MARY HAD A LITTLE LAMB

And other ways to improve intonation

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Today we will discuss:


Tuning Systems


Posture and Set up


Development of Aural skills


Common Problems and how to solve them


Putting it all together

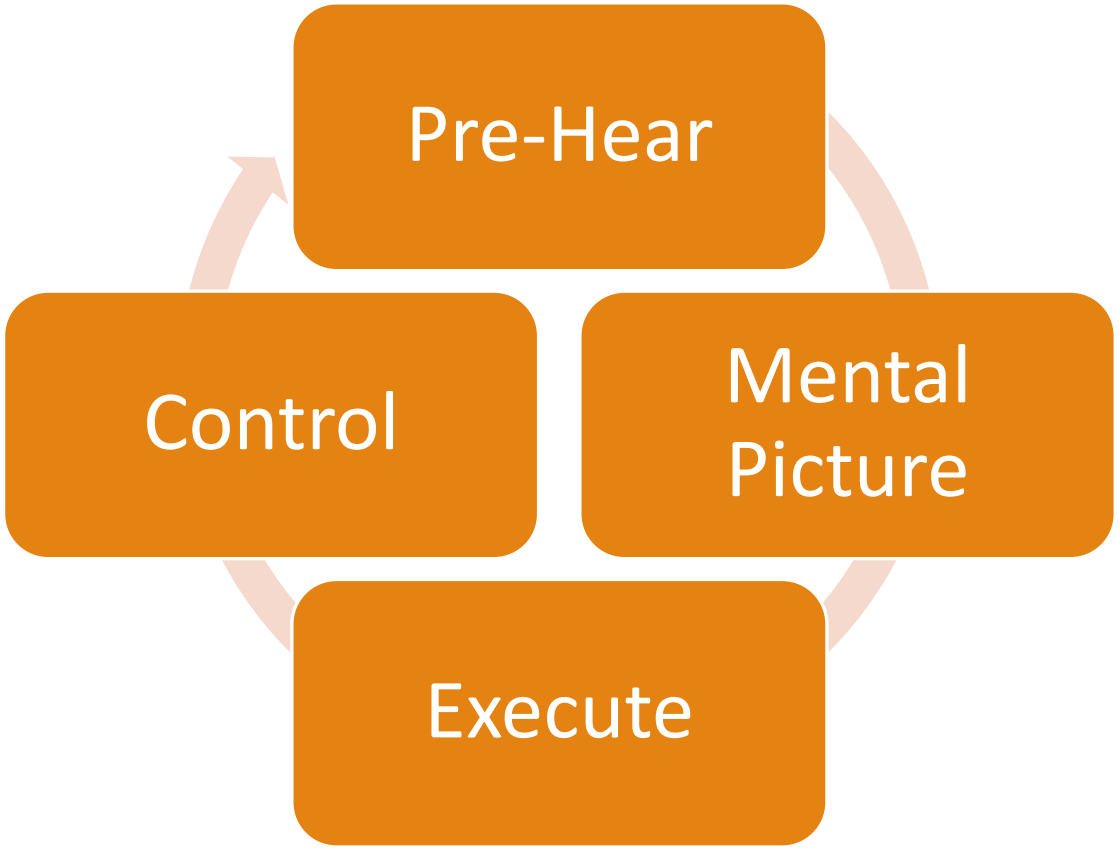
Intonation is:

Personal

Subjective

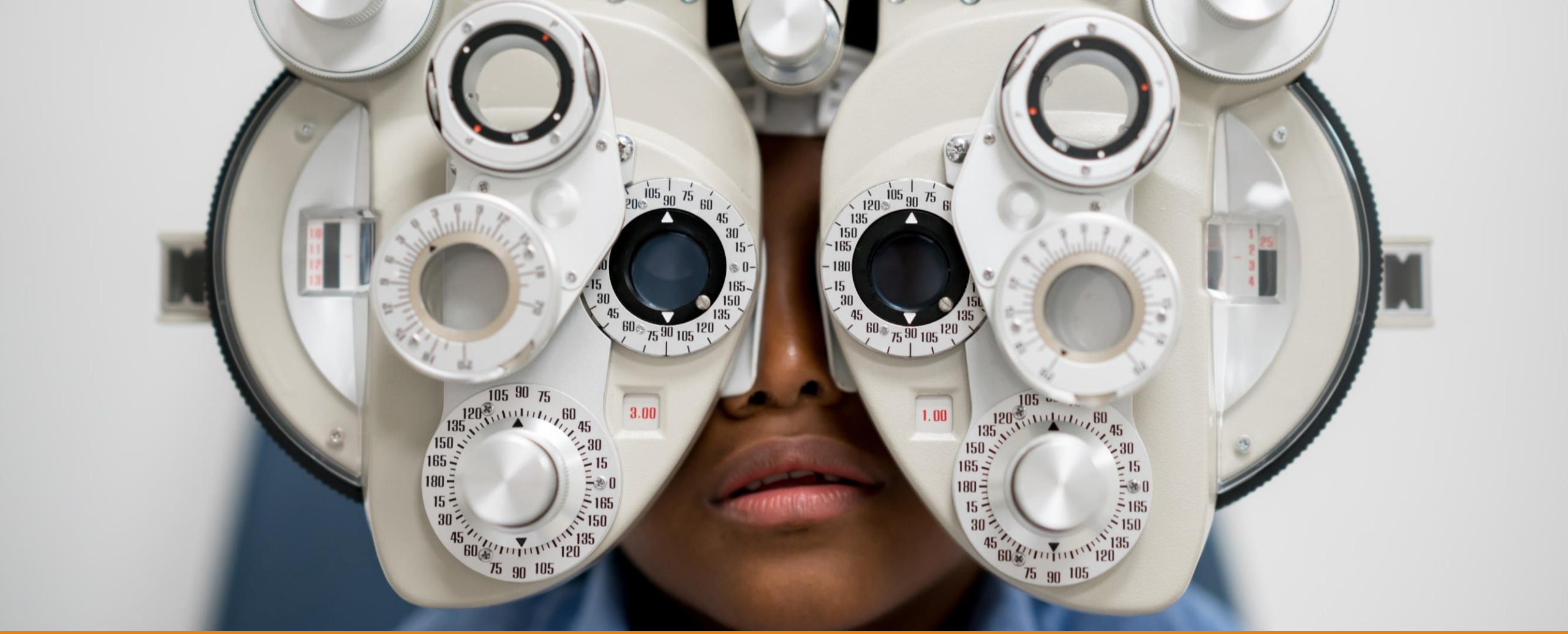
Intuitive

Playing process



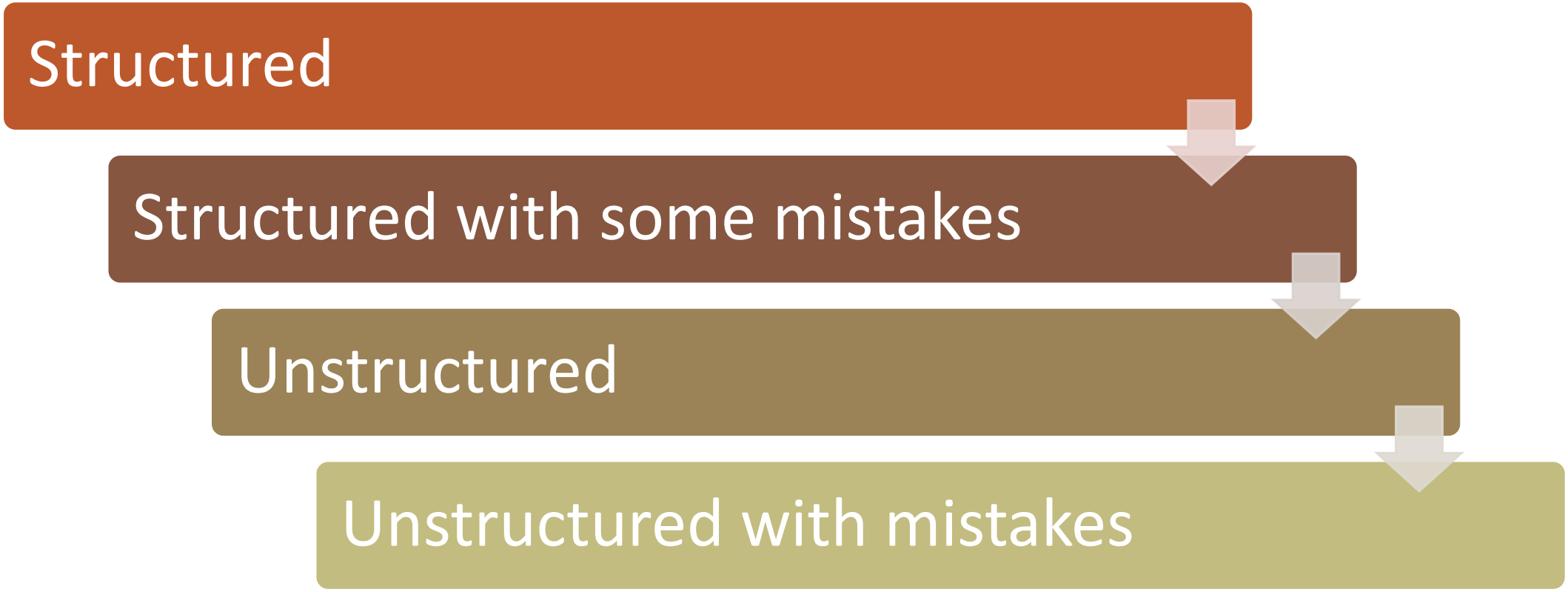
Mental Picture

- **Place**
- **Feeling**
- **Shape**
- **Tone/semitone**
- **Aural**



Test

4 Levels of Intonation



Harmonic Series

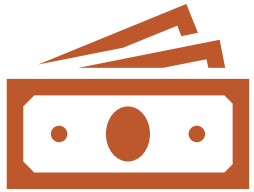
Natural Harmonics

Overtone	Part of the string Vibrating	Pitch produced
	Whole string	**FUNDAMENTAL** Note
1st	2 parts	Octave above
2nd	3 parts	8ve + 5th above
3rd	4 parts	2 Octaves above
4th	5 parts	2 Octaves + Major 3rd
5th	6 parts	2 Octaves + Perfect 5th
6th	7 parts	2 Octaves + Minor 7th
7th	8 parts	3 Octaves above

Intonation Systems Today

1. Equal Temperament
2. Just Intonation
3. Pythagorean Tuning

Cents



1 Octave = 1200 Cents

Octave is the same between 3 tuning systems

Is a Logarhythmic Unit: Logos = ratio, Arithmus = number

Equal Temperament

Divides octave into 12 equal sized semitones

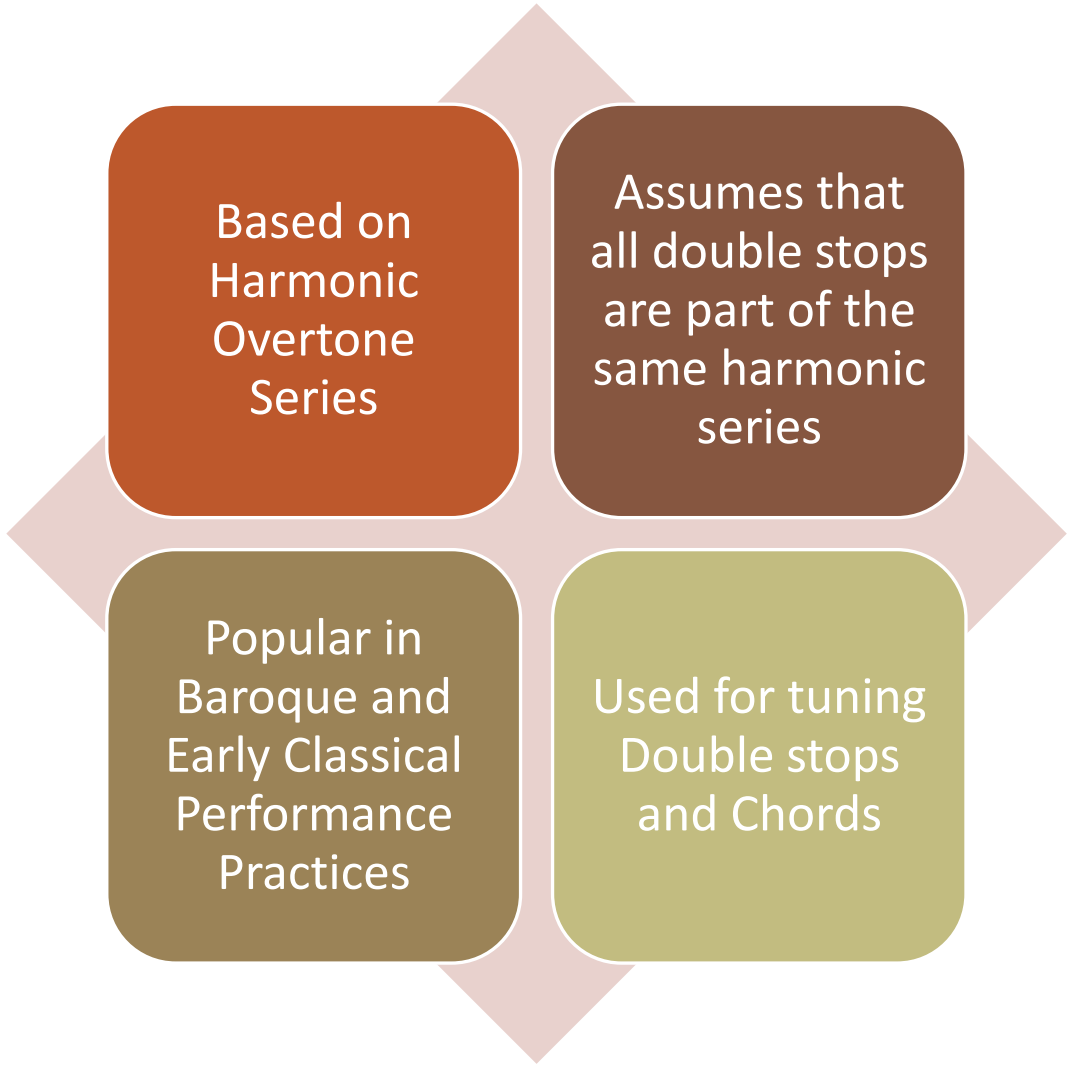
Each Semitone is 100 cents,
therefore 1 cent = 1/100th of an Equal Tempered semitone

Piano is tuned in Equal Temperament

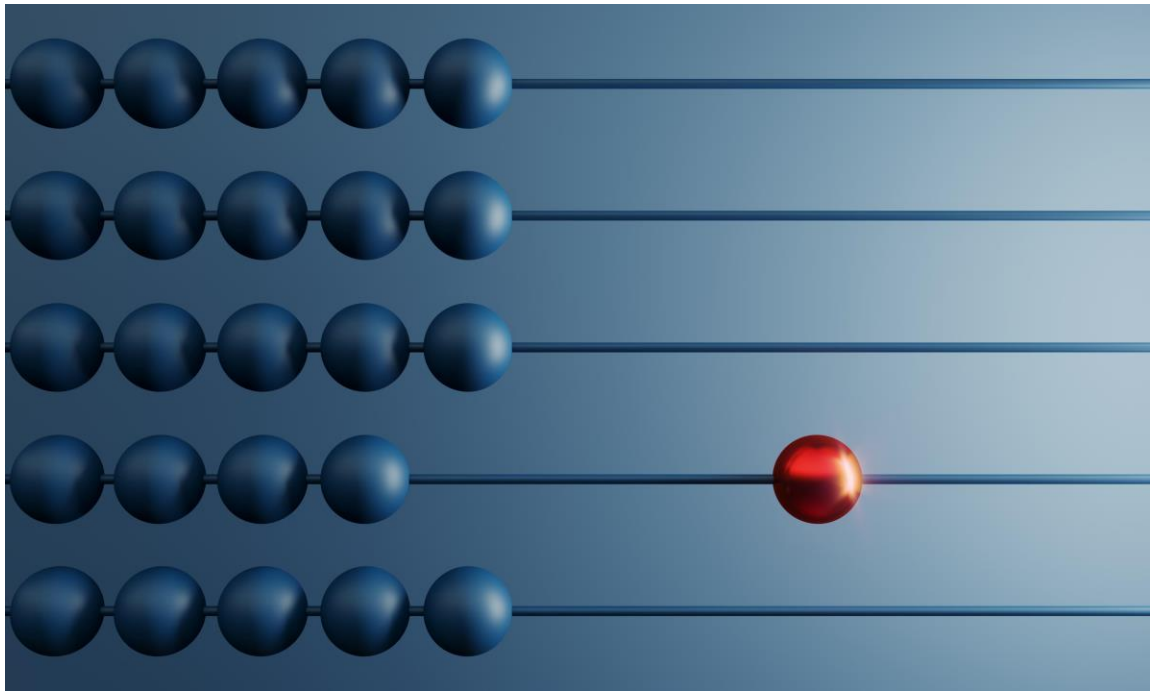
Perfect 4ths: 5 Semitones x 100 = 500 Cents
Perfect 5ths: 7 Semitones x 100 = 700 Cents
are not completely in tune

Pure Perfect 4th is 498 cents

Pure Perfect 5th is 702 cents



Just Intonation



Pythagorean Tuning

12 Perfect 5ths stacked one upon another

Pitches are related through a Spiral of Perfect 5ths

Comparing 3 systems

Interval	Equal Temperament	Just	Pythagorean
Octave	1200	1200	1200
Fifth	700	702	702
Fourth	500	498	498
Major Third	400	386	408
Semitone	100	112	90

Scary Maths

Comma is a small difference in pitch between one note tuned two different ways

Syntonic Comma is a difference between
Just Major 3rd (386 cents) and 4 stacked Perf 5ths
702 * 4 = 2808
Take away 2 octaves (2400)
2808 – 2400 = 408 Cents.
408 – 386 = 22 Cents

Pythagorean Comma is a difference between 12 Pythagorean 5ths 702 * 12 = 8424 and
7 Octaves 1200 * 7 = 8400 Cents
8424 – 8400 = 24 Cents

More Scary Maths: Semitones

Just Intonation Major 3rd is 386 Cents, and Perfect 4th is 498 Cents. Hence 498 - 386=112 Cents.
Therefore Just semitone is wider than in Equal Temperament Demonstrate with violin and harmonic

In Pythagorean Intonation, Major 3rd is 408 Cents. Perfect 4th is 498 Cents. Hence 498 - 408=90 Cents.
Therefore Pythagorean semitone It is narrower than Equal temperament

Tartini Tones (not so scary maths)

Tartini Tones = Differential Tones

3rd note that we hear is the Difference between 2 notes that you are playing

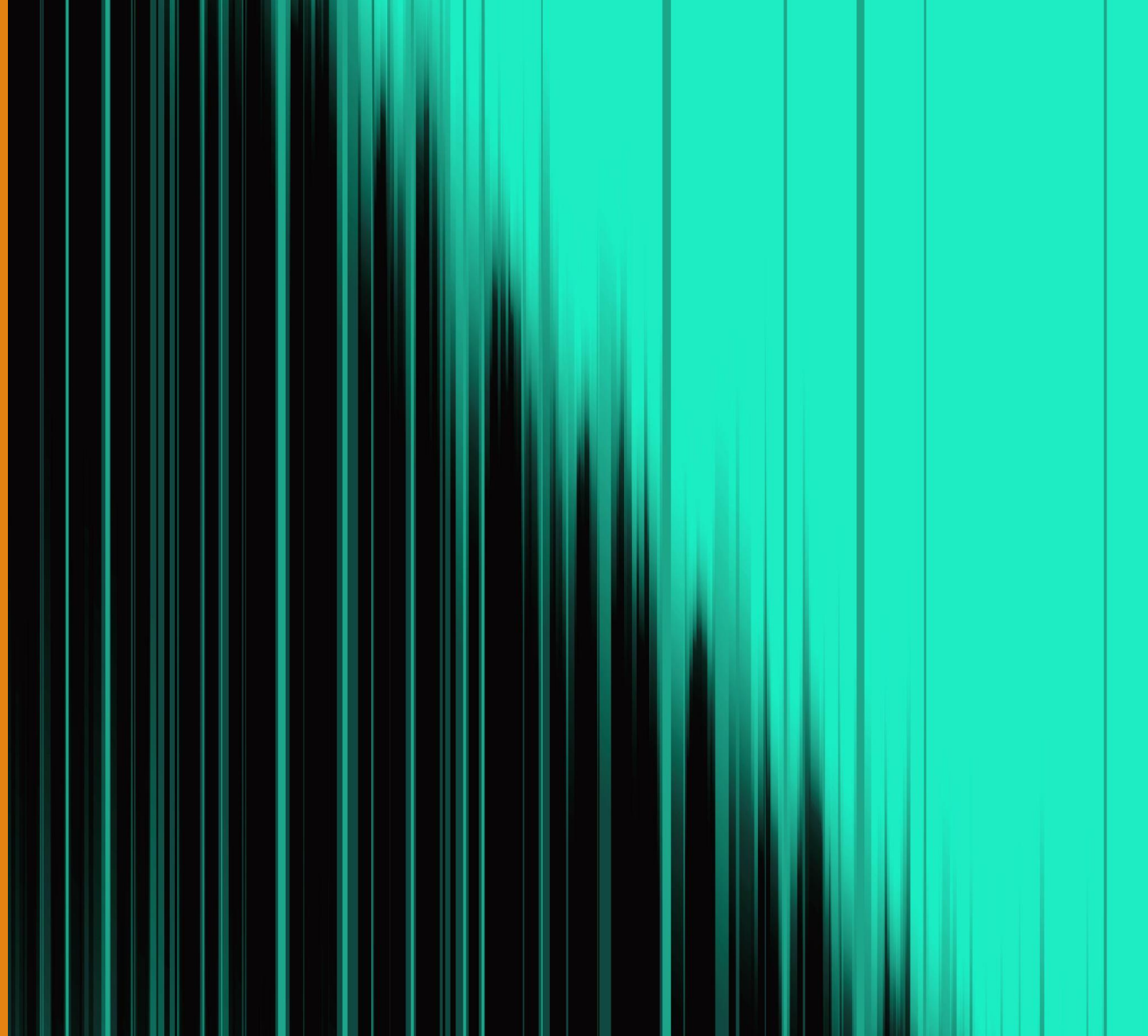
If E tuned to 660HZ and E above it is tuned to 990, then the resulting difference is:

990 – 660 = 330Hz

Tartini Tones table

Interval	Tartini Tone
Maj 3	2 Octaves below the low note
Min 3rd	One octave+ one 5th below top note
Perfect 4th	2 Octaves below high note
Perfect 5th	One octave below low note
Maj 6th	One 5th below the low note
Min 6th	Maj 6th below the low note
Maj 10th	One 5th above the low note
Min 10th	2 octaves below the low note

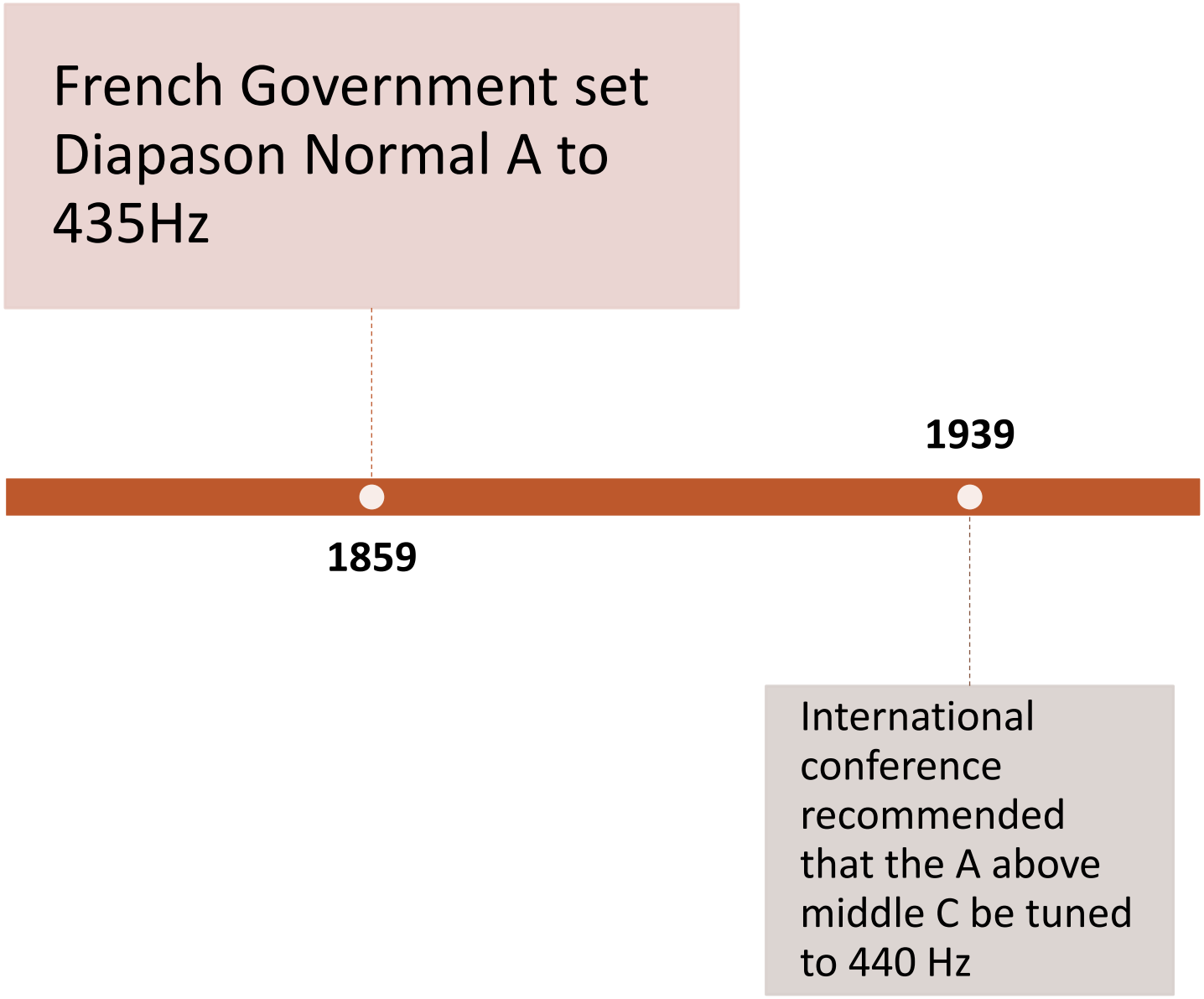
Sympathetic Vibrations



Acoustic Beats

AN INTERFERENCE OF TWO SOUNDS OF SLIGHTLY DIFFERENT FREQUENCIES

Playing in Tune



Improving Listening

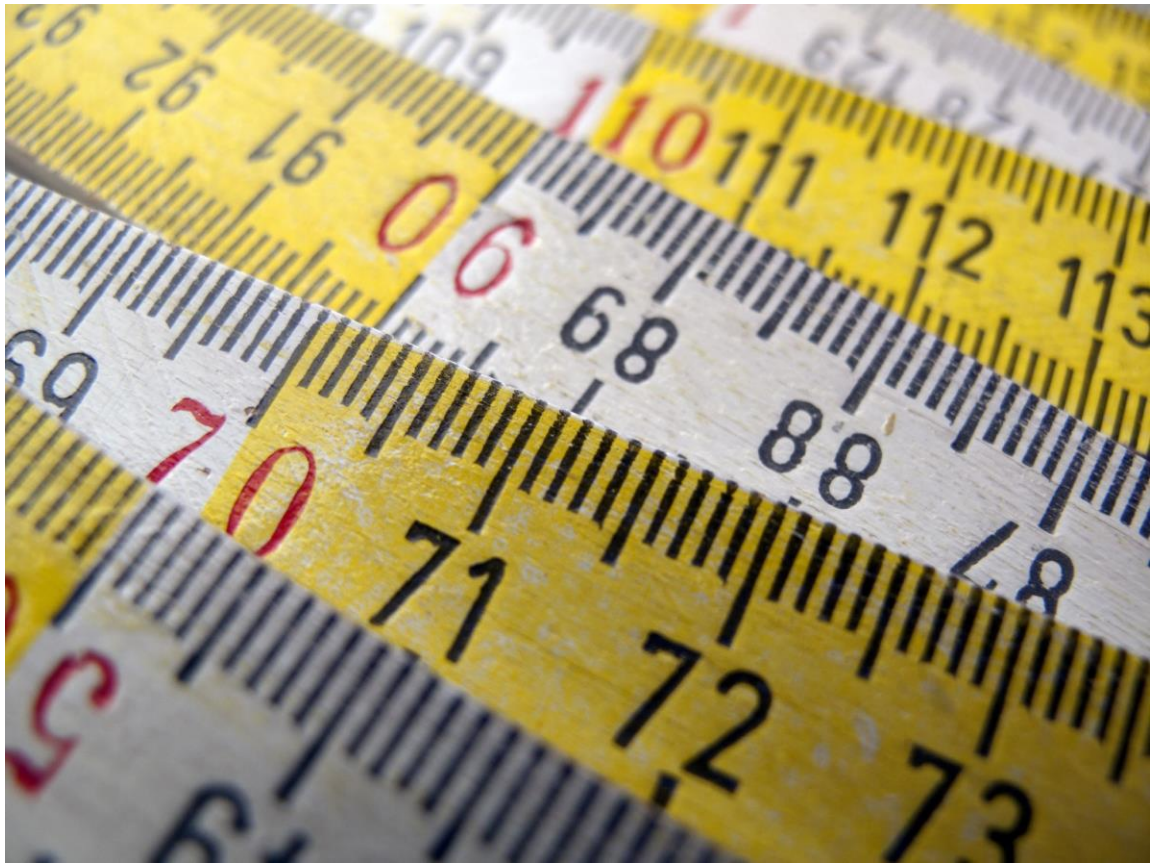
- Acoustic beats
- Sympathetic vibrations
- Tartini tones
- Background Resonance
- Intonation Exercises

Intonation Exercises

IMPROVE EAR SENSITIVITY WITH EAR TESTS

Playing Scales in Tune

- Focus on I – IV – V
- Allign III – IV and VII – VIII
- II Step is halfway between I – III
- VI Step is halfway between V – VII



Understand the difference in spacing

- The higher up the string we play, the closer the notes are
- Finger Spacing Exercise
- Note Pattern Exercise
- Transposition

Practicing Notes Only

Finger Spacing Patterns (+ denotes whole tone)

1234	123+4	12+34	1+234
1+23+4	1+2+34	1+2+3+4	+12+3+4
+12+34	+123+4	+1234	

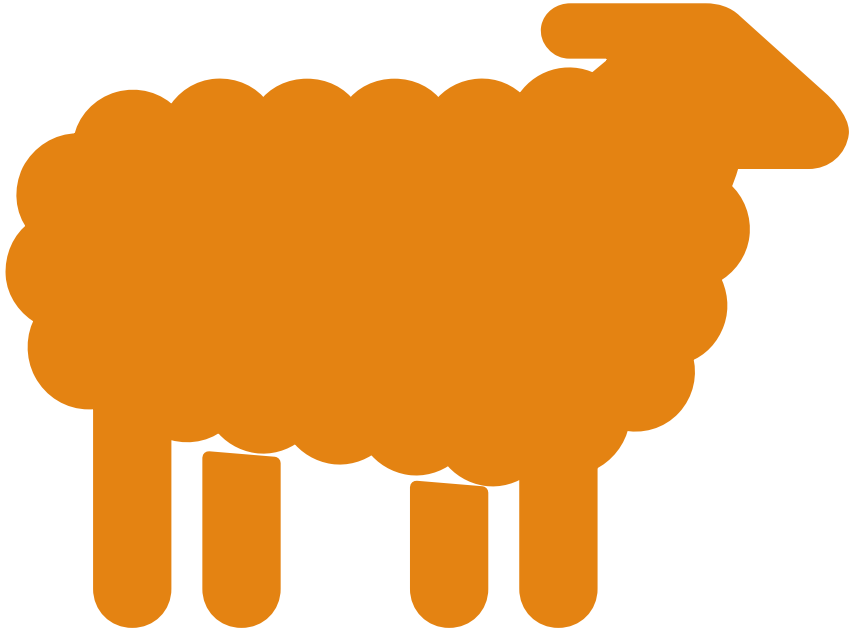
Hovering fingers above the string

Hand frame

Playing with piano

Common reasons for poor tuning (page 1 of 384)

Tension	Placement of the Head	Pressure of the bow	Built in finger tendencies to play sharp or flat	Moving fingers across the string
Square and Extended Finger Shapes	Distance between fingers	Extensions or Contractions	Pace of placing fingers on the string	Insufficient knowledge of positions
Hand Shape	Establishing intonation strongholds	Having fingers too high above the fingerboard	Left hand reacting to changes of dynamics	Choice of fingerings



What does “Mary Had a Little Lamb” have to do with any of this?

Interval	Ascending	Descending
Min 2	Pink Panther/Jaws	Fur Elise, Mozart 40
Maj 2	Happy Birthday	Mary Had a Little Lamb
Min 3	Greensleeves/ So Long, Farewell	This Old Man/ Frosty the Snowman
Maj 3	Four Seasons Spring/Kumbaya	Beethoveen 5
Perf 4	We wish you a merry Christmas	Hallelujah Haendel/ Eine Kleine
Tritone (same both ways)	The Simpsons/ Maria (West Side Story)	
Perf 5	Twinkle Twinkle	Minuet in G/Flinstones theme
Min 6	The Entertainer	Love Story/ Call me maybe
Maj 6	Dashing through the Snow	Man In the Mirror (Michael Jackson)
Min 7	The winner takes it All (ABBA)	The Shadow of your Smile
Maj 7	Somewhere Over the Rainbow	Yet to find ☺

Questions?