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YOU'RE FLAT! YOU'RE SHARP!

WELCOME TO TUNING TACTICS! Every musician deals with the challenge of playing in tune. Perhaps you had (or have) a band director standing in front of you with a tuner, calling out "Flat! Push in!" "Sharp! Pull out!" You dutifully follow instructions and then play the note again, hoping he or she will move on to the next hapless player, berating with allegations of out-of-tuneness.

Did it do much good? Once you made the suggested
from then on? Probably not. Playing in tune is not
slide, mouthpiece or tuning pegs. It is a con
every note you play, relative to the notes be
whether you *are* in tune, but whether yo

TEAM EFFORT / SELF CONFID

In an ensemble, if just one p
is more often the case wi
with each other, nobo

JUST INTONATION (PURE TUNING)

Long ago, Pythagoras observed that when the frequencies of two pitches form a simple mathematic relationship, such as 2:1 or 3:2, the resulting harmony has a pure, stable sound, as if the two notes combine seamlessly. This is the basis for 'just intonation', or pure tuning: the frequency of one note is an integer multiple of another. Pure intervals sound the most in tune, however in practical use there are significant problems with just intonation.

PURE OCTAVES

When an octave is perfectly tuned, the frequency of the top note is exactly double the frequency of the bottom note. This is a 2:1 ratio. The underlying tenet of all tuning systems is that the octaves must be pure. It makes sense: if the octaves sound out of tune, where do you go from there?

Below are four waveforms arranged in a 2:1 ratio. Each one vibrates exactly twice as fast as the one above it, and sounds one octave higher. Overlapped, they would align precisely at specific points, like the translucent pages in a picture book on anatomy.

Octaves

HEAR THE BEATS

THE TUNING NOTE A=440 is produced by a frequency of 440 Hz. If one player plays A=440 while a second player simultaneously plays A=442 (a little sharp), a pulsing effect is heard. This is caused by the discrepancy between the two frequencies; they are out of phase with each other. Musicians refer to these pulses as 'beats' that are heard when notes are slightly out of tune. The further out of tune, the faster the beats. In the above example, a discrepancy of 2 Hz produces two beats per second. When the notes are in tune, the beats vanish.

The beats are most obvious when tuning unisons or octaves, but they can be heard on other intervals. In this case, the beats are actually generated by an overtone of the lower note. To explain: let's assume the second player is now playing the fifth (E) a little sharp at 662 Hz. Remember that A=440 generates the pure-tuned fifth (E=660) as it's third harmonic. The beats are a result of the clash between the 662 Hz fundamental pitch of the fifth and the 660 Hz third harmonic of the root.

Listening for and eliminating the beats is a very effectiv
tune. If you hear beats, you are getting close. Trv
down; if the beats quicken, you are moving in th
you are heading the right way. When the
demonstration track on the *Tuning Tact*
beats when playing with the *Tuning T*

When working

THE TUNING TACTICS CD

THE TUNING TACTICS CD contains 88 demonstration and play-along tracks. Incorporating these tracks into your daily practice routine will sharpen your ear and demand a high degree of control over your instrument, dramatically improving your ability to hear and play in tune.

TRACK ORGANIZATION

Track 1: Hear The Beats

Track 2–13: Tuning Tracks

Tracks 14–25: Major Scales

Tracks 26–55: Intervals I

Tracks 56–88: Intervals II

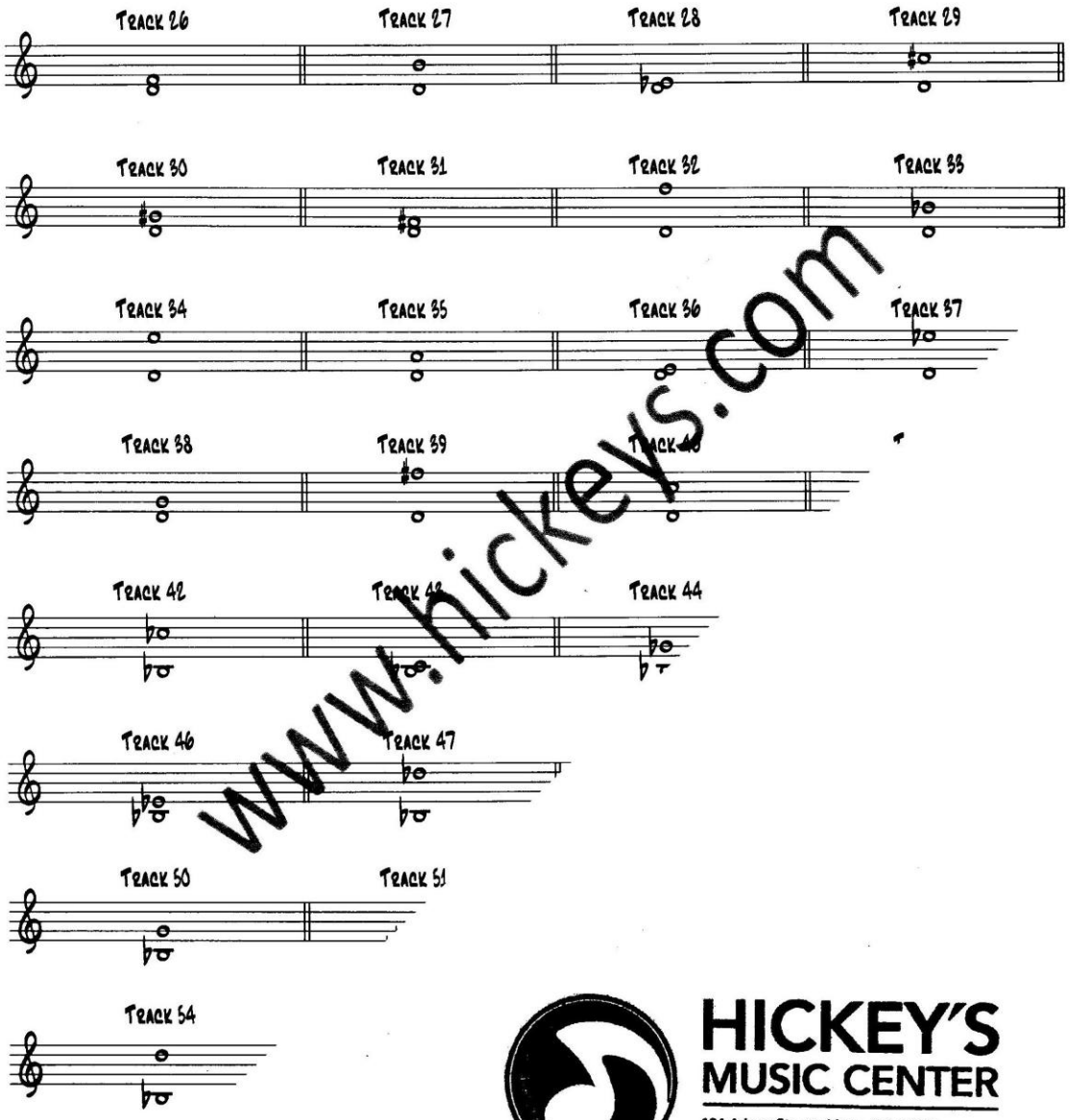
(Individual track listings can be found on page 31.)

TRACK 1: HEAR THE BEATS

This demonstration track lets you hear the beats that occur when notes are out of tune. The following demonstrations are heard:

- A=440 Hz compared to A=441: It is not easy to hear a difference of 1 Hz when the tones are played separately, but when played together, the beats are clearly audible.
- A=440 is sustained against a rising pitch of A=441, 442, 443, 444, & 445. As the upper note gets sharper, the beats get faster.
- A=440 is played against A=445, then the upper pitch is lowered in steps to 440. The beats slow down and eventually vanish.
- Pure tuned fifth: A=440 / E=660
- Out-of-tune fifth: A=440 / E=665 The beats are not as audible on an interval, but you can hear them if you listen closely. The conflict is actually between the 665 Hz fifth, and the 660 Hz overtone generated by the root. (See page 19)
- The out-of-tune fifth is lowered in steps to 660 Hz. The beats slow down and eventually vanish.
- Triads are played first in equal temperament, then in pure tuning. The beats are obvious in equal temperament. They vanish in pure tuning.
- Equal temperament and pure tuning compared: two major scales are played simultaneously, one in equal temperament and the other in pure tuning. While your ear cannot discern the two separate tones, the beats are clearly audible. The speed of the beats changes on each degree of the scale – the faster the beats, the farther away the tempered interval is from the pure interval.

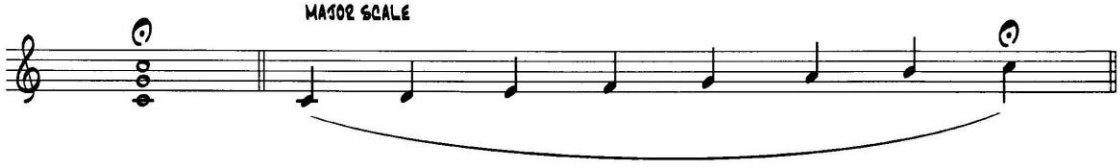
INTERVALS I



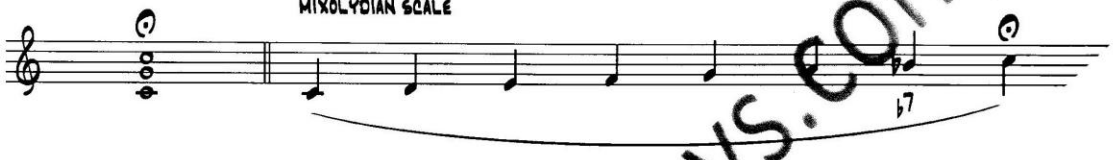
Exercises: Scales

When playing scales, try to find the 'slot' for each interval, even the dissonant ones.

Major Scale



Mixolydian Scale



Dorian Scale

Aeolian Scale

Phrygian Sc