

Why Italy chose C-256 as 'scientific tuning'

As a contribution to discussion on the reasons for establishing Middle C at 256 cycles per second as the standard tuning pitch for music, we publish below excerpts of some of the documents produced a century ago in Italy, when the Italian Ministry of War, at the urging of composer Giuseppe Verdi, adopted A-432 (calculated by them as the equivalent of C-256) as the official pitch of the military bands. In our May 6, 1988 "Science & Technology" section we published Jonathan Tennenbaum's address to a recent conference in Milan re-launching the proposal for Italy to adopt that standard pitch, as opposed to today's A-440 and upward. Tennenbaum reasoned from the lawful ordering of processes in our solar system, by the same method used by Johannes Kepler to determine the correlation of the planetary orbits with the musical intervals, to show the absolute value of C-256. The documents reproduced below are indicative of the level at which the problem was being posed a century ago.

The 1884 decree: Why A-432 (C-256) is the scientific tuning

On the selection of a normal tuning for musical works and for bands of the Royal Army (Savona 1884) which accompanies the "Instructions on the new normal tuning" issued by the Minister of War in 1884 for adoption of A-432 as the "scientific tuning." The reference to a difference of "three vibrations" has to do with the French effort to make A-435 international standard pitch, which never caught on.

It would be superfluous to repeat here the long history of the attempts made to reduce the different tunings to only one, typical and universal. And, as has been well said by the illustrious Verdi, it seems incredible that we still should not be able to make understood to all that there is a true incongruence in that what is called "A" in Rome is known in Paris as "B-flat"; while there is only one music the world over, and musical notes are as eternal and immutable as the laws of physics on which they depend! . . . Many musical masterpieces of the past were evidently written under the influence of a very moderate tuning fork. And unfortunately, with our too-high tuning, they are not reproducible today, or only at the expense of spoiling their musical effect. Perhaps one will

not have to go too far from the truth in affirming that the old tunings, which really were measured judiciously upon the natural range of the human voice, differed by about a half-tone from the higher tunings of today. And just so, the scientific tuning of 432 vibrations would be almost a half-tone from today's highest tunings. . . .

The Italian musicians assembled in Congress in Milan in 1881, were most convincing in their arguments, taking as the basis of the question the laws of acoustics and deducing from them the tuning of A-432 complete cycles, which is 864 simple (half) cycles. In the final analysis, such a tuning, by three vibrations, more or less, goes almost unnoticed to the ear; but, instead of being the result of a convention or mood, it is based on science, and is therefore indisputable. . . .

1881 Congress of Italian Musicians

The following extracts come from the proceedings of the Congress in Milan, June 16-22, 1881. The spokesman is scientist Archimede Montanelli.

The unity of tuning is then urgent and of indisputable necessity; it remains with us to establish on which criteria we must fix the standard, immutable rule; if it be practical, produced by the senses; if it be theoretical, produced by calculation. . . . The music world looks to us; it perhaps awaits the result of our discussions to deride us, or applaud and follow us in this reform. Our Italy, which has always been the land of song, must vote for a law which, to be right, must be imposed universally, and in practice will revive this are a which was for centuries her glory. . . . Our unique tonal rule was fixed at 864 simple vibrations per second (432 double vibrations per second). The greatest physicists always advocated its adoption; since the 18th century, Saveur proposed a C of 512 simple vibrations (256 double vibrations) as the normal, immutable standard of the tonality of musical notes. Chladni in his "Treatise on Acoustics," and Prony in his "Elementary Instructions on the Method of Calculating the Musical Intervals," approved this theory. Rudolph Koenig, celebrated builder of physics devices, warns all who "they will want to honor him with their orders, that he has taken as his point of departure in the construction of acoustical instruments in his catalogue, the tuning C-512 simple vibrations (C-256 double vibrations) proposed first by Chladni, as produced from each C by the numbers which are powers of 2, which renders it very convenient for use; this tuning was adopted until today almost exclusively in physics laboratories . . . it is the number used for a long time by church music and for organs."

According to Meerens, the only scientific tuning is that which begins from the most simple number series of 2, 4, 8, 16, 32, up to 256 (C, index 3) (middle C) the number which, according to this count: $27/16 \times 256$ brings the A (index 3) to the abovementioned 432 vibrations per second.