

A Different Way to Tune Your Guitar

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This article originally appeared in the American Suzuki Journal vol. 36 no. 3, 14-15. Posted with permission.

Did you ever sit down to play your guitar, find it out of tune, and then have a bear of a time getting it to sound right? And did you ever tune your guitar up so that the E chord sounded beautiful but when you switch to the A chord or the C chord, it sounded off? If so, you may have thought there was something wrong with your guitar or that your ear training needed work, but you probably were having' your own personal experience with the "Pythagorean comma."

In technical terms, the Pythagorean comma is the result of experiments by the ancient Greek philosopher Pythagoras. He tried making' one string follow the cycle of fifths all the way up from C to C again twelve fifths higher. This C is supposed to be exactly seven octaves higher than the original pitch of the open string. The result of the experiment was to discover that the pitch produced by the note twelve fifths higher is slightly sharp from the pitch of the note seven octaves higher. This slight pitch difference is called the Pythagorean comma.

In practical terms, it means that our tuning system in the world of Western music is created mostly by mathematical calculation and only partly by natural musical vibrations and, overtones. The natural part is that all octaves are in tune, the pitch ratio being exactly $2/1$, as it occurs in nature. All other intervals have been altered to fit an artificial scheme in which all half steps are exactly one twelfth of an octave, resulting in pitches that are not found in the natural overtone series. These pitches are close enough to nature so that the ear is not offended, but compromised enough to allow us to change chords and keys freely within a composition, something not possible with tuning systems that follow strictly natural overtones. This tuning system that we use in Western music is called "equal temperament." This refers to the fact that all half-steps in the system are equal.

For guitar players, we have a fretboard that is designed to create equal tempered pitches. It's the open strings that throw a monkey wrench in the works. If the strings are tuned to equal tempered pitches then the frets will work well with each other. If the strings are tuned to natural pitches, then clashes will result when you move from chord to chord or from key to key. Also, this is all assuming that the guitar is in good condition and that the strings and neck have been set up properly. But if the guitar is working well, there are several ways the guitarist can tune to equal temperament.

The first way is to use an electronic tuner. These devices have been refined to a high degree in the last twenty years and have become a very reliable resource for musicians and music students. They are also a great option for Suzuki guitar parents who may not play the guitar and who need a dependable, quick way to get in tune. Tuners come in several varieties, but all work on the same principle. They have a built in microphone which listens to the sound of the plucked string and then, registers the pitch of the string on a meter with some sort of graphic display. A moving needle or lights that light up on one side or the other tell the player whether the note is sharp or flat. On modern chromatic tuners, which can tune any note, there is also a letter display which indicates the note being played. The Korg tuner is an affordable version of this type of tuner. Some tuners, such as the Intellitouch tuner, actually can be mounted on the guitar headstock and used surreptitiously during performances.

The second way of tuning to tempered pitches is to use a metronome or other device which has a pitch pipe feature, such as the Matrix MR-600 model. This metronome's pitch pipe feature can make notes for all the six open strings. Another option is to play the notes on an electronic keyboard or an acoustic piano

that is known to be in tune. If done accurately, the result will be the same as using the electronic tuner. The catch is that if your ear is not up to the task, the tuning may come out badly after all, so this method is recommended for experienced musicians only.

The third way to accomplish the task is to use a tuning procedure that results in tempered pitches using the ear. To get the job done the procedure must be simple enough to be done efficiently. Many years ago I participated in a master class with Uruguayan composer Guido Santorsola who shared with me his special method for tuning the guitar, which I still use today with some minor modifications.

Begin by tuning the A or fifth string with a tuner or pitch pipe. It is always good to start with a standard pitch since the guitar will stay in tune better if it is always tuned to the same pitch. After tuning the A string, don't readjust it. It is now the reference for the other strings.

Next, play the A or fifth string together with the E or first string. This creates an interval of a fifth (plus an octave). You will need to adjust the string so that it is a shade flat of a natural fifth. (The actual amount flat that it needs to be is about two cycles per second, equivalent to one twelfth of the Pythagorean comma.)

Then play both E strings together. Tune the E or sixth string until it makes a pure octave against the E or first string. Next, play the E or sixth string together with the B or second string. Once again, the fifth interval must be shaded a bit flat of its natural pitch.

Then play the A or fifth string together with the A note at the second fret of the G or third string. Tune the G string until this octave sounds pure. Fret carefully so as not to influence the tuning.

Finally, play the E or sixth string together with the E note at the second fret of the D or fourth string. Tune the D string until the octave is pure.

Santorsola showed me that after tuning the B string, one should tune the D open against the A open, using the interval of a fourth and to repeat that procedure to tune the G open against the D open. My experience was that using the fretted notes to make octaves and tuning that way was easier to do for me.

To summarize:

- 1) Tune A (5) to a tuner or pitch pipe.
- 2) Tune E (1) to A (5)
- 3) Tune E (6) to E (1)
- 4) Tune B (2) to E (6)
- 5) Tune G (3) fret 2 to A (5)
- 6) Tune D (4) fret 2 to E (6)

Once you are done:, it is a good test to play an open position E chord and then 'play an open position'C chord. You may need to adjust the G string a bit to make it work.

After reading the above explanation, the question most readers will have is: how does one know when one has made the fifths properly flat? This requires careful listening. As you play the low A and high E together and in sequence, explore how one can shade the pitch of the E up and down within a small range that sounds in tune. Shade the pitch to the lower end of this range. Repeat the exploration with the low E and B strings. With trial and error, one can learn to make the tuning method work. With practice and experience, the tuning method can be very helpful for getting really in tune when it really matters.

It is important to note that this article provides a very brief look at a very broad subject and that those who wish to know more can find plenty to read about in the literature or on the Internet. Key words and topics to explore are:

- Pythagorean comma
- Equal temperament
- Overtone series
- Harmonics

Also very helpful is a book on the topic of guitar tuning by North Carolina School of the Arts professor Gerald Klickstein titled *Tuning the Guitar by Ear*. This is an in depth guide to the topic that covers not only how to achieve good tuning in standard tuning but also in dropped D and many other tuning schemes. This is a relatively new and more thorough approach to a topic too little understood by musicians in general.

So remember that tuning your guitar is a more complicated subject than it appears to be at first. Scientists, musicians, engineers and even ancient philosophers have all weighed in over the centuries on the use of tuning, pitch and intonation and it takes time, study and practice for a guitarist to learn to tune the instrument. However, if we aspire to truly beautiful, transcendent performances on our beloved six string we owe it to ourselves and our audiences to learn!

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