

Anicius Manlius Severinus Boethius
The Mechanics of Sound and Pitch

From *De institutione musica libri quinque, Book 1, Section 3**

Consonance, which rules every modulation of music, cannot come to be without sound; sound, in turn, cannot be transmitted without a certain pulse and percussion; the pulse and percussion cannot, in turn, come to be at all unless motion precedes them. For if all were immobile, it would not be possible for one thing to push against another, such that the first be impelled by the second, but if all were to be immobile and without motion, it would necessarily follow that no sound would come to be.

Therefore, sound is defined as percussion of air which does not cease until it reaches the hearing organ. Indeed, among motions, some are faster and some are slower, and again, some of these motions more rare and others are denser. For if someone examines motion in a continuum, it is necessary that it there have either speed or slowness; indeed, if someone moves his hand, he will either move it with a frequent or infrequent motion. And if the motion is slow and less dense, it is necessary that low-pitched [grave] sounds be produced as a result of the slowness and infrequency of the beats. But, on the other hand, if the motions are rapid and more dense, it is necessary that high-pitched [acute] sounds be transmitted. Indeed the string itself, if it is stretched broadly, makes a high-pitched sound, and if it is loosened, a low-pitched sound. For when [the string] is more tense, the pulse travels more rapidly and returns more quickly and, and it carries the air more densely and frequently. But if it is less taut, it will effect looser, slower and more infrequent pulses transmitted weakly, and will it not continue its vibration long.

Nor is it [a matter of] how often the string is beaten, supposing that just one sound is given off or that there is one percussion on these [strings], but the air will be pushed as frequently as the trembling string percusses it. But because the velocities of the sounds are joined, no interval is sensed by the ears, and one sound will be sensed as transmitted, either low or high-pitched, although from many [motions], either low-pitched sounds may be produced from slow and infrequent motions, [or else] a high-pitched sound is produced from faster and denser motions.

Suppose that someone were to carefully draw lines in red or another color upon one of those cones which they call a "top", and he could then spin it rapidly, then the whole cone will seem infected by the red color, not because it would be entirely so, but because the velocity joins the red-striped parts and it will not permit [the differentiation in color] to be visible. But concerning these things we will speak later.

Therefore since high-pitched voices are generated by denser and more rapid motions, and low-pitched sounds are [generated] by slower and less dense motions, it is proven that stretching [the string] generates a high-pitched sounds from a low-pitched sound by a certain addition of motions, whereas loosening produces a low-pitched sound from a high-pitched sound by subtraction of motions. For both high pitch and low pitch depend on many motions.

But in those things where plurality produces a difference, this difference must consist in some numberable [pattern]. Indeed, all paucity and plurality are thusly related to each other, such that one number can be compared to another number. Indeed, in all things which are compared according to a number, one part are equal and the other part unequal. Wherefore, further, some sounds are equally distant and others unequally distant. But in those voices which are discordant due to no inequality, there is no consonance whatsoever. For concordance is achieved by the consonance of voices which are dissimilar among themselves in one [aspect].

* This translation is based on the based on the Teubner edition of 1867, available at http://www.chmtl.indiana.edu/tml/6th-8th/BOEMUS1_TEXT.html. This translation is for informational purposes only, and should not be cited for the purposes of academic publications without prior comparison with the Latin text. Translation by [Erik Norvelle](#), published under a Creative Commons 2.0 Non-Commercial Share-Alike license.

