelm Marpurg's *Historisch-kritische Beyträge zur Aufnahme der Musik*, 'so that he performed even the widest intervals quickly and with the greatest ease and certainty. Passage-work and all varieties of melismas were of no difficulty whatever for him.'[21] Although the

interconnection of physical attributes and technical performance is prominently described, neither is linked to expression or affect. In addition, descriptions of virtuosi in the newly fashionable almanacs and other collections of biographical information followed similar principles as their visual counterparts, the portraits, by promoting virtue over virtuosity and typically describing the subject's 'extraordinary strength and true, great taste'.[22]

A physical theatricality reliant on expression of emotions through performance became somewhat of a topos in descriptions of child virtuosi in the latter part of the century. Daines Barrington's famous 'Account of a Very Remarkable Young Musician', compiled on the young Mozart for the Royal Society in London and published in their *Philosophical Transactions* of 1771, as well as further notes on the musical child published in the *Miscellanies* of the same journal ten years later, stressed the emotional maturity which radiated from the young boy's performance, yet which disappeared the very moment he finished making music. This discrepancy between emotional expression in performance and the emotional maturity perceived to be appropriate for a child was equally prominent in descriptions of the 13-year-old child prodigy cellist Bernhard Romberg, who was described as performing with 'perfect tone and mature expression', the latter providing a 'stimulating pleasure' to the listener who perceives the boy 'as long as he plays [...] in all manner of things to be a mature man', which stands in contrast to his 'immediate return to the child's play that is appropriate for his age' after finishing a piece.[23] Maturity as a virtuous quality of a person's character, then, was produced by the motion of performance, and it escaped from view the moment this motion – be that in the actual moving body or in the changing facial expressions – ceased.

Both visual and verbal portrayals, then, illustrate motion's increasing prominence in descriptions and that this motion was linked to the performer's emotional expression as the latter became the yard-stick against which to measure the person's prowess, character, ambition and position in a cultural landscape. Liszt was portrayed as a victor by being a master of his physical motions as his 'spirit [...] masters the difficulty of the matter, and [...] the matter [...] willingly bows to the triumph of the spirit', and his hands become the tools of his enchantment as he creates for his audience the semblance of ease where he masters 'colossal difficulties'.[24] His body, it appears, expressed the genius of his spirit, yet this ingenuity was not carved onto his face but appeared in view through the body's motions, contortions and exertions.

Veracity and virtuosity

In musical performance, tying expression to physicality and considering the interaction of the two as the representation of a person's artistic worth

became controversial before it could come to full fruition. On the surface, the problems lay with the all too easily reproduced 'empty' theatricalities of performance that Mendelssohn famously mocked by mimicking Liszt's performance when discussing the pianist in the company of his friends.[25] The latter's performance gestures had become so extravagant and theatrical, his facial contortions amounting to a catalogue of expressions not unlike Charles Bell's sketches, that sceptics saw the physicality as entirely separable from the musical content of the performance.

In the 1830s vehement polemics against virtuosity began in earnest and they were particularly pronounced in Germany and France. Mendelssohn's mockery was perhaps a more humorous and, significantly, a more private engagement with the issues surrounding expression and the physicality of performance. In public, Liszt found himself at the receiving end of far more vicious and personal attacks. Liszt had spent his childhood and early adulthood perfecting the art of performance and was now facing the changing winds that rated his type of technical prowess as meaningless, or as a mere exercise of the body's mechanical parts. The obvious attempt to become a composer failed; instead Liszt reinvented himself in a variety of national contexts by superimposing theatrical discourses over his physical performance.[26] In Germany he presented himself as the interpreter of 'classics' and thereby managed to engage with early Romantic notions of interpretation and *Entrückung*, while in France he enacted the role of aristocrat and man of letters. Through influential friends he shaped at least one half of reviews and reports published about him and, significantly, he took great interest in his visual portrayal.[27] Yet opposition to his type of music-making was strong in the wake of German idealist agendas which proclaimed the superiority of the symphony; virtuosity, in turn, became a rhetorical device to off-set against the symphony's musical quintessence of truth.

The symphony was heralded the pinnacle of German concert culture by the nation's thinkers who stipulated their idealist views in the mushrooming specialist periodicals and newspapers. Countless reports, reviews and essays on myriad topics suggested an intellectual landscape – founded on idealism as an aesthetic as much as a philosophical principle – that prioritised matters of the mind over the material, tangible and physical. By placing spirit over matter, objects of the world, or phenomena that could be explained empirically, were considered to be reflections of a reality that lay beyond the physical in a spiritual world.[28] Art, then, was no longer understood to reflect or imitate nature but it became a gateway towards a universe beyond that which was accessible through the physical senses. The ego's intrusion into the presentation of art (i.e. the element of performance that virtuosity relied on) rooted this art in the here and now so that this intrusion necessarily discredited the work of art. The symphony, on the other hand, came with a host of attributes that turned it into the quintessentially idealist art form. Stripped of words, the symphony's meaning was by its nature uncoupled

from distinct concepts or narratives. What's more, the increasing number of performers in a symphony orchestra seemingly defied the intrusion of a single, prominent ego (although in reality, didn't the conductor fill that void? Sorry, I digress . . .), *seeing* the performer was replaced by *listening* to the performance.

Eighteenth-century concert culture – in the widest sense – is now generally accepted to have existed in spaces that were far from silent: audiences chattered during operas and incidental music, and domestic musical soirées were performed mainly for the purpose of interaction, communication and general sociability;[29] here music was seen as much as it was heard, and the individual performer – whether the star on the operatic stage or the visiting virtuoso in the city salons – demanded the audience's attention. Reviews of the opera, in particular, focused on the performers over and above the compositional intricacies of the score, and similar reporting priorities are found in contemporaneous travelogues, diaries and letters that recorded musical culture generally. The shift in the early nineteenth century towards a concert culture that revered music silently has been amply documented and much discussed, yet its relationship to shifting priorities of sense perceptions, toppling the supremacy of the sense of sight, has remained a subliminal feature in a narrative that focuses mainly on the rise of instrumental music over its concept-bound counterpart, vocal music.[30]

While in France silent listening became a feature of opera spectacles, in Germany the shift from seeing to hearing was perhaps more pronounced as it was coupled to this shift in emphasis from opera to instrumental music and, most prominently, the symphony. German musical aesthetics fuelled the shift in a broad move from naturalist understandings of music to idealist aesthetics. Eighteenth-century music theorists, composers and musicians had operated primarily within the notions of naturalism; they explained music's effect in mechanistic terms based in a model of correspondence: music could move the passions in each individual because it mimicked the natural make-up of these passions. So as to explain the stirring of the passions, music theorists availed themselves of the languages taken from a variety of current and outmoded medical models. They regarded passions to be mental processes inspired by physical changes in the body, insinuating variously that these changes were reliant on animal spirits flowing through hollow nerves, humours and therefore personal temperaments, or the vibration of nerves and fibres. Ultimately, musical stimulation remained rooted in physical stimulation and the mind recognised and conceptualised it after the event.[31]

Yet, the aesthetic shift from naturalism to idealism brought with it a new purpose of art: to inspire in the individual the *Ahnung* or premonition of an ideal realm.[32] Crucially, the realm of ideas was a matter of the mind alone, and although the sublime experiences that art could yield were accompanied or rather succeeded by physical reactions, the experience itself remained independent of these physical reactions in the body.

Music's emotional power, according to idealist aesthetics, lay in the mental idea of foreboding which it conjured in the listener's mind. In a similar move, eighteenth-century instrumental treatises such as Carl P. Emanuel Bach's highly influential *Versuch über die wahre Art das Clavier zu spielen*, published in 1753, and Leopold Mozart's *Versuch einer gründlichen Violinschule*, published three years later, had tied physical movement to musical effect and taught the former in direct relation to musical affects while, in contrast, nineteenth-century instrumental pedagogues brought forth a wealth of technical studies that exercised physical motions separate from ideals of expression. In other words, the methods for teaching musical skill reflected the replacement of the correspondence model – in which physical motion, the motion of music and the human passions were sympathetic to each other – with the 'inspiration model', in which a work of art functioned as an inspiration to construct in the mind the reality (believed to lie) beyond our physical experiences. As the mind and mental activity accelerated towards the realm beyond the phenomenal, the body, with its fetters of tangibility, had to be uncoupled.

Virtuosity's physical spectacle, then, presented the wrong kind of exertion. Instead, listening to music became a strenuous activity that required virtue and mental virtuosity in itself. This act of listening became central to the particular German concert culture that was based on the new ideology of 'serious' music, defined as music that could sustain the strenuous mental activity of listening and inspire the mind into action. What's more, according to the prolific and influential intellectual press, this concert culture in turn formed a central part of the education and self-fashioning of the individual, particularly to his/her intellectual and emotional *Bildung*. In continuity with the use of music-making in the eighteenth century, learning an instrument and participating in music-making still served to display social status. Emotional maturity, however, was achieved not through the making of music together with others, but by attending concerts of serious music. E.T.A. Hoffmann in his review of Beethoven's Fifth Symphony of 1810 adumbrated music's new role as 'unlock(ing) for man an unfamiliar world having nothing in common with the "world of the senses" which surrounds him'.[33] Serious music was morally superior because it facilitated solitary involvement in the world beyond the physical reality of the senses. This valorisation of the mind came at a high price for the virtuoso whose art remained reliant on the visual perception of physical feats.

This concert culture and its grandiloquent ideals was, of course, manufactured to aid in the process of unifying a newly-enlarged and pan-Germanic bourgeoisie through the semblance of a common cultural heritage that extended beyond mere shared educational and intellectual codes to reach the individual's emotional life.[34] Whereas the reform of the school system and its widened radius aimed to control a new social class and lead its economic role within the state, the arts – and music in particular – were used to unify this class emotionally. A series of socio-didactical articles appeared

in specialist journals such as the *Allgemeine musikalische Zeitung* in defence of a music that was deemed infinitely more important 'as the most excellent means of education, in order to develop a pure and noble spirit, to weave love of the good and beautiful in general, and of virtue and religion, deeply and intimately into our being, so that they remain forever inseparable'.[35] The inculcation of these values of nobility and morality allowed concert culture to become a control mechanism for the nation's emotional radius.

In practice, however, the complexity of serious music posed a serious intellectual challenge to its audiences. One response to the challenge was to seek relief within the challenging music, while another was to avoid the challenges posed by symphonic concerts and to cultivate amateur music-making, *Liedertafeln* and virtuoso concerts instead.[36] On the one hand, then, scholars have argued that moments of monumentality and crudeness entered this music to offer relief from the strenuous efforts of listening.[37] These moments of relief were offered in spite of all educational ideals because concert culture was economically reliant on the new, much larger bourgeoisie. Virtuosi concerts enjoyed huge popularity, which was testified to not least by the number of intellectual articles discussing the phenomenon. That they may have offered a similar relief from the strictures of highly poetic music and its moral educational ideals was perhaps best expressed in the frenzied enthusiasm with which these concerts and their stars were greeted by the audience. In reverse, the paper and ink spent abhorring this new cult of virtuosity in the intellectual press attests to the threat it posed as much as to the relief it offered those defending it.[38] Early on, the critic Wilhelm Triest had suggested in the *Allgemeine musikalische Zeitung* that the virtuoso's enduring popularity might lie in the German soul's love for diligent practice, yet he juxtaposed the popular virtuoso with the 'true virtuoso', a term under which he subsumed those musicians whose credentials went beyond the mechanistic manoeuvres of actual music-making that he associated with the dilettante.[39] The 'true virtuoso' was virtuous in his knowledge of music, composition and counterpoint, capable of inspiring the mind rather than just stirring the senses. Triest implied that the popular virtuoso, however, allowed a more direct process of identification for the audience who could see in the spectacle of one who surpassed all possible goals of technical study their own fantasies of the limitless possibilities that could reward a well-honed work ethic. Yet as the craze for virtuoso performances grew, the virtuoso's power over the soul grew beyond a mere reflection of ambition and diligence as it came to soothe deeper-rooted anxieties over the definition of subjectivity.

The body, the anxiety of subjectivity and the virtuoso

Liszt's contemporaries, particularly those deriding his virtuoso performances, made much of the visual theatrics that he brought to his piano-playing, accusing him of a deliberate exploitation of his on-stage

performance which they deemed entirely independent of his music-making. For his audiences, however, his very fascination lay in the fact that he placed his performing body at the centre of attention, at a time when intellectual and medical discourses demanded tight control over all matters physical. By the early nineteenth century the body had come to be considered a problematic aspect of human identity.[40] Through educational policies focusing on hygiene and through state-administered interventions in hygiene and medicine, governments across Europe gradually assumed control over the body. Medical historians have documented the re-organisation of medical care around hospitals in the early nineteenth century as an equalising of care to a broader section of society.[41] With these measures, the state refashioned health as a fundamental part of liberty and assumed control over the health of the nation by claiming responsibility for its citizens' welfare. As such, developments in medical care were a result of the late eighteenth-century revolutionary values of equality, liberty and self-determination. Yet, the focus on liberty led, paradoxically, to the loss of liberty and self-determination for most in the case of illness.[42] So as to grant the health of the middling classes, all citizens had to be medically controlled; this was achieved through the implementation of a hospital system. Yet, hospital care involved a fundamental redressing of the balance of power between patient and practitioner in a fundamental cosmological move from person to object. No longer did the practitioner negotiate with his patient, but he treated the body's pathological conditions in a series of procedures that were quite separate from the person's mind, soul or emotions.

The suppression of the patient's voice was tantamount to the extrication of his/her individuality from the body, as was the objectification of the body as an entity separate from the person. Voice, thought and emotion were no longer considered as part of the body. In Germany, these ideological developments manifested themselves in a clear separation of matter and spirit in the education of the individual. Body and mind were exercised entirely separately from each other: as the mind was to be educated, stretched and moulded through the arts, the body was to be trained in specially designed new *Turnvereine* that proliferated, especially across Prussia, ostensibly to train young men to military fitness.[43] Based on an elaborate extension of the idea of the six non-naturals, *Turnvereine* offered a space in which the body was exerted so as not to interfere with the mind. The latter was the space of individuality and noble emotion that helped in the control of the body, which had to be kept in a state of health so that the individual could thrive mentally without distraction, be productive and therefore economically useful to the state at large.[44]

The interest in the body as a controllable entity – ultimately an outcome of Descartes' distinction between mind and body – facilitated a new understanding of the self, which was invariably explored in reference to the emotions as these appeared to be at once material processes of the body

and cognitive perceptions of the mind.[45] As such, the purely conceptual framing of the emotions as it emerged in the early nineteenth century, confining them to being a matter of the mind alone, proved troublesome even to the educated classes who made up the audience of both culture and organised sports. They still 'felt' their emotions physically, and most prominently described them as being located in the heart.[46] If the pain of lost love was felt as a tightening around the chest and as a palpitating of the heart, how could emotions not be bound by the physical? The persistent and entirely non-negotiable perception of emotions as physiological alterations rendered unconvincing the claim that these embodied emotions were merely expressions of affects and were entirely superfluous.

In descriptions of virtuoso music performance, the emotions frequently form a tangible physical part of the performer's identity while the spirit or soul are their companions. 'The blood boils, the pulse races and the nerves tremble', said one reviewer of one of Liszt's particularly spectacular performances, 'while his soul levitates in Olympian transfiguration'.[47] Far from being merely reactions, here the performer's emotions are theatrically embodied as causal agents as if Liszt were externalising – through the technical feats of his virtuoso performance – those feelings of embodied emotions which his audience so clearly recognised. The spirit, to be sure, was considered to give the impulse, yet the actual felt emotions, in this model, emanated from the body. As the commentator for the *Revue musicale* explained it, 'the artist's fever seemed to take him as if by an electric commotion from the instant his hand touched the keyboard'.[48] In this as in other descriptions of Liszt's playing, the pianist's inspiration was inferred from his bodily motion, not from the sounds of his playing. The body became at once the motivating force and the unifier of the emotions that corresponded with the lofty heights of the spirit's imagination.

Virtuoso performance, then, responded to the anxiety over the location of subjectivity sparked by the prominent aesthetic discourse of German idealism that had placed the onus of ingenuity and creativity solely in the mind. The virtuoso performance was theatrically constructed – both on stage and in reviews – to be proof for what everyone could feel: that the body-machine exerted influence on the mind and interacted with the latter's spirit in important ways. During the course of the early nineteenth century, the virtuoso became a paradigm of the commonly felt ties between mind and body. Popular caricatures of Liszt, published in newspapers and periodicals, played on precisely these ties as they prominently displayed body and mind, the latter represented not by a face that would portray specific emotions or noble character – the function it served in portraits – but by a head comically enlarged by its hair (see Figures 9.1 and 9.2). Here, two forces were clearly locked in battle as the prominent head portrayed the ingenious mind whereas the scrawny, yet agile body portrayed the physical. Liszt's physiology, in fact, appears to be portrayed with reference to images of mechanics

as the angularity of both moving and still limbs recalls charts of physical forces, thereby pitting the machine against the mind.

Yet beyond the mechanisation of the body, these images illustrate the endurance of the popularly perceived relationship between a noble mind and a sensible body. Liszt's portraits suggest that he did not have the tall and starved stature of Paganini, yet in these caricatures Liszt is reduced to the skinny physique that had become a feature of Paganini's portrayals in both caricatures and serious paintings. This portrayal, on the one hand, surely was an homage to the quintessential virtuoso. At the same time, however, this portrayal referenced late Hallerian theories of the body's sensibility: Liszt was deliberately reduced to his nerves alone (when the level of activity portrayed clearly demanded muscles!). Haller had separated the body into muscles and nerves, giving each clearly-defined respective functions of irritability and sensibility.[49] Liszt was portrayed as hyper-sensitised but, in an extension of Hallerian theories of nervous physiology, his sensitised body appeared to possess its own life forces. 'No system of words can accurately describe the power which Liszt possesses of dividing himself, as it were, into two, or sometimes, even, three performers', a reviewer for the *Musical World* observed in June 1840, and he described Liszt's performances to consist of 'obviously unreachable extensions', and 'playing figures of opposite character, widely-contrasted power', that 'run through and intersect each other with the utmost freedom of motion', while 'an arpeggio bass of large dimensions [...] continued uninterrupted'.[50] Here, Liszt's technical feats are attributed their own agency as the subject Liszt is divided into a variety of forces. Both caricatures and descriptions of his performances illustrated that the overriding feature of his virtuoso display was the demonstration that a singular sovereignty of mind over body was a fallacy and that the body's parts controlled the action.

Caricatures of Liszt's performances went even further as they satirised the idea that individual parts of the body contain energy and life force and herein responded to another step in the medical separation of mind and body that was explored by German physicians who developed Haller's nervous physiology. In Germany, physicians such as Johann Christian Reil, Johannes Müller and Johann Friedrich Blumenbach purported the idea of an independent 'life force', or *Lebenskraft*, as resident in the body in an attempt to explain – in mechanistic terms – the phenomena of generation, nutrition, repair and other physiological processes which did not follow an external stimulation. In his *Von der Lebenskraft*, Reil concluded from Haller's separation of the heart from both brain and body that *Lebenskraft* is an effect of the organisation of the material of the body itself.[51] He veered between physical and chemical descriptions of matter's inherent force which could be set in motion by external stimuli such as warmth, light or electricity. Significantly, *Lebenskraft* was not an immaterial principle akin to a soul, but an organic structure.[52] This mechanisation of the body's generative processes

uncoupled the emotions further from sense perception and removed them essentially as motivating forces further from the body and into the mind.[53] The body's own motivating forces were now reduced to mechanical principles alone and this redefinition could no longer account for the emotions as being *of* the body, thereby feeding into the idealist philosophy which simultaneously redefined the emotions as being experiences felt in the body, yet born of the mind. In fact, Reil framed 'the organ of the soul' and with this the emotions as an external stimulus that would influence the vital forces of the body's organs alongside others such as age, seasons, the moon, the time of day and sleep.[54] In a move reminiscent of the socio-medical discourse on the six non-naturals, Reil demanded the control of these external stimuli as a way to control the body.

Whereas the caricatures of Liszt satirised the idea that mechanistic generative forces might be operative in the body, thereby caricaturing anxieties over the role and location of emotions as much as satirising the cult of virtuosity, straight-faced commentary on the virtuoso performer embedded the emotions in the body as motivating forces and therefore retained the idea that the body forms part of a person's subjectivity, not just his/her mechanical shell. '(Liszt's) technique is home to every nuance and sentiment of the soul', one reviewer explained in a comparison between Liszt and Thalberg in the *Musikalischer Anzeiger*. 'The sublime and the capricious, majesty and grace, melancholy and dallying, the ugly and the tender – all of them have found their homely organs here, and they function in peaceful co-existence with each other.'[55] Here, the author ruled out both the idea that virtuosity is merely attention-seeking and the theory that the body's forces are purely mechanical. By drawing the connection between technique and expression and, significantly, between physicality and emotion, the reviewer refuted the idea that the body merely reacts to the emotions of the thinking, conscious mind, but portrayed body and emotions as embedded in each other.

As such, the reviewer leaned against the increasing mechanisation of the body and refuted that Liszt might be a representation of this process and, as such, a spectacular display of science, void of emotion, expression and subjectivity. He answered Liszt's critics who had purported that the pianist's type of musical performance was void of any link to the higher truth that art can present to the inspired mind. Replying to these allegations, the reviewer also refused to accept the body as an impediment to the eternally striving mind, insinuating instead that the mind was reliant on the body to propel the emotions to ever-loftier heights of sublime experience. Liszt's genius and his inspiration, in the eyes of his defenders, resided in his emotions or, more precisely, in 'the floods and storms of his heart, which alone could master the chaos of his burning emotions'.[56]

Liszt's popularity and the increasing celebration of the virtuoso among the concert-going bourgeoisie formed a significant reaction to the increasing

separation of body and mind and the increasing institutionalisation of body control. The latter had led to the derision by public voices in medicine and in aesthetics of overt displays of physicality – those that centred around a display of the body – as much as to the derision of the display of emotions through this physicality and the display of personal identity through both. However, neither the suggestions that the virtuoso was either an entity or a body-machine 'gone wrong' nor suggestions that his mind was placing his ego above the display of art could quell the popularity of virtuoso performances.

It is significant that a pathologisation of the physical displays of the virtuoso played into the rhetorics of both the dismissing and the defending parties. One of Liszt's most ardent defenders acknowledged that 'many have thought that they see in Liszt's production a pathological stimulation'.[57] The idea that over-stimulating the body could result in ill health was, of course, a heritage from theories of the six non-naturals that had trickled into aesthetic and cultural discourses as much as they had been retained – in various guises – in medical theories. For Liszt's critics, then, the pathological stimulation of his body in performance undermined the values expressed through that very performance. Tausenau, in contrast, considered the value to lie in this very stimulation, because it presented a clear defiance of the demand for a controlled body and controlled emotions; he explained that

> the surplus of strong forces, an over-wrought organisation and the exaggerated tenor of many creations are equally pathological stimulations, yet to those that accept them they will make life infinitely richer than the tedious health which – without the capacity for reaction against the outside world, and in abhorrent calmness and lazy equilibrium – drags one through the lowly valleys of uninterrupted peace.[58]

The author defended the physiological as the origin of expression, thereby simply turning the pathologisation of physical over-stimulation on its head and referencing instead the emergent discourse on ingenuity and invention. In a reversal of the mind–body relationship he portrayed the body not as stimulated by a mad mind as an external force, but as driven by its own internal *Triebe*, which could bring forth the purposeful expression of music and through that communicate its audience's anxieties over their own uncontrollable bodies.

Conclusion

Whereas the aesthetic discourse sparked by German idealism placed the onus of ingenuity and creativity solely in the mind, the *popularity* of the virtuoso proved that the bourgeois subject was not ready for a perception of self that excluded his/her physical existence and that located the emotions felt

in the presence of art or as a reaction to art in the mind alone. Instead, the virtuoso seemed to show that the body-machine presented a vital, not pathological counterpart to the mind. That he was hailed as a paradigm of the commonly felt ties between the body and mind was a signal of the anxiety over emotional subjectivity sparked by the all-pervasive discourses on bodily control. The anxiety was soothed by watching the virtuoso; its aftershocks were visible in the more moderate physical and emotional responses to virtuoso concerts, but they were muted in comparison to the virtuoso's own exertions.

The performance which Liszt's German audiences loved beyond all others was his rendition of the *Grand Galop Chromatique*, a piece modelled on the lively social dance, the *gallop*. The dance was highly popular in ballrooms across Europe, but was also criticised for its simplicity; it used primarily one step which mimicked a horse's galloping spring. It was danced in couples hopping down the line of dance in the then current waltz-hold.[59] Played at high speed – often as a ball's rousing conclusion – the *gallop* was perhaps the most physically demanding dance. In both its simplicity and its physical abandon it formed a counterpart to the more intricate, complex and refined steps of the quadrille. Liszt consciously chose the *gallop* not merely because of its potential for the display of virtuosic finger velocity. Rather, in three steps he sent his audience into frenzy, stirring their bodies through the fiendish exertion of his own in front of their eyes. For, if social dances generally presented a civilised frame for physical interaction, the *gallop* in particular spun its dancers to the outer, or lower-class, boundaries of the civilly permissible. Thirdly, Liszt's *Galop* allowed the physical act to be experienced to excess in the imagination. For him, the *Galop* was an embodied music: his body pushed at its own physical boundaries, driven by the music's compelling rhythm. For his audience, this embodied music was not sentient, but visualised and imagined. If critics of the virtuoso cult attacked virtuosity's close proximity to the dilettantish music-making that thrived on the sentient and tactile pleasures of playing the instrument at the expense of true knowledge and spiritual engagement, Liszt's *Galop* led his listeners to imagine their physicality and the emotions therein through his fanciful flights and fast-driving rhythms. As such, it was after all an act of imagination and spirit – the imagination of the body in motion – that alleviated his audience's indoctrinated anxieties over the body. If the virtuoso concert in Germany, then, was an overt articulation of the symphonic ideal, pitted against this so as to exemplify the latter's superiority, it also presented a highly controlled space for all matters physical. Watching virtuoso performance sublimated the physical body as primary site of emotional genesis into a distanced spectacle visually framed by the stage, ideologically controlled by the mechanisms and meanings of the concert. Framing the cult of the virtuoso in popular as in pathological terms was but a clever ruse, designed to affirm the abject nature of the body.

Notes

1. 'Es gränzt bei ihm das Sublimste an das Barockste, das Erhabene an das Kindische, die ungeheure Kraft und die sinnigste Zartheit, der unerreichbare, tausendgliedrige Mechanismus an das zarte Geheimnis des Seelenvermögens, der Kampf aller höchsten Gewaltsamkeit an das süsse Traumleben der allerinnigsten Gefühlsweise'. 'Liszt in Wien', *Allgemeine musikalische Zeitung* 40.20 (13 May 1838), 319–325, here at 324.
2. Although mechanical instruments were available they presented their own interaction with questions of expression, subjectivity and performance. See Annette Richards, 'Automatic Genius: Mozart and the Mechanical Sublime', *Music & Letters* 80.3 (1999), 366–389 and Carolyn Abbate 'Outside Ravel's Tomb', *Journal of the American Musicological Society* 52.3 (1999), 465–530. Up to the mid-nineteenth century orchestras and performers were generally visible during performances.
3. Liszt scholar Dana Gooley demonstrates that 'the intrusion of ego or personality into musical performance' became a particularly potent argument in the polemics against virtuosity in German-speaking countries. See Dana Gooley, 'The Battle Against Instrumental Virtuosity in the Early Nineteenth Century', in Christopher H. Gibbs and Dana Gooley, eds., *Franz Liszt and his World* (Princeton: Princeton University Press, 2006).
4. Norbert Elias, *The Civilizing Process*, Edmund Jephcott, Eric Dunning, Johan Goudsblom and Stephen Mennel, trans. and eds. (Oxford: Blackwell Publishing, 1994), 110–112.
5. Gooley discusses the problems presented by the new, socially unsuitable virtuoso in smaller German cities. See Gooley, 'The Battle against Instrumental Virtuosity', 83.
6. Gooley notes that reviewers of French and English papers discussed virtuoso phenomena as part of other topics, but showed comparatively little concern for the virtuoso as a subject in its own right. See Gooley, 'The Battle against Instrumental Virtuosity', 80–81.
7. The relocation of the emotions from the heart to the brain in the late eighteenth and early nineteenth centuries forms the subject of Fay Bound Alberti, *Matters of the Heart: History, Medicine, and Emotion* (Oxford: Oxford University Press, 2010). This goes hand in hand with the development of the emotions as a psychological category around this time. See Thomas Dixon, *From Passions to Emotions. The Creation of a Secular Psychological Category* (Cambridge, MA: Cambridge University Press, 2003).
8. Maiko Kawabata, 'Virtuosity Transfigured: In the Shadow of Paganini', *The Journal of the American Liszt Society* 57 (2006), 31–34 and Kawabato, *Demythologising Paganini's 'Demonic' Powers of Virtuosity* (Rochester: Boydell & Brewer, University of Rochester Press, 2010).
9. Christopher Gibbs notes that this feature appears equally in verbal descriptions of Liszt's playing in which the pianist is portrayed to 'defeat the piano, breaking string right and left'. See Christopher H. Gibbs, 'Just Two Words. Enormous Success', in Christopher H. Gibbs and Dana Gooley eds., *Franz Liszt and his World* (Princeton: Princeton University Press, 2006).
10. Ulrich Stadler, 'Vom Liebhaber der Wissenschaft zum Meister der Kunst. Über die verworrenen Begriffsgeschichte des Virtuosen im England und Deutschland des 17. und 18. Jahrhunderts', in Hans-Georg von Arburg, Dominik Müller,

Hans-Jürgen Schrader and Ulrich Stadler eds., *Virtuosität. Kult und Krise der Artistik in Literatur und Kunst der Moderne* (Göttingen: Wallstein Verlag 2006), 19–35.

11. Shearer West, *Portraiture* (Oxford, New York: Oxford University Press, 2004), 79, Ludmilla Jordanova, *Defining Features* (London: Reaktion, 2000).
12. Lavater's *Physiognomische Fragmente of 1775–1778* were perhaps the widest-circulated works on physiognomy, yet the Swiss doctor only reinforced a long history of physiognomic concepts. For his influence on painting, see Diana Donald, *The Age of Caricature. Satirical Prints in the Reign of George III* (New Haven, London: Yale University Press, 1996), Sharrona Pearl, *About Faces: Physiognomy in Nineteenth-Century Britain* (Boston: Harvard University Press, 2010) and John Graham, 'Lavater's Physiognomy in England', *Journal of the History of Ideas* 22.4 (1961), 561–572.
13. Johann Caspar Lavater, *Essays on Physiognomy . . . Abridged from Mr Holcroft's Translation* (London: Vernor & Hood, 1806).
14. Lavater (1806), 61–62. It is noteworthy that both Tartini and Pugnani are portrayed with very straight silhouettes as they represent the Italian school. The physiognomic features of a very upright facial angle (the axis of the profile in relation to the horizontal) denoted racial superiority and mental stability.
15. Dana Gooley argues that Liszt displayed himself in particular ways through these portraits as part of his re-invention of self in each national context. See Dana A. Gooley, *The Virtuoso Liszt* (Cambridge, MA: Cambridge University Press, 2004).
16. Christopher H. Gibbs, 'Just Two Words: Enormous Success', 191. See also Ernst Burger, *Franz Liszt: A Chronicle of his Life in Pictures and Documents*, Stewart Spencer, trans. (Princeton: Princeton University Press, 1989), 105 and 109.
17. The *Essays* were first published in London in 1806 and were reprinted in 1824 as *Essays on the Anatomy and Philosophy of Expression*. See also Lucy Hartley and L. Smith, 'The Sign in the Eye of What is Known to the Hand', *Textual Practice* 10.1 (1996), 83–122, Lucy Hartley, *Physiognomy and the Meaning of Expression in Nineteenth-Century Culture* (Cambridge, MA: Cambridge University Press, 2001), Klaus Knecht, *Charles Bell: The Anatomy of Expression (1806)* (Koln: Forschungsstelle des Instituts fur Geschichte der Medizin der Universität, 1978).
18. Charles Bell, *Essays on the Anatomy and Philosophy of Expression*, 2nd ed. (London: Murray, 1824), 141.
19. Other writers equally believed in the divine contrition of the physical and argued that the passions of the mind were expressed through involuntary physical signs. See Dixon, *From Passions to Emotions*, 164 and Roger D. Gallie, *Thomas Reid: Ethics, Aesthetics and the Anatomy of the Self* (Dordrecht, London: Kluwer Academic, 1998).
20. For physicality and sensibility, see G.J. Barker-Benfield, *The Culture of Sensibility: Sex and Society in Eighteenth-Century Britain* (Chicago, London: University of Chicago Press, 1992). For the shift in the physical conception of emotions, see Fay Bound Alberti, 'Emotions in the Early Modern Medical Tradition' in Fay Bound Alberti, ed., *Medicine, Emotion and Disease, 1700–1950* (Basingstoke: Palgrave Macmillan, 2006).
21. Friedrich Wilhelm Marpurg, *Historisch-kritische Beyträge zur Aufnahme der Musik* (Berlin: Im Verlag Joh. Jacob Schützens sel. Wittwe, 1754).
22. The quote refers to the violinst Johann Peter Salomon in a list of 'virtuosi and fine performing musicians'. See *Musikalischer Almanach für Deutschland auf das Jahr 1782* (Leipzig, 1781), 100.

23. Ibid.
24. Carl Tausenau, 'Liszt und Thalberg', *Allgemeiner musikalischer Anzeiger* vol. 11 (7 February1839), 41–44.
25. See also Lawrence Kramer, *Musical Meaning*: *Toward a Critical History* (Berkeley, CA: London: University of California Press, 2001), 69.
26. See Gooley, *The Virtuoso Liszt*.
27. Liszt reported proudly to his lover Marie d'Agoult that 'Fifty copies of my portrait have been sold in a single day'. Adrian Williams, *Franz Liszt: Selected Letters* (Oxford: Oxford University Press, 1998), 89.
28. For a summary discussion of music and idealism, see Mark Evan Bonds, 'Idealism and the Aesthetics of Instrumental Music at the Turn of the Nineteenth Century', *Journal of the American Musicological Society* 50.2/3 (1997), 387–420, 390–391.
29. For the change in listening habits in the concert hall, see James H. Johnson, *Listening in Paris*. *A Cultural History* (Berkeley, London: University of California Press, 1995).
30. The rise of instrumental music at the end of the eighteenth century has been comprehensively documented and discussed in Bellamy Hosler, *Changing Aesthetic Views of Instrumental Music in 18th Century Germany* (Epping: Bowker, 1981), John Neubauer, *The Emancipation of Music from Language: Departure from Mimesis in Eighteenth-Century Aesthetics* (New Haven, London: Yale University Press, 1986), Lydia Goehr, *The Imaginary Museum of Musical Works* (Oxford: Oxford University Press, 1992).
31. See James Kennaway, *Bad Vibrations: The History of the Idea of Music as a Cause of Disease* (Farnham: Ashgate, 2012), particularly Chapter 2, 'From Sensibility to Pathology', 23–62; see also Leslie David Blasius, 'The Mechanics of Sensation and the Construction of the Romantic Musical Experience', in Ian Bent ed., *Music Theory in the Age of Romanticism* (Cambridge, MA: Cambridge University Press, 1996), 3–24.
32. Evan Bonds, 'Idealism and the Aesthetics of Instrumental Music'.
33. E.T.A. Hoffmann, 'Rezension der 5. Symphonie von Ludwig van Beethoven', *Allgemeine musikalische Zeitung* 12.40 (1810), cols. 630–642 and 12.41, cols. 652–659, translation quoted through David Gramit, *Cultivating Music*. *The Aspirations, Interest, and Limits of German Musical Culture* (Berkeley, Los Angeles, London: University of California Press, 2002), 3.
34. See Gramit, *Cultivating Music*, Celia Applegate and Pamela Potter, *Music and German National Identity* (Chicago, IL, London: University of Chicago Press, 2002), Celia Applegate, *Bach in Berlin: Nation and Culture in Mendelssohn's Revival of the St. Matthew Passion* (Ithaca, NY: Cornell University Press, 2005), see also Eric J. Hobsbawm and T.O. Ranger, *The Invention of Tradition* (Cambridge, MA: Cambridge University Press, 1983).
35. Engelmann, 'Musik als Erziehungsmittel', *Allgemeine musikalische Zeitung* 7 (1805), col. 635, translation quoted through Gramit, *Cultivating Music*, 16.
36. Dana Gooley argues that the infrastructure of the predominantly small towns of the German countries in the early nineteenth century favoured the adherence to amateur music-making. See Dana Gooley, 'The Battle Against Instrumental Virtuosity in the Early Nineteenth Century', in Christopher H. Gibbs and Dana Gooley, eds., *Franz Liszt and his World* (Princeton and Oxford: Oxford Univeristy Press, 2006).

37. For a discussion of monumental effects in music, see Alexander Rehding, *Music and Monumentality: Commemoration and Wonderment in Nineteenth-Century Germany* (Oxford: Oxford University Press, 2009) and Gramit, *Cultivating Music*, particularly the final chapter, 'Performing Musical Culture: The Concert', 125–60.
38. For a discussion of the popularity of virtuosity, bordering on a mania for the pianist, in the same cultural context that attacked the musician in journalistic writing, see Dana Gooley, *The Virtuoso Liszt* (Cambridge, MA: Cambridge University Press, 1989), particularly chapter 5, 'Anatomy of "Liztomania": The Berlin Episode'.
39. See also Gooley, 'The Battle Against Instrumental Virtuosity'.
40. This development has been extensively discussed in medical historical literature as in cultural discourses; it forms a central part of and has been problematised in Enlightenment theories by scholars such as Peter Gay, Norbert Elias and Michel Foucault.
41. Ivan Waddington, 'The Role of the Hospital in the Development of Modern Medicine: A Sociological Analysis', *Sociology* 7 (1973), 211–224, N.D. Jewson, 'Medical Knowledge and the Patronage System in Eighteenth Century England', *Sociology* 8 (1974), 369–385, N.D. Jewson, 'The Disappearance of the Sick-Man from Medical Cosmology, 1770–1870', *Sociology* 10 (1976), 225–244.
42. Michel Foucault, *The Birth of the Clinic: An Archaeology of Medical Perception* (London: Tavistock Publications, 1973).
43. Dieter Duding, *Organisierter gesellschaftlicher Nationalismus in Deutschland (1808–1847): Bedeutung und Funktion der Turner- und Sangervereine fur die deutsche Nationalbewegung* (Munich: R. Oldenbourg, 1984).
44. In the eighteenth century this interest in the six non-naturals was part of an empowerment of the individual and a turn away from the idea that health or illness were caused by ill will or by divine providence, usually in response to repeated acts of sin. In the late eighteenth century, broadly speaking, these belief systems were replaced by the myriad manners of understanding the body and its workings, and by the resulting measure of secular and personal control as suggested in conduct manuals and popular medical treatises. See Roy Porter ed., *The Popularisation of Medicine, 1650–1850* (London and New York: Routledge, 1992), Philipp Sarasin, *Reizbare Maschinen: Eine Geschichte des Körpers 1765–1914* (Frankfurt, AM: Suhrkamp Verlag, 2001), particularly 34–42.
45. Bound Alberti, *Matters of the Heart*.
46. Even if the soul remained ultimately immaterial, the emotions were considered to be physiologically rooted. With the emotions, then, an element of subjectivity was felt to reside in the body.
47. *Revue musicale* 6.52 (26 January 1833), 413.
48. Ibid.
49. James L. Larson, 'Vital Forces: Regulative Principles or Constitutive Agents? A Strategy in German Physiology, 1786–1802', *Isis* 70.2 (1979), 235–249.
50. *Musical World* 13.220 (11 June 1840), 361–364.
51. Johann Christian Reil, *Von der Lebenskraft* (Leipzig, 1795).
52. Sarasin, *Reizbare Maschinen*, 67.
53. For the historically contingent concept of emotions as man's motivating forces see Dixon, *From Passions to Emotions* and Jan Plamper, *Geschichte und Gefühl. Grundlagen der Emotionsgeschichte* (München: Siedler Verlag, 2012).

54. Reil, *Von der Lebenskraft*, 74–79, see also Sarasin, *Reizbare Maschinen*, 66.
55. Tausenau, 'Liszt and Thalberg'.
56. Ibid.
57. Ibid.
58. Ibid.
59. The early waltz was not danced in close embrace.

Works Cited

Primary Sources

Addison, Joseph, *Remarks on Several Parts of Italy in the Years 1701, 1702, 1703* (London: Tonson, 1718).

Albrecht, J.W., *Tractatus physicus de effectibus musices in corpus animatum* (Leipzig: Martini, 1734).

Allen, G., 'Note Deafness', *Mind* 3 (1878), 157–167.

Andreasen, Nancy C., *The Creating Brain: The Neuroscience of Genius* (New York: Dana Press, 2005).

[Anon.], *A Physico-Mechanical Essay on Improving the Corpuscular Philosophy* (London: Dormer, 1733).

[Anon.], 'The Memoirs of the Late Richard Brocklesby, M.D., F.R.S', *The European Magazine and London Review for May 1798* 33 (1798), 296.

Bacon, Francis, *Sylva Sylvarum* (London: William Lee, 1626).

Baglivi, Giorgio, *Opera omnia* (Venetiis: Apud Gasparum Girardi, 1738).

Baly, William, et al., *Recent Advances in the Physiology of Motion, the Senses, Generation, and Development* (London: Taylor and Walton, 1848).

Barry, James, *An Account of a Series of Pictures in the Great Room of the Society of Arts, Manufactures, and Commerce, at the Adelphi* (London: Cadell and Walter, 1783).

Barry, James, *The Works of James Barry* (London: Cadell and Davies, 1809).

Bartók, Béla, 'Why and How Do We Collect Folk Music? And Some Problems of Folk Music Research in East Europe,' Reprinted in Benjamin Suchoff, ed., *Béla Bartók Essays* (Lincoln, NE: University of Nebraska Press, 1997), 9–24, 173–194.

Bastian, H.C., *A Treatise on Aphasia and Other Speech Defects* (New York: D. Appleton and Company, 1898).

Bell, Charles, *Essays on the Anatomy and Philosophy of Expression* (London: Murray, 1824).

Benton, A.L. and Joynt, R.J., 'Early Descriptions of Aphasia', *Archives of Neurology* 3 (1960), 205–222.

Bichat, Xavier, *Recherches physiologiques sur la vie et sur la mort*, 3rd ed. (Paris: Brosson, 1805).

Blocq, P., 'L'amusie,' *Gazette Hebdomadaire de médecine et de Chirurgie* 8 (1893), 86–90.

Bouillaud, J-B., 'Discussion sur la faculté du langage articulé', *Bulletin de l'Académie Impériale de Médecine* 30 (1865), 724–781.

Brazier, Dr., 'Du troubles des facultés musicales dans l'aphasie. Etude sur les representations mentales des sons et des symboles musicaux', *Revue philosophique dirigee par Ribot* 34 (1892), 337–368.

Brendel, Adam, *De curatione morborum per carmina et cantos musicos* (Wittenberg, MD, 1706).

Bright, Timothy, *A Treatise of Melancholie* (London, 1586).

Broca, Paul, 'Nouvelle observation d'aphémie produite par une lésion de la troisième circonvolution frontale', *Bulletins de la Société d'anatomie (Paris)* 2.6 (1861a), 398–407.

Broca, Paul, 'Perte de la parole: Ramollissement chronique et destruction partielle du lobe anterieur gauche du cerveau', *Bulletins de la Societe d'anthropologie* 1.2 (1861b), 235–238.

Broca, Paul, 'Remarques sur le siège de la faculté du langage articulé, suivies d'une observation d'aphémie (perte de la parole)', *Bulletins de la Société d'anatomie (Paris)* 2.6 (1861c), 330–357.

Broca, Paul, 'Sur le siege de la faculte du langage articule', *Bulletin de la Societe d'anthropologie* 6 (1865), 337–393.

Brocklesby, Richard, *Reflections on Antient and Modern Musick with the Application to the Care of Disease* (London: Cooper, 1749).

Brown, M., *A Day with Wagner* (London: Little and Brown, 1911).

Browne, Richard, *Mechanical Essay on Singing, Musick and Dancing* (London: 1727).

Buisson, Mathieu François Regis, *De la division la plus naturelle des phénomènes physiologiques considérés chez l'homme* (Paris: Feugneray, 1802).

Byatt, A.S., 'Observe the Neurones', *Times Literary Supplement* (22 September 2006).

Campbell, Don, *The Mozart Effect for Children* (London: Hodder and Staughton, 2000).

Cheyne, George, *Philosophical Principles of Natural Religion* (London: Strahan, 1705).

Cheyne, George, *Essay on Health and Long Life* (London: Strahan, 1724).

Cheyne, George, *The English Malady or a Treatise of Nervous Diseases of All Kinds* (London: Strahan, 1733).

Cid, F.X., *Tarantismo observado en España con que se prueba el de la Pulla, dudado de algunos y tratado de otros de fabuloso y memoria para escribir la Historia del insecto llamado Tarántula, efectos de su veneno en el cuerpo humano . . . y su aplicación como remedio de varias enfermedades* (Madrid: Imprenta de González, 1787).

Connolly, Thomas, *Mourning into Joy: Music, Raphael, and Saint Cecilia* (New Haven and London: Yale University Press, 1994).

Corominas, J.F., *Aposento Anti-Crítico desde donde se ve representar la gran Comedia que en su Theatro Crítico regaló al Pueblo el RR. P.M. Feijoo, contra la Música Moderna y uso de los Violines en los Templos, o carta que en defensa de uno y otro . . .* (Salamanca: Imprenta de la Santa Cruz, 1726).

Dahlin, O., 'Berättelse om en Dumbe, som kan siunga' [On a Mute Who Can Sing], *Swenska Wetenskaps Academiens Handlingar* 6 (1745), 114–115.

Dax, M., 'Lésions de la moitié gauche de l'encéphale coïncident avec l'oubli des signes de la pensée (lu à Montpellier en 1836)', *Bulletin hebdomadaire de médecine et de chirurgie* 2 (1865), 259–262.

Debussy, Claude, *Debussy on Music*, Richard Langham Smith, trans. (New York: Knopf, 1977).

Description des machines et procédés specifiés dans les brevets d'invention, de perfectionnement et d'importation, 28 vols (Paris: Madame Huzard/Imprimerie Nationale, 1836).

Desessartz, Jean-Charles, *Réflexion sur la musique considérée comme moyen curative* (Paris: Baudouin 1802).

de Ulloa, P., *Musica universal, o Principios universales de la música* (Madrid: Imprenta de música, por B. Peralta, 1717).

Doménech y Amaya, P.F., 'Memoria sobre el descubrimiento significativo; el pulso dícroto continuo sin ninguna hemorragia espontánea o extraordinaria, por cualquiera de las cavidades naturales, es el signo más cierto y positivo del embarazo a setenta días. Y, Observación de un picado por la tarantula', *Memorias de la Real Academia Médico-práctica de Barcelona* (Madrid: 1798).

Domínguez Rosains, B., *Disertación médico medico-práctica en que se demuestra la música ser remedio de muchas enfermedades* (Seville: Academia de Medicina de Sevilla, 1766).
Duffy, R.J. and Liles, B.Z., 'A Translation of Finkelnburg's (1870) Lecture on Aphasia as "Asymbolia" with Commentary', *Journal of Speech and Hearing Disorders* 44 (1979), 156–168.
Duverney, Joseph-Guichard, *Traité de l'organe de l'ouïe* (Paris: Estienne Michallet, 1683).
Edgren, J.G., 'Amusie (musicalische Aphasie)', *Deutsche Zeitschrift für Nervenheilkunde* 6 (1895), 1–64.
Ein Wort, G.N., 'Sowohl im Interesse des Judenthums, als der jüdischen Literatur-Gesellschaft', *Jüdisches Volksblatt* 2.40 (1855), 157–158.
Eling, P., *Reader in the History of Aphasia: From Franz Gall to Norman Geschwind* (Amsterdam: John Benjamin's Publishing Company, 1994).
Ettmüller, Michael Ernst, *Disputatio effectus musicae in hominem* (Leipzig, MD, 1714).
Falret, J., 'Aphasie, aphémie, alalia', in A. Dechambre, ed., *Dictionnaire encyclopédique des sciences médicales*, vol. 5 (Paris: Asselin 1866), 5, 605–642.
Fechner, Gustav, *Elemente der Psychophysik* (Leipzig: Breitkopf und Härtel, 1860).
Feijoo, B.J., *Teatro crítico universal* (Madrid: D. Joaquín Ibarra, Real Compañía de Impresores y Libreros, 1726, 1778).
Feijoo, B.J., *Cartas eruditas y curiosas* (Madrid: Imprenta Real de la Gazeta, (1742, 1777).
Feijoo, B.J., *Three Essays or Discourses on the Following Subjects, a Defence or Vindication of the Women, Church Music, a Comparison Between Antient and Modern Music*, John Brett, trans. (London: T. Becket, 1778).
Finkelnburg, D.C., 'Niederrheinische Gesellschaft in Bonn', *Berliner klinische Wochenschrift* 7 (1870), 449–450, 460–462.
Forgues, V., *De l'influence de la musique sur l'économie animale* (Montpellier: Martel, 1802).
Gall, F.J., *On the Functions of the Brain and of Each of its Parts: With Observations on the Possibility of Determining the Instincts, Propensities, and Talents*, Winslow Lewis, trans. (Boston: Marsh, Capen & Lyon, 1835).
Geoffroy, Etienne-Louis, *Dissertations sur l'organe de l'ouïe, 1. De l'homme, 2. Des reptiles, 3. Des Poissons* (Amsterdam, Paris: Cavelier, 1778).
Gesner J., 'Die Sprachamnesie', *Sammlung von Beobachtungen aus der Arzneygelahrtheit und Naturkunde*, vol. 2 (Nördlingen: CC Beck 1770), 107–182.
González y Centeno, V., 'Disertación Físico Médica. Oración inaugural. Sobre el influjo que tiene en la salud humana el ímpetu violento 23 de Octubre de 1788', *Memorias de la Real Sociedad de Sevilla* (Sevilla) 7 (1798), 400–401.
Graham, James, *A Short Inquiry into the Present State of Medical Practice* (London: J. Walter, 1776).
Graham, James, *The General State of Medical and Chirurgical Practice* (London: Almon, 1779).
Hanslick, Eduard, *Vom Musikalisch-Schönen* (Leipzig: Weigl, 1854).
Hartley, David, *Observations on Man*, 2 vols (London: Richardson, 1749).
Helmholtz, Hermann, *Die Lehre von den Tonempfindingen als physiologische Grundlage für die Theorie der Musik* (Brunswick: Vieweg, 1863).
Helmholtz, Hermann, 'Über die physiologischen Ursachen der musikalischen Harmonie (Lecture in Bonn)', *Vorträge und Reden* I (1865), 119–155.
Hering, Ewald, 'On Memory as a General Function of Organized Matter', reprinted in Samuel Butler, ed., *Unconscious Memory*, 2nd ed. (New York: Dutton, 1911).

Histoire de la Société Royale de Médecine, année 1776 (Paris: Philippe-Denys Pierres, 1779).
Hoffmann, E.T.A., *E.T.A. Hoffmann's Writings on Music, Collected in a Single Volume* (London: Routledge, 2004).
Honing, Henkjan. Musical Cognition: A Science of Listening (London: Transaction, 2011).
Hutcheson, Francis, *An Inquiry into the Origin of Our Ideas of Beauty and Virtue* (London: J. Darby, 1725).
Jackson, J.H., 'Clinical Remarks on Emotional and Intellectual Language in Some Cases of Disease of the Nervous System', *The Lancet* 87 (1866), 174–175.
Knoblauch, A., 'Über Störungen der musikalischen Leistungsfähigkeit infolge von Gehirnläsionen', *Deutsches Archiv für Klinische medecin* 43 (1888), 331–352.
Koelsch, Stefan, *Music and the Brain* (Oxford: Wiley-Blackwell, 2012).
Kovaleff, Nancy and Thomas Christensen, *Aesthetics and the Art of Musical Composition in the German Enlightenment: Selected Writings of Johann Georg Sulzer and Heinrich Christoph Koch* (Cambridge, MA: Cambridge University Press, 1995).
Krishaber, Maurice, *De la névropathie cérébro-cardiaque* (Paris: Masson, 1873).
Krishaber, Maurice, 'Musicien (Hygiène des)', Deuxième Série Dechambre, ed., *Dictionnaire encyclopédique des sciences médicales* vol. 11 (Paris: Masson, 1875), 606.
Kulke, Eduard, *Tagebuch*, vol. 5 (Wienbibliothek im Rathaus, Vienna, Austria).
Kulke, Eduard, Letters to Ernst Mach (Ernst Mach Nachlass, Deutsches Museum Archives, Munich, Germany).
Kulke, Eduard, *Über die Umbildung der Melodie: Ein Beitrag zur Entwickelungslehre* (Prague: J.G. Calve, 1884).
Kulke, Eduard, *Richard Wagner und Friedrich Nietzsche* (Leipzig: Reissner, 1890).
Kulke, Eduard, *Kritik der Philosophie des Schönen* (Leipzig: Deutsche Verlagactiengesellschaft, 1906).
Kussmaul, A., 'Die Störungen der Sprache: Versuch einer Pathologie der Sprache', in H. von Ziemsson, ed., *Handbuch der speciellen Pathologie und Therapie*, vol. 13 (Leipzig: Verlag von F.C.W. Vogel, 1877).
La Mara, ed., *Letters of Franz Liszt* (New York: Greenwood, 1894).
Lavater, Johann Caspar, *Essays on Physiognomy* (London: Vernor & Hood, 1806).
Lehrer, Jonah, *Proust was a Neuroscientist* (Boston: Houghton Mifflin, 2007).
Lewin, Tamar, 'No Einstein in Your Crib? Get a Refund', *New York Times* (23 October 2009), A1.
Lichtheim, L. 'Über aphasie', *Deutsches Archiv für Klinische Medicin* 36 (1885), 204–268.
Mach, Ernst, *Letters to Eduard Kulke* (Washington, DC: Smithsonian Institution Libraries).
Mach, Ernst, 'Zur Theorie des Gehörorgans', *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften* 48 (1863), 283–300.
Mach, Ernst, 'Über einige der physiologischen Akustik angehörige Erscheinungen', *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften* 50 (1864), 345.
Mach, Ernst, 'Bemerkungen über die Accommodation des Ohres', *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften* 51 (1865), 343–346.
Mach, Ernst, 'Über die physikalische Bedeutung der Gesetze der Symmetrie,' *Lotos. Zeitschrift für Naturwissenschaften* 21 (1871), 139–147.
Mach, Ernst, 'Die Ökonomische Natur der physikalischen Forschung', *Almanach der Kaiserlichen Akademie der Wissenschaft* 32 (1882), 293–319.
Mach, Ernst, 'Die Erklärung der Harmonie', reprinted in *Populär-Wissenschaftliche Vorlesungen* (Leipzig: Barth, 1896).

Mach, Ernst, 'Why Man has Two Eyes?' *Popular Scientific Lectures*, Thomas McCormack, trans. (Chicago: Open Court, 1898).
Mach, Ernst, Forward to Eduard Kulke's *Kritik der Philosophie des Schönen* (Leipzig: Deutsche Verlagactiengesellschaft, 1906).
Mach, Ernst, *The Analysis of the Sensations and the Relation of the Physical to the Psychical*, trans. C.M. Williams from the 5th (1897) German edition (New York: Dover, 1959).
Marpurg, Friedrich Wilhelm, *Historisch-kritische Beyträge zur Aufnahme der Musik* (Berlin: Verlag Joh. Jacob Schützens sel. Wittwe, 1754).
Martínez, M., *Carta defensiva, que sobre el primer tomo del Theatro Critico Universal, que dió a luz el Rmo. P.,M. Fr. Benito Feijoo* (Madrid: Imprenta Real, 1726).
Martínez, M., *Anatomia completa del hombre: Con todos los hallazgos, nuevas doctrinas y observaciones raras hasta el tiempo presente, y muchas advertencias necessarias para la cirugia segun el methodo con que se explica en nuestro theatro de Madrid* (Madrid: Imprenta de Bernardo Peralta, 1728).
Miliotti, D., *Lezioni cliniche dell'anno scolastico 1883–1884 sulle malattie del sistema nervoso* (Milan: Vallardi, 1885).
Moutier, F., *Aphasie de Broca* (Paris: G. Steinheil, 1908).
Müller, Johannes, *Handbuch der Physiologie des Menschen für Vorlesungen*, 2 vols (Coblenz: Hölscher, 1833–1840).
Nietzsche, Friedrich, *Der Fall Wagner: Ein Musikanten-Problem* (Leipzig: Naumann 1888).
Nordau, Max, *Entartung* (Berlin: Duncker, 1892).
Nugent, Christopher, *Essay on Hydrophobia* (London: James Leake, 1753).
Oberhuber, Konrad, *Raphael: The Paintings* (Munich and New York: Prestel, 1999).
Odier, Ludovicus, *Epistola physiologica inauguralis de elementariis musicae sensationibus* (Edinburgh, 1770). [dissertation submitted to medical faculty later published in Montpellier as *Traité de la musique comme process physiologique*].
Oppenheim, Hermann, 'Ueber das Verhalten der musikalischen Ausdrucksbewegungen und des musikalischen Verständnisses bei Aphatischen', *Charité-Annalen* 13 (1888), 345–383.
Parrot, J., 'Atrophie complète du lobule de l'insula et de la troisième circonvolution du lobe frontal avec conservation de l'intelligence et de la faculté du langage articulé – Observation par M. le Dr. Parrot', *Bulletin de la Société Anatomique de Paris* 8 (1863), 372–401.
Pascal, Jean-Joseph, *De l'ouïe considérée dans ses rapports avec l'intelligence et la voix* (Paris: Didot le Jeune, 1821).
Perrault, Claude, *Essais de physique; ou, Recueil de plusieurs traitez touchant les choses naturelles*, vol. 2 (Paris: Jean Baptiste Coignard, 1680).
Petit, Marc-Antoine, *Essai sur la médecine du coeur* (Lyon: Garnier, 1806).
Plato, *Republic*, 2 vols (Cambridge, MA: Loeb, 2013).
Popper-Lynkeus, Josef, *Fürst Bismarck und der Antisemitismus* (Vienna: H. Engel, 1886).
Proust, Adrien, 'De l'aphasie', *Archives générale de médecine* 19.6 (1872), 147–166, 303–318, 653–685.
Rauscher, F.H., Shaw, G.L. and Ky, K.N., 'Listening to Mozart Enhances Spatial- Temporal Reasoning; Towards a Neurophysiological Basis', *Neuroscience Letters* 185 (1995a), 44–47.
Rauscher, F.H., Shaw, G.L. and Ky, K.N., 'Music and Spatial Task Performance', *Nature* 365 (1995b), 611.
Reil, Johann Christian, *Von der Lebenskraft* (Leipzig, 1795).
Ribot, Théodule, *Les Maladies de la mémoire* (Paris: Baillière, 1881).

Ribot, Théodule, 'Enquête sur les idées générales', *Revue Philosophique* 32 (1891), 376–388.
Richardson, Jonathan, *An Account of Some of the Statues, Bas-Reliefs, Drawings and Pictures in Italy* (London: Knapton, 1722).
Robinson, Nicholas, *New System of the Spleen* (London: Bettesworth, Innys and Rivington, 1729).
Roger, Joseph-Louis, *Traité des effets de la musique sur le corps humain* (Paris: Brunot, 1803).
Sainte-Marie, Etienne, *Nouveau formulaire médical et pharmaceutique* (Paris: Rey et Gravier, 1820).
Schellenberg, E.G., 'Music and Cognitive Abilities', *Current Directions on Psychological Science* 14 (2005a), 317–320.
Schellenberg, E.G., 'Music Listening and Cognitive Abilities in 10- and 11-Year-Olds: The Blur Effect', *Annals of the New York Academy of Sciences* 160 (2005b), 202–209.
Schellenberg, E.G., 'Long-Term Positive Associations Between Music Lessons and IQ', *Journal of Educational Psychology* 98 (2006), 457–468.
Schenker, Heinrich, Drabkin, William and Bent, Ian, *Der Tonwille: Pamphlets in Witness of the Immutable Laws of Music, Offered to a New Generation of Youth*, 2 vols (Oxford: Oxford University Press, 2004).
Schubert, Gotthilf Heinrich, *Die Symbolik des Traumes* (Bamberg: 1814).
Seashore, C., *Manual of Instructions and Interpretations of Measures of Musical Talent* (Chicago: C.H. Stoelting, 1919).
Sleigh, Joseph Fenn, *Tentamen physico-medicum inaugurale, de auditu* (Edinburgh, MD, 1753).
Somer, Edmund, *Dissertatio physico-medica, inauguralis, de sonis et auditu* (Edinburgh, MD, 1783).
Sömmerring, Samuel Thomas, *De corporis humani fabrica* 6 vols (Frankfurt am Main 1794–1801).
Spencer, Herbert, 'The Origin of Music', *Mind* 15.60 (1890), 449–468 and 16.64 (1891), 535–547.
Sterne, Laurence, *The Life and Opinions of Tristram Shandy* (Harmondsworth: Penguin, 1967).
Tausenau, Carl, 'Liszt und Thalberg', *Allgemeiner musikalischer Anzeiger* (7 February 1839), 41–44.
Teule, Jules-Charles, *De l'oreille: essai d'anatomie et de physiologie, précédé d'un exposé des lois de l'acoustique* (Paris: Gabon, 1828).
Tieck, Ludwig and Wackenroder, Wilhelm Heinrich, *Phantasien über die Kunst* (Hamburg: Friedrich Perthes, 1799).
Tosca, T.V., *Compendio mathematico: en que se contienen todas las materias mas principales de las ciencias, que tratan de la Cantidad* (Madrid: Impr. de A. Marin, 1727).
Trousseau, A., 'Discussion sur la faculté du langage articulé,' *Bulletin de l'Académie Impériale de Médecine* 30 (1865), 647–657 and 59–75.
Trousseau, A. and Belloc, H., *Traité pratique de la phthisie laryngée*, de la *laryngite chronique et des maladies de la voix* (Paris: J.-B. Baillière, 1837).
Ureña, Marquis of (G. de Molina y Zaldívar), *Reflexiones sobre la arquitectura,* Ornato y Música del Templo: Contra los procedimientos arbitrarios sin consulta de la Escritura Santa, de la disciplina rigurosa y de la crítica facultativa (Madrid; Imp. de J. Ibarra, 1785).
Wagner, Richard, *Über das Dirigiren* (Leipzig: C.F. Kahnt, 1870).

Wainewright, Jerimiah, *A Mechanical Account of the Non-Naturals: Being a Brief Explication of the Changes Made in Humane Bodies* (London, 1707).
Wallace, Alfred Russell, *Darwinism: An Exposition of the Theory of Natural Selection with Some of its Applications* (London: Macmillan 1889).
Wallaschek, Richard and Cattell, James McKeen, 'On the Origin of Music', *Mind* 16.63 (1891a), 375–388.
Wallaschek, Richard and Cattell, James McKeen, 'Über die Bedeutung der Aphasie für den musikalischen Ausdruck', *Vierteljahrsschrift für Musikwissenschaft* 7 (1891b), 53–73.
Wallaschek, Richard and Cattell, James McKeen, *Primitive Music* (London: Longmans, Green and Co., 1893).
Wallaschek, Richard and Cattell, James McKeen, 'Die Bedeutung der Aphasie für die Musikvorstellung', *Zeitschrift für Psychologie und Physiologie der Sinnesorganie* 6 (1894), 8–32.
Wallaschek, Richard and Cattell, James McKeen, 'Über Programm-Musik', *Die Zeit* (27 March 1897), 202–203.
Willis, Thomas, 'Two Discourses Concerning the Soul of Brutes', *The Remaining Medical Works* (London, 1683), 69–74.
Wittgenstein, Ludwig, von Wright, G.H., Nyman, Heikki and Pichler Alois, *Culture and Value: A Selection from the Posthumous Remains*, rev. 2nd ed. (Oxford: Blackwell, 1998).
Wood, William, *A Mechanical Essay Upon the Heart. In Three Anatomical Lectures* (London: Weaver Bickerton, 1729).
Wundt, Wilhelm Max and Titchener, Edward Bradford, *Principles of Physiological Psychology, Vol. 1, The Bodily Substrate of the Mental Life*, trans. from the 5th German ed. (London: Swan Sonnenschein, 1904).
Ximenez de Lorite, B., *Historia natural de la tarántula. Los prodigiosos fenómenos de su puntura, la peculiar idea de la música con que se cura y el mecanismo con que obra* (Seville: Academia de Medicina de Sevilla, 1776).

Secondary Sources

Abbate, Carolyn, 'Outside Ravel's Tomb', *Journal of the American Musicological Society* 52.3 (1999), 465–530.
Alberti, Fay Bound, *Medicine, Emotion and Disease, 1700–1950* (Basingstoke: Palgrave Macmillan, 2006).
Alberti, Fay Bound, *Matters of the Heart: History, Medicine, and Emotion* (Oxford: Oxford University Press, 2010).
Alsop, D., 'Strains of New Beauty: Haendel and the Pleasures of Italian Opera, 1711–1728', in Roy Porter and M.M. Roberts, eds., *Pleasure in the Eighteenth Century* (Basingstoke: Macmillan, 1996), 133–163.
Applegate, Celia, *Bach in Berlin: Nation and Culture in Mendelssohn's Revival of the St. Matthew Passion* (Ithaca: Cornell University Press, 2005).
Applegate, Celia and Potter, Pamela, eds., *Music and German National Identity* (Chicago: Chicago University Press, 2002).
Ascherson, Neil, 'The Fourth Auditory Ossicle: Fact or Fantasy?' *The Journal of Laryngology and Otology* 83.12 (1978), 452–465.
Austern, Linda, 'Music, Sensation, and Sensuality', *Critical and Cultural Musicology* (London: Routledge, 2002).

Baly, William and Kirkes. W.S., *Recent Advances in the Physiology of Motion, the Senses, Generation, and Development* (London: Taylor and Walton, 1848).

Barash, J.A., ed., *The Symbolic Construction of Reality: The Legacy of Ernst Cassirer* (Chicago: University of Chicago Press, 2010).

Barker, Andrew, 'Timaeus on Music and the Liver', in M.R. Wright, ed., *Reason and Necessity: Essays on Plato's Timaeus* (London: Gerald Duckworth, 2000), 85–100.

Barker-Benfield, G.J., *The Culture of Sensibility: Sex and Society in Eighteenth-Century Britain* (Chicago: University of Chicago Press, 1992).

Barona, J.L. and Moscoso, J., Pimentel, J. (eds.), *La Ilustración y las ciencias: para una historia de la objetividad* (Valéncia: Universitat de Valéncia, 2003).

Barrell, John, *The Political Economy of Painting from Reynolds to Hazlitt* (New Haven: Yale University Press, 1986).

Barry, Kevin, *Language, Music and the Sign: A Study in Aesthetics, Poetics and Poetic Practice from Collins to Coleridge* (Cambridge, MA: Cambridge University Press, 1987).

Bashwiner, David Michael, 'Lifting the Foot: The Neural Underpinnings of the "Pathological" Response to Music', in Barbara Maria Stafford, ed., *Bridging the Humanities-Neuroscience Divide: A Field Guide to a New Meta-Field* (Chicago: University of Chicago Press, 2011), 239–266.

Baxendale, Leo, *Pictures in the Mind* (Stroud: Reaper, 2000).

Bent, Ian, *Music Theory in the Age of Romanticism* (Cambridge, MA: Cambridge University Press, 1996).

Berry, David Carson, *A Topical Guide to Schenkerian Literature: An Annotated Bibliography with Indices* (Hillsdale, NY: Pendragon Press, 2004).

Blasius, Leslie David, 'The Mechanics of Sensation and the Construction of the Romantic Musical Experience', in Ian Bent, ed., *Music Theory in the Age of Romanticism* (Cambridge, MA: Cambridge University Press, 1996), 3–24.

Bohlman, Philip, 'The Remembrance of Things Past: Music, Race, and the End of History in Modern Europe', in Ronald Radano and Philip V. Bohlman, eds., *Music and the Racial Imagination* (Chicago: Chicago University Press, 2000a), 644–676.

Bohlman, Philip, 'Composing the Cantorate: Westernizing Europe's Other Within', in Georgina Born and David Hesmondhalgh, eds., *Western Music and its Others* (Berkeley: University of California Press, 2000b), 187–212.

Bonds, Mark Evan, 'Idealism and the Aesthetics of Instrumental Music at the Turn of the Nineteenth Century', *Journal of the American Musicological Society* 50.2/3 (1997), 387–420.

Bordogna, Francesca, *William James at the Boundaries: Philosophy Science, and the Geography of Knowledge* (Chicago: Chicago University Press, 2008).

Bowler, Peter, *Evolution: The History of an Idea* (Berkeley: University of California Press, 2003).

Breathnach, C.S., 'Richard Brocklesby FRS FRCP (1722–1797): Physician and Friend', *Journal of Medical Biography* 6.3 (1998): 125–127.

Brett, Philip, Wood, Elizabeth, Thomas, Gary C., eds., *Queering the Pitch: The New Hay and Lesbian Musicology* (New York: Routledge, 1994).

Brisson, L., 'Plato's Theory of Sense Perception in the *Timaeus*. How it Works and What it Means', in J.J. Cleary and G.M. Gurtler, eds., *Proceedings of the Boston Area Colloquium in Ancient Philosophy* 13 (1999), 147–176.

Brown, Julie. 'Bartók, the Gypsies, and Hybridity in Music', in Georgina Born and David Hesmondhalgh, eds., *Western Music and its Others: Difference, Representation, and Appropriation in Music* (Berkeley: University of Califonia Press, 2000).

Brown, Theodore M., 'From Mechanism to Vitalism in Eighteenth-Century English Physiology', *Journal of the History of Biology* 7 (1974), 179–216.
Brust, John C., 'Music and the Neurologist: An Historical Perspective', *Annals of the New York Academy of Sciences* 930 (2001), 143–152.
Bullard, Truman, 'The First Performance of Igor Stravinsky's *Sacre du Printemps* (Dissertation Eastman School of Music, 1971).
Burger, Ernst, *Franz Liszt: A Chronicle of his Life in Pictures and Documents*, Stewart Spencer, trans. (Princeton: Princeton University Press, 1989).
Burnham, Scott, *Beethoven Hero* (Princeton: Princeton University Press, 1995).
Cassirer, Ernst, Koelln, Fritz C.A. and Pettegrove, James P., *The Philosophy of the Enlightenment* (Boston: Beacon Press, 1955).
Cassirer, Ernst and Ralph, Manheim, *The Philosophy of Symbolic Forms* (New Haven and London: Yale University Press, 1953).
Cavell, Stanley, 'Music Discomposed', in Stanley Cavell, ed., *Must We Mean What We Say?* (Cambridge, MA: Cambridge University Press, 1976), 141–157.
Christensen, Thomas, *The Cambridge History of Western Music Theory* (Cambridge, MA: Cambridge University Press, 2002).
Chua, Daniel K.L., *Absolute Music and the Construction of Meaning. New Perspectives in Music History and Criticism* (Cambridge, MA: Cambridge University Press, 1999).
Clarke, Edwin and Jacyna, L.C., *Nineteenth-Century Origins of Neuroscientific Concepts* (Berkeley: University of California Press, 1987).
Clynes, Manfred, ed., *Music, Mind and Brain* (New York: Plenum, 1982).
Coen, Deborah, *Vienna in the Age of Uncertainty: Science, Liberalism, and Private Life* (Chicago: University of Chicago Press, 2007).
Cohen, H.F., *Quantifying Music: The Science of Music at the First Stage of the Scientific Revolution* (Dordrecht: Reidel, 1984).
Conway, Bevil R. and Rehding, Alexander, 'Neuroaesthetics and the Trouble with Beauty', *Plos Biology* XI (2013).
Cook, Nicholas, *The Schenker Project: Culture, Race and Music Theory in fin-de- siecle Vienna* (Oxford: Oxford University Press, 2010).
Crawford, Matthew B., 'The Limits of Neurotalk', *New Atlantis* 19 (2008), 65–78.
Critchley, Macdonald and Henson, R.A., eds., *Music and the Brain: Studies in the Neurology of Music* (London: Heinemann, 1977).
Cunningham, Andrew, 'Medicine to Calm the Mind: Boerhaave's Medical System, and Why it was Adopted in Edinburgh', in Andrew Cunningham and Roger French, ed., *The Medical Enlightenment of the Eighteenth Century* (Cambridge, MA: Cambridge University Press, 1990), 40–66.
Curran, William C., 'Dr. Brocklesby of London (1722–1797): An Eighteenth Century Physician and Reformer', *The Journal of the History of Medicine* (October 1962), 509–521.
Cusick, Suzanne, 'Feminist Theory, Music Theory, and the Mind-Body Problem', *Perspectives of New Music* 22 (1994), 8–27.
Dahlhaus, Carl, *Nineteenth-Century Music* (Berkeley and London: University of California Press, 1989a).
Dahlhaus, Carl, *The Idea of Absolute Music* (Chicago: University of Chicago Press, 1989b).
Dixon, Thomas, *From Passions to Emotions* (Cambridge, MA: Cambridge University Press, 2003).
Donald, Diana *The Age of Caricature. Satirical Prints in the Reign of George III* (New Haven, London: Yale University Press, 1996).

Düding, Dieter, *Organisierter gesellschaftlicher Nationalismus in Deutschland (1808–1847): Bedeutung und Funktion der Turner- und Sängervereine für die deutsche Nationalbewegung* (München: R. Oldenbourg, 1984).

Duncan, David A., 'Persuading the Affections: Rhetorical Theory and Mersenne's Advice to Harmonic Orators', in Georgia Cowart, ed., *French Musical Thought* (Ann Arbor: UMI Press, 1989), 149–175.

Duffin, Jacalyn, *To See with a Better Eye: A Life of R.T.H. Laennec* (Princeton: Princeton University Press, 1998).

Elias, Norbert, *The Civilizing Process*, Edmund Jephcott, trans., Eric Dunning, Johan Goudsblom and Stephen Mennel, eds. (Oxford: Blackwell Publishing, 1994).

Erlmann, Veit, *Reason and Resonance: A History of Modern Aurality* (New York: Zone, 2010).

Finger, Stanley, *Origins of Neuroscience: A History of Explorations into Brain Function* (New York: Oxford University Press, 1994).

Fischel, Oscar, *Raphael*, 2 vols, Bernard Rackham, trans. (London: Kegan Paul, 1948).

Foucault, Michel, *The Birth of the Clinic: An Archaeology of Medical Perception* (London: Tavistock Publications, 1973).

Gallie, Roger D., *Thomas Reid: Ethics, Aesthetics and the Anatomy of the Self* (Dordrecht, London: Kluwer Academic, 1998).

Gaukroger, Stephen, ed., *The Soft Underbelly of Reason: The Passions in the Seventeenth Century* (London and New York: Routledge, 1998).

Gell, Alfred, *Art and Agency: An Anthropological Theory* (Oxford: Clarendon Press, 1998).

Geyer-Kordesch, Johanna, 'Georg Ernst Stahl's Radical Pietist Medicine and its Influence on the German Enlightenment', in Andrew Cunningham and Roger French eds., *The Medical Enlightenment of the Eighteenth Century* (Cambridge, MA: Cambridge University Press, 1990), 67–87.

Gibbs, Christopher H., 'Just Two Words. Enormous Success', in Christopher H. Gibbs and Dana Gooley, eds., *Franz Liszt and his World* (Princeton: Princeton University Press, 2006).

Gibson, Sophie, *Aristoxenus of Tarentum and the Birth of Musicology* (London: Routledge, 2005).

Goehr, Lydia, *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music* (Oxford: Clarendon Press, 1992).

Goldstein, Jan, *The Post-Revolutionary Self: Politics and Psyche in France, 1750–1850* (Cambridge, MA: Harvard University Press, 2005).

Gooley, Dana, *The Virtuoso Liszt* (Cambridge, MA: Cambridge University Press, 2004).

Gooley, Dana, 'The Battle Against Instrumental Virtuosity in the Early Nineteenth Century', in Christopher H. Gibbs and Dana Gooley, eds., *Franz Liszt and his World* (Princeton: Princeton University Press, 2006).

Gouk, Penelope, 'Some English Theories of Hearing in the Seventeenth Century: Before and After Descartes', in Charles Burnett, Michael Fend and Penelope Gouk, eds., *The Second Sense: Studies in Hearing and Musical Judgement from Antiquity to the Seventeenth Century* (London: The Warburg Institute, 1991), 95–113.

Gouk, Penelope, *Music, Science and Natural Magic in Seventeenth-Century England* (New Haven: Yale University Press, 1999).

Gouk, Penelope, 'Making Music, Making Knowledge: The Harmonious Universe of Athanasius Kircher', in Daniel Stolzenberg, ed., *The Great Art of Knowing: The Baroque Encyclopaedia of Athanasius Kircher* (Stanford: Stanford University Libraries, 2001).

Gouk, Penelope, 'The Role of Acoustics in the Scientific Revolution', in Thomas Christensen, ed., *The Cambridge History of Western Music Theory* (Cambridge, MA: Cambridge University Press, 2002), 223–245.

Gouk, Penelope, 'Raising Spirits and Restoring Souls: Early Modern Medical Explanations for Music's Effects', in Veit Erlmann, ed., *Hearing Cultures: Essays on Sound, Listening, and Modernity* (Oxford: Berg, 2004), 87–105.

Gouk, Penelope, 'Music's Pathological and Therapeutic Effects on the Body Politic: Doctor John Gregory's Views', in P. Gouk and H. Hills, eds., *Representing Emotions: New Connections in the Histories of Art, Music, and Medicine* (Aldershot, Hants, England; Burlington, VT: Ashgate, 2005a), 191–207.

Gouk, Penelope, 'The Role of Harmonics', in Penelope Gouk and Helen Hills, eds., *Representing Emotions: New Connections in the Histories of Art, Music and Medicine* (Aldershot: Ashgate, 2005b), 223–245.

Gouk, Penelope, 'In Search of Sound: Authenticity, Healing and Redemption in the Early Modern State', *The Senses and Society* 2 (2007), 303–328.

Gouk, Penelope and Sykes, Ingrid, 'Hearing Science in Mid-Eighteenth-Century Britain and France', *Journal of the History of Medicine and Allied Sciences* 64 (2011), 507–545.

Graf, Ernst, *Die Kampf um die Musik im griechischen Altertum* (Quedlinburg: Kloppel, 1907).

Graham, John, 'Lavater's Physiognomy in England', *Journal of the History of Ideas* 22.4 (1961), 561–572.

Gramit, David, *Cultivating Music. The Aspirations, Interest, and Limits of German Musical Culture* (Berkeley, Los Angeles, London: University of California Press, 2002).

Graziano, Amy and Julene Johnson, 'Richard Wallaschek's Nineteenth-Century Contributions to the Psychology of Music', *Music Perception* 23.4 (2006), 293–304.

Graziano, A.B., Pech, A. Hou, C. and Johnson, J.K., 'Hermann Oppenheim's Observations About Music in Aphasia', *Journal of the History of the Neurosciences* 21 (2012), 1–16.

Gremek, M.D., 'Baglivi Georgius', in *Complete Dictionary of Scientific Biography* (Detroit: Charles Scribner's Sons, 2008), 391–392.

Grosche, Stefan, *'Zarten Seelen ist gar viel gegönnt', Naturwissenschaft und Kunst im Briefwechsel zwischen C. G. Carus und Goethe* (Göttingen: Wallstein, 2001).

Guerrini, Anita, Obesity *and Depression in the Enlightenment: The Life and Times of George Cheyne* (Norman: University of Oklahoma Press, 2000).

Harrington, Anne, *Medicine, Mind, and the Double Brain: A Study in Nineteenth-Century Thought* (Princeton, New Jersey: Princeton University Press, 1987).

Hartley, Lucy, *Physiognomy and the Meaning of Expression in Nineteenth-Century Culture* (Cambridge, MA: Cambridge University Press, 2001).

Hartley, Lucy and Smith, L., 'The Sign in the Eye of What is Known to the Hand', *Textual Practice* 10.1 (1996), 83–122.

Hertzog, Patricia. 'The Condition to Which All Art Aspires: Walter Pater on Music', *British Journal of Aesthetics* 36 (2 April 1996), 122–134.

Hess, Jonathan, *Middlebrow Literature and the Making of German-Jewish Identity* (Redwood City: Stanford University Press, 2010).

Hobsbawm, Eric and Ranger, Terence, *The Invention of Tradition* (Cambridge, MA: Cambridge University Press, 1983).

Hoeckner, Berthold, *Programming the Absolute: Nineteenth-Century German Music and the Hermeneutics of the Moment* (Princeton: Princeton University Press, 2002).

Holsinger, Bruce, *Music, Body and Desire in Medieval Culture: Hildegard of Bingen to Chaucer* (Stanford: Stanford University Press, 2001).

Hosler, Bellamy, *Changing Aesthetic Views of Instrumental Music in 18th Century Germany* (Epping: Bowker, 1981).

Howe, Michael, *Genius Explained* (Cambridge, MA: Cambridge University Press, 1999).
Hui, Alexandra, *The Psychophysical Ear: Musical Experiments, Experimental Sounds, 1840–1910* (Cambridge, MA: MIT Press, 2012).
Hui, Alexandra, 'Changeable Ears: Ernst Mach's and Max Planck's Studies of Accommodation in Hearing', *Osiris* 28 (2013), 119–145.
Ishizuka, Hisao ' "Fibre Body": The Concept of Fibre in Eighteenth-century Medicine, c. 1700–1740', *Medical History* 56.4 (2012), 562–584.
Jackson, Myles, *Harmonious Triads: Physicists, Musicians, and Instrument Makers in Nineteenth-Century Germany* (Cambridge, MA: MIT Press, 2006).
Jackson, Stanley W., 'Force and Kindred Notions in Eighteenth-Century Neurophysiology and Medical Psychology', *Bulletin of the History of Medicine* 44 (1970), 397–410.
James, Jamie, *The Music of the Spheres: Music, Science and the Natural Order of the Universe* (New York: Springer, 1993).
Jewson, N.D., 'Medical Knowledge and the Patronage System in Eighteenth Century England', *Sociology* 8 (1974), 369–385.
Jewson, N.D., 'The Disappearance of the Sick-Man from Medical Sosmology, 1770–1870', *Sociology* 10 (1976), 225–244.
Jiménez Girona, J., 'La medicina de Baglivi', *Archivo Iberoamericano de historia de la Medicina* 6 (1954), 427–592.
Johnson, James H., *Listening in Paris. A Cultural History* (Berkeley: University of California Press, 1995).
Johnson, Julene and Graziano, Amy, 'August Knoblauch and Amusia: a Nineteenth-Century Cognitive Model of Music', *Brain and Cognition* 51 (2003), 102–114.
Johnson, Julene, Nicolas, Serge and Graziano, Amy, 'Jean-Martin Charcot's Role in the Nineteenth-Century Study of Music Aphasia', *Brain* 134 (2013), 1662–1670.
Jordanova, Ludmilla, *Defining Features* (London: Reaktion, 2000).
Julene, Johnson, Graziano, Amy and Hayward, J., 'Historical Perspectives on the Study of Music in Neurology', in F.C. Rose, ed., *Neurology of Music* (London: Imperial College Press, 2010), 17–30.
Kahn, Doug, *Noise, Water, Meat: A History of Sound in the Arts* (Cambridge, MA: MIT Press, 1999).
Kassler, Jamie Croy, 'Man – a Musical Instrument: Models of the Brain and Mental Functioning Before the Computer', *History of Science* 22 (1984), 59–92.
Kassler, Jamie Croy, *Inner Music: Hobbes, Hooke and North on Internal Character* (London: Athlone Press, 1995).
Kawabata, Maiko, 'Virtuosity Transfigured: In the Shadow of Paganini', *The Journal of The American Liszt Society* 57 (2006), 31–34.
Kawabata, Maiko, *Demythologising Paganini's 'Demonic' Powers of Virtuosity* (Rochester: Boydell & Brewer, University of Rochester Press, 2010).
Kennaway, James, 'Nervous Music in fin de siècle Literature', in Anne Stiles, ed., *Neurology and Literature in the Fin de Siècle* (Palgrave: August 2007), 141–162.
Kennaway, James, 'From Sensibility to Pathology: The Origins of the Idea of Nervous Music Around 1800', *Journal of the History of Medicine and Allied Sciences* 65 (2010), 396–426.
Kennaway, James, 'Stimulating Music: The Pleasures and Dangers of "Electric Music" 1750–1900', *Configurations* (2011a), 191–211.
Kennaway, James, 'The Piano Plague: The Nineteenth-Century Medical Critique of Female Musical Education', *Gesnerus* 68.1 (July 2011b), 26–40.

Kennaway, James, *Bad Vibrations: The History of the Idea of Music as a Cause of Disease* (Farnham: Ashgate, 2012a).
Kennaway, James, 'Musical Hypnosis: Sound and Selfhood from Mesmerism to Brainwashing', *Social History of Medicine* 25.2 (2012b), 271–289.
Kivy, Peter, *Music, Language, and Cognition: And Other Essays in the Aesthetics of Music* (Oxford: Clarendon, 2007).
Knecht, Klaus, *Charles Bell: The Anatomy of Expression (1806)* (Cologne: Forschungsstelle des Instituts für Geschichte der Medizin der Universität, 1978).
Knoeff, Rina, *Herman Boerhaave (1668–1738), Calvinist Chemist and Physician* (Amsterdam: Koninnklijke Nederlandse Akademie van Wetenschappen, 2002).
Kramer, Lawrence, *Musical Meaning*: *Toward a Critical History* (Berkeley: University of California Press, 2001).
Kümmel, Werner Friedrich, *Musik und Medizin. Ihre Wechselbeziehungen in Theorie und Praxis von 800 bis 1800* (Freiburg/Munich: Verlag Karl Aber, 1977).
Large, David C. and Weber, William, eds., *Wagnerism in European Culture and Politics* (Ithaca: Cornell University Press, 1984).
Larson, James L., 'Vital Forces: Regulative Principles or Constitutive Agents? A Strategy in German Physiology, 1786–1802', *Isis* 70.2 (1979), 235–249.
Lawrence, Christopher, 'The Nervous System and Society in the Scottish Enlightenment', in Barry Barnes and Steven Shapin, eds., *The Natural Order* (London: Sage, 1979), 19–40.
Legrenzi, Paolo and Umilta, Carlo, *Neuromania: On the Limits of Brain Science* (Oxford: Oxford University Press, 2011).
León Sanz, Pilar, 'Literatura médica española sobre musicoterapia en el siglo XVIII', *Nassarre* 7.2 (1991), 73–155.
León Sanz, Pilar, 'Teoría de la acción terapéutica de la música en la medicina del siglo XVIII', *Nassarre* 9.1 (1993), 79–117.
León Sanz, Pilar, 'Musicoterapia y observación clínica en la España del siglo XVIII: el tarantismo', *Nassarre* 13.1–2 (1997), 69–122.
León Sanz, Pilar, 'Medical Theories of Tarantism in Eighteenth-Century Spain', in Peregrine Horden, ed., *Music as Medicine* (London: Ashgate, 2000), 273–292.
León Sanz, Pilar, *La Tarantola Spagnola. Empirismo e tradizione nel XVIII secolo* (Besa: Editrice Lècce, 2008).
León Sanz, Pilar, 'Evolution of the Concept of Emotion in Medicine: A Music-Therapy Approach', in A.M. Gonzalez, ed., *The Emotions and Cultural Analysis* (Burlington, VT: Ashgate, 2013), 69–95.
León Tello, F.J., *La teoría musical del padre Tosca* (Valencia: Sucesor de Vives Mora, 1971).
León Tello, F.J., *La teoría española de la música en los siglos XVII y XVIII* (Madrid: Consejo Superior de Investigaciones Científicas, 1974).
Leppert, Richard, *The Sight of Sound: Music, Representation and the Body* (Berkeley: University of California Press, 1995).
Le Rider, Jacques, *Modernity and Crises of Identity: Culture and Society in Fin-de- Siècle Vienna* (New York: Polity, 1993).
Levitin, Daniel, *This is Your Brain on Music: The Science of a Human Obsession* (Penguin: Plume, 2006).
Lieberman, Matthew D., Berman, Elliot T. and Wager, Tor D., 'Correlations in Social Neuroscience aren't Voodoo', *Perspectives on Psychological Science* 4 (2009), 299–307.
Lippman, Edward A., 'The Sources and Development of the Ethical View of Music in Ancient Greece', *The Musical Quarterly* 49.2 (1963), 188–209.

Lippman, Edward A., ed., *Musical Aesthetics: A Historical Reader, Volume I: From Antiquity to the Eighteenth Century* (New York: Pendragon Press, 1986).
López Piñero, J.M., *Joan de Cabriada i la introducció de la ciència mèdica moderna a Espanya* (València, Consell Valencià de Cultura, 1994).
López Piñero, J.M. ed., *Diccionario histórico de la ciencia moderna en España* (Barcelona, Península, 1983).
Lorch, Marjorie, 'Examining Language Functions: A Reassessment of Bastian's Contribution to Aphasia Assessment', *Brain* 136 (2013), 2629–2637.
Lorch, Marjorie, Multiple Languages, Memory and Regression: An Examination of Ribot's Law', *Aphasiology* 23 (2009), 643–654.
Lorch, Marjorie, ' "Fools at Musick" – Thomas Willis (1621–1675) on Congenital Amusia', in F. Clifford Rose, ed., *Neurology of Music* (London: Imperial College Press, 2010), 151–172.
Lynn, Kremer Richard, *Letters of Hermann von Helmholtz to his Wife, 1847–1859* (Stuttgart: Franz Steiner, 1990).
Martín Moreno, A., *El Padre Feijoo y las ideologías musicales del XVIII en España* (Orense: Instituto de Estudios Orensanos Padre Feijoo, 1976).
Martínez Vidal, A., 'Los supuestos conceptuales del pensamiento médico de Martín Martínez (1684–1734): La actitud antisistemática', *Llull* 9 (1986), 127–152.
Martínez Vidal, A., *Neurociencias y revolución científica en España: la circulación neural* (Madrid: Consejo Superior de Investigaciones Científicas, 1989).
McClary, Susan, 'Music, the Pythagoreans and the Body', in Susan Leigh Foster, ed., *Choreographing History* (Bloomington, IN: University of Indiana Press, 1985), 82–104.
McClary, Susan, *Feminine Endings: Music, Gender and Sexuality* (Minneapolis: University of Minnesota Press, 2002).
McColl, Sandra, 'Positivism in Late Nineteenth-Century Thought About Music: The Case of Richard Wallaschek', *Studies in Music* 26 (1992), 34–74.
McColl, Sandra, 'Richard Wallaschek: Vienna's Most Uncomfortable Music Critic', *International Review of the* Aesthetics *and Sociology of Music* 29.1 (1998), 41–73.
McGilchrist, Iain, *The Master and His Emissary: The Divided Brain and the Making of the Western World* (New Haven: Yale University Press, 2009).
Meulders, Michel, *Helmholtz: From Enlightenment to Neuroscience* (Cambridge, MA: The MIT Press, 2010).
Möller, Hans-Jürgen, *Musik gegen Wahnsinn: Geschichte und Gegenwart musiktherapetischer Vorstellungen* (Stuttgart: J. Fink, 1971).
Mossakowski, Stanislav, 'Raphael's 'St. Cecilia: An Iconographical Study', *Zeitschrift fur Kunstgeschichte* 31 (1968), 1–26.
Myers, David, *Resisting History: Historicism and its Discontents in German-Jewish Thought* (Princeton: Princeton University Press, 2003).
Neubauer, John, *The Emancipation of Music from Language: Departure from Mimesis in Eighteenth-Century Aesthetics* (New Haven: Yale University Press, 1986).
Neubauer, John, 'Tales of Hoffmann and Others on Narrativizations of Instrumental Music', in Ulla-Britta Lagerroth, ed., *Interarts Poetics: Essays on the Interrelations of the Arts and Media* (Amsterdam: Rodopi, 1997), 117–136.
Nussbaum, Charles O., *The Musical Representation: Meaning, Ontology, and Emotion* (Cambridge, MA and London: MIT Press, 2007).
Otis, Laura, *Müller's Lab* (Oxford: Oxford University Press, 2007).
Otto, Peter, 'James Graham as Spiritual Libertine', in Peter Cryle and Lisa O' Connell, eds., *Libertine Enlightenment: Sex, Liberty and Licence in the Eighteenth Century* (London: Palgrave Macmillan, 2003), 204–220.

Overy, Katie, Peretz, Isabelle, Zatorre, Robert, Lopez, Luisa, Manjo, Maria, *Neurosciences and Music IV* (New York: Wiley, 2012).
Pankhurst, Tom, *Schenkerguide: A Brief Handbook and Website for Schenkerian Analysis* (New York: Routledge, 2008).
Park, Katherine S., 'The Organic Soul', in C.B. Schmitt and Quentin Skinner, eds., *The Cambridge History of Renaissance Philosophy* (Cambridge, MA: Cambridge University Press, 1988), 464–484.
Patel, Aniruddh, 'Language, Music, Syntax and the Brain', *Nature Neuroscience* 6 (2003), 674–681.
Patel, Aniruddh, *Music, Language and the Brain* (Oxford: Oxford University Press, 2006).
Pater, Walter, *The Renaissance. Studies in Art and Poetry*, Adam Philips, ed. (Oxford and New York: Oxford University Press, 1986).
Pearl, Sharrona, *About Faces: Physiognomy in Nineteenth-Century Britain* (Boston: Harvard University Press, 2010).
Pelosi, Francesco, *Plato on Music, Soul and Body* (Cambridge, MA: Cambridge University Press, 2010).
Plamper, Jan, *Geschichte und Gefühl. Grundlagen der Emotionsgeschichte* (Munich: Siedler Verlag, 2012).
Porter, Roy, 'The Sexual Politics of James Graham', *British Journal for Eighteenth-Century Studies* 5 (1982), 199–206.
Porter, Roy, 'William Hunter: A Surgeon and a Gentleman', in Roy Porter and William F. Bynum, eds., *William Hunter and the Eighteenth-Century Medical World* (Cambridge, MA: Cambridge University Press, 1985), 7–34.
Porter, Roy, ed., *The Popularisation of Medicine, 1650–1850* (London and New York: Routledge, 1992).
Pressly, William, *The Life and Art of James Barry* (New Haven and London: Yale University Press, 1981).
Quinlan, Sean, 'Physical and Moral Regeneration After the Terror: Medical Culture, Sensibility and Family Politics in France, 1794–1804', *Social History* 29.2 (2004), 139–164.
Rehding, Alexander, 'The Quest of the Origins of Music in Germany Circa 1900', *Journal of the American Musicological Society* 53 (2000), 345–385.
Rehding, Alexander, *Music and Monumentality: Commemoration and Wonderment in Nineteenth-Century Germany* (Oxford: Oxford University Press, 2009).
Richards, Annette, 'Automatic Genius: Mozart and the Mechanical Sublime', *Music & Letters* 8.3 (1999), 366–389.
Riese, Walter, 'The Early History of Aphasia', *Bulletin of the History of Medicine* 21 (1947), 322–334.
Riley, Matthew, *Musical Listening in the German Enlightenment* (Aldershot: Ashgate, 2004).
Riskin, Jessica, *Science in the Age of Sensibility: The Sentimental Empiricists of the French Enlightenment* (Chicago: University of Chicago Press, 2002).
Roach, Joseph R., *The Player's Passion: Studies in the Science of Acting* (Newark: University of Delaware Press, 1985).
Rodríguez Merino, J.M., *Aplicación del modelo mecanicista a la Biomedicina en la Ilustración española (T.V. Tosca, D.M. Zapata, M. Martínez, B.J. Feijóo, J. Arnau, A. Piquer)* Madrid: Universidad Autónoma de Madrid, 1989).
Rorke, Margaret Ann, 'Music Therapy in the Age of Enlightenment', *Journal of Music Therapy* 38.1 (2001), 66–73.

Rose, Frank Clifford, ed., *The Neurology of Music* (London: Imperial College Press, 2010).
Rosen, Charles, *Music and Sentiment* (New Haven: Yale University Press, 2011).
Roth, Michael, *Rediscovering History: Culture, Politics, and the Psyche* (Redwood City: Stanford University Press, 1994).
Rousseau, George, *Nervous Acts: Essays on Literature, Culture and Sensibility* (Basingstoke: Palgrave Macmillan, 2004).
Rozenblit, Marsha, *The Jews of Vienna, 1867–1914: Assimilation and Identity* (Albany, NY, 1984).
Rozenblit, Marsha, *Reconstructing a National Identity: The Jews of Habsburg Austria During World War I* (Oxford: Oxford University Press, 2001).
Sacks, Oliver, *Musicophilia: Tales of Music and the Brain*, rev. and expanded ed., (London: Picador, 2008).
Said, Edward, *Orientalism* (New York: Penguin, 1978).
Sarafianos, Aris, 'Burke's Physiological Iconography of Aesthetic Perception and the Invention of Sublime Medicine', *Comparative Critical Studies* 2 (2005a), 227–240.
Sarafianos, Aris, 'Pain, Labor, and the Sublime: Medical Gymnastics and Burke's Aesthetics', *Representations* 91 (2005b), 58–83.
Sarafianos, Aris, 'The Contactility of Burke's Sublime and Heterodoxies in Medicine and Art', *Journal of the History of Ideas* 69 (2008), 23–48.
Sarasin, Philipp, *Reizbare Maschinen: Eine Geschichte des Körpers 1765–1914* (Frankfurt: Suhrkamp, 2001).
Sarjala, Jukka, *Music, Morals and the Body. An Academic Issue in Turku, 1653–1808* (Finnish Literature Society, Helsinki, 2001).
Saslawa, J., 'Forces, Containers and Paths: The Role of Body-Derived Schemas in the Conceptualization of Music', *Journal of Music Theory* 15 (1996), 217–243.
Sassi, M.M., *Le Teorie dela percezione in Democrito* (Florence: La Nouva Italia, 1978).
Schiebinger, Londa, *The Mind has No Sex? Women in the Origin of Modern Science* (Cambridge, MA: Harvard University Press, 1989).
Schiller, F., *Paul Broca: Explorer of the Brain* (Oxford: Oxford University Press, 1992).
Schorske, Carl, *Fin-de-Siècle Vienna: Politics and Culture* (New York: Vintage, 1981).
Schueller, Herbert M., *The Idea of Music: An Introduction to Musical Aesthetics in Antiquity and the Middle Ages* (Kalamazoo: Medieval Institutes Publications, 1988).
Schumacher, Rudolf. *Die Musik in der Psychiatrie des 19. Jahrhunderts* (Frankfurt: Peter Lang, 1982).
Seth, Suman, *Crafting the Quantum: Arnold Sommerfeld and the Practice of Theory, 1890–1926* (Cambridge, MA: MIT Press, 2010.
Shawe-Taylor, Desmond, *Genial Company: The Theme of Genius in Eighteenth-century British Portraiture* (Nottingham: University Art Gallery, 1987).
Shihamura, Arthur P. and Stephen E. Palmer, eds., *Aesthetic Science: Connecting Minds, Brains and Experience* (Oxford: Oxford University Press, 2012).
Sigerist, Henry E., 'The Story of Tarantism', in Dorothy M. Schullian and Max Schoen, eds., *Music and Medicine* (New York: Henry Schuman, 1948), 96–116.
Silverman, Debora, *Art Nouveau in Fin-de-Siècle France: Politics, Psychology, and Style* (Berkeley: University of California Press, 1989).
Simonton, Dean, *Origins of Genius: Darwinian Perspectives on Creativity* (Oxford: Oxford University Press, 1999).
Skidelsky, Edward, *Ernst Cassirer: The Last Philosopher of Culture* (Princeton: Princeton University Press, 2010).

Solie, Ruth,ed., *Musicology and Difference* (Berkeley and Los Angeles: University of California Press, 1995).
Spary, Emma, *Utopia's Garden: French Natural History from the Old Regime to the Revolution* (Chicago, Chicago University Press, 2000).
Stadler, Ulrich, 'Vom Liebhaber der Wissenschaft zum Meister der Kunst. Über die verworrenen Begriffsgeschichte des Virtuosen im England und Deutschland des 17. und 18. Jahrhunderts', in Hans-Georg von Arburg, ed., *Virtuosität: Kult und Krise der Artistik in Literatur und Kunst der Moderne* (Göttingen: Wallstein, 2006), 19–35.
Steptoe, Andrew, *Genius and the Mind: Studies of Creativity and Temperament in the Historical Record* (Oxford: Oxford University Press, 1998).
Sterne, Jonathan, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham, NC: University of North California Press, 2003).
Stewart, Lauren, 'Musical Thrills and Chills', *Trends in Cognitive Sciences* 11 (2007), 5–6.
Stewart, Lauren, von Kriegstein, K., Warren, Jason D. and Griffiths, Timothy D., 'Music and the Brain: Disorders of Musical Listening', *Brain* 129 (2006), 2533–2553.
Stiffoni, G., 'Introducción', in B.J. Feijoo, ed., *Teatro crítico universal o Discursos varios en todo género de materias, para desengaño de errores comunes* (Madrid: Castalia, 1986).
Storr, Anthony, *Music and the Mind* (New York: Harper Collins, 1992), *género de materias, para desengaño de errores comunes* (Madrid: Castalia, 1986).
Sykes, Ingrid',Music and the Commodification of Sound: Advertising Acoustics in France 1800–1830', Bruno Blondé, Eugénie Briot, Natacha Coquery and Laura Van Aert, eds., *Retailers and Consumer Changes in Early Modern Europe: England, France, Italy and the Low Countries* (Tours, France: Presses Universitaires François-Rabelais, 2005), 125–138.
Sykes, Ingrid, 'Hearing Science in Mid-Eighteenth-Century Britain and France', *Journal of the History of Medicine and Allied Sciences* 66.4 (2011a), 507–545.
Sykes, Ingrid, 'Sounding the Citizen Patient: The Politics of Voice in Post- Revolutionary France', *Medical History* 55.4 (2011b), 479–502.
Syson, Lydia, *Doctor of Love: James Graham and his Celestial Bed* (London: Alma Books, 2008).
Tallis, Raymond, *Michelangelo's Finger: An Exploration of Everyday Transcendance* (London: Atlantic Books, 2010).
Tallis, Raymond, *Aping Mankind: Neuromania, Darwinitis and the Misrepresentation of Humanity* (London: Acumen, 2011).
Taruskin, Richard, 'A Myth of the Twentieth Century', *Modernism/Modernity* 2 (1995), 1–26.
Thomas, Downing A., *Music and the Origins of Language: Theories from the French Enlightenment* (Cambridge, MA: Cambridge University Press, 1995a).
Thomas, Downing A., *Music and the Origins of Language: Theories from the French Enlightenment. New Perspectives in Music History and Criticism* (Cambridge, MA: Cambridge University Press, 1995b).
Thompson, Emily, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900–1933* (Cambridge, MA: MIT Press, 2002).
Thormählen, Wiebke, 'Playing with Art: Musical Arrangement as Educational Tools in van Swieten's Vienna', *The Journal of Musicology* 27 (2010), 342–376.
Underwood, E. Ashworth, *Boerhaave's Men at Leyden and After* (Edinburgh: Edinburgh University Press, 1977).
Vila, Anne C., *Enlightenment and Pathology: Sensibility in the Literature and Medicine of Eighteenth-Century France* (Baltimore: Johns Hopkins University Press, 1998).

Vul, Edward, Harris, Christine, Winkielman, Piotr and Pashler, Harold, 'Voodoo Correlations in Social Neuroscience', *Perspectives on Psychological Science* 4 (2007), 274–290.

Waddington, Ivan, 'The Role of the Hospital in the Development of Modern Medicine: A Sociological Analysis', *Sociology* 7 (1973), 211–224.

Walker, Daniel Pickering, *Spiritual and Demonic Magic from Ficino to Campanella* (London: The Warburg Institute, 1958).

Walker, Daniel Pickering., 'Medical Spirits in Philosophy and Theology from Ficino to Newton', *Arts du spectacle et histoire des ideés* (Tours: Centre d'Etudes Supérieures de la Renaissance, 1984), 287–300.

Wardhaugh, Benjamin, *Music, Experiment and Mathematics in England, 1653–1705* (Farnham: Ashgate, 2008).

Weiner, Marc, *Richard Wagner and the Anti-Semitic Imagination* (Lincoln, NE: University of Nebraska Press, 1995).

Weisberg, Deena Skolnick, Keil, Frank C., Goodstein, Joshua, Rawson, Elizabeth and Gray, Jeremy R., 'The Seductive Allure of Neuroscience Explanations', *Journal of Cognitive Neuroscience* 20 (2008), 470–477.

West, Martin, *Ancient Greek Music* (Oxford: Clarendon, 1992).

West, Shearer, *Portraiture* (Oxford: Oxford University Press, 2004).

Whitaker, H.A., 'Neurolinguistics from the Middle Ages to the Pre-modern Era': Historical Vignettes', in B. Stemmer and H.A. Whitaker, eds., *Handbook of Neurolinguistics* (San Diego: Academic Press, 1998), 37–79.

Williams, Adrian, *Franz Liszt: Selected Letters* (Oxford: Oxford University Press, 1998).

Williams, Elizabeth A., *The Physical and the Moral: Anthropology, Physiology, and Philosophical Medicine in France 1750–1850* (Cambridge, MA: Cambridge University Press, 1994).

Wu, Duncan, *Romanticism: An Anthology* (Oxford: Blackwell, 2005).

Zon, Bennet, *Music and Metaphor in Nineteenth-Century British Musicology* (Farnham: Ashgate, 2000).

Zon, Bennet, 'From Great Man to Fittest Survivor: Reputation, Recapitulation and Survival in Victorian Concepts of Wagner's Genius', *Musicae Scientiae* 13.2 (2009–2010), 415–445.

zur Capellen, Jurg Meyer, *Raphael: A Critical Catalogue of his Paintings* (Landshut, c. 2001).

Index