844 N. Ave 65
Los Angeles CA 90042
Feb 22, 1994

Dear Charles,

I hope this finds you well. Things are not so bad out this way. The mountains are starting to move. Whether they are coming to me at long last, I cannot yet tell. No work. But I have been spending more time on music and plant-breeding. I have become very intrigued with the resourcefulness of <u>recurrent sequences</u> in the formation of scales, sonorities, timbres, and even rythms.

The Fibonacci series is a recurrent sequence whos <u>recurrence relation</u> is $A_n = A_{n-1} + A_{n-2}$. A particular case of this sequence where $A_1 = 1$ and $A_2 = 1$ is the well-known sequence 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377. Regardless of how the sequence is <u>seeded</u> the ratio of ~~the~~ any 2 terms in sequence will converge on the limit 1.618⋯. Example; $55 \div 34 = 1.617647$, $89 \div 55 = 1.618,182$, $144 \div 89 = 1.617978$. When the integers of this sequence are taken to be the corresponding harmonics of the harmonic series, chords/timbres/scales are formed with the most remarkable sum/difference-tone properties.

A musically more accessible sound however comes from the recurrence relation $H_n = 2(H_{n-3} + H_{n-4})$. The particular case where $H_1 = 1$, $H_2 = 2.5$, $H_3 = 3$, $H_4 = 5$ produces the recurrent sequence;

Just Diatonic
F C G D A E B
1, 2.5, 3, 5, 7, 11, 16, 24, 36 (9), 54, 80, 120, 180, 268, 400, 600, 896,

1,336, 2,000, 2,992, 4,464, 6,672, 9,984, 14,912, 22,272 etc. In this case $H_n \div H_{n-1}$ (any 2 terms in sequence) will converge on the limit 1.49453018048. This compares <u>sympathetically</u> with John Harrison's 1.49441150965, such that <u>there will be a significant carry-over of the sum/difference-tone properties</u>.

More later
Sincerely,
Erv Wilson

Recurrent Sequence, $H_n = 2(H_{n-4} + H_{n-3})$ (meta-meantone)

(1.4945301 8048 = Limit of H_n / H_{n-1})

(rev Feb 20, 1994 E.W.)

			Key F		Scalatron Settings	
→ H_{n-4}	1	256 ✓	352			
+ → H_{n-3}	2.5	320 ✓	440			
	3	384 ✓	264			
×2 =	5	320 ✓	440			
→ H_n	7	224•	308	E♭	2 5 7 10	
	11	352	242	B♭	2 3 7 8	
	16	256 ✓	352	F	4 9 10	
	24	384 ✓	264	C	6 7 9	
(9)	36	288	396	G	1 3 5 8 9 10	
	54	432	297	D	1 3 4 5 10	
	80	320 ✓	440	A	1 3 4	
	120	240	330	E	1 2 5 6 8 10	
	180	360	247.5	B	1 2 3 4 6 7 8	upper keyboard
	268	268	368.5	F#	1 7 9 10	Lower Keyboard
	400	400	275	C#	3 6 8 9	
	600	300	412.5	G#	1 2 7 8 9 10	
	896	224•	308	D#	2 5 7 10	
	1,336	334	229.62	A#	2 6 7	
	2,000	250	343.75	(E#) F	2 4 6 7 8 10	
	2,992	374	257.125	C	1 2 5 6 9	
	4,464 ✓	279	383.625	G	1 5 6 7 9 10	
	6,672 ✓	417	286.69	D	2 3 6 7 8 9	
	9,984	312 (39)	429.00	A	3 4 6 7 8 9 10	
	14,912	233	320.38	E	1 2 4 8 10	
	22,272	348	239.25	B	1 5 6 8	
	33,312	260.25	357.84			
	49,792	389				
	74,368	290.5				
	111,168	434.25				
	166,208	324.625				
	248,320	242.5				
	371,072	362.375				
	554,752	270.875				
	829,056	404.8125				
	1,238,784	302.4375				
	1,851,648	226.03125				
	2,767,616	337.84375				
	4,135,680	252,421875				
	6,180,864	377.25				
	9,238,528	281.9375				

Recurrent Sequence

Example; $2(1 + 2.5) = 7$

$2(2.5 + 3) = 11$

$2(3 + 5) = 16$

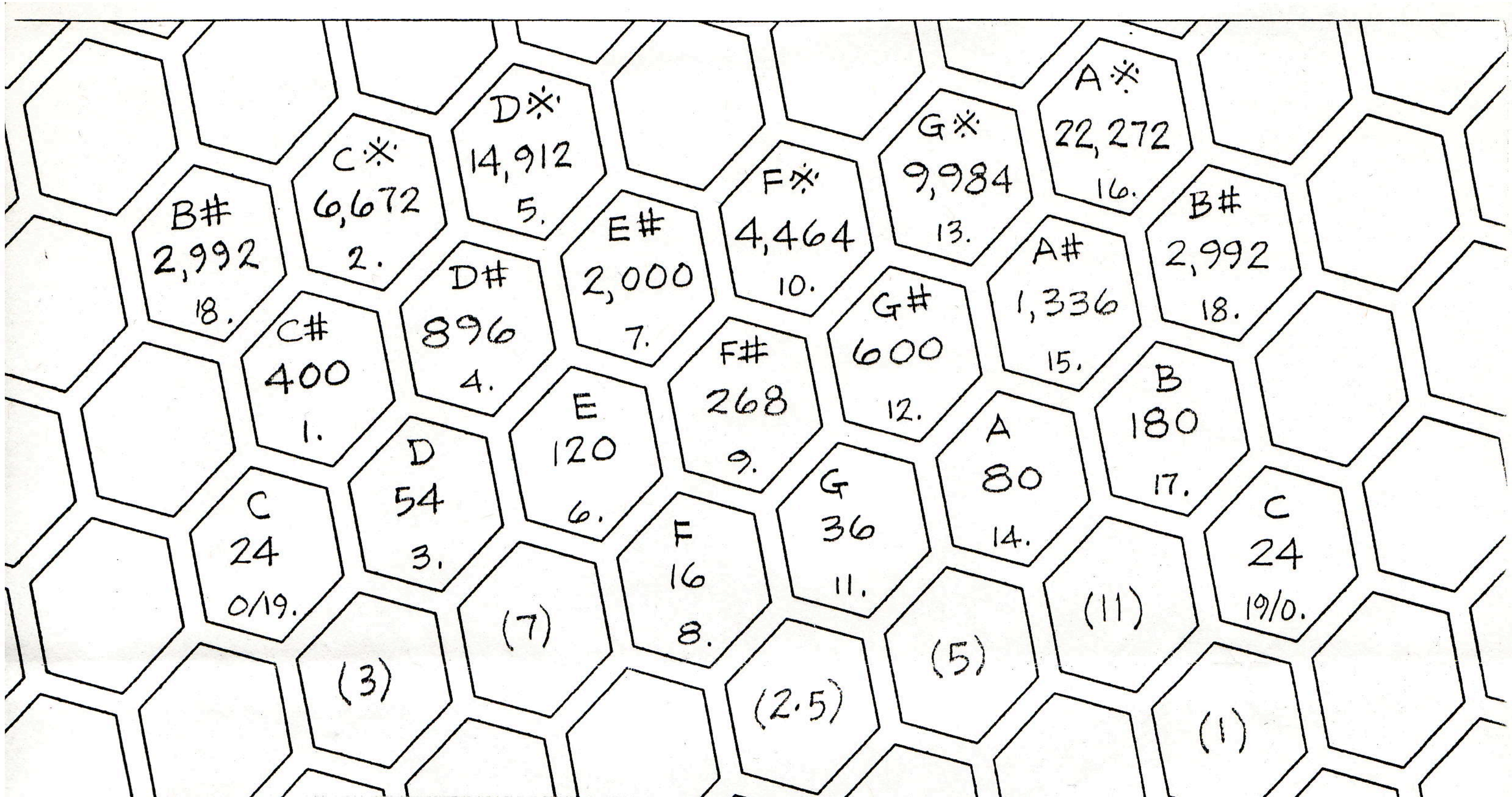
$2(5 + 7) = 24$

$2(7 + 11) = 36$

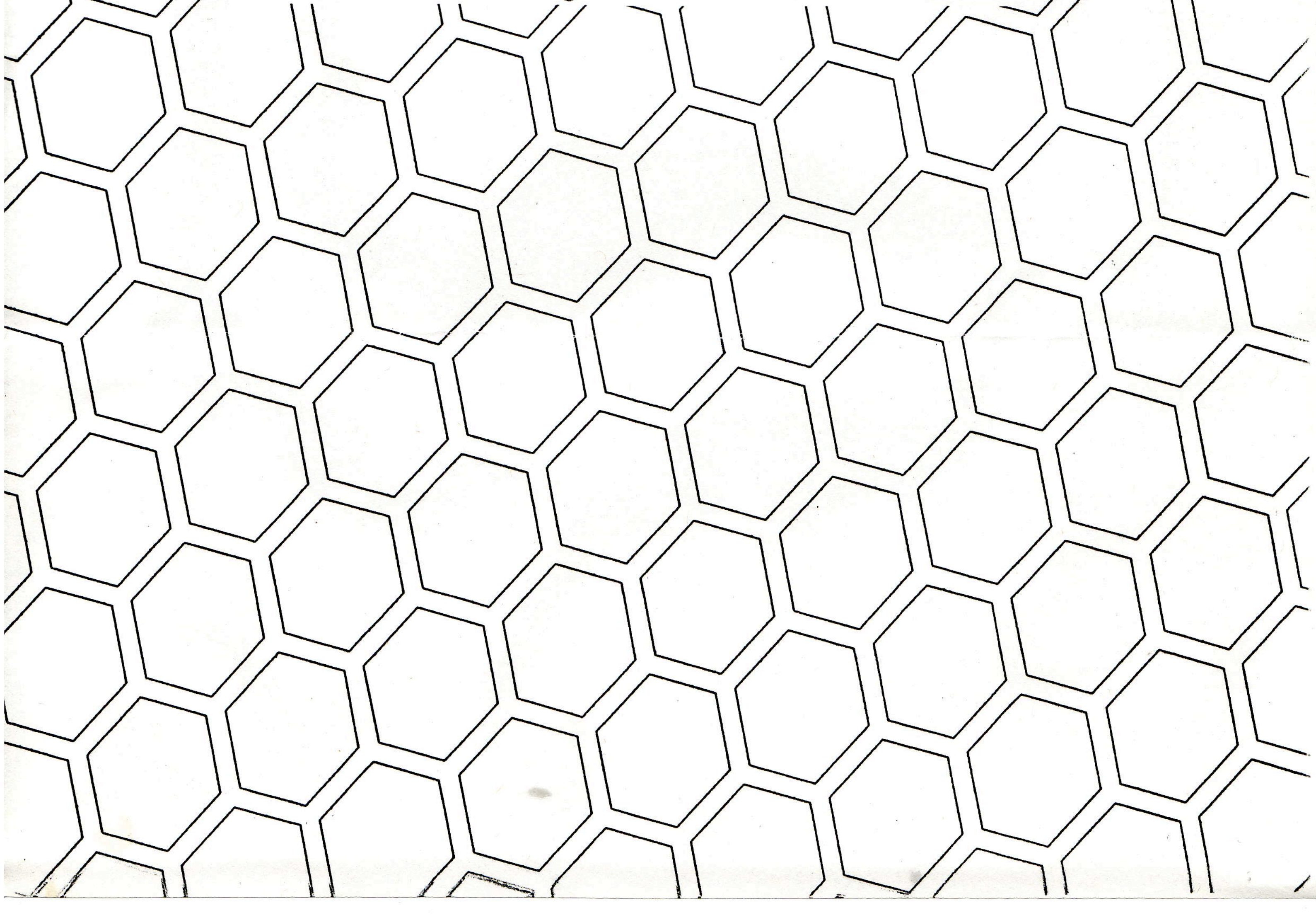
$2(11 + 16) = 54$

$2(16 + 24) = 80$

$2(24 + 36) = 120$ etc.



Recurrent Sequence, $H_n = 2(H_{n-3} + H_{n-4})$
1, 2.5, 3, 5, 7, 11, 16, 24, etc as shown,
on the Bosanquet Keyboard Geometry



Proportional "4, 5, 6" Sequence

dated
Oct 16, 1993
Erv Wilson

Meta-Meantone

ref John Harrison's scale

0	+1	+2	+3	+4
2	3	4.5	6.75	10.125

$\frac{16}{11}$ $\frac{24}{16}$ $\frac{36}{24}$ $\frac{54}{36}$ $\frac{80}{54}$ $\frac{120}{80}$ $\frac{180}{120}$

$\frac{27}{18}$ $\frac{40}{27}$ $\frac{60}{40}$ $\frac{90}{60}$ $\frac{134}{90}$ $\frac{200}{134}$ $\frac{300}{200}$

$H_n = 2(H_{n-4} + H_{n-3})$, Recurrent Sequence

H_{n-4} H_{n-3} H_n

(67) ÷4

1.5 1 2.5 3 5 7 11 16 24 36 54 80 120 180 268 400 600

Proportional Triad(s)

(1) (2) (1,)

(2) (3) (2,) H_n/H_{n-1} Converges on 1.4945301804 8

(3) (4) (3,) (see also proportional "4,5,6" 1992)

To get a quick convergence (4) (1,) (4,)

(	(	(	(
RCL 1	RCL 3	RCL 1	RCL 3
+	+	+	+
RCL 2	RCL 4	RCL 2	RCL 4
)	)	)	)
×	×	×	×
2	2	2	2
=	=	=	=
STO 1,	STO 3,	STO 1,	STO 3,
(	(	[÷	[÷
RCL 2	RCL 4	RCL 4	RCL 2,
+	+	=	=
RCL 3	RCL 1,	STO 5]	STO 7]
)	)	(	(
×	×	RCL 2	RCL 4
2	2	+	+
=	=	RCL 3	RCL 1,
STO 2,	STO 4,	)	)
	÷	×	×
	RCL 3,	2	2
	=	=	=
		STO 2,	STO 4,
		[÷ RCL 1, = STO 6]	[÷ RCL 3, = STO 8]

This stores the ratios for viewing at 5,6,7,8

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Try this: 2 3 4.5 6.5 10 15 22 33 50 74 110 166 248 368