Overtone series

Overtone Series		Overtone Series
Sympsionics Symbol		

A naturally occurring series of overtones, partials or harmonics from a fundamental or any other tone, sound or frequency. The nature of this Progressive Evolution is discretely arithmetical according to what is vibrating whether it be a string, rod fastened at one end or both ends, diaphragm, volume of gas, etc. its substance, density, etc. as also by how the vibrating object is excited; striking, bowing or sympathetically. When as a volume the Progressive Evolution is geometric as in Russell's Scale of Locked Potentials.

Naturally Occurring Harmonics and Partials

Overtone Harmonics
(See MUTATIONS for more complete list.)
C:
First Octave
1 = c
Second Octave
2 = c'
3 = g'
Third Octave
4 = c''
5 = e''
6 = g''
7 = bb (it's actually about half way between a and bb)
Fourth Octave
8 = c'''
9 = d'''
10 = e'''
11 = f#''' (halfway between f and f#)
12 = g'''
13 = a'''
14 = bb''' (sort of)
15 = b'''
16 = c
17 = c#/db
18 = d
19 = eb (a bit flatter)
20 = e
21 = ???
22 = f# (sort of)
23 = f# (a bit sharper)
24 = g

This video contains an excellent description of **overtones**.

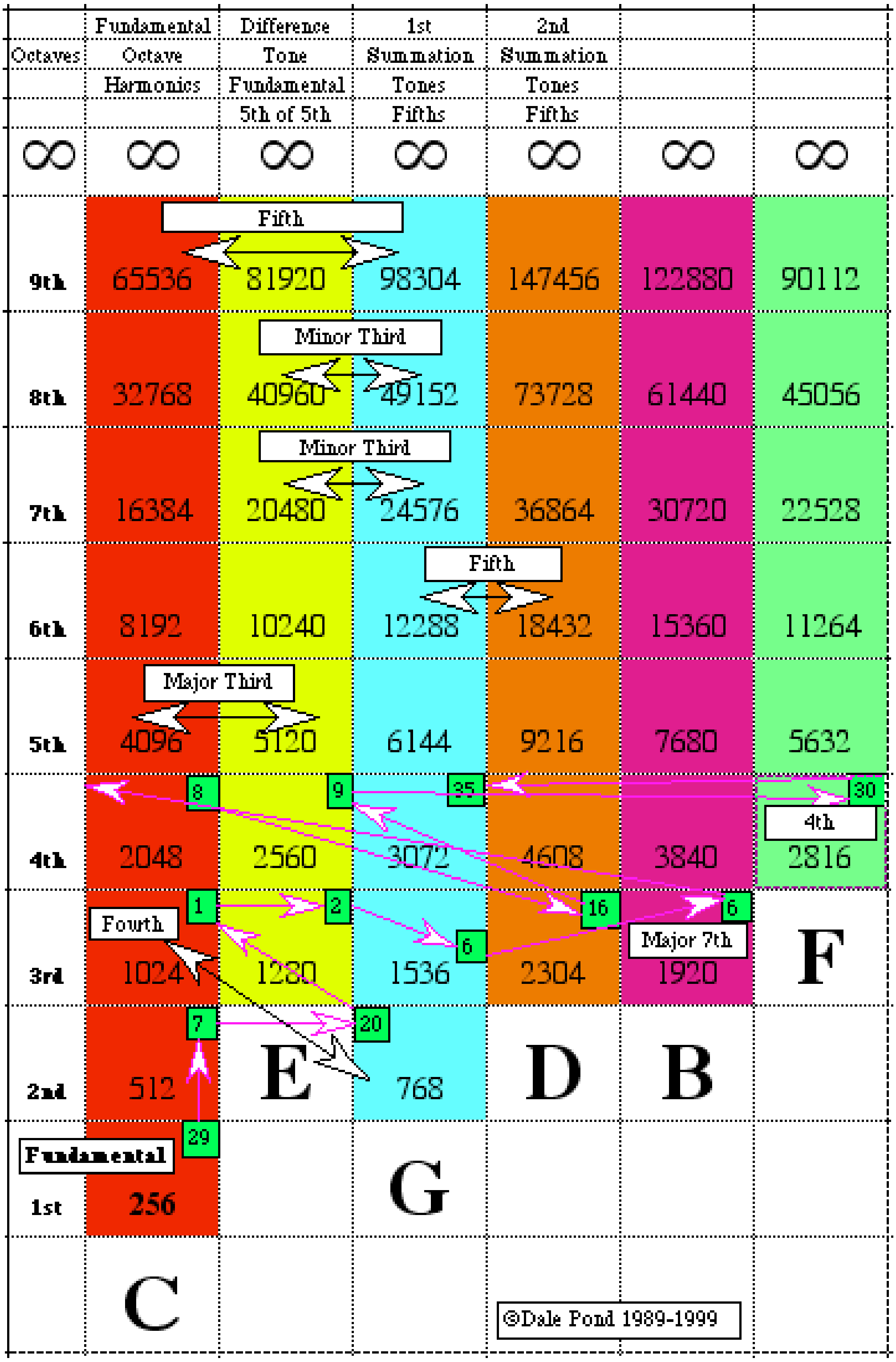

Figure 1.12 - Naturally Occurring Frequencies Modes and Music Interval Relations
(click to enlarge)

Naturally Occurring Harmonics and Partials

Rod Fixed at Both Ends
"A rod fixed at both ends and caused to vibrate transversely divides itself in the same manner as a string vibrating transversely.

"But the succession of its **overtones** is not the same as those of a string, for while the series of tones emitted by the string is expressed by the natural numbers, 1, 2, 3, 4, 5, etc., the series of tones emitted by the rod is expressed by the squares of the odd numbers, 3, 5, 7, 9, etc." [from "Sound" by John Tyndall]

Rod Fixed at One End

"A rod fixed at one end can also vibrate as a whole, or can divide itself into vibrating segments separated from each other by nodes.

"In this case the rate of vibration of the fundamental tone is to that of the first **overtone** as 4:25, or as the square of 2 to the square of 5. From the first division onwards the rates of vibration are proportional to the squares of the odd numbers, 3, 5, 7, 9, etc.

"With rods of different lengths the rate of vibration is inversely proportional to the square of the length of the rod." [from "Sound", John Tyndall]

The Harmonic Series

$$1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\ldots\ldots=\infty$$

(click to enlarge)

The Overtone Series (Harmonics)

Frequency	Multiple	Name	Pitch
65 Hz	1x	Fundamental	C1 (Base pitch)
130 Hz	2x	First Harmonic	C2 (1 octave higher)
195 Hz	3x	Second Harmonic	G2 (octave + fifth higher)
260 Hz	4x	Third Harmonic	C3 (2 octaves higher)
325 Hz	5x	Fourth Harmonic	E3 (2 octaves + maj 3rd higher)
390 Hz	6x	Fifth Harmonic	G3 (2 octaves + fifth higher)
455 Hz	7x	Sixth Harmonic	Bb3 (2 octaves + minor seventh higher… though it will be slightly out of tune)
520 Hz	8x	Seventh Harmonic	C4 (3 octaves higher)
585 Hz	9x	Eighth Harmonic	D4 (3 octaves + major 2nd)
And so on…			

Harmonic Series

(click to enlarge)

Researchers discover new channels to excite magnetic waves with terahertz light

Plucking a guitar string is a simple action that generates a harmonic series of overtones. However, skilled guitar players can elevate their performance by applying pressure to the strings while plucking them. This subtle technique causes the pitch of the note to bend—rising or falling with each deft movement—and infuses the music with expressiveness, texture, and character by intentionally harnessing the "nonlinear effects" of guitar strings.
In a study published today in Nature Physics , researchers from MIT and the University of Texas at Austin draw a fascinating scientific parallel to this musical artistry. The paper, authored by MIT graduate student Zhuquan Zhang, University of Texas at Austin Postdoc Frank Gao (MIT PhD '22), MIT's Haslam and Dewey Professor of

Chemistry Keith Nelson, and Edoardo Baldini, an Assistant Professor of Physics at the University of Texas at Austin, demonstrates the ability to control the dancing patterns of tiny magnetic bits, often referred to as “spin waves” or “magnons,” in a nonlinear manner, akin to how skilled guitar players manipulate guitar strings. Researchers discover new channels to excite magnetic waves with terahertz light

See Also

1.20 - Evolution and Devolution of Frequency
1.23 - Power of Harmonics through Summation Tones
12.18 - Multiple Octave Progression
12.19 - Fibonacci Relationships
12.21 - Fibonacci Whole Numbers v Irrational Decimal near Equivalents
12.38 - Orbital revolution
14.15 - Movement Caused by Spirit
15.15 - Progressive Dissociation
15.15.05 - Progressive Association
3.04 - Power Accumulation via Fibonacci-like Patterns
8.17 - Law of Harmonic Vibrations
8.22 - Law of Harmonic Pitch
9.8 - Spontaneous Creation of Harmonic Series
9.9 - Sympathy or Harmony Between Harmonics or Overtones
Additive and Subtractive Synthesis
arithmetic progression
arithmetical progression
Differentiation
Dissolution
evolve
Evolution
Fibonacci Relationships
Fibonacci Series
Overtones Developed Musically
Figure 8.5 - Summation Tones
Fractal
fugue
Genesis of the Scale
Geometrical Progression
Golden Section
Growth
harmonic progression
Harmonic Series
Harmonic
Interval
Law of Harmonic Pitch
Law of Harmonic Vibrations
Life
major
major key
major scale
Master Tone
master tones
Medu-Neter

Mid-tone
Motion
Movement
musical progression
Neter
octave tones
Overtone Position
Overtone
partial
PHI
progression of adjacencies
progression of keys
Progression
Progressive Evolution
Progressive Science
Ramsay - PLATE II - The Genesis
Resultant Tone
Scale
self-evolve
Square Law
Sympathetic Vibration
Sympathy
Tetractyls
Undertone
Vibrating Rod Harmonics