

HOW STANDARD IS STANDARD PITCH?

By ROGER GOODMAN

Most musicians today use electronic tuners to make sure their instruments are “in tune.” Electronic tuners are based on the “standard pitch” of A-440, meaning that the A above middle C vibrates at 440 Hz (Hertz) or cps (cycles per second). The pitch pipes and tuning forks that preceded electronic tuners were also based on the A-440 standard. Have you ever wondered about A-440? What’s so special about A-440? Or, who got to decide that it was the magic number? Or why do we need to have a standard pitch anyway? Hopefully, you’ll find the answers to these questions as fascinating as I do because in this issue, we are taking a little side road on the Musical Highway to learn about something we simply take for granted.

Humans have probably been communicating with music longer than they have with language. When they first discovered music it is likely that one person at a time created unaccompanied melodies. There was no need to standardize pitch—people just sang where it felt comfortable. When people began to sing with others they still didn’t need a standard pitch because a group tends to reach a consensus just by singing together. Even when singing became more complex and methodical as, for example, when the monks developed the liturgical chant or plainsong, there was still no standard pitch. By the time Pope Gregory codified the rules of notation for the chant, some monasteries seemed to center on a particular pitch range but it varied from one monastery to the next.

With the advent of musical instruments, pitch became more important because of the instrument’s physical constraints but it remained quite random. Even when voice and instruments were combined it varied widely from place to place. Then came the pipe organ and with it a compulsory pitch. This meant that, if one was to sing or play with a pipe organ, there was no choice but to agree with the pitch chosen by the organ maker. Still, pitch differed from town to town and from church to church. Pitch even varied on the same organ within a church. That’s because organs that had metal pipes were often tuned by hammering in the ends of the pipe to raise the pitch or flaring them out to lower the pitch. After a few dozen rounds of this the ends would become frayed. The easiest way to fix this was to trim the ends off all of the pipes. This would make the pipes tunable again but raised the overall pitch of the instrument. The older the organ, the higher the pitch. Well, during the 16th & 17th Centuries most of the organs were in churches and it was commonly believed that the higher the music, the closer it was to God. So, the pitch was allowed to creep gradually higher.

Another era of pitch-raising began after the Napoleonic wars when, during the Congress of Vienna (1814-1815), the Czar of Russia, Alexander I, presented the Austrian regiment bands with a full set of beautiful Russian-made instruments. These instruments were in the “higher German pitch” which made the bands sound brighter and more brilliant. The new instruments were very popular, especially since they were better able to fill larger and larger venues with sound. The higher A-440 pitch quickly replaced the older A-430.5, which had by then been the official pitch of Europe for over 100 years. As a result, manufacturers started tuning their instruments slightly higher to make them sound brighter than their competitors. Other companies were then compelled to make theirs even brighter, and the pitch kept floating upward.

But there were problems with the new higher pitch. Violinists were breaking strings as they kept increasing the tension to reach the climbing pitch of



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the new wind instruments. The traditional gut strings were improved and the high E was eventually replaced with a metal string. Then opera singers began to complain and rightfully so. The rising pitch stretched the singer’s range to the point of damage and vocal chords, unlike gut strings, could not be replaced. Something had to be done. In 1859, the French put their collective foot down and came up with a compromise pitch of A-435, right between A-430.5 and A-440 and actually passed legislation to mandate its use. At the time when the French set this pitch the typical ambient temperature was usually about 15 degrees Celsius (59 degrees Fahrenheit). As concert halls began using steam heat, the standard temperature became a more comfortable 20 degrees Celsius (68 degrees Fahrenheit). It has since been argued by London’s Royal Philharmonic Society that the oboe (the wind instrument that sets the pitch standard for the orchestra) tuned to A-435 at 59 degrees Fahrenheit will raise to a pitch of A-439 at 68 degrees Fahrenheit. Thus, in 1896 A-439 became the standard pitch in Britain. Elsewhere, including the United States, pitch was still creeping upward.

The arrival of radio brought together music and musicians from all over the world. The lack of a worldwide standard pitch was now an obvious problem. In the 1930’s there was a great effort by the broadcasting industry for standardization of concert pitch in North America and Europe, and, in 1939, this was achieved at an international conference in London. The original intent was to use the Royal Philharmonic’s A-439. The BBC decided to begin regular broadcasts of an electronically produced reference tone. To produce the note, they used an oscillator controlled by a piezo-electric crystal vibrating at 1 MHz. This was reduced to a frequency of 1 KHz by electronic dividers. It was then electronically multiplied 11 times and divided by 25 producing the frequency of 440 Hz. It turns out that the desired target of 439 is a prime number and as such cannot be reached by dividing and multiplying. So the BBC began broadcasting a reference tone of 440 Hz. This is how we arrived at the magic number of 440 Hz.

If you had assumed it to be a spiritual number that vibrated in resonance with the Universe and was delivered by the hand of God, my deepest apologies. As we have seen it was the result of various science, pseudo-science and practical considerations and is at best a necessary compromise. For the time being the pitch of A-440 is a globally accepted standard pitch but not without ongoing dissention, most notably from those who play and study historical music. Placed in the current context of our rapidly changing world of technology, A-440 begins to feel like an immutable constant and I have no doubt that it will remain as such — but know that, in any particular span of time, local conventions for standard pitch have moved up and down without any apparent scheme. So get out your pitch pipe, tuning fork or electronic tuner, listen for that 440 Hz and, of course, stay tuned.

Roger Goodman is a musician, mathematician, punster, reader of esoteric books and sometime writer; none of which pays the mortgage. For that, he is a computer network guy for a law firm. He has been part of the L. A. old-time & contradance music community for over thirty years. While not a dancer, he does play fiddle, guitar, harmonica, mandolin, banjo & spoons. Roger has a penchant for trivia and obscure and sometimes tries to explain how the clock works when asked only for the time. He lives with his wife, Monika White, in Santa Monica, CA.

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