

COMMUNICATIONS



REPORTS

Eighteenth-Century Music © The Author(s), 2021. Published by Cambridge University Press
doi:10.1017/S1478570621000026

DISSONANCE AND HARMONY: RESPONSE TO DANIEL R. MELAMED

I am grateful to Daniel R. Melamed for taking the time to review my work, and for his conclusion that ‘This is scholarship that deserves close and respectful attention, but I do not think that its results can be taken at face value, however attractive they appear’ (‘“Parallel Proportions” in J. S. Bach’s Music’, *Eighteenth-Century Music* 18/1 (2021), 120). That Melamed is not convinced by the results is, of course, fine by me. What I am concerned about, though, is his misleading representation of the theory that could deter new readers from *Bach’s Numbers: Compositional Proportion and Significance* (Cambridge: Cambridge University Press, 2015), or sow doubt for those who have found it inspiring. There seems to be a dissonance in the article that makes it hard to discern Melamed’s aim. Is it designed to take the discussion forward, or to discredit the theory of proportional parallelism? As Melamed is a valued colleague, I trust his desire is to open discussion of the topic, regardless of his opinions. For the readers’ sake, therefore, I will now comment upon aspects of his article that, in my view, misrepresent the theory.

Throughout the article there is a troubling oversimplification of the nature and scope of proportional parallelism, including several statements that imply serious misreading or misunderstanding of my work. For example, Melamed writes: ‘First we need to decide what a “bar” is and what constitutes a “movement”’. We have explicit evidence from Bach on these points for Bach’s 1733 Dresden Missa, and his own tallies do not agree with those in the theory’ (99); ‘we have to acknowledge that there are multiple ways to count’ (102); ‘There are multiple ways to assemble the various choices, but only the ones that work are presented: others are silently rejected’ (108). These, and similar phrases, give a distorted view of my theory, and could imply to the unsuspecting reader that I had not considered how to count bars and movements, had disregarded the evidence in Bach’s manuscripts, and was unaware of the multiple ways of counting. As anyone who reads *Bach’s Numbers* can see, this is simply not the case. The section ‘Foundations’ (chapters 1–4 of *Bach’s Numbers*, 1–130) lays out systematically every element of the source-based theory: how Bach and his contemporaries used and counted the bar, how they planned and laid out compositions, scores and manuscripts, how and why I selected data, how and why I chose the methodology, how numbers in music and the arts were understood and practised in Bach’s time, and much more. These first chapters include numerous seventeenth- and eighteenth-century sources not previously seen or examined in Bach scholarship. Together they provide our discipline with a solid foundation on the basis of which numbers and compositional ordering can be discussed with integrity.

The theory of proportional parallelism has been evolving for decades and continues to do so. One unexpected development since the publication of *Bach’s Numbers* was the discovery in 2017 that Chopin used Bach’s proportional ordering as the basis for his own collection of twenty-four preludes (see Tatlow, ‘Symmetry and a Template: Bach’s *Well-Tempered Clavier*, and Chopin’s Preludes, Op. 28’, in *Bach and Chopin: Baroque Traditions in the Music of the Romantics*, ed. Szymon Paczkowski (Warsaw: The Fryderyk Chopin Institute, 2020), 51–85). This startling feature of the score shows that Bach’s proportional ordering had been noticed by Chopin himself in 1838/1839, long before



I stumbled across it. It lends weight to the notion that proportional ordering was a widely known phenomenon, handed down verbally and in writing from teacher to pupil, and still in use in the nineteenth century.

Another development has come through the engagement of several statistically minded scholars, including Melamed, who have sensed that the examples in *Bach's Numbers* could be shown to be a matter of chance rather than the composer's intention. In December 2016 I received an email from computer scientist Alan Shepherd asking to discuss with me some potentially disturbing statistical observations. We worked hard to understand exactly what, from our own areas of expertise, were the central issues. Keeping an open dialogue, we faced hard facts and uncomfortable results head-on, asking how best to create a fair test and interpret its statistical significance. Shepherd's comprehensive explorations can be read in *Let's Calculate Bach: Applying Information Theory and Statistics to Numbers in Music* (New York: Springer, 2021).

As some readers might not be qualified to assess the validity of Melamed's statistical results and interpretations, and because these results are the topic of almost half of his article, it is important that I point out both their value and their shortcomings. He correctly shows that a vast number of proportions will randomly be found in any set of numbers. This leads him to conclude that we cannot 'attribute mathematical relationships and their putative meaning to Bach' (120). This is a logical response based on his tests. But these tests are limited. Shepherd also demonstrates that there is a high to near-certain chance of proportion *existing* in the figures shown in *Bach's Numbers*, but he then goes on to explore the probability of a composer *finding* a proportion among all the possible combinations. The question then becomes: given all the combinations, can the composer's final choice be attributed to chance? Using the Monte Carlo simulation, Shepherd's results show time and again that it is highly improbable that the multiple proportions are there by chance. In other words, the parallel proportions shown in *Bach's Numbers* are more likely to be Bach's design than analytical coincidence. Melamed explains in footnote 26 (page 120) that he saw a copy of Shepherd's work after his own article was complete. It is a great pity that this did not result in Melamed revising his conclusions, or even withdrawing the article – something that would be standard practice in any scientific study.

Since 1997 I have been presenting my research questions from first principles at mainstream international conferences, and publishing them in open-access and standard publications. The most comprehensive statement about my theory is published in *Bach's Numbers*, honoured by *Choice* as an 'Outstanding Academic Title 2016'. The monograph explores the proposition that Bach ordered the structures of his revised compositions proportionally, and asks why he and his contemporaries might have done so. The parallel proportions can be seen in the structures of Bach's publications and fair copies, in the forms of one or more layers of perfect 1:1 or 1:2 proportions in several dimensions, existing not only in the numbers of bars and movements, but in the numbers of pieces and in multiple layers where each side of the proportion is further subdivided into the same proportion. Furthermore, these proportions are frequently double or triple (that is, x:x movements each formed with y:y bars, arranged in consecutive or mirror-image symmetry).

At the heart of *Bach's Numbers* and the theory of proportional parallelism is the eighteenth-century Lutheran understanding of universal harmony and its theologically motivated desire to strive for unity in all things. To give the reader a taster of the spirit and aspiration of *Bach's Numbers*, I would like to close with a few sentences from its conclusion: 'The case is now made for proportional parallelism. The path of discovering the theory was fraught with the Aristotelian paradox, but now it is formulated, I wonder if it would have seemed so paradoxical to Bach and his contemporaries. Authors in Bach's immediate sphere have testified to every element of the theory, including the concepts of perfection, Harmony and parallelism with their far-reaching implications for cultural and creative endeavours of the time. . . . At every stage the results are supported with data and documentary evidence, presented as objectively as possible, to help



the reader assess the results, and in the hope of inspiring a new generation of musicologists to discover many new methods' (Tatlow, *Bach's Numbers*, 368–369).

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Eighteenth-Century Music © The Author(s), 2021. Published by Cambridge University Press
 doi:10.1017/S1478570621000142

RESPONSE TO RUTH TATLOW

In speculating about my aim in her letter of response, Ruth Tatlow wonders whether my article is 'designed to take the discussion forward, or to discredit the theory of proportional parallelism'. I do not think that these are the only two choices or that they are mutually exclusive.

The author's book on parallel proportions does devote space to eighteenth-century understandings of bars and other elements, but this discussion contributes little when it comes time to assign numbers of bars and to add them up. There are multiple ways to count, sometimes invoked in the same analysis, and the matter is complicated by the composer's own ambiguous counting. The study of eighteenth-century writings does not fix these problems, and I suggested not that the author was unaware of them, but rather that she sidesteps them in the theory's application.

The response maintains that the theory of proportional parallelism is supported by the recent 'discovery' that Chopin used Bach's proportional ordering in his own preludes. But if this sort of relationship is mathematically inevitable in Bach, it is equally inevitable in Chopin. The law of large numbers applied in the nineteenth century as well as in the eighteenth, and points to the near certainty of a particular result in both. There is no evidence that Bach intentionally established proportions, none that Chopin found them in Bach's music, none that he purposely created them himself, and none that the practice was 'handed down verbally and in writing from teacher to pupil', as is claimed.

I was indeed fortunate to see Alan Shepherd's work after my article was completed, but it did not change my view. Shepherd ran randomized tests similar to the ones I performed on the Dresden *Missa* but using the *Well-Tempered Clavier Book 1*. In reporting the results, he mentions in passing that of 100,000 tests, every one had a solution – a 100 per cent probability of there being a proportion. But he then goes on to calculate that the 'probability of finding a 1:1 proportion by chance' is, on average, 0.146 per cent (page 122 of pre-publication version). I am not exactly sure what he means by the probability of 'finding a proportion', but the letter echoes this language in speaking of the improbability of Bach's '*finding* a proportion among all the possible combinations'. Perhaps this means that it would have been difficult for Bach to spot the proportions, but there is no evidence that he did, or even knew they existed. The modern analyst has found them, not Bach, and assigned significance to them.

Or maybe it relates to the likelihood of hitting on a particular proportional combination, but it is difficult to see why we might care about the odds of finding a specific proportion in any event. If I drop a hook and worm into water teeming with hungry fish, chances are really good that I will catch one; that's what it means to say a spot is a good place to fish, not that I have a certain (tiny) probability of landing a particular fish from among the many filling the waters of the seas.

Overall, the response reiterates the claim that proportions exist in this music, but it is trivial that they do, given their mathematical inevitability. The matter is non-trivial only if they can be shown to mean something,