TUNING

TUNKS

PYTHAGOREAN – 1+2+3+4=10

ALL TONES FOUND BY PURE 5THS

	204	204	90	204	204	204	90	
C	D	E	F	G	A	B	C	
	$\frac{9}{8}$	$\frac{9}{8}$	$\frac{256}{243}$	$\frac{9}{8}$	$\frac{9}{8}$	$\frac{9}{8}$	$\frac{256}{243}$	

PYTHAGOREAN COMMA = DIFFERENCE BETWEEN B# ARRIVED AT BY 5THS (702¢) AND C ARRIVED AT BY 7 OCTAVES (1200¢) – 12 5THS, 7 8VAS

COMMA = 24¢

$$C \times \tfrac{3}{2} = G \times \tfrac{3}{2} = D \times \tfrac{1}{2} = D \times \tfrac{3}{2} = A \times \tfrac{3}{2} = E \times \tfrac{1}{2} = E$$

$$\tfrac{3}{2} \times \tfrac{3}{2} = \tfrac{9}{4} \times \tfrac{1}{2} = \tfrac{9}{8} \times \tfrac{3}{2} = \tfrac{27}{16} \times \tfrac{3}{2} = \tfrac{81}{32} \times \tfrac{1}{2} = \tfrac{81}{64}$$

PYTHAG. 3RD

SYNTONIC COMMA OR DIDYMEAN COMMA = 22¢

$\frac{80}{64}$

JUST – BASED ON PURE 5TH PLUS PURE 3RD (5/4)

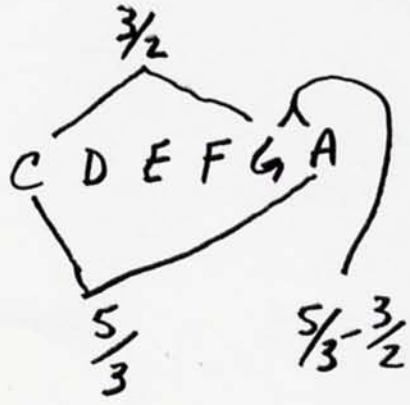
$\frac{5}{4} =$

1+2+3+4+5

8VA – 2/1
5TH – 3/2
4TH – 4/3
3RD – 5/4
2ND – 9/8
2ND – 10/9

C	D	E	F	G	A	B	C
$\frac{9}{8}$	$\frac{10}{9}$	$\frac{16}{15}$	$\frac{9}{8}$	$\frac{10}{9}$	$\frac{9}{8}$	$\frac{16}{15}$	

$\frac{4}{3} - \frac{5}{4} = \frac{4}{3} \times \frac{4}{5} = \frac{16}{15}$



$\frac{5}{3} - \frac{3}{2} = \frac{5}{3} \times \frac{2}{3} = \frac{10}{9}$

TEMPERAMENT (cont.)

MEAN TONE – BASED ON ALTERING SUCCESSIVE 5THS USED IN ARRIVING AT 3RD IN ORDER TO GET PURE 3RD INSTEAD OF PYTH. 3RD. THIS MEANS SPREADING 1/4 DIDYMEAN COMMA ($\frac{80}{81}$ OR 22 CENTS) OVER EACH OF THE 4 5THS (702 CENTS) USED. 1/4 OF THE 22 CENTS IS 5½ CENTS, SO EACH 5TH IS 696½ CENTS INSTEAD OF 702.

C 702 G 702 D 702 A 702 E = 2808

696½ 696½ 696½ 696½ = 2786 – minus 8VA (2400) = 386 PURE 3

SO – 8VA = 1200 CENTS

5TH = 696½ CENTS

3RD = 386 CENTS

2ND = 386/2 (MEAN TONE)* = 193 CENTS

vs. 408 Pyth.

TO TUNE

FROM C ADD 5THS THROUGH B

FROM C SUBTRACT 5THS FOR F, $B^{\flat}$, $E^{\flat}$

THEN

$F^{\#} = D + 386$

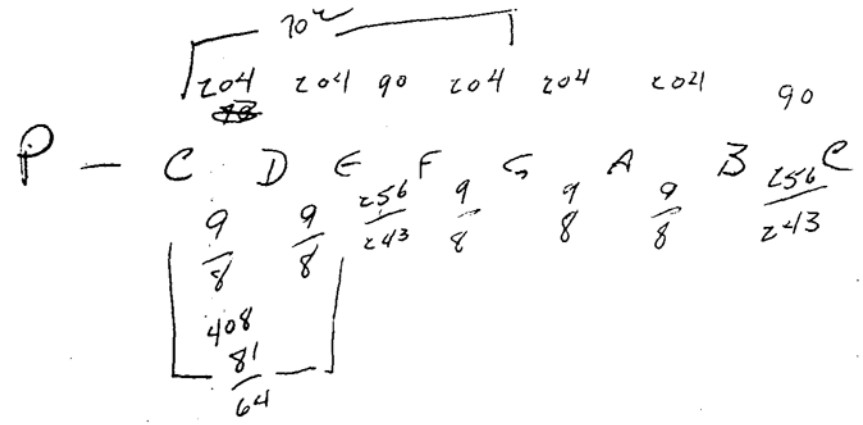
$C^{\#} = A + 386$

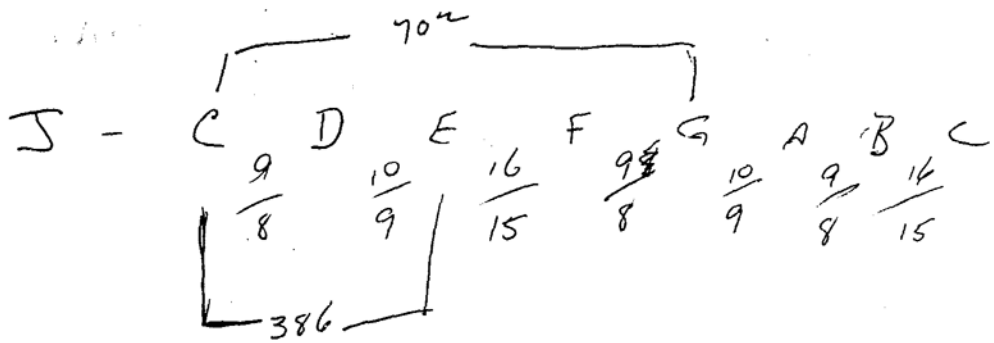
$G^{\#} = E + 386$

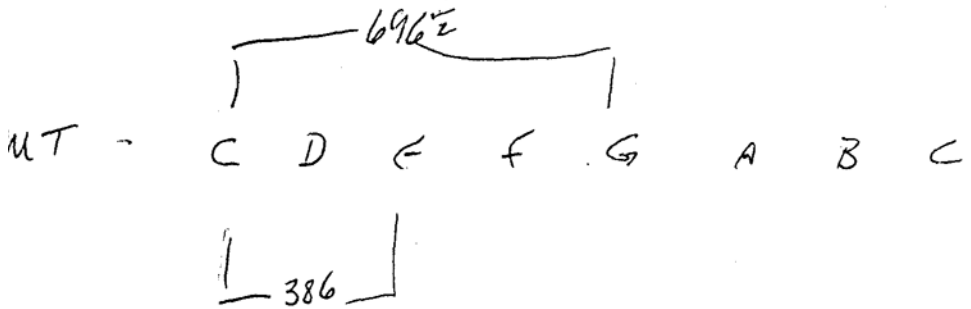
Wolf Tone

SO ACCIDENTALS ARE – $B^{\flat}, E^{\flat} / F^{\#}, C^{\#} G^{\#}$

WOLF TONE IS DIFF. BET $A^{\flat}$ & $G^{\#}$ ARRIVED AT BY COMPARING TUNING METHODS ABOVE. EASIER WAY IS – $G^{\#}$ IS TWO 3RDS UP FROM C – 772 → $A^{\flat}$ IS ONE 3RD DOWN FROM C – 814







$\frac{702}{4} - 5\frac{1}{2} = 696\frac{1}{2}$

$2808 - 22 = 2786$

$C \to G \to D \to A \to E \to B$

$C \to F \to B^{\flat} \to E^{\flat} \to A^{\flat}$

$E \to G^{\#}$ ← WOLF

$D \to F^{\#}$

$A \to C^{\#}$

Comparison in Cents Among Various Tuning/Temperament systems

Physics 1320
Professors Olness and Tunks

	Pythagorean	Just	Mean Tone*	Equal
C	0	0	0	0
C#	114	92	76	100
D	204	204	193	200
Eb	294	316	310	300
E	408	386	386	400
F	498	498	503	500
F#	612	590	579	600
G	702	702	696.5	700
G#	816	816	772	800
A	906	884	890	900
Bb	996	996	1007	1000
B	1110	1088	1083	1100
C	1200	1200	1200	1200

*1/4 comma (Aron, 1523)

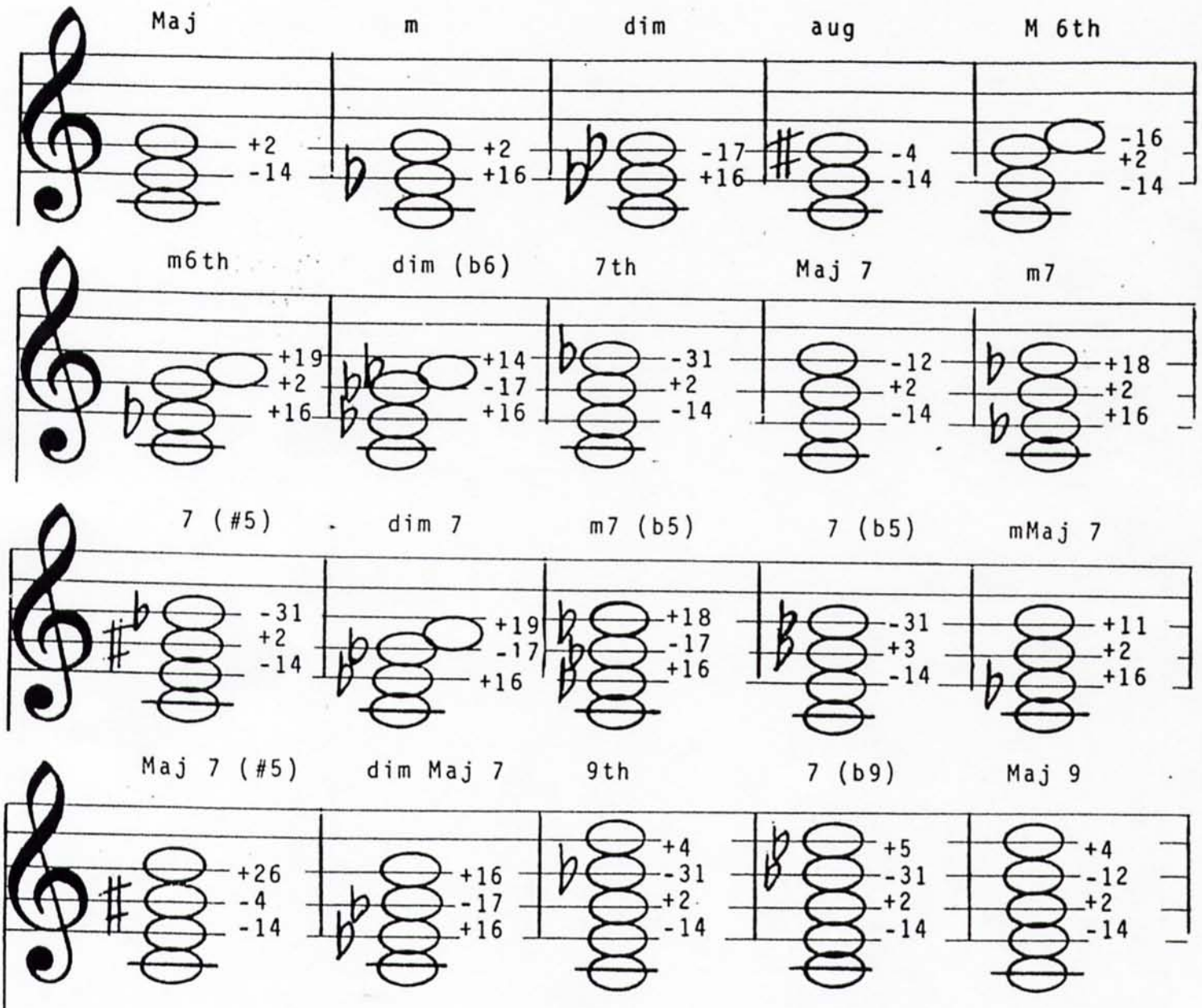
Notes	C	D	E	F	G	A	B	C
Just Diatonic	0	0	0	0	0	0	0	0
Pythagorean	0	0	+22	0	0	+22	+22	0
Mean Tone	0	-11	0	+5.5	-5.5	+5.5	-5.5	0
Equal Temperament	0	- 4	+14	+2	-2	+16	+12	0

Comparison of scales with the just diatonic scale as base

THE "IN TUNE" CHORDS OF JUST INTONATION

In the following chords the notes of equal temperament are considered to be "0" (zero) pitch. All of the IN TUNE chords are based on the root "C" which is equal tempered "0" pitch. Cents +X, or -X indicates the cents difference necessary to be IN TUNE from the equal tempered "0" pitch.

Regardless of the frequency of the starting point the structure of the chord remains constant. Therefore, the pitches of the notes shown here would occur on each of the twelve equal tempered roots...only the frequencies would be different.



Thanks to Mr. Ward Widener and his fabulous AccuTone Tuner for calculating the notes of these IN TUNE chords of just intonation.

JACK HOLLAND PRODUCTIONS 2722 BRENTWOOD BLVD. ST. LOUIS, MO 63144 (314) 962-2005