

## APPENDIX: My 17-note circulating temperament

AS MENTIONED IN MY INTRODUCTION, about ten months before I learned of George Secor's 17-WT, I devised a 17-note circulating tuning as an extension of a regular tuning with pure major thirds at 11:14 (~417.508 cents), and fifths at about 704.377 cents (~2.422 cents wide). In looking at a 17-note circle other than 17-ET for the first time, what especially impressed me was the flexibility of this intonational form in comparison with a traditional 12-note well temperament: I could take a complete 12-note regular tuning and incorporate it into a 17-note scheme without any alterations.

Looking at the problem, I realized that in order to close the circle, the remaining fifths would have to be tempered just about the right amount to produce pure 7:9 major thirds (~435.084 cents) in the most remote portion of the circle. Accordingly, while the 11 fifths of my regular 11:14 scheme (Eb-G#) are tempered at 704.377 cents, five of the remote fifths (Ab-Db-Gb-A#-D#-G#) are tempered at about 708.771 cents (~6.816 cents wide), resulting in these just thirds at G#-Db/B# and D#-Ab/F##. An "odd" fifth at Ab-Eb is tempered at the slightly smaller amount of about 707.998 cents (~6.043 cents wide) to close the circle.

Here is a keyboard diagram, with the lower manual having the unaltered regular tuning with 11:14 major thirds around which the system is built:

126:121									
70.100		343.787		561.329		778.871		1052.558	
Db		D#		Gb		Ab		A#	
C	D	E	F	G	A	B	C		
0	208.754	417.508	495.623	704.377	913.131	1121.885	1200		
1:1		14:11					2:1		
196:121									
130.639		286.869		626.262		835.016		991.247	
C#		Eb		F#		G#		Bb	
C	D	E	F	G	A	B	C		
0	208.754	417.508	495.623	704.377	913.131	1121.885	1200		
1:1		14:11					2:1		

The overall effect of this scheme is a rather dramatic contrast between an 11:14 temperament (almost identical to 46-ET) in the nearer range of Eb-G#, with semitones at about 78.115 cents, and conditions resembling 22-ET in the most remote portion of the circle, with pure 7:9 major thirds and semitones as small as 56.145 and 56.918 cents (by comparison to the regular diatonic semitone of 22-ET at ~54.545 cents). As noted, the most remote fifths are tempered by almost 7 cents.

Secor's 17-WT, in comparison, is a more "temperate" well-temperament: all semitones are in the range of about 64-78 cents, and the most heavily tempered fifths, here the nearer ones (Ab-B) at about 707.220 cents, are impure by no more than about 5.265 cents.

In some ways, the two schemes are like mirror images. Secor's 1978 scheme has major thirds close to 7:9 in the nearest keys, and remote major thirds at 11:14; in my scheme, this situation is reversed. In his 17-WT, the most remote fifths are nearest to pure; in my scheme, the nearer fifths.

These contrasts may reflect the different design philosophies of the two tunings. In Secor's "palace of ratios," as I have styled it, factors of 3, 7, 11, and 13 all play an important role in the crafting of the temperament, with intervals arrayed so as to provide approximations of complex isoharmonic sonorities such as 7:9:11, 9:11:13, and 6:7:9:11:13.

My scheme is centered more, in what one might call a kind of Gothic or neo-medieval manner, on the fifth and fourth as primary stable consonances, which are impure by only about 2.42 cents in the nearer portion of the circle. Maintaining this situation over the full range of the 12 "more usual" notes of the tuning, Eb-G#, however, requires a more drastic temperament of the most remote fifths (almost 6.82 cents) than anywhere in Secor's circle.

Both schemes share some features common to any 17-note circle, such as many neutral intervals and a set of major and minor thirds in the intermediate portion of the circle with sizes around those of 17-ET (where major third of  $6^\circ 17$  are at ~423.529 cents, and minor thirds of  $4^\circ 17$  at ~282.353 cents).

By incorporating a complete 12-note tuning with 11:14 major thirds, my circle includes one notable feature of this regular temperament: three sonorities close to 14:17:21, with supraminor or small neutral thirds at ~339.393 cents and submajor or large neutral thirds at ~364.984 cents (a just 121:98).

While Secor's scheme does not have quite enough smaller fifths at 704.377 cents to reach this result, it comes quite close to this region, with E-Ab-B having a smaller neutral third Eb-Ab at ~342.236 cents (compare 32:39, ~342.483 cents) and the larger Ab-B at the same 121:98 or 364.984 cents as the near-17:21 thirds in my temperament.

In Secor's 17-WT, ratios of 3 and 7 are treated much like ratios of 3 and 5 in a usual 12-note well-temperament of the late 17th-19th century era: thirds closest to 7:9 and 6:7, like those closest to 4:5 and 5:6 in this historical model, occur in the nearest keys, along with the most heavily tempered fifths. However, Secor's system of extended ratios including not only 3 and 7, but also 11 and 13, has an intricacy going beyond such a model.

My circulating 17-note scheme might reflect what John Chalmers has termed a "para-Pythagorean" tuning (personal correspondence, 1998), with more gently tempered fifths in the nearer positions, along with 11:14 major thirds. This tuning and Secor's 17-WT may suggest the range of approaches open to a 17-note circle.