

Between art and science: Music as performance

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Abstract: Musicologists have traditionally treated music as a form of sounded writing. Informed by interdisciplinary performance studies, this article explores what musicology might look like if it was built on the idea of music as performance, and how the study of performance can contribute to an understanding of the role of music in culture. In addition to traditional humanities approaches and the employment of close listening, the sheer number of recorded performances creates scope for the use of quantitative approaches. Setting these into the broader context of digital humanities, and putting forward the idea of ‘augmented listening’, I show how technology can serve to advance the understanding of music as cultural phenomenon and human experience.

Keywords: music, performance, science, digital, humanities, text, modernism, mazurka, Schenker, Hatto

MUSIC AS TEXT

No academic discipline comes into being for purely academic reasons. Musicology as we know it today came into being in the context of 19th-century nation building, an important dimension of which was the recovery, or invention, of national cultural traditions. If the leading role in that development was played by literature, and by the philological techniques of editing that aimed to reconstruct texts in their original form, then music followed in its wake, and musicology modelled its approaches on those of philology. That is why editing traditionally lay at the heart of the discipline: it was set up to treat music as, in essence, a form of writing, a branch of literature. That is not to say that those who reconstructed historical texts weren’t interested in performing them, but the text came first and performance followed. To perform

the music meant to reproduce the score, interpreting it through appropriate source criticism and an understanding of relevant period conventions. Seeing musical performance this way turns it into a matter of getting things right rather than creative practice.

This image of music as text resonated with much older patterns of thought. The idea that music is in essence some kind of abstract entity, embodied in or signified by notation, can be traced back much further. As early as the 10th century, according to Sam Barrett (2008: 90), neumatic notation was seen as reflecting a higher order of being, and if the basic framework of thought goes back to Plato, then equally it persists in the sometimes explicitly platonic approaches of present-day philosophers who see music's meaning as inherent, deposited in the score by the composer. And if you see music that way, then it follows that you see performance as in essence a process of reproducing the composer's meaning, something that can be done well or badly but in which the essential criterion of success is faithfulness to the composer's intentions, or in another version that is at the same time more metaphysical and more positivistic, faithfulness to the music itself.

That is the aesthetics of *Werktreue*, and it is also the backdrop to the frequent complaints by 20th-century composers that performers have sought to interpose themselves between composer and listener: Stravinsky's (2003: 127) 'great principle of submission'—the submission of the performer to the composer—is only a particularly conspicuous example of a much more widespread way of thinking. The idea of music as a text reproduced in performance is so deeply embedded in thinking about Western 'art' music that, however much we might wish to, we find it hard to conceive the role of performers in musical culture more generously. And my 'we' includes performers themselves, for many of whom authenticity is an abiding concern: it is important to them that their interpretive choices can be justified in terms of historical style or composers' intentions, in a way that has few parallels in other performing arts. There is a sense you just don't find in the theatre that you shouldn't perform classical music unless you have your paperwork in order, and Daniel Leech-Wilkinson (2012: para 3.3) refers to the 'performance police (teachers, critics, bloggers)' whose self-imposed role is, in effect, to check the paperwork.

Compared to most performance cultures, then, classical music performance is regulated in a quite extreme way by the text and those charged with the authority of the text. The HIP or historically informed performance movement that changed the face of early music in the decades after 1970 was built on traditional discourses of the performer's duty, whether to the composer or to the conditions of period performance: it disciplined performance by subjugating it to the stipulations of period treatises as interpreted by musicologists. Though in reality relationships between performers and musicologists were nothing like as one-way or as hierarchical as that

might suggest—and after all, they were in some cases the same people—the ideology behind it was based on the authority of writing over playing.

And while the world of HIP has loosened up significantly since those early days, there is another area in which the old ideologies maintain much of their grip: that part of the North American music-theoretical establishment that is concerned with performance. As expressed by Wallace Berry in his 1989 book *Musical Structure and Performance*, the aim is to explain ‘how ... a structural relation exposed in analysis can be illuminated in the inflections of edifying performance’ (Berry 1989: 2). Put admittedly crudely, the idea is that the theorist knows how the music works, based on analysis of the score, and accordingly tells the performer how it should go. In essence it’s a one-way street, from analysis to performance, from page to stage. In today’s parlance, it is knowledge transfer rather than knowledge exchange.

In this way, established music-theoretical approaches to performance treat it as in essence an epiphenomenon of structure as specified by the score. Except within strict limits, performance oriented towards the projection of structure isn’t seen as an option, a performer’s choice, but rather as the paradigm of what performance is or should be. References to Murray Perahia’s ‘very natural and spontaneous musicianship’,¹ for example, reflect a characteristic quality of articulation in his playing that conveys the compositional structure, but with delicacy rather than insistence. You can hear this in the careful shaping of the phrases when he plays Schubert’s G^b major Impromptu Op. 90 No. 3 (Example 1 at <https://www.britac.ac.uk/journal/2/cook-n.cfm>):² he rounds off each phrase by playing more slowly and softly, articulating the phrases in such a way that they form a clearly perceptible framework within which slight but telling nuances of timing and dynamics highlight expressive junctures. It’s the simplest possible illustration of Berry’s principle that edifying performance involves identifying the structure and then finding ways to bring it out in performance.

Perahia is the most famous present-day musician to have acknowledged the strong influence of Heinrich Schenker, the turn-of-the-20th-century Viennese pianist, writer, and teacher whose methodical approach to the analysis of music from Bach to Brahms became the basis of the most theoretically informed of present-day performance pedagogies, particularly as regards the piano. Early in his career Schenker planned, partially drafted, and frequently talked about a book on performance, but he never completed it. And when they developed the analytical method of Schenker’s later

¹ Stanley Sadie reviewing Perahia’s recording of Mozart’s Piano Concertos Nos 17, K453 and 18, K456 (Sony Classical 88691 91411-2), Gramophone, October 1981 (<http://www.exacteditions.com/read/gramophone/murray-perahia-special-33385/13/2/>, accessed 2 August 2013).

² Recorded in 1982 and reissued on Murray Perahia, Schubert Impromptus, Sony BMG Masterworks Classic Library 94732 (2005).

years into a theory and pedagogy of performance, post-war Schenkerians such as Charles Burkhardt and Carl Schachter saw themselves as bringing to fruition the project that Schenker had initiated. But there's a problem here, a quite fundamental issue of how theorists approach historical documents, whether musical scores or verbal texts.

Peter Johnson (2007) has shown how, when they wrote about Beethoven's Quartet Op. 135, mid-20th-century English musicologists and critics were actually writing about specific characteristics of the Busch Quartet's famous recording from 1933: they thought they were simply talking about what Beethoven wrote, but you can't make sense of notes—you can't imagine or even *read* them—without making assumptions of how they should be played. And the problem is that those assumptions have often been both unconscious and anachronistic. That's what happened with Schenker. When theorists from the second half of the 20th century read his analytical graphs and theoretical writings, they imagined the music he was talking about according to what had by then become mainstream performance style—a way of playing that was much less expressively inflected than had been the norm a generation or two earlier, and much more oriented towards the projection of structure.

We don't know how Schenker himself played, except through the thoroughly unsatisfactory medium of verbal description, but we do know how a pianist he greatly admired played the G \flat major Impromptu on a piano roll dating from 1905, and this pianist, Eugen d'Albert, took a quite different approach (Example 2 at <https://www.britac.ac.uk/journal/2/cook-n.cfm>).³ As I said, Perahia structures his performance around the regular four-bar phrasing that Schubert composed into the music through the rhythm and contour of the melody, and through its harmonic and cadential patterning. D'Albert starts in the same way as Perahia, marking the end of the first phrase at bar 9 (about 16 seconds into the recording), but from then on he lets the phrase structure look after itself—which it can do very well, since the melodic and harmonic organisation specifies it so clearly. Instead d'Albert's basic strategy is to slow down over a series of beats in order to target and bring out some particularly expressive moment that may be located anywhere within the phrase. He plays through the phrase breaks, and it is only at bar 32—at the very end of Example 2—that his playing comes back into phase with the composed structure. Even then he does little more to underline the sense of closure than a brief expressive lingering on the note that initiates the final cadential motion (second beat of bar 30), nor does he need to: Schubert has taken care of it.

³Transferred on *The Great Pianists Vol. 6, Dal Segno DSPRCD022* (1992). D'Albert is playing the music in Liszt's edition, which—like most of its time—transposed the music to G major and notated it in 2/2 rather than 4/2. Bar numbers in the text of this article and in Example 3 reflect this (to convert them into the bar numbers in modern editions subtract 1, divide by 2, and add 1).

Rather than translating structure as an analyst might see it into sound, then, d'Albert for the most part shapes his performance around what he sees as particularly expressive moments—or to be more precise, moments that embody a potential for expression that is realised through his intervention. In other words he doesn't think of performance as an epiphenomenon of compositional structure. And no more, it seems, did Schenker. Twenty years after d'Albert made his piano roll, Schenker published an analytical article on the G \flat major Impromptu—arguably the first article in which what we think of as Schenkerian theory appears in a fully worked out form. And as in most of Schenker's analytical articles, there is a two-page section in which he gives a bar-by-bar commentary on how the music should be played (2005: 141–2). Modern Schenkerians hardly ever talk about these commentaries, because they can't make sense of them. The reason is that Schenker is talking about a style of performance quite different from that with which modern Schenkerians are familiar.

Even allowing for the fact that words can only communicate so much of the quality of performance, it is quite clear that what Schenker describes, or prescribes, has far more in common with d'Albert's playing of the G \flat major Impromptu than with Perahia's. Modern listeners and critics frequently complain about d'Albert's unsteady timing, but that is precisely the kind of playing Schenker is talking about: I count twelve specific invocations of hesitating, delaying, lingering, and pausing on the one hand, and of resuming motion, hurrying forward, pushing forward, and accelerating on the other. Schenker (2005: 141) might have been thinking of Example 2 when he wrote, 'One should not simply announce one note after the other: rather, one should lead toward and retreat from significant notes.' It's obvious that, when he wrote about the music, Schenker imagined it going quite differently from how modern Schenkerians imagine it going when they read what he wrote.

That doesn't of course mean that the structure-oriented style of performance that modern Schenkerians have read into Schenker's descriptions is wrong, in the sense of being misguided or meaningless. But it means it's just that, a *style* of performance, a performance option, and moreover one that is characteristic of the period from around 1950 on—and not a paradigm of performance in general, as theorists, teachers, and philosophers of music have represented it.

MUSIC AS PERFORMANCE

Even more than the HIP ideologues, then, analysis-to-performance theorists sought to discipline the act of performance: they located the meaning of music in the authored text, and so created a hierarchical relationship between, on the one hand, authors and their representatives—including musicologists and theorists—and on the other hand

performers. It's hardly an exaggeration to say that to do that is to think of music as something other than a performing art. It's an extreme case of the bias towards written language and against the performative that Carolyn Abbate (2004) has identified in musicology, and James Winn (1998) in the humanities in general. And as such it stands at the furthest possible remove from performance studies, the amalgam of theatre studies and anthropology that has been one of the disciplinary success stories of recent decades. The basic principle of performance studies is that meaning is generated in the act of performance. To think of music as performance is therefore to focus on how meaning is created in real time—in the act of performing it, and equally in the act of hearing it, whether live or on a recording. It's to focus on the different meanings that result from the different ways that music is performed, or has been performed at different times and places, and on the relationships this involves or creates between performers, listeners, and the musical work as a tradition regulated—in the case of Western 'art' music—by documentation.

Theatre studies can be seen as a secession from traditional literary studies, a reaction against the latter's exclusive focus on the text: the history of Shakespeare studies makes the point. If theatre studies has a weakness, it is that in the act of secession it threw out the baby with the bathwater. Theatre studies, and even more the broader discipline of performance studies into which it fed, tend to swerve away from close engagement with the specifics of texts and the ways they condition the meanings that arise in the act of performance. W.B. Worthen (2003: 12) writes that 'Dramatic performance is not determined by the text of the play: it strikes a much more interactive, *performative* relation between writing and the spaces, places, and behaviors that give it meaning, *force*, as theatrical action.' That is a fair and balanced statement, but in asserting its disciplinary autonomy, its independence from traditional, text-based studies, performance studies has tended to create the impression that the meaning generated in the act of performance is the only meaning that matters. Another way of seeing it is that textual and performative meaning have been separated out through being assigned to different disciplines.

Given the extent to which musicology has traditionally been oriented towards the text, it's not surprising that there are calls for the establishment of a new discipline of music performance studies, focusing on the generation of meaning in the act of performance in the same way that performance studies does. But we don't have to follow the model of theatre studies, which by seceding from literary studies left the latter as an unreconstructed discipline and divided text from act. The problem with such a division is that, while—as Worthen said—texts do not *determine* performances or the meanings they embody, they create a potential for the generation of certain meanings or kinds of meaning. These meanings emerge in the act of performance, and crucially, it is through performance that we come to know what meanings a given dramatic text

or musical score may afford. (The Busch Quartet's recording of Beethoven's Op. 135 illustrates that.) There is in this way a reciprocity of text and act—of the written and the aural—that makes it essential to understand each in terms of the other, at least in the case of musical traditions as strongly conditioned by writing as Western 'art' music. And this means we can take advantage of the fact that musicology has taken so long to embrace the idea of music as performance: we can choose a different route from theatre and performance studies. Rather than creating a new discipline with its own societies and journals, we can create a broader musicology in which writing and playing are both understood as integral dimensions of music's existence and meaning.

With this proviso, performance studies forms a good model for the furthering of a performative perspective within musicology, and if musicology has borrowed approaches from performance studies, I'd like to think that in return it might offer the insights from close reading and close listening that, as an unreconstructed discipline, musicology has retained. Many of the areas in which musicological approaches to performance are developing reflect work in performance studies: issues of embodiment, ranging from the visual and kinesthetic dimensions of performance to the embodied dimension of listening (more on that shortly); the social dimensions of performance, for example how ensemble performance involves the negotiation of relationships that are at the same time social and musical; the relationship between explicit or declarative knowledge on the one hand, and tacit or procedural knowledge on the other. These are areas in which one of the most important research methods is participant observation, and a major ongoing transformation in musicology is an upsurge of ethnographical approaches applied to Western musics. Another way to put it is that musicology and ethnomusicology are converging around the study of performance.

In this article, however, I shall focus on a further approach to performance analysis, one that doesn't figure on the agenda of performance studies. Musicologists have customarily used research methods that are appropriate to data poor fields like medieval polyphony, where all the world's extant original sources could quite possibly be piled on a single, very large dining table. But they have also done the same in areas where far more data are available, resulting in a self-reinforcing focus on that tiny sample of the repertory that we call the canon. (Franco Moretti (2000: 57) has made the same complaint about literary studies.) Admittedly there are some signs of change. As digital libraries based on widely disseminated music representation languages develop, we are beginning to see more notation-based corpus studies, though they certainly aren't part of the musicological mainstream. Performance, however, offers much greater scope for data-rich approaches, partly because of the existence of over a century's worth of commercial recordings, with major repertory items in literally

hundreds of different versions, and partly because of the extent to which salient aspects of performance can be captured in very concise codes (MIDI is an obvious example, at least in relation to keyboard music). That in turn means that key data extracted from performance—in particular data concerning tempo, dynamics, or articulation—are highly amenable to quantitative analysis. In fact it's hard to think of another creative practice that is so deeply cultural, evoking strong emotions and deeply held values, and yet so amenable to quantitative investigation.

There has been a certain amount of work along these lines in the areas of performance analysis I just mentioned. There has been a flowering of empirical investigation of gesture and other aspects of embodied performance, based on motion capture technologies, as well as research focusing on microtiming and other negotiated dimensions of ensemble performance. Again, however, such work has not permeated the musicological mainstream. But over the last two decades one quantitative approach to performance has made some headway in musicology and more specifically theory: this typically involves extracting tempo—that is, the pattern of beat durations over the course of a performance—and either representing it graphically or subjecting it to simple statistical analysis. And in repertory like 19th-century piano music, where *rubato* is a major source of musical meaning, this results in readily interpretable data.

Figure 1 graphs the central part of d'Albert's playing from Example 2, starting about 16 seconds in. The line graph represents durations: higher means longer, in other words, slower tempo. (The silhouette-like shapes at the top represent dynamics, but I will not discuss them.) There are divisions between composed phrases at bars 9 and 25—at left and right borders of Figure 1—and also at bar 17, which I have marked by a heavy line. But you can see that d'Albert doesn't shape his playing around them. Instead he slows down as he approaches bar 14; he is targeting the crotchet melody notes in that bar (first circle). You might imagine him trudging uphill. Then at bar 15 he reaches the crest and walks more freely, gathering speed and rushing through the phrase break at bars 16–17 in a way that it is hard to imagine a modern pianist doing (second circle). Only in bar 18 does he begin to slow down again: now he is targeting the *appoggiatura* and resolution in bar 19, easing up in bar 20 (third circle). From bar 21 he starts yet again to slow down, now targeting bar 25. While in terms of composed phrasing this is the beginning of a new eight-bar phrase, the effect of d'Albert's deceleration and prolongation of the first beat of bar 25 is to blur the boundary, creating a momentary effect that time is standing still.

The same kind of data can also be used in simple statistical analysis. As an example, a scattergram from Eric Grunin's 'Eroica' website⁴ (Fig. 2) shows the degree of tempo flexibility in recordings of Beethoven's 'Eroica' Symphony from the 1920s

⁴<http://www.grunin.com/eroica/> (temporarily unavailable at the time of writing).

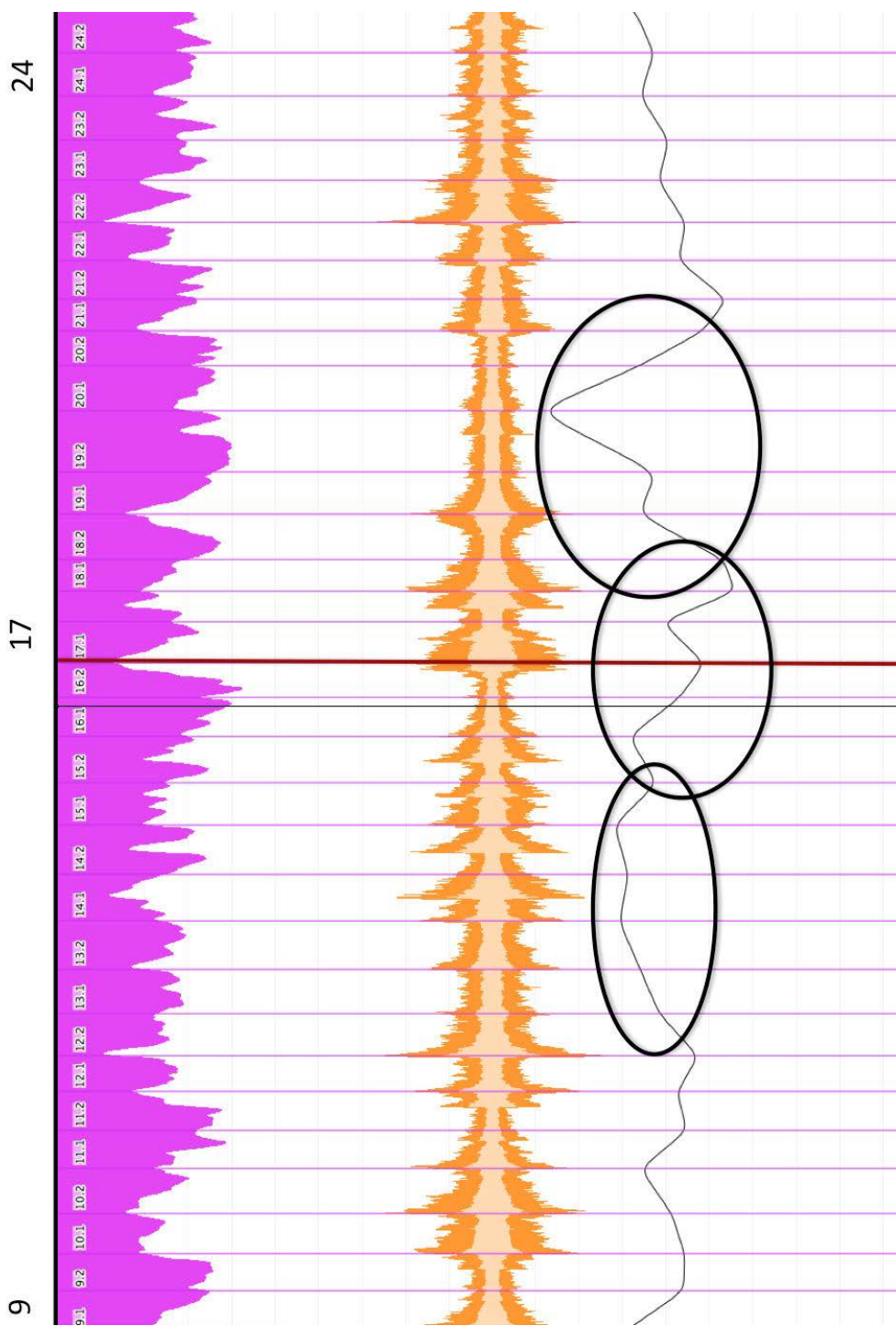


Figure 1. Beat duration graph for d'Albert's performance of Schubert's *Impromptu* Op. 90 No. 3, bars 9–24, created using Sonic Visualiser. Duration values are aligned with the end of the beat to which they refer.

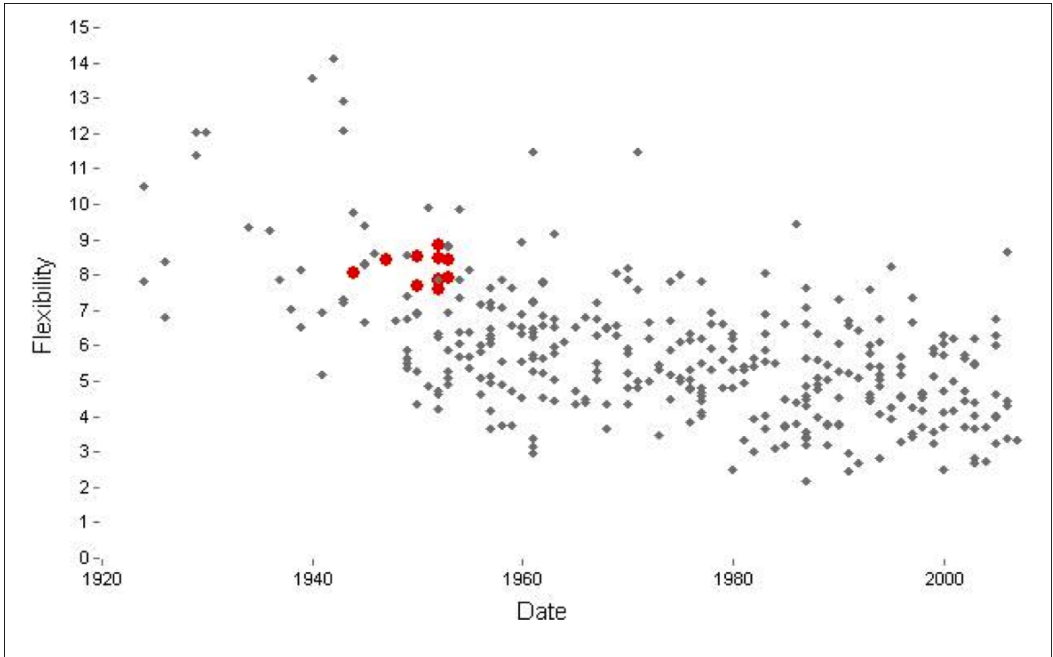


Figure 2. Eric Grunin’s comparative measure of flexibility in recordings of Beethoven, Symphony no. 3 (first movement exposition), plotted against date of recording, with Furtwängler’s recordings highlighted. Used by permission of Eric Grunin.

to the present day, where flexibility is defined by dividing the music into sections and comparing the average tempo of each section to that of the whole: each diamond represents a different recording, with Wilhelm Furtwängler’s being highlighted, and you can see they are characterised by rather flexible tempos compared to most other conductors’. At the same time, it is important to recognise that approaches like this are highly reductive. For instance, the same average tempo in the ‘Eroica’ might mean that the conductor plods along at exactly the same speed throughout, or that wildly frenetic tempos alternate with monumental caesurae. (Furtwängler is closer to the second than the first.) In other words, there is no guarantee that such approaches relate meaningfully to the qualities of the performance as experienced.

But that doesn’t necessarily mean you can’t make musically significant deductions from them. I can illustrate this in terms of a project carried out at the AHRC Research Centre for the History and Analysis of Recorded Music (CHARM), where much of the research described in this article was based. One of the CHARM researchers, Craig Sapp, used a correlation technique based on tempo data to group recordings of Chopin mazurkas, discovering patterns that corresponded to a lesser or greater degree with chronology, nationality, or teacher–pupil relationships. That is what he expected to find. What he didn’t expect was the fact that, in the course of this work, he kept

finding implausibly high correlations between Joyce Hatto's recordings and those of another pianist, Eugen Indjic. But anybody who saw Victoria Wood's film 'Loving Miss Hatto', which the BBC screened on prime time television over Christmas 2012, will know what was going on.

In 1993 a recording of Chopin's mazurkas was issued under Hatto's name by Concert Artists, a label owned by Hatto's husband, William Barrington-Coupe; initially released on cassette, a slightly tweaked version of the recording appeared as a CD box set in 2006.⁵ It was in fact a reissue of a recording by Indjic dating from around 1988—except that Barrington-Coupe had changed the order of the tracks, slightly altered some tempi and the recording acoustic, and helpfully corrected one track where Indjic had misinterpreted the notated pattern of repeats. Sapp's implausible correlations were in fact the first proof of the Hatto hoax. Most people think the hoax came to light when someone put a Hatto recording onto his iPod and the Gracenotes software identified the recording it had been taken from, but that's because our university was still worrying about the legal implications of going public when the story broke.

Even though CHARM missed the boat (we went public the following day), we found ourselves caught up in a media storm, and judging by the classical music chat lists, a lot of people got the impression that CHARM had been set up—at not inconsiderable cost to the taxpayer—in order to detect illicit recordings. Of course it hadn't, and that kind of forensic musicology has little to do with musicology as I understand it, the point of which is to understand music in its cultural context and to gain a better understanding of that cultural context through the study of music. The confusion arises because researchers come to empirical performance analysis from different disciplines, and carry it out for different purposes and on the basis of different assumptions.

For example, music psychologists are drawn to performance analysis because of the combination of cultural depth and ease of quantitative investigation to which I referred: they are primarily interested in general principles rather than the specific qualities of individual cases. That also applies to researchers in music information retrieval (MIR), whose approach is, however, more pragmatic: they are interested, for example, in developing algorithms to model listeners' tastes, with the aim of optimising the music preference systems that enable consumers to find what they want as the availability of digital music on the web explodes (and the music business is becoming more and more about selling services like this, rather than selling the music itself). MIR is in effect an applied area of computer science, and a number of more mainstream computer scientists have worked on recorded performances in order to develop and assess approaches such as data mining and artificial intelligence.

⁵ Joyce Hatto, Chopin: The Mazurkas, Concert Artist CACD 20012 (2006).

Now, situations where different researchers work in the same area, and perhaps use the same techniques, but with quite different aims and on the basis of quite different epistemological assumptions, are generally fraught with misunderstanding. The study of performance is no exception, though interactions between empirical musicologists, music psychologists, and computer scientists have often been remarkably productive. The difficulties have rather arisen in relation to more traditional musicologists, who object to the use of empirical approaches in performance analysis or in music analysis more generally, on the grounds that quantitative methods cannot possibly tell you anything about culturally constructed and negotiated meanings. John Deathridge, for example, writes in his dust jacket endorsement of Adorno's *Towards a Theory of Musical Reproduction* (2006) that 'In his refreshing antidote to the mere collection and measurement of data that too often passes for research into the practice of music, Adorno effectively declares war on the impoverishment of musical performance in the modern era and the shallow empirical investigations that unwittingly reflect it.' And Richard Taruskin (1995: 24) complains of analysis in general that 'Turning ideas into objects, and putting objects in place of people, is the essential modernist fallacy—the fallacy of reification, as it is called. It fosters the further fallacy of forgetting that performances, even canned performances, are not things but acts.'

Actually the same kinds of objections are found across the range of digital humanities, particularly in relation to the use of empirical and statistical approaches for purposes of critical understanding. Stephen Ramsay (2011: 167) writes that 'The inability of computing humanists to break into the mainstream of literary critical scholarship may be attributed to the prevalence of scientific methodologies and metaphors in humanities computing research—methodologies and metaphors that are wholly foreign not only to the language of literary criticism, but to its entire purpose.' An example is when computational analysis is claimed to 'verify' critical hypotheses: Ramsay points out that critical insight is a matter of 'deepened subjectivity', not objectively verifiable data. Linked to this is an unhelpful tendency for digital humanities scholars to see their approaches as superior rather than complementary to traditional ones, as when Moretti gives the impression that traditional close reading has been rendered obsolete by what he calls 'distant reading': by this he means extracting statistical patterns from large textual corpora, a more sophisticated development of Grunin's approach to the 'Eroica'.

In contrast to this, Ramsay presents his own 'algorithmic criticism' as a ludic approach that is designed to provoke new critical responses through principled deformation or defamiliarisation of texts, in this way complementing traditional close reading. In this way, he says, quoting Jerome McGann, 'we are brought to a critical position in which we can imagine things about the text that we didn't and perhaps

couldn't otherwise know' (Ramsay 2011: 172). That in turn resonates with Willard McCarty's claim that the value of computational models lies in their ability to facilitate processes of critical reading: as he says, 'what matters in this process is not the model but its perfective iteration at the hands of the modeller. What matters is not the model but the modelling' (McCarty 2007: 10). This is a perhaps even more relevant approach when one is dealing not with texts but with performances, or in the case of recordings with representations of performances.⁶

I can make the point in relation to musicologists' use of timing graphs such as Figure 1. Graphs of this kind appeared with some frequency in music-theoretical articles during the 1990s, but they suffered from a fundamental problem: it's easy enough to get the graph out of the music, but it's very hard to put it back. In other words, it's hard to relate the graph to the aural experience of the music in anything except the most broad-brush level (and at that level the graph probably serves little useful purpose anyhow). This problem encouraged a kind of deciphering approach in which people searched visually for possibly significant patterns or trends, often without really knowing what they were looking for. It resembled nothing so much as the way investment analysts try to make sense of financial data. For example, in December 2012 Dominic Frisby (2012), of *MoneyWeek*, published a graph of the price of gold between 2008 to 2012, and explained that he had added a red trend line below which one should not expect the price to fall; then, he said, he had added a 144-day moving average in green, which modelled the price beautifully between 2009–11, but for some reason ceased to do so thereafter. Finally he added wide blue and amber lines that show how since early 2011 the price has repeatedly tested, but failed to break through, a lower limit of \$1,520 and an upper limit of \$1,800. The bottom line was that he was holding his gold.

Given the socially constructed nature of the price of gold, not to mention the unpredictable swings that result from computer-based trading, there may not be any real alternative to this kind of approach. (Perhaps that is why most financial analysts have such a poor record of success; four months later, on 15 April 2013, the price of gold dropped by 8.7%, the largest drop in a single day since 1983.) But tempo graphs are different. As Wolff-Michael Roth and Michael Bowen (2001: 162) say, 'to interpret graphs means to build rich situational descriptions from reductionist and transformed mathematical representations', so that the same graph can have completely different meanings depending on the domain to which it refers. Unlike a graph of gold prices, Figure 1 is the representation from a particular perspective of a concrete phenomenological reality, and the way to make sense of it is to relate what you see directly back

⁶The nature of phonographic representation is a complex issue with major implications for performance research, on which I will not touch here; it is discussed in Cook 2013: chapter 11.

to the sonic experience. Patterns in the graph make sense to the extent that they orientate your listening, help you to hear the music in a particular way.

Technology has provided a solution to the problems analysts had with tempo graphs in the 1990s. Programs like Sonic Visualiser⁷ can be used to generate such graphs, but more important, they synchronise them with playback of the music: this is illustrated by Example 3 (<https://www.britac.ac.uk/journal/2/cook-n.cfm>), which in effect puts together Example 2 and Figure 1.⁸ Heard as well as seen, the graph brings to life the metaphor I previously invoked of wearily trudging up a slope, getting slower and slower, and then relaxing as you get to the top and walk more easily; perhaps thinking of the landscape of his native country, the Swiss theorist and pedagogue Matthis Lussy used just this image when describing performance in 1874.⁹ The graph helps you hear more clearly, or more consciously, just how d'Albert shapes his playing to squeeze the maximum emotion out of the music—which is how I described his playing earlier on, and of course, my analysis was based on this kind of computer assisted listening. The graph means little if anything considered as a product, the outcome of an analytical process: its meaning lies rather in the process, in the analytical hearing that it facilitates. As McCarty said, what matters is not the model but the modelling. Or to put it another way, these graphs, like other music-analytical representations, signify not as things but in terms of the acts of listening they prompt—and that's my reply to Taruskin. As for Deathridge, I hope that by the end of this article you'll agree that empirical investigations of performance don't necessarily have to be shallow.

Used this way, technology serves as a means of training skills of close analytical listening, so that after a time you become able to hear far more, even without the graph. But that's not the only point of using an integrated visualisation and playback environment like Sonic Visualiser. It also makes it easy to do with recordings all the things that you take for granted in working with scores but can't do with a CD player: go straight to bar 36; jump between different points in the music to make comparisons; or compare the same point in different recordings (Sonic Visualiser can align different recordings of the same piece so that you hop from one to another as they play). One might draw an analogy between this kind of computer-assisted listening and the technologies of augmented reality that superimpose information on the scene in front of you when you view it on your mobile. This is a more powerful and flexible version of the close listening that lies at the heart of traditional musicology.

⁷<http://www.sonicvisualiser.org/>. Developed at the Centre for Digital Music at Queen Mary, University of London, Sonic Visualiser was partially funded by the AHRC through CHARM.

⁸Note that Sonic Visualiser shows a spurious value for the first note (the line graph should properly begin at 1.2, i.e. where the first beat ends and consequently acquires a duration value).

⁹Quoted from Lussy's *Traité de l'expression musicale* in Christiani 1885: 276.

PERFORMANCE AS CULTURE

Disciplinary change happens not when it becomes technically possible to do something, but when it becomes sufficiently easy that people can do it on an everyday basis. So I think the relatively modest uses of technology I've been describing, building on traditional skills and creating everyday ways of working with materials that have been largely disregarded by musicology, will have more impact on the discipline than the more ambitious applications of quantitative approaches that primarily engage the interest of specialist researchers in digital humanities. But I'd still argue that more ambitious quantitative approaches to performance have something to offer cultural musicologists, and in the rest of this article I'll make the point through two different analyses, both of which involve recordings of Chopin's mazurkas. The first revolves around a recording of Op. 33 No. 2 that Ignaz Friedman made in 1925 (Example 4 at <https://www.britac.ac.uk/journal/2/cook-n.cfm>).¹⁰

Friedman's playing of mazurkas lies at the core of his reputation, and this is frequently linked to his claim, if we are to trust his pupil Bruce Hungerford, that in his early years he had danced mazurkas in the Polish villages (Evans 2009: 7). There is a whole branch of scholarship, mainly Polish, that tries to relate Chopin's scores to different aspects of the various folk dances that fed into the umbrella category of the mazurka. But because of its role in the construction of Polish identity, not to mention the Polish tourist industry, the mazurka is a highly mythologised genre, the history of which is hard to reconstruct with any certainty. Besides, Chopin's mazurkas are not music to dance to, but rather representations of dance. And a major element in this representation is the extraordinarily strong sense of embodiment that you experience when you hear them, almost as if you were dancing yourself rather than sitting in a concert hall or living room. It is this phenomenon of the mazurka in live or recorded performance, rather than its largely irrecoverable origins in the 19th century or earlier, on which I shall focus.

In his 1925 recording of Op. 33 No. 2, Friedman creates the effect of embodiment through rubato, dynamics, and articulation. Actually to say that is to say very little, since those are the three measurable parameters of expressive pianism, but through measurement and close listening I developed a model of Friedman mazurka performance that is based on the idea of anacrusis.¹¹ By clipping notes or playing them up front—that is, before the beat—he generates dynamic momentum that may be discharged on a downbeat or climax, or alternatively rolled over, rather like the jackpot in a lottery. The effect of this rolling over is a kind of supercharging that can't be

¹⁰ Reissued on Friedman: Complete Recordings, Volume 1, Naxos ADD 8.110684 (2003).

¹¹ For detailed explanation see Cook 2013: chapter 5.

obtained by purely compositional means or by those of standard performance practice: you can hear an example of it near the end of Example 4, just before the return of the opening section at 0'32". And when I say you can 'hear' it, this is hearing with the whole body. It's as if the surplus energy spills over from aural experience and is mapped onto your torso, arms, and legs. You may be sitting still, but you are dancing all the same. And rather than all this taking place against the backdrop of a steadily flowing, chronometric time, it's as if time is drawn into the body, shaped by the body.

That's just one example: other pianists have quite different ways of playing this mazurka. But what they all have in common is the creation through some kind of more or less continuous rubato of surplus anacrusic energy, resulting in an unusually vivid sense of embodiment. And that, in the context of the discrete historical repertory that is Chopin's mazurkas, is sufficient to trigger the range of social and cultural connotations that have accrued to them in the first 180 years of their existence. It would hardly be an exaggeration to say that mazurka performance has been seen as a kind of blood test of Polishness, and indispensably for such mythologisation, this can be traced back to Chopin, or at least to what Chopin is supposed to have said: that 'the French did not understand his Mazurkas, and that one had to be Polish to feel the subtleties of the national rhythm, and to render the proper local colour' (Eigeldinger 1986: 122, quoting Marie Roubaud).

Musicologists see the political signification of Chopin's music, and above all his mazurkas, as a 19th-century phenomenon. But thinking of music as performance changes your perspective on music history: playing (and listening to) 18th- and 19th-century compositions constituted a major dimension of classical music in the 20th century, but has barely figured in most so-called histories of 20th-century music (actually chronologies of innovation in 20th-century composition). And just as 'pictures of [Chopin] decorate classrooms in every Polish school, alongside those of Polish Nobel Prize winners, writers and scientists' (Mach 1994: 65), so Polish identity continues to be performed through the changing but unbroken pianistic tradition that is monumentalised in such publications as Stanisław Dybowski's *Słownik Pianistów Polskich* (2003), with its biographies, photographs, chronological tables, and genealogies.

But the central authority in this musical, cultural, and political performance of Poland is the International Fryderyk Chopin Piano Competition, which was set up in 1927 and in the postwar decades played a role in national consciousness that we might more readily associate with the Olympics. As Krystian Zimerman—who himself won the competition in 1975—recalls,

if you took a train during the Chopin Competition hours, you'd find that every passenger would be discussing the contest. Everyone would be constantly checking their watches and say, 'It's ten o'clock now; that means the Russian pianist is playing

soon' . . . In that era, the Chopin Competition was not just a music competition, it was the life of the Polish people.¹²

And within such context a chart like Figure 3, based on the same correlational technique that led Sapp to identify the Hatto hoax, becomes something more than simply an exercise in empirical performance analysis. Based on their playing, pianists aggregate into clusters that are as much geographical or political as musical. Performance itself becomes a form of auditory cartography, giving rise to a map of the world based on a musical projection that places Warsaw at its centre.

The remarkable thing is that a correlational approach like Sapp's makes any sense at all, given that it reduces a performance to a single series of values representing the time between one beat and the next. But it is also possible to base the same kind of corpus approach on more perceptually salient dimensions of performance, and this takes me to my second example of a quantitative approach offering something to cultural musicologists. It's based on phrase arching, the tendency to play faster and louder as you enter a musical phrase, and slower and softer as you come out of it. (Phrase arching is one of the means by which Perahia brings out the structure of the Schubert Impromptu.) Music psychologists such as Neil Todd have seen this as a core attribute of expressive—or as people say, 'musical'—performance: Todd developed a computer model that takes the score as its input, together with an analysis of the phrase structure on multiple levels (2 bars, 4 bars, 8 bars, and so on), and outputs a tempo map in which each phrase is expressed through a combined timing and dynamic curve.

Schubert's Op. 90 No. 3 was one of Todd's examples, and when his model is used to control playback of a deadpan MIDI file of the piece, the result is Example 5 (<https://www.britac.ac.uk/journal/2/cook-n.cfm>). It's a quite impressive improvement over plain MIDI, though reassuringly characterless. You might even say it is more 'musical' than MIDI—and that is exactly Todd's claim. But psychologists have a habit of leaving history out of the equation when they investigate things like musicality. Indeed Todd (1992: 3549) suggests that phrase arching draws upon the general cognitive mechanisms that underlie the sense of self-motion: that, he says, is why phrase arching sounds so 'natural' (the same word Sadie applied to Perahia). The implication is that musicality is biologically determined rather than historically constructed.

Such a notion must incense any red-blooded musicologist, and so Sapp and I set out to establish—on the basis of several dozen recordings of Chopin's Mazurka Op. 63 No. 3—how far it was consistent with the evidence. Our approach was to extract tempo and dynamic information from this corpus of recordings dating from 1923 to the present day, and analyse it for evidence of phrase arching. This involved developing

¹²Chiao 2007, II: 6 (in Chinese translation).

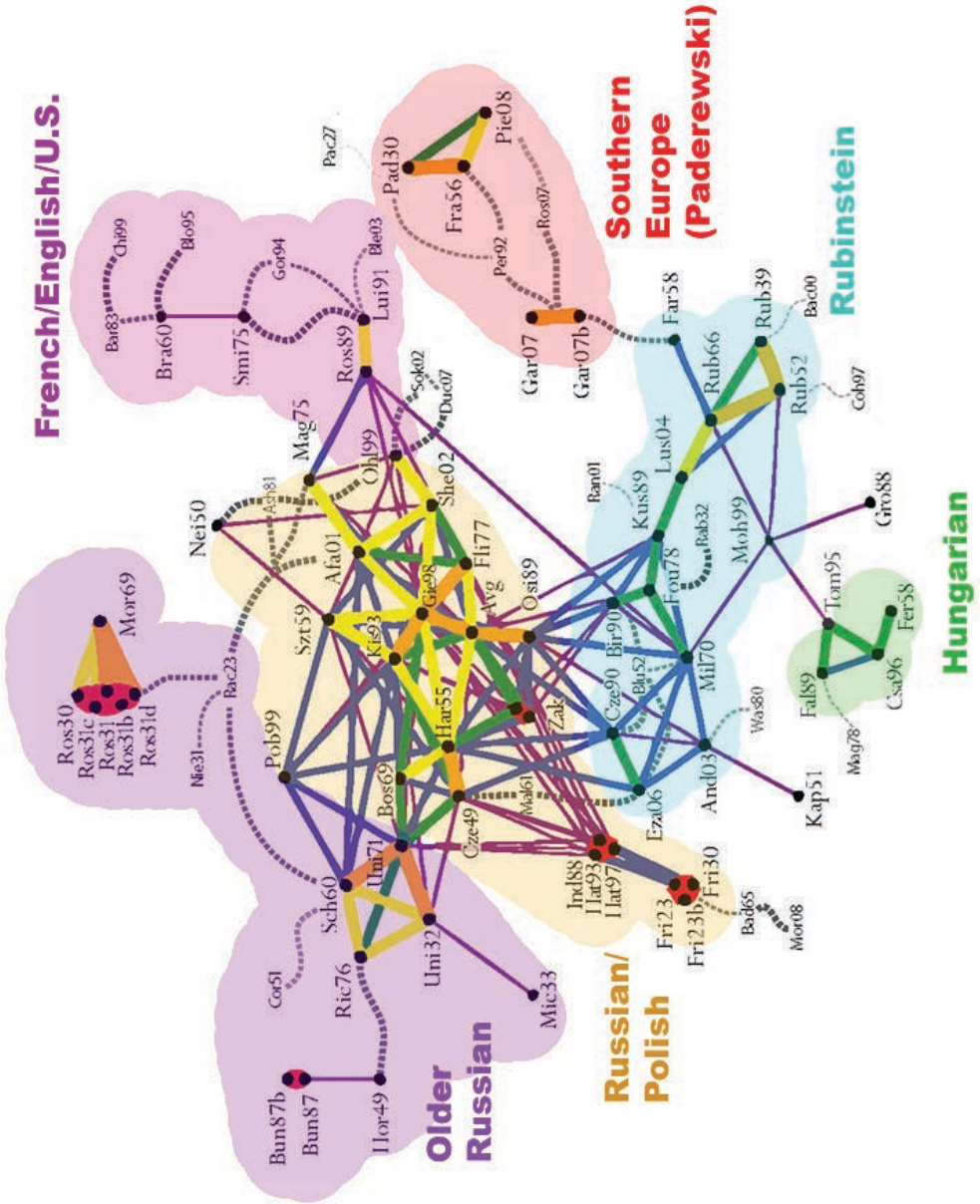


Figure 3. Tempo correlations in recordings of Chopin's Mazurka Op. 63 No. 3 (Sapp 2011: 37). Used by permission of Craig Sapp.

an algorithm that stepped through the data, matching them to rising or falling arch shapes, together with a range of visualisations that brought out different aspects of the data. Cutting to the chase, we used this as the basis of a formula that yielded an overall estimate of strength of phrase arching, which we could then plot against the date of recording. The resulting scattergram (Figure 4) looks much like Grunin's chart of flexibility in recordings of the 'Eroica' (Figure 2), but represents a much more salient dimension of listening experience.¹³ As in Grunin's chart, each data point represents a different recording, but this time the vertical axis represents the strength of phrase arching: the higher in the scattergram a recording appears, the more phrase arching there is.

So what might this tell us? Many well known pianists today employ a high degree of phrase arching (I have marked Grigory Sokolov as a representative example). But it is obvious that the kind of phrase arching Todd describes is by no means universal: though there are elements of phrase arching in interwar recordings, it is only after the Second World War that tempo, dynamics, and composed phrasing became firmly locked together. In this way phrase arching is a historical style, and also to some extent a geographical one, disproportionately associated with Russian or Russian-trained pianists (marked by the squares in Figure 4): 68% of the Russians fall into the top half of the scattergram, as against 44% of the Poles and 37% of the others. In short, phrase arching is a cultural construction, and as such can be interpreted in light of broader cultural developments. Because today's dominant styles of performance are relatively uninflected, we tend to think of expressive practices such as phrase arching as survivals from the past. It makes more sense, however, to see the phrase arching style that was adumbrated between the wars and came to fruition after 1945 as exactly the opposite: a modernist reaction to the now obsolete style of pianists such as d'Albert and Friedman.

Pianists whose style was formed before the First World War aimed to draw the greatest possible emotion out of particular points in the music, resulting in a very detailed, even intricate style of performance that, from the mid-century perspective, must have seemed hopelessly cluttered in the same way as the antimacassars and knick-knacks of the Edwardian interior. The aesthetic embodied in phrase arching, by contrast, was one of simplification, along the lines of the functionalist aesthetic that developed between the wars and was given a boost by post-war austerity. Whether in interior decor, architecture, or fashion design, the modernism that swept across Europe in two waves, before and after the Second World War, revolved around a set of buzzwords that included structure, clarity, and simplicity.

¹³ A later stage of this research, based on a larger data set and resulting in a rather more complex picture, is reported in Cook 2013: chapter 6.

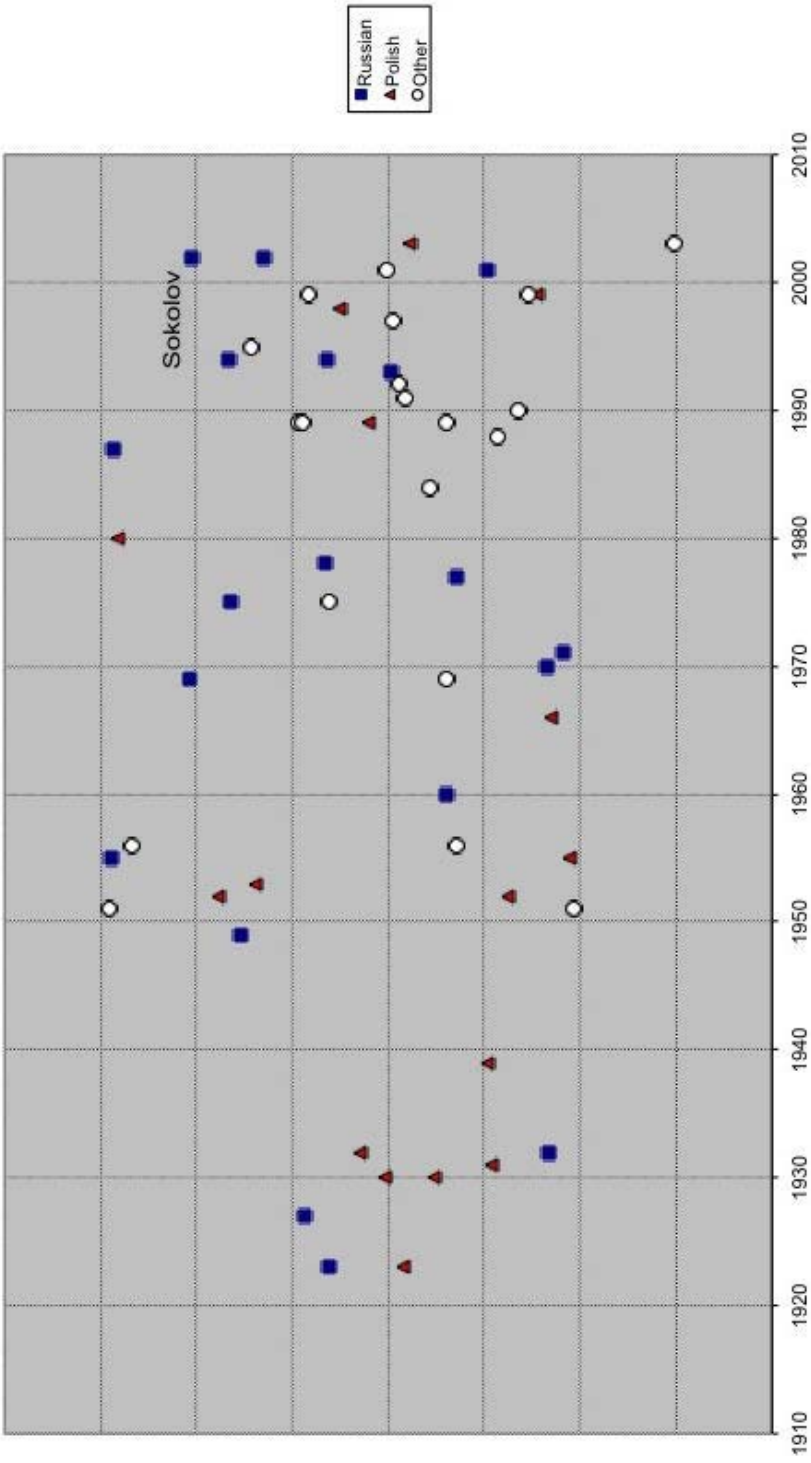


Figure 4. Phrase arching in recordings of Chopin's Mazurka Op. 63 No. 3, arranged by date of recording.

An article from *Vogue* in 1924 said of Coco Chanel's fashion designs that 'Simplicity . . . was the first thing. . . . [T]he simpler it was, the better'.¹⁴ And if Coco Chanel's little black dress was an emblem of such values, then another prominent member of the chic Parisian set—and possible lover of Chanel—expressed them in musical terms. It was in 1942 that Stravinsky called for a new ideology of performance in his *Poetics of Music in the Form of Six Lessons*: he condemned the romantic idea of interpretation, describing it as lying 'at the root of all the errors, all the sins, all the misunderstandings that interpose themselves between the musical work and the listener and prevent a faithful transmission of its message' (Stravinsky 2003: 122). Instead he demanded execution, that is to say, a self-effacingly literal style of performance dedicated to the accurate reproduction of the composer's score. This is *Werktreue* in its most literal form.

It's notorious that Stravinsky didn't conform to his own injunctions, and the problem is something that has been obvious ever since the invention of MIDI: literal performance, where every *mezzo piano* is equally loud and every crotchet is twice as long as every quaver, is as unbearable for the listener as it is unachievable by the performer. That is why musical notation has always depended on, and made sense in terms of, aurally transmitted traditions of performance. And that is where the phrase arching style that came to fruition after the war comes in. It squared the circle. It drew on existing codes of expressive performance, but restructured and rationalised them. It eliminated what were now seen as the excessively subjective, personal, and arbitrary qualities of pre-war performance that emphasised the musician rather than the music, buttonholing the listener and so intruding upon private aesthetic experience. Through phrase arching, expressivity was relocated from the moment-to-moment progression of the performance to the more abstract and impersonal level of musical structure. It became the expressivity of the music itself, an embodiment of the qualities of self-effacement, faithfulness to the composer or work, and transparency that had now become installed as the permanent values of classical performance culture. In this way musical performance was not simply an expression of modernist culture. It was an aspect of modernism itself, one of the arenas in which modernism was constructed and contested.

I quoted Ramsay on the error of seeing computer-assisted research in the humanities as more 'scientific' or 'objective' than traditional approaches, and the study I have just described demonstrates his point: my attempt to interpret the data in light of broad cultural trends is typical of humanities scholarship, aiming at persuasion rather than proof. Yet the empirical, data-rich approach is fundamental to it because, in performance as in other aspects of culture, trends emerge not from individual cases but

¹⁴'Before and after taking Paris', *Vogue* (New York), 1 Nov. 1924, p. 100, quoted in Davis 2006: 166.

at the statistical level. It's the same point Moretti (2003: 76, 90) is making about the history of the novel when he says that 'what we must explain is the pattern as a whole, not just one of its phases . . . individual episodes tend, if anything, to conceal it, and only the abstract pattern brings out the historical trend'.

Such approaches also help to counter some of the confounds of traditional humanistic approaches to the history of performance, such as the malleability of the ear. Like Bryce Morrison, who gave a recording of Rachmaninoff's Piano Concerto a far more glowing review when he reviewed it as Hatto's work than as Yefim Bronfman's,¹⁵ we hear what we expect or even want to hear. And the resulting circularity combines with the cherry-picking inherent in using a handful of supposedly representative examples to advance your interpretation. It would be easy to narrate the development of phrase arching in terms of just those examples that illustrate the developing elements of the new style. What such a narrative would omit is the most important thing to come out of Figure 4: that playing with little or no phrase arching has persisted to the present day. It's not that there was a transformation of performance style as a whole, if indeed the idea of 'performance style as a whole' makes sense. It was rather the creation of a new option in performance.

And that bears directly on Taruskin's argument about turning ideas into objects and putting them in place of people. The implication is that music, and its history, can be understood only in terms of the choices of situated agents, rather than the impersonal forces to which historians in the Hegelian mould so readily resorted. But for all its apparent self-evidence and moral rightness, such a claim is far too sweeping. There are such things as style characteristics and trends that everyone takes for granted, that are seen as just the way things are: that's why archaeologists can date sites from the shaping of a pot handle. The same applies to the stylistic assumptions that many musicians internalise by their late teens, and then retain throughout their careers. Consequently, as Leech-Wilkinson (2009: 250) has argued, stylistic change in musical performance is generally best understood in terms of when performers were born.

But this doesn't apply to phrase arching. Among the cluster of recordings exhibiting strong phrase arching that appeared in the years after the war is one by Halina Czerny-Stefanska, who was just thirty when she made it, and still in her twenties when she won both the First Prize and the Polish Radio Mazurka Prize at the Fourth International Frederick Chopin Piano Competition in 1949, the first to be held after the war. So one might think of her as representing the new generation of post-war performers. But another recording in the same cluster—actually the most extreme example of phrase arching in any recording of Op. 63 No. 3 that I know—is by Heinrich Neuhaus, an immensely influential pianist and teacher at the Moscow

¹⁵The reviews in question appeared in the September 1992 and February 2007 issues of *Gramophone*.

Conservatory, and he was in his mid-sixties when he made it. And if you reformat Figure 4 according to date of birth rather than date of recording, no intelligible pattern emerges. What this tells us is that phrase arching was in essence a fashion, something that performers could choose to put on or not, like Chanel's little black dress. Rather than reifying style change, then, the data-driven approach makes it clear that we are dealing with individual acts of agency.

* * *

In this article I have tried to show two things. First, broadly scientific methods can open up otherwise inaccessible areas of culture for analysis: in doing this, they do not substitute for but rather add value to traditional humanities approaches. Secondly, fundamental dimensions of what music means, and particularly of what it means to the general public rather than just to specialists, lie in its performance. The music we hear sounds the way it does because performers play it that way: performers' choices constitute an essential dimension of the creativity of musical culture. Yet performance has always been the elephant in the musicological room. It has been written out of the books that represent music as a written tradition rather than a performing art. Even performers think of it this way: 'The psychological advantages of being able to justify their choices by attributing them to the composer', Leech-Wilkinson (2012: paragraph 1.2) observes, 'seem far to outweigh the uncertain likelihood of critical praise that might or might not accrue to them were there no higher authority to whom they could look for support'. Here, at the heart of classical musical culture, we see the continuing grip of the bias towards writing that Winn identifies across the humanities. Yet a case might be made that, contrary to the composer-based historiographies (or hagiographies) that still dominate both within and beyond the academy, it is performers who function as the primary motors of musical culture. Composers, after all, just write the notes.

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