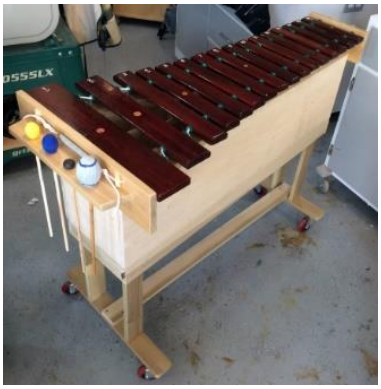
Instrument Specifications:

Instrument: Overtone Series Marimba
Year Completed: 2020
Designer/Builder: Chris Banta
No. of Notes: 32
No. of Octaves: 5
Scale: Overtone or harmonic series
Music Range: C2 to C7
Frequency Range: 65.4Hz to 2093Hz
Height: 34”
Width: 84-3/4”
Depth: 26”
Weight: 85 lbs.
Bars: African Padauk
Resonators: Baltic Birch plywood
Frame: Hard Maple
Finish: Semi-Gloss Clearcoat, waterbase

Project Inspiration:

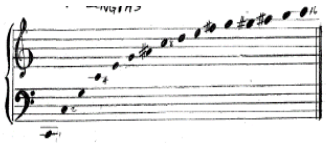
An earlier version overtone scale had only 16 bars with a range from the lowest of C2 to highest being C6. The idea was to further split hairs by adding another upper octave and take the harmonics out to the 32nd place – which is the pitch of C7.



Scale Definition:

A tube that is open at both ends has a series of harmonics or overtones within its length. Its primary or lowest resonant frequency is considered its fundamental pitch. For example, if the fundamental frequency is 100Hz and is multiplied by its 2nd harmonic (100 x 2) then the resulting frequency would be 200Hz. Repeat the process by its 3rd (300Hz), 4th (400Hz), and so forth, the harmonic pitches will go on out to infinity. As the harmonics go higher the distance between them gets closer and closer.

In this instrument the starting or lowest pitch is bass or cello C (65.4Hz) and its harmonics only go out 32 places.



OVERTONE	NOTE	FREQUENCY	BAR WIDTH	BAR LENGTH*	1×WAVELENGTH	STOPPED RESONATOR LENGTH (in)	TUNING COLLECTION
FUNDAMENTAL	CELLO C	65.406Hz	3 3/4"	22 3/8"	17.26'	51.78"	C EXACTLY
2ND	TENOR C	130.81	3"	18.15"	8.63'	25.89"	C EXACTLY
3RD	G	196.218	2 1/4"	16.99"	5.75'	17.26"	G+2
4TH	MIDDLE C	261.63	2 1/8"	14.62"	4.32'	12.94"	C EXACTLY
5TH	E	327.03	2 1/8"	13.61"	3.45'	10.36"	E-14
6TH	G	392.44	2"	12.89"	2.87'	8.63"	G+2
7TH	A#	457.84	2"	12.2"	2.46'	7.39"	A#-31
8TH	C	523.24	1 7/8"	11.78	2.15'	6.47"	C EXACTLY
9TH	D	588.65	1 7/8"	11.37"	1.92'	5.75"	D+4
10TH	E	654.06	1 7/8"	10.97"	1.78'	5.18"	E-14
11TH	F#	719.46	1 7/8"	10.58"	1.57'	4.70"	F#-49
12TH	G	784.87	1 7/8"	10.99"	1.44'	4.32"	G+2
13TH	G#	850.27	1 7/8"	10.21"	1.33'	3.98"	G#+40
14TH	A#	915.68	1 7/8"	9.85"	1.23'	3.69"	A#-31
15TH	B	981.09	1 7/8"	9.67"	1.15'	3.45"	B-12
16TH	C	1046.49	1 7/8"	9 1/2"	1.08'	3.24"	C EXACTLY

* BAR LENGTH BASED UPON A 4 OCTAVE LOGARITHMIC SCALE - FACTOR: 1.0181253
48 LOG. STEPS FROM 9 1/2" TO 22 3/8". OR $\sqrt[48]{2.36}$ EACH!

Scale Technical Explanation:

The following is a list of frequencies that correspond to the numbered harmonic.

1 65.4Hz 1st Harmonic (Fundamental) [Bass C - C2]
2 130.8Hz 2nd Harmonic [Tenor C - C3]
3 196.23Hz
4 261.63Hz 4th Harmonic [Middle C - C4]
5 327.05Hz
6 392.46Hz
7 457.87Hz
8 523.25Hz 8th Harmonic [Treble C – C5]
9 588.69Hz
10 654.10Hz
11 719.51Hz
12 784.92Hz
13 850.33Hz
14 915.74Hz
15 981.15Hz
16 1046.50Hz 16th Harmonic [High C - C6]
17 111.9Hz
18 1177.3Hz
19 1242.7Hz
20 1308.1Hz
21 1373.5Hz
22 1438.9Hz
23 1504.3Hz
24 1569.7Hz
25 1635.2Hz
26 1700.5Hz
27 1765.9Hz
28 1831.4Hz
29 1896.8Hz
30 1962.2Hz
31 2027.6Hz
32 2093Hz 32nd Harmonic [Double High C - C7]