

3. Basic neo-medieval stepwise progressions in 17-WT

SURVEYING the resources of 17-WT, we begin with some basic neo-medieval progressions in which all voices move some variety of “step”: $1^\circ 17$, $2^\circ 17$, or $3^\circ 17$. The permutations range from familiar cadences of a 13th–14th century European type to “equable resolutions” and idioms involving neutral thirds and sixths. The latter progressions offer engaging special effects in a range of settings, but often set the norm in “fusion” styles centered on medieval Near Eastern and related scales (Section 4). These many options also bring into play the shifting colors of the 17-WT tuning circle, displaying unequal temperament in action.

3.1. Closest approach: intensive and remissive cadences (steps of $3^\circ 17$, $1^\circ 17$)

We begin with familiar progressions combining two-voice resolutions where one voice moves by a whole-tone ($3^\circ 17$) and the other by a diatonic semitone ($1^\circ 17$). Such closest approach resolutions involve a total expansion (M6-8, M3-5, M2-4) or contraction (m3-1, m7-5) equal to a minor third, here $4^\circ 17$. In Gothic and neo-medieval styles, these progressions take on two distinct manners:

Intensive manner

E4	--	+64	--	F4		D4	--	-214	--	C4
(214)				(493)		(278)				(0)
D4	--	-214	--	C4		B3	--	+64	--	C4
(493,278)				(493,0)		(707,429)				(707,707)
B3	--	+64	--	C4		G3	--	-214	--	F3
(922,707,429)				(1200,707,707)		(985,707,278)				(707,707,0)
G3	--	-214	--	F3		E3	--	+64	--	F3
(M6-8 + M3-5 + m3-1 + M2-4)						(m7-5 + m3-1 + M3-5 + m3-1)				

Remissive manner

E4	--	+212	--	F#4		D4	--	-70	--	C#4
(214)				(496)		(278)				(0)
D4	--	-70	--	C#4		B3	--	+209	--	C#4
(493,278)				(496,0)		(707,429)				(704,704)
B3	--	+209	--	C#4		G3	--	-67	--	F#3
(922,707,429)				(1200,704,704)		(985,707,278)				(704,704,0)
G3	--	-67	--	F#3		E3	--	+212	--	F#3
(M6-8 + M3-5 + m3-1 + M2-4)						(m7-5 + m3-1 + M3-5 + m3-1)				

The *intensive* resolutions of the sonorities G3-B3-D4-E4 and E3-G3-B3-D4, identical to those of Section 1.5, have ascending semitone steps and descending whole-tone steps; *remissive* resolutions of these same sonorities, in contrast, feature descending semitone steps (e.g. G3-F#3, D4-C#3) and ascending whole-tone steps (e.g. B3-C#4, E4-F#4).

In 14th-century European music, the creative contrast between these two manners plays a vital role in shaping musical forms and patterns of longer-range organization: intensive progressions at final cadences typically alternate with remissive progressions at other prominent points.⁴² The medieval terms *ouvert* and *clos*, referring to half and full cadences used on first and second repetitions of a section in certain fixed forms, may capture this contrast: intensive cadences seem more definitive, and remissive cadences more “open” (although these also can make pleasing conclusions, less rare in the 13th century).

For example, 14th-century pieces concluding on a sonority of F3-C4-F4, or on D3-A3-D4 (both popular choices), often exhibit cadential patterns like these:

<i>Center of F3-C4-F4</i>				<i>Center of D3-A3-D4</i>			
G4	A4	E4	F4	D4	E4	C#4	D4
D4	E4	B3	C4	A3	B3	G#3	A3
Bb3	A3	G3	F3	F3	E3	E3	D3
<i>Ouvert</i>		<i>Clos</i>		<i>Ouvert</i>		<i>Clos</i>	

In 17-WT, we are free to cadence on any step in either an intensive or remissive manner, with the fascinating refinement that these cadences and manners are apt to take on subtly different “modal colors” because of the varying temperament of the stable fifths and fourths, as well as the changing sizes of other vertical and melodic intervals as we move about the circle.

In the four-voice cadences above, for example, G3-B3-D4-E4 resolves intensively to F3-C4-F4, with fifths and fourths tempered at about 5.265 cents; but remissively to F#3-C#4-F#4, tempered at a smoother 2.422 cents.

A closer look also reveals some finer orbital mechanics of 17-WT. The 64-cent semitones in the intensive cadences to F, with all notes within the Ab-B portion of the circle, become somewhat larger steps of 67 cents (G-F#) or 70 cents (D-C#) in the remissive cadences to F#. However, curiously, the intensive resolution of the 429-cent major third G3-B3 to the 707-cent fifth F3-C4 requires a tad more *total* expansion (equal to the 278-cent minor third in this part of the circle) than the remissive resolution of the same G3-B3 to the 704-cent F#3-C#4 (an overall expansion of only about 276 cents, smaller than any minor third in 17-WT).

Just as any closest approach sonority in 17-WT can resolve either intensively or remissively, so any stable sonority can be approached in either manner:

⁴²In medieval European theory, the concepts of *intensio* and *remissio* are associated with melodic ascent and descent, as by a given interval. My usage of “intensive” and “remissive” specifically to express the contrast between cadences with ascending and descending semitones is inspired by Tomas de Santa María, who in his treatise published in 1565 uses the Spanish *sostenido* and *remissa* in exactly this way, albeit in a Renaissance rather than Gothic setting. In 1597, Thomas Morley likewise contrasts “sharp” and “flat” cadences.

F#4	--	+67	--	G4
(496)				(493)
C#4	--	+70	--	D4
(919,423)				(1200,707)
A3	--	-214	--	G3

(M6-8 + M3-5)

F4	--	+214	--	G4
(493)				(493)
C4	--	+214	--	D4
(922,429)				(1200,707)
Ab3	--	-64	--	G3

(M6-8 + M3-5)

Approaching the stable goal of G3-D4-G4, the second or remissive cadence from Ab3-C4-F4 remains entirely within the Ab-B or 707.220-cent portion of the circle, with “near-7” sonorities and 64-cent semitones.

The intensive approach from A3-C#4-F#4, in contrast, takes us into the portion of the circle where thirds and sixths have tuning chains mixing the two varieties of fifths. The major third A3-C#4, built from two larger and two smaller fifths, has a size of about 423.195 cents, very close to 17-ET (~423.529 cents), and likely in a region of maximum harmonic complexity. In many harmonic timbres, this complexity can translate into a sense of tension, lending a heightened excitement to cadences like these in an Ars Nova style (c. 1300–1420), as George Secor remarks in his companion article. In milder timbres, the effect can be one of an intriguingly rich and translucent concord, again giving this region its own color.

In the remote portion of the tuning circle, sonorities and melodic steps may be identical to those of a regular 704.377-cent temperament, with just 11:14 major thirds and 78-cent diatonic semitones. This happens in the first or intensive resolution of D#4-Fx4-A#4-B#4, equivalently spelled as Fb4-Ab4-Cb5-Db5 in the second remissive resolution:

B#4/Db4	--	+78	--	C#4
(209)				(496)
A#4	--	-209	--	G#4
(496,287)				(496,0)
Fx4/Ab4	--	+78	--	G#4
(913,704,418)				(1200,704,704)
D#4	--	-209	--	C#4

(M6-8 + M3-5 + m3-1 + M2-4)

B#4/Db5	--	+212	--	Eb5
(209)				(493)
A#4/Cb5	--	-72	--	Bb4
(496,287)				(493,0)
Fx4/Ab4	--	+214	--	Bb4
(913,704,418)				(1200,707,707)
D#4/Fb4	--	-75	--	Eb4

(M6-8 + M3-5 + m3-1 + M2-4)

Standard closest approach cadences in 17-WT not only take on pleasant contrasts and nuances of unequal temperament, but invite variations like these beautiful modern voicings:

B4	C5
E4	F4
D4	C4
G3	F3

(M10-12 + M6-8 + M6-8 + M2-4)

A4	B5
D4	E4
C4	B3
F3	E3

(M10-12 + M6-8 + M6-8 + M2-4)

In this nearer portion of the circle, the unstable sonorities approximate just ratios of 14:21:24:36, resolving to 2:3:4:6. The lower pair of voices descend together in fifths, while the upper pair likewise ascend, so that between the two pairs or “interval streams” there is a majestic expansion by contrary motion.

3.2. Equable cadences (steps of 2°17, 2°17)

In his very first letter to me, as related at the beginning of this article, George Secor called to my attention a kind of progression using the same vertical intervals and resolutions as familiar closest approach progressions, but with a radically different melodic aspect. Each voice moves by what might be termed in a 14th-century European kind of style a chromatic semitone of 2°17:

C4	--	+145	--	C#4		E4	--	+133	--	Gb4
(214)				(496)		(214)				(496)
Bb3	--	-136	--	G#3		D4	--	-148	--	Db4
(493,278)				(496,0)		(493,278)				(496,0)
G3	--	+142	--	G#3		B3	--	+131	--	Db4
(922,707,429)				(1200,704,704)		(922,707,429)				(1200,704,704)
Eb3	--	-133	--	C#3		G3	--	-145	--	Gb3
(M6-8 + M3-5 + m3-1 + M2-4)						(M6-8 + M3-5 + m3-1 + M2-4)				

While I came to call this a “bi-step” cadence because of the 2°17 motions, Secor suggested (personal correspondence, 28 December 2001) a very evocative term borrowed from Ptolemy and Harry Partch, and not so specific to a 17-note circle: an *equable* cadence. In Ptolemy’s *homalon* diatonic, aptly translated by Partch as the “Equable Diatonic,” the tetrachord divides a fourth arithmetically into three near-equal steps at 12:11:10:9 (steps of ~150.64-165.00-182.40 cents).⁴³

In a neo-medieval setting, a resolution like the 17-WT bi-step divides a minor third of cadential expansion or contraction into two more or less “equable” parts, often approximating an arithmetic or harmonic division: for example, a 6:7 third into 14:13:12 (steps of ~128.30-138.57 cents) or the converse arrangement 12:13:14.

In the first cadence above, for example, the two middle voices resolve from a 278-cent minor third to a unison, making a near-12:13:14 division: the lower of these voices ascending G3-G#3 (~142.01 cents) and the other descending Bb4-G#3 (~136.33 cents). In the second cadence, we have a near-14:13:12 division, with an ascending B3-Db4 (~130.64 cents) and a descending D4-Db4 (~144.855 cents).

With unstable sonorities on the other side of the tuning circle, minor thirds near 11:13 (~289.21 cents) may resolve in an equable cadence approximating a division of 13:12:11 (~138.57-150.64 cents) or 11:12:13, as here:

⁴³Harry Partch, *Genesis of a Music: An Account of a Creative Work, Its Roots and its Fulfillments* (2nd ed. enlarged, Da Capo Press: New York, 1974), pp. 173–176. As Secor suggests, “equable” could also be synonymous with “temperate.”

Gb4/E#4 -- +145 -- G4 (209) (493)	G#4 -- +136 -- Bb4 (209) (493)
D#4 -- -139 -- D4 (496,287) (493,0)	F#4 -- -148 -- F4 (496,287) (493,0)
Db4/B#3 -- +148 -- D4 (913,704,418) (1200,707,707)	D#4 -- +139 -- F4 (913,704,418) (1200,707,707)
G#3 -- -142 -- G3	B3 -- -151 -- Bb3
(M6-8 + M3-5 + m3-1 + M2-4)	(M6-8 + M3-5 + m3-1 + M2-4)

In the first example, a 287-cent minor third Db4/B#3-D#4 between the middle voices resolves in a near-11:12:13 division, the lower voice of this pair ascending B#3-D4 (~147.70 cents) and the upper descending D#4-D4 (~139.17 cents); the second has a near-13:12:11 division of D#4-F#4 with identical step sizes conversely arranged (smaller D#4-F4 ascending, larger F#4-F4 descending).⁴⁴

The concept of an equable resolution, illustrated by these progressions from minor third to unison, more generally applies to *any* of the directed two-voice resolutions in these cadences, all of which involve a total expansion or contraction by a minor third (4°17) equably divided into two 2°17 steps.

In the first two cadences of this section, for example, the lower pair of voices form a 429-cent major third expanding to a 704-cent fifth, a total expansion of about 276 cents or ~6:7, with rounded steps of -133/+142 cents (~14:13/~13:12) or -145/+131 cents (~13:12/~14:13). Our second pair of examples have a lower 11:14 major third at a rounded 418 cents expanding to 707-cent fifth, an overall expansion of about 289 cents or very close to 11:13, with motions of -142/+148 (~13:12, ~12:11) or -151/+139 (~12:11, ~13:12). In the last example, both steps are virtually just.

An interesting consequence is that any unstable interval or sonority of the “closest approach” type in 17-WT has available *three* manners of resolution: intensive, remissive, or equable. such an unstable sonority can serve as a “gateway” to three different stable “goals,” with the notations below the examples showing the ascending and descending melodic steps of each manner:

<i>Intensive</i>	<i>Remissive</i>	<i>Equable</i>
C#4 D4	C#4 D#4	C#4 Eb4
G#3 A3	G#3 A#3	G#3 Bb3
E3 D3	E3 D#3	E3 Eb3
(-3°17,+1°17)	(-1°17,+3°17)	(-2°17,+2°17)

⁴⁴ Although the middle minor third of these sonorities at ~286.869 cents is quite close to 11:13, we might also take it as a tempered representation of 28:33 (~284.45 cents), the “fifth complement” of the pure 11:14 major third, an interval here present — a term for which Secor prefers the form “fifth’s complement” by analogy to the computer programmer’s “two’s complement.”

Similarly, any stable sonority or goal may be approached from three different gateways, each in its own manner:

<i>Intensive</i>	<i>Remissive</i>	<i>Equable</i>
C#4 D4	C4 D4	B#3/Db4 D4
G#3 A3	G3 A3	Fx3/Ab3 A3
E3 D3	Eb3 D3	D#3 D3
(-3°17,+1°17)	(-1°17,+3°17)	(-2°17,+2°17)

To this point, we have discussed equable progressions using conventional Pythagorean spellings of a kind congenial to many neo-medieval contexts largely along 13th-14th century European lines, where such progressions could be described as one charming form of “chromaticism.”

Often, however, equable cadences lend themselves to a fractional notation, especially when they involve regular scale steps or patterns of a given style rather than “chromatic alterations.” Here are simple fractional spellings for the equable cadences in the last examples:

C#4 Dd4	C≠4 D4
G#3 Ad3	G≠3 A3
E3 Dd3	Ed3 D3

This “simple” style of spelling uses no more than one accidental modifier for each note. At times, I find myself following a curious kind of more complex or hybrid spelling, with the last cadence providing an example:

<i>Simple Fractional</i>	<i>Complex Fractional</i>
C≠4 D4	C≠4 D4
G≠3 A3	G≠3 A3
Ed3 D3	Eb≠3 D3

From one perspective, the latter spelling emphasizes that we have “regular” vertical major thirds and sixths (6°17, 13°17), although from any logical viewpoint, the two notations are precisely equivalent in 17-WT, with the former having the advantage of economy and elegance. In the next section, I suggest another possible motivation for sometimes using complex spellings, especially in certain analytical contexts.

As mentioned in Section 1.4, the equable progressions of 17-WT have counterparts in a range of neo-medieval tuning systems. For example, in the regular 24-note temperament there discussed with fifths at about 704.61 cents, a near-6:7 third at about 264.50 cents such as Eb4-F*4 (with the * raising a note by the 55.28-cent diesis), or 14 fifths up, divides into two equal chromatic semitones of 132.25 cents (Eb4-E4-F*4), as in the following progression:

C#*5	--	-132	--	C*5	--	-132	--	B4
(397)				(264)				(0)
Bb4	--	--	--	--	--	+132	--	B4
(705,308)				(495,440)				(705,705)
F#*4	--	-132	--	F*4	--	-132	--	E4
(1101,705,397)				(969,705,264)				(705,705,0)
Eb4	--	--	--	--	--	+132	--	E4
(m7-5 + m3-1 + M3-5 + m3-1)								

In this progression, the voices begin at an “exotic” sonority rather like a major seventh combination in 12-EDO or meantone (a rounded 0-397-705-1101 cents). The second lowest voice and highest voice then descend together by chromatic semitone steps (F#*4-F*4, C#*5-C*5) while the others remain stationary, arriving at a near-12:14:18:21 sonority of Eb4-F*4-Bb4-C*4 (0-264-705-969 cents) which resolves equably to the fifth E4-B4, each voice moving by a chromatic semitone.

Not only is the concluding cadence equable, but two of voices make equable melodic divisions of a near-6:7 third: F#*4-F*4-E4 or C#*5-C*5-B5. From one viewpoint, the 132.25-cent step might be said to represent either the 13:12 or the 14:13 of a 12:13:14 or 14:13:12 division.⁴⁵

In turn, this idiom suggests a 17-WT version with a counterpoint of equable divisions on different levels:

D#5	--	-139	--	D5	--	-148	--	Db5
(418)				(278)				(0)
B4	--	--	--	--	--	+131	--	Db5
(704,287)				(707,429)				(704,704)
G#4	--	-142	--	G4	--	-145	--	Gb4
(1125,707,420)				(985,705,278)				(704,704,0)
E4	--	--	--	--	--	+133	--	Gb4
(m7-5 + m3-1 + M3-5 + m3-1)								

On one level, the second to lowest and highest voices make melodic divisions G#4-G4-Gb4 and D#4-D4-Db4, dividing 287-cent minor thirds respectively into descending steps of 142-145 cents (a near-geometric division into almost equal intervals) and 139-148 cents (very close to 13:12 and 12:11).

On another level, the cadence from E3-G3-B3-D4 to the fifth Gb3-Db4 with its four directed resolutions offers some shades and variations on a 12:13:14 theme. The lower pair of voices resolve m3-1 (+133/-145 cents), as do the upper pair (+131/-148 cents), each progression; the middle pair have an M3-5 expansion (-145/+131 cents); while the outer pair have a somewhat less efficient m7-5

⁴⁵Thus this tuning might be said to disperse the 168:169 comma (~10.27 cents) between 13:14 and 12:13.

resolution requiring about 281 cents of contraction (+133/-148 cents), since the near-4:7 minor sevenths of 17-WT at around 985 cents are somewhat less accurate than near-7:9 or near-6:7 thirds (see Section 1.5 and n.32).

Equable steps and divisions, a theme relevant to many musics in both fixed and flexible intonation⁴⁶, take on shifting gradations of color in 17-WT, a feature of unequal temperament we now consider in another aspect.

3.3. Equable cadences and the tuning circle: Shifting affinities

As we move about the tuning circle, equable progressions can take on either “intensive-like” or “remissive-like” affinities, or give a more “ambiguous” impression sometimes quite distinct from either of these manners.

Equable cadences to trines or fifths on D# or A#, for example, seem to me to convey a decidedly “intensive” impression:

D5	--	+139	--	D#5		A4	--	+136	--	A#4
(214)				(496)		(214)				(493)
C5	--	-142	--	A#4		G4	--	-145	--	Gb4
(493,278)				(496,0)		(493,278)				(493,0)
A4	--	+136	--	A#4		E4	--	+133	--	Gb4
(922,707,429)				(1200,704,704)		(922,707,429)				(1200,707,707)
F4	--	-139	--	D#4		C4	--	-142	--	A#3
(M6-8 + M3-5 + m3-1 + M2-4)						(M6-8 + M3-5 + m3-1 + M2-4)				

In contrast, equable cadences to trines or fifths on D or A, for example, seem to my ears to have a decidedly “remissive” cast:

B#4/Db5	--	+148	--	D5		Fx4/Ab4	--	+151	--	A4
(209)				(493)		(209)				(493)
A#4	--	-136	--	A4		E#4/Gb4	--	-133	--	E4
(496,287)				(493,0)		(496,284)				(493,0)
Fx4/Ab4	--	+151	--	A4		Cx4/Eb4	--	+151	--	E4
(913,704,418)				(1200,707,707)		(913,704,420)				(1200,707,707)
D#4	--	-139	--	D4		A#3	--	-136	--	A3
(M6-8 + M3-5 + m3-1 + M2-4)						(M6-8 + M3-5 + m3-1 + M2-4)				

These cadences can also have a more “ambiguous” or assertively distinctive quality when directed to certain steps such as B or Eb:

⁴⁶Douglas Leedy, for example, notes the importance of a “‘passing-tone division’ (10:11:12) of the minor third in unaccompanied folk music, especially for fiddle or voice,” in his “Review of Martin Vogel’s *On the Relations of Tone*,” *Xenharmonikon* 17 (Spring 1998), pp. 120-123 at 121. This division recalls Ptolemy’s equable diatonic tetrachord of 12:11:10:9 (also dividing an 11:9 neutral third into 11:10:9).

Bb4	--	+151	--	B4	C#5	--	+133	--	Eb5
(214)				(496)	(209)				(493)
Ab4	--	-131	--	F#4	B4	--	-151	--	Bb4
(493,278)				(496,0)	(496,287)				(493,0)
F4	--	+148	--	F#4	G#4	--	+136	--	Bb4
(919,704,426)				(1200,704,704)	(916,707,420)				(1200,707,707)
Db4	--	-131	--	B3	E4	--	-151	--	Eb4
(M6-8 + M3-5 + m3-1 + M2-4)					(M6-8 + M3-5 + m3-1 + M2-4)				

One key factor is the varying size of the $2^{\circ}17$ steps, about 130.639–150.543 cents. These sizes range from “2/3-tones” close to 13:14 (~128.30 cents) to virtually just realizations of 11:12 neutral seconds or “3/4-tones” (~150.64 cents). We might expect that equable cadences with small ascending and large descending steps would tend toward an intensive affinity, while those with the converse arrangement would suggest a remissive quality.

This prediction could fit some of the examples above: the “intensive-like” cadences have smaller ascending than descending steps, sometimes approaching a parity in the middle part of the range around 12:13, while the “remissive-like” cadences have notably large ascending steps near 11:12 and small descending ones between 13:14 and 12:13.⁴⁷

The examples I hear as more ambiguous or “distinctively different,” however, suggest a more complex pattern. Based on step sizes alone, one might predict that the cadence on B (with motions of -131, +148, -131, +151) should be strongly remissive in affinity, and the cadence on Eb (-151, +136, -151, +133) strongly intensive. Yet, at least to my ears, they proclaim themselves as “something else again,” having what I might call a spaciousness transcending accustomed categories.

My experiments with equable progressions to each note of the circle suggest another possible variable which could interact with melodic step sizes. The strongest “remissive” affinities seem associated with cadences to large fifths, and the strongest “intensive” ones with cadences to small fifths, where the step sizes also fit the predicted patterns. When predicted remissive step size patterns occur in a cadence to a small fifth (as in the cadence to B), or intensive patterns in a cadence to a large fifth (as in the cadence to Eb), the result can be “ambiguous” or “distinctively different.”

What variables may actually operate remains an open question, and one which it might be interesting to address based on the experiences of more than one listener! However, whatever the explanation, the shifting affinities of equable

⁴⁷Some experiments with equable cadences in the 704.61-cent regular temperament, where a 264.50-cent minor third near 6:7 is divided into two precisely equal chromatic semitones of the “2/3-tone” variety at 132.25 cents each, suggest that I often hear such cadences as rather intensive, but sometimes as more ambiguous or even remissive-like.

progressions in different portions of the tuning circle open yet another dimension of expressive variety in 17-WT.

As discussed in the last section, any unstable sonority of the closest approach type can serve as a gateway to three alternative stable or “goal” sonorities, one approached in each manner. In one type of situation, the intensive and equable cadences have a certain affinity:

<i>Intensive</i>		<i>Equable</i>		<i>Remissive</i>	
F#4	G4	F#4	G#4	F#4	G#4
E4	D4	E4	D#4	E4	D#4
C#4	D4	C#4	D#4	C#4	D#4
A3	G3	A3	G#3	A3	G#3

(“more intensive”)

Here the equable progression is spelled in a mixed notation combining Pythagorean and fractional symbols. Another set of resolutions where the equable and remissive cadences seem to have a certain affinity demonstrates an optional nuance in this “mixed” style of spelling:

<i>Intensive</i>		<i>Equable</i>		<i>Remissive</i>	
B#4/D \flat 5	C#5	C#5	D5	D \flat 5	E \flat 5
A#4	G#4	Bd4/B \flat #4	A4	C \flat 5/A#4	B \flat 4
Fx4/A \flat 4	G#4	G#4	A4	A \flat 4	B \flat 4
D#4	C#4	Ed4/E \flat #4	D4	F \flat 4/D#4	E \flat 4

(“more remissive”)

For the lowest and third lowest voices in the equable progression, the first spelling is in simple fractional style, with no more than one modifying accidental. The second and more complicated spelling Eb#4-G#4-Bb#4-C#5 may suggest that this sonority has a certain affinity to the “usual” Eb4-G4-Bb4-C5 in the remissive resolution to the same goal D4-A4-D5.

When the equable cadence has a more ambiguous or assertively distinctive quality, the simplest fractional spelling seems best in this kind of analytical notation:

<i>Intensive</i>		<i>Equable</i>		<i>Remissive</i>	
C#5	D5	C#5	Dd5	C#5	D#5
B4	A4	B4	Ad4	B4	A#4
G#4	A4	G#4	Ad4	G#4	A#4
E4	D4	E4	Dd4	E4	D#4

(“more distinctive”)

In styles where intensive and remissive cadences set the general norm, as in 14th-century European composition, these affinities can facilitate shifts or “mutations” of $1^\circ 17$, the distance between the expected goal of a cadence and the actual goal reached in an equable manner:

Bb4	G4	A4	A#4/Bb#4
F4	F4	E4	E#4/F#4
Bb3	C4	C4	A#3/Bb#3

Especially if Bb has been established as a vertical center, we have what appears to be a cadential sequence leading back to this center. From a relatively concordant C4-F4-G4, a tempered 6:8:9, we move to C4-E4-A4 at a tempered 7:9:12, with an intensive resolution to Bb3-F4-Bb4 routine. However, we actually arrive at A#3-E#4/Gb4-A#4 — or, in mixed fractional, Bb#3-F#4-Bb#4, the expected sonority “shifted” up by $1^\circ 17$, as it were.

The intensive-like affinity of this equable cadence makes the “substitution” a kind of musical *synonym* for the expected resolution, at once quite similar and yet different. In contrast, a progression like the following is a “surprise” of a different magnitude:

D4	B3	C#4	Eb4/Dd4
A3	A3	G#3	Bb3/Ad4
D3	E3	E4	Eb3/Dd3

Again we have a shift of $1^\circ 17$, but here the equable cadence to Eb has a quality differing dramatically from the expected intensive cadence to D. Both types of shifts, the more “synonymous” and the more strikingly contrasting, enrich the possibilities opened by 17-WT.

3.4. Omnitonal cadences (steps of $3^\circ 17$, $3^\circ 17$)

In cadences of a kind I call “omnitonal,” common in 13th-century European pieces, each voice moves by a whole-tone, or $3^\circ 17$ in 17-WT. Here are examples involving the *quinta fissa* or mildly unstable sonority with outer “split fifth” divided into major third below and minor third above:

G3	--	+214	--	A3		C#4	--	+209	--	D#4
(278)				(0)		(493)				(496)
E3	--	-214	--	D3		A#3	--	-209	--	G#3
(707,429)				(707,707)		(704,418)				(704,704)
C3	--	+214	--	D3		F#3	--	+209	--	G#3
(M3-1 + M3-5)						(M6-8 + M3-5)				

In the nearer portion of the circle, a sonority like C3-E3-G3 approximates 14:18:21 (a rounded 0-435-702 cents), with each voice moving by a 214-cent

whole-tone to arrive at a stable fifth, and directed resolutions of major third to unison ($6^{\circ}17-0^{\circ}17$) and minor third to fifth ($4^{\circ}17-10^{\circ}17$). The total expansion or contraction in these two-voice resolutions is equal to the size of a *major* third or $6^{\circ}17$, here about 429 cents — in contrast to the total motion of a minor third or $4^{\circ}17$ shared by intensive, remissive, and equable cadences.

In the second progression, we have a just 11:14 major third, with F#3-A#3-C#4 approximating 22:28:33 (0-418-702 cents). Here we have slightly smaller whole-tone steps of about 209 cents. Intermediate sizes of thirds, and mixtures of slightly unequal whole-tone motions, are available in other parts of the circle.

Omnitonal cadences can have a very stately effect, sometimes mixed with a dramatic element of dissonance in 13th-century styles further amplified in 17-WT. For example, here is a progression making a most impressive final cadence in *Vetus ab it littera*, an anonymous four-voice composition from around 1200, the era of Perotin:

F4	--	+214	--	G4
(64)				(493)
E4	--	-214	--	D4
(493,429)				(493,0)
C4	--	+214	--	D4
(771,707,278)				(1200,707,707)
A3	--	-214	--	G3
(m6-8 + M3-1 + m3-5 + m2-4)				

The vertical semitone E4-F4 between the two upper voices, a very effective dissonance at 243:256 or about 90 cents in a medieval Pythagorean tuning, becomes yet more intense in 17-WT at around 64 cents, close to the Archytan ratio of 27:28 (with A3-C4-E4-F4 approximating 18:21:27:28). As George Secor puts it in another context, the musical landscape takes on especially “vivid” colors (personal communication, 12 October 2001), with the incisive Archytas-like semitones adding excitement to harmony and melody alike.

A modern variation on this progression with a wide voicing has a fanfare-like effect when played, for example, in a triple rhythm:

1	2	3		1
D5	C5	C5		D5
G4	F4	F4		G4
D4	E4	E4		D4
G3	A3	A3		G3

Another omnitonal progression illustrating bold contrasts in the 13th century between stability and instability, a theme further accentuated in 17-WT, is from major seventh to fifth ($16^{\circ}17-10^{\circ}17$), as in these three-voice cadences:

E4	--	-214	--	D4
(707)				(707)
A3	--	-214	--	G3
(1136,429)				(707,0)
F3	--	+214	--	G3

(M7-5 + M3-1)

E4	--	+209	--	D4
(429)				(0)
C4	--	-209	--	D4
(1136,707)				(707,707)
F3	--	+209	--	G3

(M7-5 + M3-1)

The major seventh, already bright in a Pythagorean tuning at 128:243 or about 90 cents, takes on an extra intensity at 1136 cents in these sonorities approximating 14:18:27 and 14:21:27, painting the musical beauty of the Gothic era in Secor's yet more vivid colors and revealing another aspect of 17-WT as a neo-medieval tuning par excellence.

3.5. Neutral cadences (steps of 3°17, 2°17)

"Neutral cadences" addressed in this section involve such resolutions as a neutral third contracting to a unison or expanding to a fifth (5°17-0°17, 5°17-10°17), or a neutral sixth expanding to an octave (15°17-17°17). One voice moves by a whole-tone of 3°17, the other by a neutral second of 2°17, with a total expansion or contraction of a neutral third (5°17). Also fitting this pattern are resolutions from neutral second to fourth (2°17-7°17), or neutral seventh to fifth (15°17-10°17).⁴⁸

In some portions of the tuning circle, these cadences may suggest an intensive or remissive quality, as in these two respective examples:

B3	--	+131	--	Db4
(365)				(707)
Ab3	--	-209	--	Gb3
(707,342)				(707,0)
E3	--	+133	--	Gb3

(N3-1 + N3-5)

F4	--	+214	--	G4
(493)				(493)
C4	--	+214	--	D4
(844,351)				(1200,707)
G#3	--	-142	--	G3

(N6-8 + N3-5)

At other locations, they may take on more of an "omnitonal" kind of quality:

G#4	--	+136	--	Bb4
(356)				(707)
F4	--	-214	--	Eb4
(704,348)				(707,0)
C#4	--	+133	--	Eb4

(N3-1 + N3-5)

Gb4	--	+145	--	G4
(493)				(493)
Db4	--	+148	--	D4
(844,351)				(1200,707)
A3	--	-214	--	G3

(N6-8 + N3-5)

⁴⁸Other resolutions of neutral types of intervals by stepwise contrary motion considered elsewhere in this article include neutral seventh to octave (15°17-17°17) and neutral sixth to fifth (12°17-10°17), with each voice moving by a semitone of 1°17, see Sections 5.2 and 5.3.

As with equable cadences, these “affinities” could be influenced by various factors. Thus the first of the above four progressions, arriving at a fifth on Gb, resembles “intensive-like” cadences in regular temperaments at around 704 cents (Sections 1.2, 1.4) both in its whole-tone and “2/3-tone” step sizes and the sizes of vertical thirds (342/365 cents), with a like musical effect. Just how these shifting parameters interact to suggest different “colors” or “moods” as we move around the circle invites much further exploration.

In 17-WT, neutral cadences of the kind we are considering can take two forms or “manners”: an unstable sonority may resolve with descending whole-tone motions and ascending neutral second motions ($-3^{\circ}17, +2^{\circ}17$), or conversely with descending neutral second and ascending whole-tone motions ($-2^{\circ}17, +3^{\circ}17$). For unstable sonorities at certain locations, these alternative manners may take on something analogous to an intensive/remissive contrast, as with the following four-voice cadences illustrating the resolutions of neutral seventh to fifth and neutral second to fourth:

Eb4	--	-211	--	Db4	Eb4	--	-133	--	C#4
(342)				(0)	(342)				(493)
B3	--	+131	--	Db4	B3	--	+209	--	C#4
(707,365)				(704,704)	(707,365)				(493,0)
Ab3	--	-209	--	Gb3	Ab3	--	-131	--	F#3
(1049,707,342)				(704,704,0)	(1049,707,342)				(1200,707,707)
E3	--	+133	--	Gb3	E3	--	+211	--	F#3
(N7-5 + N3-1 + N3-5 + N3-1)					(N7-5 + N3-1 + N3-5 + N3-1)				
F4	--	+148	--	F#4	F4	--	+214	--	G4
(139)				(496)	(139)				(493)
D#4	--	-209	--	C#4	D#4	--	-139	--	D4
(493,354)				(496,0)	(493,354)				(493,0)
C4	--	+145	--	C#4	C4	--	+214	--	D4
(844,704,351)				(1200,704,704)	(844,704,351)				(1200,707,707)
G#3	--	-209	--	F#3	G#3	--	-142	--	G3
(N6-8 + N3-5 + N3-1 + N2-4)					(N6-8 + N3-5 + N3-1 + N2-4)				

As these pairs of examples show, the same sonority may resolve in either manner; likewise, any stable sonority may be approached in either manner. In the resolutions of E3-Ab3-B3-Eb4, the outer neutral seventh is a virtually just 6:11. At other places in the circle, both manners can take on subtle colors and shadings which I tend to hear as somewhat “omnitonal-like” from a neo-medieval European viewpoint, but which a listener better acculturated to the fine points of neutral intervals might describe more discerningly.

While closest approach progressions of the intensive and remissive varieties, and also omnitonal progressions, demonstrate the excellence of 17-WT for

traditional European idioms of a 13th-14th century variety, the equable and neutral cadences augment this melodic and harmonic vocabulary with a wealth of intermediate steps and intervals.

Here we have touched on some of the main permutations and possibilities, considering only stepwise progressions where all unstable intervals resolve in the same manner. Cadences in “mixed” manners, for example those involving vertical diminished fifths ($8^\circ 17$) or augmented fourths ($9^\circ 17$), further multiply the range of choices (see Sections 4, 5.3, 7.3).

Equable and neutral cadences take center stage in another kind of neo-medievalism fusing together some elements of Gothic polyphony with Near Eastern scales and modes, an approach to which we now turn.