
Not only did René Descartes, Isaac Newton, and numerous other seventeenth-century scholars find it worth their while to contribute part of their efforts to burning issues in quantitative musical theory, but many of them did so in particularly noteworthy and innovative ways. Some of these have now been analyzed for the first time in Benjamin Wardhaugh’s excellent first book. Its greatest merit is to mark in a clear-cut and accessible manner a coherent array of significant innovations that were brought about in musical science, for the most part between c. 1660 and c. 1700.

In the historical literature on seventeenth-century musical science, most attention has so far been given to how hoary conceptions of cosmic harmony were undermined by a range of transformations, leading among other feats to a partly novel, physicalized account of musical consonance (Galileo, Beeckman, Mersenne); to magic-infused, experimental researches into the nature of sound (Bacon), and to inquiries into how our sense of hearing turns the input it receives into our perception of musical sound and even harmony (Beeckman, Descartes). Most of these innovations were feats of the first half of the seventeenth century. Not only does Wardhaugh in his book sum up with great fairness the main findings in the literature—he also notes that results obtained in musical science by these and like-minded scholars underwent a great deal of sophistication in the second half. This increase in sophistication, as it stands revealed in a range of treatises, mostly English and mostly unpublished, forms his subject proper.

From Pythagoras onward, musical notes used to be examined as discrete entities, pictured on a right line that represents a string divided at definite points. The approach made it hard, impossible even, to compare and evaluate the sizes of intervals. Wardhaugh has identified a growing awareness in course of the century that musical notes form a continuous spectrum, with logarithms providing a ready means to reconceptualize them that way. He has also discovered that the man to pioneer the novel approach was Descartes. His 1618 treatise *Compendium musice* (written as a youth for his elder friend Beeckman, and published posthumously) is not a particularly novel or exciting piece of writing, but it now turns out that one particular diagram in the treatise forms quite an exception—it is the first token of scholars becoming aware of the logarithmic nature of musical sound.

The diagram is a late addition that Descartes must have made to his manuscript in the late 1630s. It offers a circular representation of the octave, arrived at by means of logarithms. It displays exactly calculated values for the notes on this newly continuous scale, thus making intervals mutually comparable in ways inconceivable before. Wardhaugh shows that, as reprints and translated versions of the treatise accumulated, ongoing deterioration of the printed diagram caused it to lose this vital characteristic, making it insignificant or even pointless. He is too modest an author to trumpet his
discovery, but it is really quite an important one—he also shows how both Nicolaus Mercator and Isaac Newton took the diagram as their point of departure in their own respective examinations of musical intervals. The meaning of the diagram has been obscured so far, not only by this ongoing process of deterioration-in-print, but also by the fact that Descartes, in enriching his manuscript treatise with it, did not add a word to elucidate what it was actually meant to represent. It just stands there, with its meaning left to be found out, as it finally has now, almost four centuries later.

Beside this transition from a discrete range to a continuous spectrum of musical pitch, a new concern also arose in course of the seventeenth century over a problem up to then skirted at best—how is it that our hearing goes both with musical consonance as given by ratios of the first few integers and with subtle deviations that utterly destroy the very simplicity of these ratios? Generally speaking, those intervals please us best which are produced by integral frequency ratios like 2:1 for the octave, 3:2 for the fifth, or 5:4 for the major third. However, certain basic mathematical exigencies compel us in practice to temper the consonances a little; in keyboard music in particular we do not as a rule hear the pure triad but rather slightly adapted fifths and thirds. How, then, is it that our hearing, so attuned to simple ratios like 3:2 and intolerant of only slightly more complicated ones like 9:8, nonetheless also accepts tiny deviations like, say, 3:2.10?

The question upset the meanwhile standard account of consonance in terms of a coincidence of ‘pulses’, or ‘strokes’, brought about by the vibrating string or pipe—an at least partly novel account seemed to be called for. Wardhaugh investigates in some detail how the question was dealt with in the manuscripts he has selected for in-depth examination. Among the novelties he comes up with I find his analysis of a book by the Bolognese mathematician Pietro Mengoli particularly impressive. Henry Oldenburg and other Fellows of the Royal Society awaited it with great expectation, yet upon arrival it almost at once fell into oblivion. The reason is obvious—both then and now the book’s argument looks quite impenetrable, as I and a few other latter-day students quickly discovered. Too quickly, really, for Wardhaugh has succeeded where both Oldenburg and us later commentators felt obliged to throw in the towel. He has examined it with the problem just outlined firmly in mind, and also armed with vast amounts of both mathematical expertise and anatomical knowledge. It then turns out that in a partly outrageously mistaken, partly quite perceptive and innovative argument Mengoli settled for (and analyzed the mathematics and the anatomical details of) not one but two distinct faculties of hearing, so as to account for this odd phenomenon of our toleration of tempered intervals.

There is much more to enjoy in Wardhaugh’s book, such as notably his accounts of how it was sought to connect musical theory and performance practice. He relates with gusto and insight how the Royal Society let itself be persuaded to have a sonata for two violins played for it by way of a decisive experiment in musical science.

In all this Wardhaugh has gone out of his way to elucidate with utmost clarity the very basics of the science of music—I have come across few, if any, more accessible introductions to the field. His book, while vastly learned and exuding a quiet mastery