STUDIES IN MUSICAL PERFORMANCE AS CREATIVE PRACTICE

MUSIC AND SHAPE

Edited by

DANIEL LEECH-WILKINSON

HELEN M. PRIOR

Music and Shape

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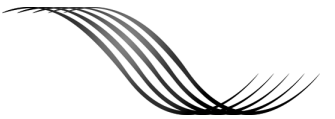

STUDIES IN MUSICAL PERFORMANCE AS CREATIVE PRACTICE

About the series

Until recently, the notion of musical creativity was tied to composers and the works they produced, which later generations were taught to revere and to reproduce in performance. But the last few decades have witnessed a fundamental reassessment of the assumptions and values underlying musical and musicological thought and practice, thanks in part to the rise of musical performance studies. The five volumes in the series Studies in Musical Performance as Creative Practice embrace and expand the new understanding that has emerged. Internationally prominent researchers, performers, composers, music teachers and others explore a broad spectrum of topics including the creativity embodied in and projected through performance, how performances take shape over time, and how the understanding of musical performance as a creative practice varies across different global contexts, idioms and performance conditions. The series celebrates the diversity of musical performance studies, which has led to a rich and increasingly important literature while also providing the potential for further engagement and exploration in the future.

These books have their origins in the work of the AHRC Research Centre for Musical Performance as Creative Practice (www.cmpcp.ac.uk), which conducted an ambitious research programme from 2009 to 2014 focused on live musical performance and creative music-making. The Centre's close interactions with musicians across a range of traditions and at varying levels of expertise ensured the musical vitality and viability of its activities and outputs.

Studies in Musical Performance as Creative Practice was itself broadly conceived, and the five volumes encompass a wealth of highly topical material. *Musicians in the Making* explores the creative development of musicians in formal and informal learning contexts, and it argues that creative learning is a complex, lifelong process. *Distributed Creativity* explores the ways in which collaboration and improvisation enable and constrain creative processes in contemporary music, focusing on the activities of composers, performers and improvisers. *Music and Shape* reveals why a spatial, gestural construct is so invaluable to work in sound, helping musicians in many genres to rehearse, teach and think about what they do. *Global Perspectives on Orchestras* considers large orchestral ensembles in diverse historical, intercultural and postcolonial contexts; in doing so, it generates enhanced appreciation of their creative, political and social dimensions. Finally, *Music as Creative Practice* describes music as a culture of the imagination and a real-time practice, and it reveals the critical insights that music affords into contemporary thinking about creativity.

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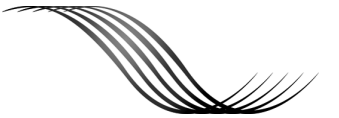

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CONTENTS

LIST OF CONTRIBUTORS

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David Amram is one of the most prolific and performed composers of his generation, and has left a unique mark on the world of music. He became the first composer-in-residence with the New York Philharmonic in 1966 at the request of Leonard Bernstein. At eighty-six Amram continues to work as a classical composer, multi-instrumentalist, band leader, lecturer and guest conductor, constantly composing as he tours the world.

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George Benjamin was born in 1960 and began composing at the age of seven. After studying with Messiaen he worked with Alexander Goehr at King's

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Lucia D'Errico is an artist devoted to experimental music, performing on plucked string instruments. As a performer and improviser, she collaborates with contemporary music groups and with theatre, dance and visual art companies. An artistic researcher at Orpheus Institute Ghent, she is part of the ME21 research project. Her doctoral research (on the docARTES programme) focuses on recomposing baroque music. She is also active as a freelance graphic designer.

Scott deLahunta has worked as writer, researcher and organizer on a range of international projects bringing performing arts with a focus on choreography into conjunction with other disciplines and practices. He is currently Senior Research Fellow at Deakin University (Australia) in partnership with Coventry University (UK), R-Research Director (on sabbatical) at Wayne McGregor | Random Dance, and Director of Motion Bank/The Forsythe Company.

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Eugene Feygelson took a performance-based PhD at King's College London, focusing on modes of nonverbal communication used in improvisatory contexts. His other interests include classical and contemporary improvisation, music cognition, and relationships between music and language, as well as music's role in human evolution. Feygelson's postgraduate research, including his Master's from the University of Cambridge, was supported by the Jack Kent Cooke Foundation.

Evelyn Glennie was the first musician to create and sustain a career as a solo percussionist. She has played around two thousand five hundred concerts in more than fifty countries, recorded thirty albums and won three GRAMMY awards. In 1990 she released her autobiography, *Good Vibrations*, and since then has written several essays, has contributed to a variety of publications and often publishes printed music. She continues to invest in realizing her vision: to Teach the World to Listen.

Rolf Inge Godøy is Professor of Music Theory at the Department of Musicology, University of Oslo. His main interest is in phenomenological approaches to music theory, taking our subjective experiences of music as the point of departure for music theory. This work has been expanded to include research on music-related body motion in performance and listening, using various conceptual and technological tools to explore the relationships between sound and body motion in the experience of music.

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Julia Holter is a musician from Los Angeles interested in songwriting, performing and various methods of recording. Her most recent recording was the studio album *Loud City Song* (2013) on Domino Records. Since the release of her previous two albums, *Tragedy* (2011) and *Ekstasis* (2012), she has performed

at venues and festivals throughout Europe, North America, Lebanon and Australia. She has had pieces commissioned by and/or has performed with ensembles such as the Los Angeles Philharmonic and Stargaze. She frequently collaborates in group projects with artist and musician friends including Rick Bahto, Ramona Gonzalez, Yelena Zhelezov, Laurel Halo, Mark So, Cat Lamb and Laura Steenberge.

Stephen Hough is an English pianist with a catalogue of more than fifty CDs. His iPad app 'The Liszt Sonata' was released by Touch Press in 2013. As a composer, he has been commissioned by the Wigmore Hall, the Musée du Louvre, the National Gallery (London), musicians of the Berliner Philharmoniker, BBC Symphony Orchestra, Westminster Abbey and Westminster Cathedral. He is on the faculty of the Juilliard School in New York and is a visiting professor at the Royal Academy of Music in London and the Royal Northern College of Music in Manchester.

I-Uen Wang Hwang moved from Tainan, Taiwan to the USA and earned her PhD in music composition from the University of Pennsylvania (1998). Since she is both a painter and a musician, a link between her music and art naturally developed. She often paints to amplify her creativity while composing. The Taiwan National Symphony Orchestra has commissioned three of her symphonies, including *Diptych of Taiwan* (2010), which was included in the CD that won Taiwan's Golden Melody Award (2014) for best art music album.

Steven Isserlis is a British cellist who is acclaimed worldwide for his technique and musicianship. He enjoys a distinguished career as a soloist, chamber musician, educator and author. While his extensive performing and recording career takes up the majority of his time, he has also written two books for children about the lives of the great composers, and he gives frequent masterclasses all around the world. For the past seventeen years he has been Artistic Director of the International Musicians' Seminar at Prussia Cove in Cornwall.

Mats Küssner is Research Associate in the Department of Musicology and Media Studies at Humboldt University, Berlin. In 2014–15, he was Peter Sowerby Research Associate in Performance Science at the Royal College of Music. Küssner completed his PhD within the AHRC Research Centre for Musical Performance as Creative Practice at King's College London, investigating embodied cross-modal mappings of sound and music. In 2013, he and Daniel Leech-Wilkinson co-edited a special issue of *Empirical Musicology Review* on 'Music and Shape'.

Timothy B. Layden was born in the USA but is currently living and working in the UK. He studied fine art at the University of the Americas (Mexico), before receiving a doctorate in fine art from the University of Barcelona in 2005. He is an interdisciplinary artist working primarily with sound, image and text. He

has been involved in diverse art and educational projects around the world. Much of his work is inspired by his own experience of synaesthesia.

Daniel Leech-Wilkinson studied at the Royal College of Music, King's College London and Clare College, Cambridge, becoming first a medievalist and then, since c. 2000, specializing in the implications of early recordings, especially in relation to music psychology and performance creativity. He led a project on 'Expressivity in Schubert song performance' within the AHRC Research Centre for the History and Analysis of Recorded Music (CHARM), followed by 'Shaping music in performance' as part of the AHRC Research Centre for Musical Performance as Creative Practice. Books include *The Modern Invention of Medieval Music* (2002) and *The Changing Sound of Music* (2009).

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Helen M. Prior is a lecturer at the University of Hull. Her work on music and shape began when she was a postdoctoral researcher within the AHRC Research Centre for Musical Performance as Creative Practice at King's College London. She has interests in musical performance, music and emotion, and music perception and familiarity.

Alex Reuben makes movies characterized by dance, music and environment. His films are exhibited by Picturehouse and Curzon Cinemas. *Routes—Dancing to New Orleans* was selected in the 'Top 20 Movies of the Decade' (Geoff Andrew, BFI/Time Out). Reuben is a lecturer at Camberwell and Central Saint Martins. He has been commissioned by Sadler's Wells, Channel 4 TV, DanceDigital and the BBC, with awards from The British Council and Jerwood Charitable Foundation, and he is director of *Cinderella (RockaFela)*, a movie about cognition and movement, for the Wellcome Trust and Arts Council England.

Steve Savage is an active producer and recording engineer. He has been the primary engineer on seven records that received GRAMMY nominations, including CDs for Robert Cray, John Hammond, The Gospel Hummingbirds and Elvin Bishop. Savage holds a PhD in music and teaches musicology at San Francisco State University. He has several books that frame his work as a researcher and as a practitioner, including his most recent work *Mixing and Mastering in the Box* (2014).

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Jamie Ward is Professor of Cognitive Neuroscience at the University of Sussex. He has an MA in Natural Sciences from the University of Cambridge and a PhD in Psychology from the University of Birmingham. He previously held a faculty position at University College London. He is Co-Director of Sussex Neuroscience and was Founding Editor of the journal *Cognitive Neuroscience*. He has a particular research interest in synaesthesia and, more generally, in the question of how information is integrated between the senses.

LIST OF ILLUSTRATIONS

Figures

Tables

ABOUT THE COMPANION WEBSITE

Oxford University Press has created a password-protected website to accompany *Music and Shape*, which contains additional illustrations, including all the book's colour illustrations, sound files, videos and excepts from interviews. Examples available online are indicated in the text with Oxford's symbol ⓟ.

Anna Meredith, I-Uen Wang Hwang and Timothy B. Layden have all provided artwork and corresponding sound files for the compositions they discuss in their 'Reflections' on shape. Adam Ockelford, Lucia D'Errico and Max Baillie have used colour to clarify some of their illustrations. Zohar Eitan, Renee Timmers and Mordechai Adler provide a score of Schubert's 'Die Stadt', discussed in their chapter. Helen M. Prior provides numerous additional figures, together with extracts (in the Tables) from her interviews with musicians that illustrate each component of the model of musical shaping she finds that they use. Malcolm Bilson provides, over and above his Reflection, a video of a full-length lecture he gave at the Liszt Academy, Budapest, on the topics discussed here.

All these items enrich a reading of *Music and Shape*.

www.oup.com/us/musicandshape

PREFACE

Daniel Leech-Wilkinson and Helen M. Prior

> There can be no doubt that concepts of shape are ubiquitous in musical discourse and music cognition: we use innumerable shape-related metaphors for most (if not all) features of music such as dynamics, timbre, harmony, pitch, contour, rhythm, texture, tempo, timing, expressivity and affective qualities. Also, we encounter shapes in various music-related images such as in graphical scores, composers' sketches, music analysis illustrations, as well as in more directly signal-based shape images as waveforms and spectrograms, and last but not least, as shape images of music-related body motion. We could thus speak of widespread and deep-rooted *shape cognition* in music.
>
> —Godøy (2013: 223)

'Music and *what*?!' people have tended to ask us. But, as Godøy's remarks suggest, that puzzlement is not shared by musicians: they always seem to know what we're referring to.[1] In a sense it's that discrepancy that inspired this book and the research project from which it has emerged. For although the connection between shape and sound may seem mystifying to others, Prior (2012) finds that professional musicians use 'shape' to talk and think about how to perform notes, phrases, melodic lines, melodic patterns, harmonic features, harmonic patterns, rhythms, movements, compositions, changes in loudness, tempo and expression; and this applies in classical music, jazz, folk, pop, rock, urban, world musics and crossover, and for people who originated from thirty-one countries, 43 per cent of them fluent in a language other than English. Moreover, for speakers of languages which do not use a simple equivalent to 'shape' in discussion of music, the concept was nevertheless immediately recognized from their own musical discourse. The use of the term is also not merely a current 'fashion': there is evidence to show its use by composers, performers and critics throughout the twentieth century and to some degree earlier (see Table 0.1).[2] Evidently, shape is a concept that is flexible, ubiquitous and very useful when thinking and speaking about performance and composition.

With so many and such varied uses, it cannot just be visual or tactile shape that we are dealing with. Shape must be doing much broader metaphorical work, transferring into different, less tangible domains including time, quantity, intensity, complexity, speed and emotional response, at least.[3] One way of looking at this is to say that shape means so many things in relation to music

TABLE 0.1 **Historical examples of the use of shape**

Shape as form or structure	W. R. Anderson (critic)	'*Caractacus*, the composer's Op. 35 (Leeds, 1898: dedicated to Queen Victoria), immediately precedes the *Variations*, the *Sea Pictures*, and *Gerontius*, and looks strongly onward from the earlier cantatas, both in shape and idiom.' (Anderson 1934: 396)
	Benjamin Britten (composer/performer)	'I never, never, start a work without having a very, very, clear conception of what that work is going to be. Err. . . When I say conception, I don't mean, necessarily tunes, or specific rhythms, or harmonies, or . . . old fashioned things like that, but I mean the actual . . . shape of the music, the kind of music it's going to be, rather than the actual notes.'
		'I know that the first drafts for *The Turn of the Screw* were in what one would call then the normal three-act form . . . and . . . even I think, the libretto was written in that shape.' (Britten and Mitchell 1969)
	Fryderyk Chopin (composer/performer)	'Chopin . . . is at the piano and does not observe that we are listening to him. He improvises as if haphazardly. He stops. "What's this, what's this?" exclaims Delacroix, "you haven't finished it!"
		"It hasn't begun. Nothing's coming to me. . . . Nothing but reflections, shadows, shapes that won't settle. I'm looking for the colour, but I can't even find the outline." ' (George Sand, in Eigeldinger 1997: 240)
	Lang Lang (performer)	'When you're talking about Mr Barenboim, he can really bring the knowledge, the structure, how to put every element into one big shape.' (Barenboim 2005)
	Claus-Steffen Mahnkopf, Frank Cox and Wolfram Schurig (composers/musicologists)	'While in common-practice music concepts such as theme or motive, phenomena such as line or melody and the systems of syntax and rhythm are generally taken to be self-explanatory, the question concerning corresponding means in post-traditional music (i.e. new music since 1945)—that is, sufficient to shaping the musical surface in a potentially meaningful manner—is rarely reflected upon and more commonly suppressed.' (Mahnkopf, Cox and Schurig 2004: 7)
	Anthony Marwood (performer)	'I didn't have any influence over the structure or shape of the piece, but I know that he [Thomas Adès] had my playing in mind when he wrote it.' (Anonymous 2008: 15)
	Michael Quinn (critic)	'The Delmé find the shape, structure and even the nobility of Haydn's *Emperor* but the detail seems sadly lacking.' (Quinn 1999: 72)
	Stephen Plaistow (critic)	'. . . his feeling for the shape of a Bach fugue, and for part playing and the character and brilliance of Bachian figuration, is full of finesse, quite the equal of any Bach specialist's.' (Plaistow 1965: 114)

(continued)

TABLE 0.1 **Continued**

Shape in relation to musical expression	Nalen Anthoni (critic)	'The music breathes a life of its own as he ardently inflects its phrases to shape the tension of his line.' (Anthoni 2008: 65)
	Dietrich Fischer-Dieskau (performer)	'Shape the endings of the long phrases in the recitative in a way that the conductor can easily follow you.' (Dietrich Fischer-Dieskau in Monsaingeon 1992)
	Trevor Harvey (critic)	'The orchestral playing is not just good, it is really outstanding: the conductor knows how to give us flexible and shapely phrases as well as tightly rhythmic music.' (Harvey 1954: 59)
	Rachel Podger (performer)	'With Vivaldi there are so many possibilities to shape the music.' (Podger 2003: 15)
	Stephen Plaistow (critic)	'Richter doesn't shape the actual subjects in the fugues very much, preferring to state them flatly and to let the counterpoint achieve its own expressiveness.' (Plaistow 1965: 114)
	Alec Robertson (critic)	'It is a pity this artist has so little feeling for the shape of a phrase.' (Robertson 1947: 165)
	Stanley Sadie (critic/musicologist)	'Another thing Podger is specially good at is the shaping of those numerous passages of Vivaldian sequences, which can be drearily predictable, but aren't so here because she knows just how to control the rhythmic tension and time the climax and resolution with logic and force.' (Sadie 2003: 51)
Shape in relation to movement or gesture	Aaron Cassidy (composer/musicologist)	'. . . the notion that the primary morphological unit—not only in my music but also in music in general—is not merely the aural gesture, but far more importantly, the physical gesture. I would assert that the shapes and local forms that we hear and process as listeners are at their core the byproducts of physical, visceral activities and energies, and, further, that the physical motion required to create a particular sound or set of sounds is the most important component of a gesture's morphological identity.' (Cassidy 2004: 34)

that it in effect means nothing at all. But that kind of throwing up of hands in despair doesn't lead to very penetrating scholarship; and in any case, its very imprecision may prove to be its *raison d'être*. Better, then, to approach shape as a concept with some unusual and intriguing properties, and to try to find out what those might be and what they might suggest about its place in the brain's responses to music.

It was with this aim as an ideal, albeit one we could not hope to realize, that we planned and carried through a three-year research project (2009–12) on music and shape, funded by the UK's Arts and Humanities Research Council within its Research Centre for Musical Performance as Creative Practice.[4] In the event we managed to continue for a further two years, since there was so much to do and King's College London continued to provide support. This book contains some of the results of that project work (the chapters by Küssner,

by Leech-Wilkinson and by Prior). But mainly it consists of contributions by scholars not involved with the project whose work seemed to us to be dealing with topics in which, our research suggested, shape might be implicated. This then is not a conference proceedings. We did hold a highly interesting and fruitful conference on 'Music & Shape' in London in July 2013, the result of an open call for papers, and the studies we attracted are published in three special issues (forming volume 8) of the journal *Empirical Musicology Review*. The chapters in this book, however, were commissioned separately, the choice of authors reflecting the research areas that seemed most crucial to those engaged in the music-and-shape project. Authors' home disciplines include music psychology, music analysis, music therapy, musicology, performance (jazz, classical and DJ), synaesthesia, and dance (scholarship and performance). That every author, although none had discussed shape before, found it quite easy to see how their work might contribute, only confirms the flexibility and ubiquity of shape as a concept that does some useful work for those who try to understand music and musical practice.

As well as commissioning the eleven chapters, we followed the example set by the *Cambridge Companion to Recorded Music* (one of the publications from our predecessor project, the Centre for the History and Analysis of Recorded Music).[5] There we had included 'personal takes' by a wide variety of artists in different areas linked to recordings. For this volume, we commissioned 'shape reflections' from a similarly wide spread of music practitioners. We approached a range of performers (wind, strings, keyboards, percussion, guitar) and composers (classical, film, graphic, jazz, popular)—two of whom were also notable conductors—as well as a record producer, a music painter and a synaesthete. Their instruction was simply to tell us how they used 'shape' in their own musical work and thinking, or to reject it as a useful concept if in fact they didn't use it (none took up that last option).

Performers' thought about music-making has not always been well understood by musicology, despite being at the heart of much ethnomusicology, and more recently music sociology and psychology. At its best (for example, Berliner's 1994 ethnography of jazz practice), studies of performers' experience of what they do can illuminate a whole world of music-making. In a previous study of violinists and harpsichordists (Leech-Wilkinson and Prior 2014)—developed here in Chapter 8 on DJs' practices by Greasley and Prior—we argued that the way musicians talk about performing details in scores, however approximate it may look to music theory, reveals a highly efficient means of enabling the body to generate expressive performances in real time. The Reflections here offer similar evidence over a wider field. Of the heuristics we identified, shape proves to be one of the most powerful, for it summarizes, with a generality that allows it to be implemented and enacted in a great many ways, the essential characteristics of a 'musical' performance. As Eitan, Timmers and Adler conclude in their Chapter 3, shape is a concept that is sufficiently flexible to map between domains on any hierarchical level

from a single note to a whole piece of music; it can apply to scores, performances and listening experiences, and within those to such varied features as narrative structure, form, loudness, brightness, tempo, speed, density, register, intensity, harmonic or interval patterning, pitch direction, sound spectrum, distance and timbre. As such, it acts as a highly efficient synthesizing tool for musicians to use in order to negotiate the vast array of musical choices available to them in performance.

Shape's flexibility and usefulness are just as clear from the range of other views that this book offers. In Adam Ockelford's Chapter 5, shape is seen as a core property of music that links together its notation, its audible features and our cognition of musical structure. In Michael Spitzer's Chapter 4, a sonata by Bach is compared 'both to the *shape* of particular emotional behaviours and to the expressive *shapings* of a formal model' as well as 'performance styles of "expressiveness"'. For Milton Mermikides and Eugene Feygelson, writing about improvisation in Chapter 6, shaping processes are conceived of as strategies through which material is selected and transformed within musical space. For Philip Barnard and Scott deLahunta, in Chapter 10, 'shape' is a useful concept for dancers and choreographers not just to describe bodily configuration and movement but also 'to index the more ineffable meanings and relationships that are intuited to "make sense" in an artistic context'. For Rolf Inge Gødoy (Chapter 1), 'shape-cognition in music is opening up new areas of musicological, aesthetic and affective psychological research, as well as providing practical tools in artistic creation, for example in the domains of sonic design and various kinds of multimedia art'. For the synaesthetes with whom Jamie Ward works, shapes not only are a means of *conceptualizing* complex interactions of musical features and the feelings they seem to trigger, but are experienced 'at multiple levels in music: from single notes through to whole compositions and performances' (Chapter 9) as sensations automatically generated by hearing music. Among the various aspects of shape our practitioners discuss in their Reflections, George Benjamin mentions shape especially in relation to form, Malcolm Bilson to performance style, Stephen Hough to composition style, Timothy B. Layden to visual impressions, Lucia D'Errico to bodily sensation, Alex Reuben to body movement, Alice Eldridge to both gesture and visual representations, Richard G. Mitchell to emotional change, Evelyn Glennie to dynamics (in the fluid sense), David Amram to musical character, I-Uen Wang Hwang to rhythm and metre, Max Baillie to harmony, Simon Desbruslais to timbre, Steven Isserlis to narrative, Steve Savage to sonic landscape, Antony Pitts to initial inspiration, and Julia Holter to closure. It goes without saying that all of these factors could be written about separately and in much greater depth, and indeed they have been. But the point is not that 'shape' could always be replaced by a more precise term—one which varies according to the context in which shape is being used. Rather, what we need to ask is why shape is so useful in the sample of contexts discussed here, and by implication in so many others; and why it is so much more useful than the more precise term that might pin it down in each case.

Concepts very like the 'synthesizing' notion we discuss here have been invoked in the past. Mine Doğantan-Dack has summarized this interestingly in her essay in the *Empirical Musicology Review* volume mentioned above:

> Christian von Ehrenfels, who is best-known today for his article titled 'Über Gestaltqualitäten', i.e. 'On Gestalt Qualities', ... published in 1890 ... argued that each experience we have of a Gestalt or form in *any sensory modality* is cognized as *structurally analogous* to the experience of a *spatial shape*. In other words, spatial Gestalten serve in his view as references for our comprehension of forms in other modalities. An immediate implication of this idea is that concepts related to the perception of spatial shapes can be applied to shapes extended in time—for instance, tonal patterns. Indeed, the idea that there are *similarities of form* between different fields of experience is one of the most important conclusions of Ehrenfels' article. (Doğantan-Dack 2013: 213–14)

Jin Hyun Kim, in her article in the same collection, notes that:

> Delineating the causal relation between bodily aroused states and vocalizations, [Friedrich von] Hausegger discusses dynamic forms of sound, which are experienced as an expression of mental states, in his seminal monograph *Music as Expression* (*Die Musik als Ausdruck*) (1887). ... Hausegger contends that shaped vocal sounds are not only experienced as expressions of others' aroused states, but also give rise to the 'co-sense (*Mitempfindung*)' of arousal (p. 42). He also considers this kind of phenomenon in the context of non-sentient phenomena such as music and dance.
>
> In the monograph *Shaping and Movement in Music* (*Gestaltung und Bewegung in der Musik*), [Alexander] Truslit (1938) tackles the coupled relationship between the shaping of music and musical experience. The shaping of music is regarded as fundamental to the musical experience, which takes place during both music-making and music perception; the latter is characterized by the listeners' 'co-shaping (*mitgestalten*)' of music (Truslit 1938, p. 20) through their inward experience of movement (p. 27). Basing the shaping of a sound on its duration and intensity, Truslit conceives of movement as the primordial element being shaped. Movement in music is shaped by dynamics—gradations of sound intensity changing the volume of sound as perceived—in conjunction with agogics—temporal changes of sound causing its deceleration or acceleration within the given overall temporal structure—resulting together in spatio-temporal contours of music. According to Truslit, dynamics and agogics act as fundamentals of the process of musical shaping. (Kim 2013: 164–5)

Yet neither of these studies was followed up at the time, probably because they had no points of contact with contemporary musicology, whose concern above

all was to present music as a subject for historical and textual study. Closest in the intervening years, as Doğantan-Dack points out, was Susanne Langer (1942), whose interest in how music feels brings some of her work into the same orbit. And indeed, shape's re-emergence recently can be understood as part of a growing interest in those musical practices and responses that draw on feeling more than on thinking; this is a result of the increasing focus of music studies on emotion, enabled by the development of music psychology and neuroscience. In this context, Kim, Doğantan-Dack and Leech-Wilkinson (this last in our volume) have all (independently) pointed to child-psychiatrist Daniel Stern's work on vitality affects (2010), which in a sense (though unknown to Stern) extends Truslit's work, as a valuable theoretical base for understanding musical shape. Interrelations with other work are suggested, too, by Godøy in the continuation of the quotation that begins this Introduction:

> We could thus speak of widespread and deep-rooted *shape cognition* in music, as well as in human reasoning in general, as suggested by some directions in the cognitive sciences, foremost by so-called *morphodynamical theory* and so-called *cognitive linguistics*. (Godøy 2013: 223)

Much relevant work has been done by researchers studying music and gesture, outstandingly Godøy himself and Marc Leman (Leman 2007; Godøy and Leman 2010). Gesture clearly implies shape: it is often considered as including performers' executive and expressive movements—that is, how they move while they play—but it has also been used extensively to talk about habits in the forming or performing of short sequences of notes (Gritten and King 2006, 2011). Yet while gesture is closely tied to indicative human movement, shape seems more abstract and thus more flexible in its application to musical and other kinds of action.

Another difficulty is hinted at in Leech-Wilkinson's chapter, where the possibility is raised that a sense of 'shape' arises from a submodal feature common to all the sense modalities. This extends beyond the cross-domain mapping that several chapters (Ockelford's; Eitan, Timmers and Adler's; and Spitzer's in particular) see as crucial to shape's multiple applications. A submodal role for shape might explain why our understanding of what shape refers to in music is at once so multifaceted and so hazy, and why it may always remain so. For submodal features, as pointed out by Marks (1978), are necessarily beyond conscious perception: they are components in our sensory experience but not accessible to consciousness directly through the senses. Alex Reuben's impressionistic Reflection on his work as a filmmaker may well be pointing towards this aspect of shape: in using shape to link feelings in different senses and art forms, he is not being merely touchy-feely but may be drawing on the submodal qualities of shape (operating in the recently discovered domain of multisensory perception) as an aspect of the dynamics of all sensory experience. What previously seemed fanciful now is beginning to seem simply

correct: feelings aroused by one sense can be linked by the brain to feelings aroused by others, so that input in one mode can be read in terms of the impressions arising from others—and not just for synaesthetes, in fact particularly not for synaesthetes since for them the effect is fixed whereas for others it varies with context. Synaesthetes, nevertheless, offer particularly interesting insights into musical shape. For, as Jamie Ward has shown, their experiences, though remarkably varied, still make better sense to nonsynaesthetes than artificial alternatives.

It looks, then, as if the kind of work that 'shape' does for musicians draws on some quite fundamental aspects of perception, while at the same time offering us a host of ways of thinking about the experience and practice of music on many other levels. The chapters and Reflections are interleaved and ordered so as to emphasize interconnections. While they are grouped thematically into five sections—shapes mapped, composed, performed, seen and felt—there is also a gradual shift of theme so that the borders between sections are fuzzy. To read from cover to cover, then, should be to take a journey through views of music and shape. Most contributions speak of multiple facets of this complex relationship, however: other orderings are possible, and dipping in and out will often make further connections apparent.

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PART 1

Shapes mapped

Reflection

Evelyn Glennie, percussionist

The shape of music is constantly fluid because nothing resonates the same twice. Every sound and shape is born and reborn. When music is printed on the page it takes shape in my imagination with the eye leading the way.

As a performer, the environment is my instrument and percussion instruments are my tools to deliver the sound. I can provide all the musical ingredients for the environment I am immersed in. The acoustic will mould the sound meal which is thus delivered to the audience. The members of the audience will have differing perspectives on the sound and shape according to where they are situated and their emotional state at the time.

Listening is ever-present, recognizing that the body is a huge ear that allows us to experience the sensation of the sound journey, reached far beyond the capacity of the ear alone. That in turn creates the fluid shapes in music.

1

Key-postures, trajectories and sonic shapes

Rolf Inge Godøy

It seems that we come across expressions of shape everywhere in music-related contexts. When talking about music, people—with or without musical training—often tend to use shape metaphors such as 'thin', 'fat', 'smooth', 'rough', 'curved', 'flat' etc., or when listening to music, people often tend to trace shapes with their hands or other body parts, shapes that reflect sonic features of the music. And needless to say, the body motion of musicians and dancers in performance can be perceived as shapes, as can music notation and graphical scores (see Ockelford, Chapter 5 below), in more recent times extended to signal-based graphical representations of musical sound as waveforms and spectrograms (see Greasley and Prior, Chapter 8 below).

The ubiquity of shape expressions in music-related contexts seems to be spontaneous and robust, as well as quite practical, when we talk about music. But on reflection, the widespread use of shape metaphors and other shape representations is also enigmatic for the simple reason that audible sound is basically invisible (unless we use some technology for sound visualization), whereas 'shape' is primarily something in the visual domain. 'Shape' is defined in the *New Oxford American Dictionary* as 'the external form, contours, or outline of someone or something' and as 'a geometric figure such as a square, triangle, or rectangle', yet it can also have more indirect or conceptual visual-geometric significations such as 'the specified condition of someone or something'. Although this and similar definitions of 'shape' may include such general and nonvisual applications of the term, the question remains as to why and how we so readily link sonic features with visual shape representations in musical experience.

This is even more enigmatic considering that music unfolds in time, and so shape by definition is something that we overview or 'have in the field of vision' as an 'all-at-once' experience, and hence is something 'instantaneous' in our minds (at least subjectively, although there is a time-dependent scanning and mental processing going on in the perception and cognition of visual images).

How this 'temporal-to-atemporal' transformation in our minds works still seems not to be well understood in the relevant cognitive sciences, but from our own and others' research, we believe the linking of sonic features and visual shape images has much to do with experiences of music-related body motion. In what can be broadly called a *motor theory* perspective on music perception, it seems that body postures at salient moments in sound production (both instrumental and vocal), what we call *key-postures*, and body motion *trajectories* between these key-postures, relate to subjectively perceived *sonic shapes*, as suggested by the title of this chapter.

The basic tenet of this chapter is therefore that shape in music-related contexts is closely related to experiences of *something that we do* or *mentally simulate that we do*; so after an introductory presentation of some main notions of shape in musical experience and music-related research this chapter goes on to develop some ideas of motor cognition in music. Relevant elements of research on music-related body motion are reviewed, including various kinds of the *sound-producing* body motion of musicians and *sound-accompanying* body motion that we can observe in music listening. A central issue in this connection is an assessment of the correspondences between body motion features and sonic features: rhythm and pitch contours are often seen to be clearly reflected in body motion, but other features such as texture, timbre, dynamics and a number of so-called expressive features may all be related variably to body motion and thus also to shape images.

One crucial issue in such a listing of links between body motion and sonic features is that of timescales: in listening, either to a short tune or to a more extended work of music, we need to segment sound and associated body motion into meaningful chunks that enable more specific determinations of shape. Various instrumental, biomechanical, cognitive and musical-aesthetic constraints seem to converge in suggesting that we experience fragments of music at what we call the *meso timescale,* very approximately in durations ranging from 0.5 to 5 seconds, as particularly salient with regard to both body motion and sonic features. After a presentation of relevant research on this phenomenon of chunking and motion-sound shapes at the meso timescale, the chapter concludes with some ideas on how principles of key-postures, trajectories and sonic shapes may be put to use in music-related research and practical contexts.

Shape representations

Needless to say, music and shape is a very extensive topic, with ramifications to most areas of music and music-related research. Yet out of all this material, it could be useful to take a brief look at some aspects of western music notation and more recent instances of shape representations in musical research, to better situate our motor theory perspective on shape in music.

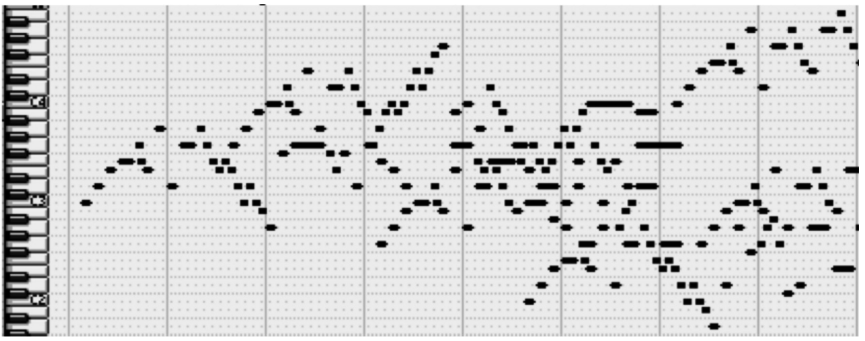

FIGURE 1.1 A pianola representation of the first eight bars of J. S. Bach's Fugue in C major, *Well-Tempered Clavier* Book I. This representation highlights the gradually expanding pitch space, fanning out to several octaves from the initial middle C. The shape of this pitch space expansion is one of the main architectural elements here (as well as in the rest of J. S. Bach's works and much other music for that matter); however, the timescale of this kind of shape is rather slow, i.e. is on what we call the macro timescale (see p. 14 below).

For one thing, western common practice notation, as well as recent extensions such as MIDI pianola representation (Figure 1.1), can partly be regarded as a kind of choreographic script, a system for denoting sound-producing body motion to be realized by performers. Trained score readers may readily see correspondences between the graphical shapes in the score, the required motion shapes of the performers and the emergent sonic shapes, in particular as pitch contours and rhythmical-textural shapes. In other cases, there may be less clear relationships between visible shapes in the score and subjectively perceived sonic shapes; e.g. a tamtam strike may be indicated in the score as a single onset point in time, perhaps with some dynamic marking and indication of the type of mallet to be used, yet the result in performance is a protracted and extremely complex sound.

Evidently, timbral features are in general not well represented in western notation because of its focus on pitch and duration. And as we know, this focus has tended to leave expressive features of pitch, dynamics and timing outside the mainstream conceptual apparatus, relegating these to the domain of performance practice, a focus that has led to problems when attempting to represent music of other cultures by western music notation transcriptions. But within this pitch- and duration-focused western musical culture, we have also seen some further abstractions from perceptual features, such as at times disregarding octave placement, equating for instance an octave-compressed chord with a widely spaced chord.[1] Similar distortions of perceptually salient pitch shape, and also of rhythm–shape relationships, are found in twentieth-century serial and integral serial music, as well as in so-called pitch-class set theory, effectively resulting in what could be called a 'spatiotemporal collapse' of salient perceptual features (see Godøy 1997 for a discussion of this).

In the twentieth century, however, we have also seen attempts to develop more graphical and shape-reflecting representations, such as the Schillinger system (Sethares 2007) or various kinds of graphical scores, such as those of Cage, Ligeti, Bussotti, Logothetis and others (Schäffer 1976). One of the most important music-and-shape efforts of the twentieth century is in the work of Xenakis, for example in his development of connections between musical and architectural shapes such as in his well-known composition *Metastaseis* and later design of the Philips Pavilion at the Brussels World's Fair in 1958 (Xenakis 1992).

Since the advent of sound-analysis technologies, we have had the means for signal-based representations of musical sound as shapes. An early and remarkable effort in this direction of visualizing the shapes of actual sonic unfolding of music was the work of Cogan (1984), and in the ensuing decades we have seen a great expansion of signal-based representations of music in the domain of so-called Music Information Retrieval (MIR). MIR is actually a matter of going in the opposite direction from western music notation: instead of making continuous sound from discrete symbols, it tries to extract the discrete pitches and durations from continuous, complex and, we could say, often messy signals. Confronted with continuous musical sound, we soon realize that the great difficulty in MIR in making computer-based transcription of music (in particular of polyphonic music) is that human listening, including shape perception in music, although seemingly versatile and robust, is dependent on a number of perceptual cues in combination with extensive prior knowledge and mental schemas, hence on something that has yet to be implemented in MIR technologies.

As the universe of continuous sound has been opened up to explorations by signal processing technologies, in principle giving us access to the above-mentioned timbral and expressive features, we also need to develop a conceptual apparatus for handling these features (see e.g. Peeters et al. 2011). One pioneering research effort based on continuous sound was that of Pierre Schaeffer and co-workers (Schaeffer 1966, [1967] 1998; Chion 1983; Godøy 1997, 2006). The point of departure for Schaeffer and co-workers was to take the subjectively perceived overall pitch, dynamic and timbre-related shapes of sound fragments, of so-called *sonic objects*, as the point of departure, and then successively to differentiate more and more subfeatures as shapes, only at a later stage trying to correlate these subjectively perceived shape features with physical features of the acoustic signal.

After this pioneering work of Schaeffer and co-workers, there have been some related projects of exploring musical sound by way of subjective shape metaphors, for example the Unités Sémiotiques Temporelles (UST) project (Delalande et al. 1996), which is more oriented towards affective features of sonic objects. The common point of departure for Schaeffer and the UST project was the idea that although western musical culture has been good at

conceptualizing features that can be ordered into more abstract symbolic systems such as those of pitch and duration, it has not been well suited to conceptualizing more continuous, composite and multidimensional features. In assessing the work of Schaeffer and followers, we find the idea of using various shape images as a nonsymbolic means for feature representation to have been an attractive solution, something that we now see has an affinity with body motion (Godøy 2006).

Shape ontologies

Shape in musical contexts is a *multimodal* phenomenon because it involves sound and vision and—our main concern here—also the sense of motion. Multimodality has in recent years received a lot of attention in the cognitive sciences, and 'classical' notions of the separation of the senses have been challenged. There is now mounting evidence that the sense modalities work together and complement one another, sometimes even with one sense modality overriding another, resulting in what may be judged as illusions, as in the 'McGurk effect' where visual impressions of a speaker's mouth motion can change the subjective interpretation of the sound heard (McGurk and MacDonald 1976).

The sense of motion is now regarded as composite, including *kinematic* (visible motion), *effort* (dynamic, not directly visible), *proprioceptive* (self monitoring) and *haptic* (sense of touch) components. Additionally, musical sound is obviously highly composite and multidimensional, with many features in parallel. This means that we need to be sufficiently precise about which features we have in mind when we discuss shape in musical contexts so that we do not make so-called category mistakes, mixing incommensurable features. We thus need to consider shape ontologies, carefully analysing what features of musical sound and/or body motion we are referring to, and also whether some instances of shape can be considered amodal, i.e. more independent of a specific modality and applicable across modalities.

Considering shape ontologies also means trying to distinguish what is in the signal (auditory, visual, haptic, etc.) and what is in our minds, regarding mental shape images as just as salient as more physical shapes, provided that these mental shape images are shared by people. This should mean in turn that we treat illusions on an equal footing with the 'real', as long as they are subjectively experienced as relevant for experiences of shape in music, as in the well-known illusions of endless ascending or descending sounds by Jean-Claude Risset, similar to M. C. Escher's optical illusions of endless ascending or descending staircases. The dividing line is to be placed between subjectively comparable and incomparable features, meaning that there should be a perceivable similarity between two domains, as is the case with this endless decent or ascent in Risset and Escher, making auditory and visual shape sensations ontologically

commensurable. On the other hand, abstractions based on western music notation may lead to category mistakes, for example by transferring numerical features from one domain to another without reflecting perceivable similarities.

The risk of making such category mistakes is also present in technology-based shape applications, in so-called sonifications of data from nonauditory sources, converting a visual domain image to sound. We could use the term 'mapping', well known in music technology contexts (Hunt, Wanderley and Paradis 2003) for keeping track of shape ontologies. Basically, 'mapping' means taking data from one domain and assigning it to features in another domain. For instance, stock exchange data could be used to control pitch on a musical instrument so that we could listen to the development of the stock market as a melodic curve. Or we could use a stream of video or data from other sensors in mapping body motion to sound generation in various ways, and so listen to body motion (Jensenius and Godøy 2013). Or we could take a picture of a cat and use this picture as a spectrogram for generating a sound. The extent to which the resultant sound would have any 'cat'-like perceptual features is doubtful: we could probably call this cat sonification a case of category mistake in shape mapping, in principle similar to the ontological mismatching of shape, mentioned above, that we may find in music using western common practice notation.

Mapping is at the core of all electronic instrument development, and given the fact that any mapping between input data and sound output is possible with electronic instruments, the crucial question concerns what kinds of mappings make sense to, or could be called 'intuitive' by, musicians and audience. This is a question that can be studied empirically, as has been done in some recent research projects (see Jensenius 2007 and Nymoen 2013 for overviews). From this research as well as numerous informal observations over decades of development in the field of new electronic instruments, the prime candidate for shape transfer from one domain to another is our sense of body motion, meaning the mapping of motion along axes in three-dimensional space to various perceptually salient sonic feature dimensions, typically pitch, loudness and spectral centroid.

Shape cognition

Findings in a number of domains seem to converge in suggesting that notions of shape are fundamental to much (and perhaps most) human cognition and behaviour. This means that we should also consider some principles of general, amodal shape cognition, as these may be useful when we migrate across modalities and features as we do here in the context of music and shape.

Providing an 'all-at-once' overview image of whatever we perceive or think about is both the prime attribute of shape cognition and its prime advantage,

as well as its challenge, in our context: if we do not somehow have such overviews of lived experience and are just submerged in a continuous stream of sensations we will not be able to make sense of the world in general or of music in particular, as was pointed out by Edmund Husserl more than a century ago (Husserl 1991). To Husserl, it was obvious that we need to interrupt the continuous stream of sensations from time to time, and make overview images of whatever is being perceived, by a series of intermittent 'now-points' (Godøy 2010b). Shape cognition could then be defined as our capacity to capture and handle the ephemeral and temporally distributed features of music, as well as other lived experience. And with presently available methods and technologies for recording and processing both sound and body motion, we have the possibility of 'freezing' transient sound and motion and examining them at leisure as shapes.

Historically, one of the first and most extensive projects on shape cognition originated in music with gestalt theory in the last decades of the nineteenth century (Smith 1988), with, among other things, a focus on how shapes emerge and are conserved across different instances, such as melodies across various instrumental or vocal guises. Gestalt theory was later extended to other domains, and is now often primarily associated with the visual. The remarkable insights of early gestalt theory concerning coherence criteria in shape cognition still have validity today, both in auditory perception (Bregman 1990) and in human motor control (Klapp and Jagacinski 2011).

But one of the most extensive recent research efforts on shape cognition is no doubt that of so-called *morphodynamical* theory (Thom 1983; Petitot 1985, 1990; Godøy 1997). The gist of morphodynamical theory is that human perception, understanding and reasoning are based on ordering sensory input as shapes, or in the words of René Thom, the leading figure of this theory, 'the first objective is to characterise a phenomenon as shape, as a 'spatial' shape. To understand means first of all to geometrise' (1983: 6).[2]

Of interest here is the morphodynamical distinction between the 'control space' and the 'morphology space', meaning a distinction between the input and the perceived results of any generative model (Petitot 1990), be that in physics, biology, behavioural sciences or other domains such as musical sound. It is always the perceived shapes—the features of the morphology space—that are of interest for us here in musical contexts, and the distinction between control and morphology spaces helps us to determine what are ontologically comparable features and avoid various mapping mismatches or category mistakes as mentioned above.

The distinction between control and morphology spaces is particularly useful for exploring categorical thresholds between shapes. This means making systematic explorations of perceived shapes by generating incrementally different variants through what is often called analysis-by-synthesis (Risset 1991). A simple but important example of this is the distinguishing of 'percussive'