On Shifting Grounds: Meandering, Modulating, and Möbius Passacaglias

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An intriguing development in recent passacaglia writing is the subversion of tonal closure via themes which employ elements of traditional tonality but veer away from the putative tonal center.

A traditional passacaglia is a kind of loop, but a rather flattened one: tonal motion proceeds primarily in one direction, from tonic to dominant, and then drops quickly back to the tonic, like a skier going slowly up the lift and rapidly down the slope. Modulating passacaglia themes, by contrast, suggest more nearly circular forms, with no obvious start or endpoint. Some are like helixes, progressing in an orthogonal dimension even as they circle back to their initial position. Some themes modulate stealthily, undermining the sense of key by replacing the half cadence of a traditional open passacaglia with a strong cadence in a "pretender tonic"—only to return to the opening sonority in a *trompe l'oreille*. Others hover between two or more equally plausible tonics, with different cadence points implying different tonal centers: this transforms the passacaglia loop into a Möbius strip, whose tonally contrasting "sides" follow one another with no discontinuity. A common feature of modulatory passacaglias is quasi-Shepard-scale voice leading: the prevailing motion appears to continue endlessly in its initial (usually downward) direction even as the theme repeats

Such structural ambiguity is foreshadowed in some Baroque passacaglias. To be sure, even an "open" Baroque passacaglia (one that ends with a half cadence) still has a clear tonal center. But the *continuity* of "continuous variation" sometimes loosens the normal relationship between melodic phrasing and harmonic underpinning, resulting in a music in which directed motion, normally envisioned as proceeding in a straight-line "arrow of time," is bent towards something more circular, as almost any point along the ground becomes a possible beginning or endpoint for a melodic phrase. The ground-bass songs of Henry Purcell represent the apex of this freedom.



Fig. 1 Purcell, "Ah! Belinda" A section. No two phrases or phrase segments begin at the same point over the ground.

The 4-bar theme of "Ah Belinda," from Purcell's *Dido and Aeneas*, is harmonically closed, cadencing with a veritable "thud" on a sustained dotted-half after a rhythm of running quarters. I choose this example because it would seem a limited and limiting theme, a particularly *poor* candidate for free-flowing, irregular phrasing. Yet that is exactly what Purcell achieves: the voice phrases "at will," as if indifferent to the regularly recurring cadence point of the ground. The first vocal phrases are of 7 bars (4+3) and 9 bars (4+3+2), with no phrase or phrase segment beginning or ending at the same point over the ground (fig. 1). A chart of phrases for the entire aria reveals a very even distribution of incipit points throughout the 4 bars of the ground (fig. 2).



Fig. 2 Phrase and sub-phrase incipit points for "Ah Belinda" (entire song) mapped onto the ground pattern.

The region from 9 o'clock to 12 o'clock is the exception that proves the rule. The greater concentration of incipits here serves as a counter to the fourth-measure doldrums in the ground that would otherwise sap the momentum of the song.

In "Belinda," Purcell seems to relish the challenge of creating a free and supple line despite an unpromisingly square ground. More characteristic of Purcell's ground-bass writing are 3-, 5-, or 6-bar grounds, with a multitude of potential cadence points. The 5-bar ground of "An Evening Hymn" presents three cadence options, all of which Purcell exploits to create a line that floats above the bass, transcending the fixed ground as the poet imagines his sleeping soul to be released from the earthly realm into God's arms.



Fig. 3 Purcell, "Evening Hymn" ground, showing three potential cadence points

Figure 4 illustrates a hemiola-like treatment of the harmonic pattern, as Purcell creates an overarching syncopated shape by exploiting every *second* of the *three* cadence points, across two statements of the theme. This makes for maximal variety of phrase length, and belies the narrowly repetitive nature of the ground.



Fig. 4 Purcell, "Evening Hymn," mm. 21-31: cadence "hemiola"

Purcell's most famous aria, "Dido's Lament," employs a very similar ground, though Purcell does not take advantage of the third cadence point in this piece.



Fig. 5 Purcell, "When I Am Laid In Earth" ground, showing potential cadence points.

In the aria's B section, the "phase shift" of the melody ("Remember me...") against the ground hints at 20th-C compositional procedure. In the second statement of the vocal phrase, the melody lags behind its original position relative to the ground, as Dido's ties to the temporal world dissolve.



Fig. 6 "When I Am Laid In Earth," comparison of B section phrase incipits

In the Classical period, the predilection for periodic phrasing favored sectional over continuous variation. Even extremely short themes that form the basis of elaborate large structures (e.g. Beethoven's "Diabelli" Variations and Thirty-Two Variations in C minor) are treated mostly sectionally. Aside from some self-consciously neo-Baroque examples from the Romantic period, most famously the finale of Brahms' 4th Symphony, the passacaglia form fell into disuse until the 20th century.

The passacaglia was rediscovered by neoclassically-minded composers, notably Britten and Shostakovich. The extended tonal grammar of 20th-C practice made possible numerous interesting extensions of the non-linear passacaglia idea. The Largo from Shostakovich's Piano Trio in E Minor is an example of the subtly modulating theme.



Fig. 7 Shostakovich, Piano Trio in E Minor: Largo (theme)

(Note that in some traditional passacaglias, including "Ah Belinda" and "Evening Hymn," the bass is transposed to closely related keys in the middle section. This is not to be confused with the internally modulatory themes I am describing here.)

After an unequivocal i-V in B-flat minor, the tonal syntax blurs as the progression continues with increasingly ambiguous functions and increasingly complex sonorities. After the maximal ambiguity of bars 4-6, featuring a tritone resolution in similar motion and a disorienting m9-M7 voice-exchange, the sonorities resettle to root-position triads, with strong, consonant outer-voice counterpoint converging on an octave B-natural, supporting B^{\\[\epsilon as tonal goal. The incomplete B-minor triad on the downbeat of the eighth and final measure of the theme, following as it does the harmonic smokescreen of bars 3-6, may even take on pretender status as "the" tonic. The octave F that follows on the second beat is like a bell that tolls to waken the listener—lost in a merely bleak B minor daydream—back down to the terrifyingly tragic B-flat minor reality. (At the end of the movement, the unresolved B^{\\[\epsilon functions as the dominant preparation for the finale, which is in the Trio's home key of E minor.)}}

Note the illusion of endless descent in the voice leading of the upper line:



Fig. 8 Shostakovich, Shepard scale effect

This calls to mind the endless scale illusion discovered by Roger Shepard. Shepard synthesized tones of unusual spectrum, consisting of only octave harmonics, with the strength of the partials falling away logarithmically from a central frequency in the mid-range of human hearing, Such tones have a definite pitch-class, but are ambiguous as to register. When a series of Shepard tones is arranged in a scale or glissando, the effect is of endless ascent or descent, like the stripes of a rotating barber pole. As we will see, this sort of Shepard-effect voice leading is a common element of circular passacaglia themes.

A similar modulation, smooth on the way out and sudden on the return, is presented by the progression of the "Spaceship" scene from Philip Glass' *Einstein on the Beach*:



Fig. 9 Glass, "Spaceship" harmonies

This progression modulates *down* a half-step, tonicizing E major (or F-flat, \flat I) skipping back up to F minor on the turnaround. The effect is much more abrupt than in the Shostakovich, even though both feature commontone voice-leading between triads with roots a half-step apart. This may be because the Glass ascends to the original tonic where the Shostakovich descends, or because the solid IV-V⁷- I cadence so strongly favors E. Or it may be because the E chord arrives on what sounds like the downbeat of a 4-bar hypermeasure, but turns out to be a metrically "extra" fifth bar; the F minor follows, creating a hypermetrical double downbeat analogous to the double E/F tonic. Also significant are the constantly changing measure lengths and arpeggio figurations (not shown in my harmonic reduction) which make each return to F minor, no matter how expected after innumerable repetitions of the progression, still jarringly unpredictable as to its precise moment. The rapidity of the cycle and the enormous number of iterations render the tonic truly indeterminate; in fact, my classroom experience suggests most listeners identify E as the tonic and F minor as the "wrong" chord, even though the piece begins on F. Note here too the Shepard effect, rising in this case.

Both the Glass and the Shostakovich undermine the unitary tonic by replacing the half cadence of a traditional open passacaglia with a more conclusive cadence in a pretender tonic. However, a traditional sense of beginning and end is preserved, if modified. While the Glass is ambiguous even as to the perceptual "start point" of the pattern (E or F?), the hiccup between E and F minor makes the cycle anything but seamless, evoking rather an unedited tape loop.

In this sense, the unbroken circularity György Ligeti's passacaglia themes presents a more radical recasting of the passacaglia idea. Perhaps no composer has explored the possibilities of extended passacaglia geometries more than Ligeti. Notable among his passacaglia innovations is the endlessly transposing theme of the fourth movement of the Violin Concerto, which turns the passacaglia loop into a helix, like a common geometric model of pitch-space.



Fig. 10 Ligeti, Violin Concerto, 4th mvt., passacaglia pitches (after Stephen Taylor)

The theme of the fourth movement of the Horn Trio (fig. 11) maintains the same pitch classes throughout, but shifts register in a smooth descending cycle. In addition, the 5 dyads of the theme are followed by their inversion, further obscuring the seam between passacaglia statements. The theme is tonally suggestive but not determining: all the dyads are $3^{rds}/6^{ths}$ or $4^{th}/5^{ths}$, making possible multiple possible triadic completions. Any 3 to 4 contiguous dyads are amenable to a tonally-centered interpretation, but no one tonal context convincingly subsumes the entire theme; the effect is of kaleidoscopically shifting overlapping tonal areas. Ligeti suggests different tonal emphases through the contextualizing pitches of the free parts.



Fig. 11 Ligeti, Horn Trio, 4th mvt., passacaglia pitches

Another intriguingly circular passacaglia is "Flying Robert," no. 4 of Ligeti's *Nonsense Madrigals*, a setting of a Hoffmann "Struwwelpeter" story in Victorian translation:

from *Struwwelpeter* by Heinrich Hoffmann The Story of Flying Robert



What a wind! Oh! how it whistles Through the trees and flow'rs and thistles. It has caught his red umbrella; Now look at him, silly fellow, Up he flies To the skies. No one heard his screams and cries; Through the clouds the rude wind bore him, And his hat flew on before him.





Soon they got to such height, They were nearly out of sight! And the hat went up so high, That it almost touch'd the sky. No one ever yet could tell Where they stopp'd, or where they fell; Only this one thing is plain, Rob was never seen again!

When the rain comes tumbling down In the country or the town, All good little girls and boys Stay at home and mind their toys. Robert thought, —"No, when it pours, It is better out of doors." Rain it did, and in a minute Bob was in it. Here you see him, silly fellow,

Underneath his red umbrella.

Ligeti, who was interested in effecting auditory illusions usually associated with electronics in nonelectronic media, does so here with absolutely minimal means. The theme extends for eleven beats: 3 two- or three-element segments separated by two intervals of silence. The basic thrust of the theme is downward, with each two-or three-note fragment ending lower than it begins. Only the upper voice of the third fragment (G-B) ends higher than it starts. However, the upper B^3 is to some extent "masked" as an overtone of the tonicized E^3 and B^2 . As much as is possible with the unenhanced human voice, Ligeti creates the illusion that the prevailing motion is continually descending—text-painting not only the endlessly falling rain but the protagonist's eventual doom.



Fig. 12 Ligeti, Nonsense Madrigals No. 4, "Flying Robert" passacaglia pitches: Shepard effect

The theme begins with a minor-sounding cadence on the D-A fifth, but "modulates" to end with a cadence on the E-B fifth. "Flying Robert" begins *in medias res*, on an upbeat and in the middle of a lyric; the baritones and bass, limning out the accompanying passacaglia pitches, complete the phrase "When the rain..." begun by the tenor's melody line (ex. 12).



Fig. 13 "Flying Robert" opening (variants from publ. score as sung by the King's Singers)

As with most of Ligeti's mature passacaglias, the theme becomes progressively overshadowed by free voices as the madrigal progresses. At the climax, the theme has been reduced to metrically prominent but extremely fleeting pitches overwhelmed by a thick and highly chromatic texture, rendering the passacaglia effectively inaudible. However, Ligeti continues to respect the passacaglia structure strictly, except for one discontinuity, which occurs just after the climax. Here the passacaglia theme breaks off following its second element (the D-A dyad), resuming from the start of the theme (B-flat) a few beats later. The madrigal ends (or rather trails off) just after beginning a last iteration of the theme, which likewise proceeds only as far the D-A cadence (although the final sonorities and rests can be analyzed as subsuming some of the following elements, 3-6, of the passacaglia; see fig. 14).



Fig. 14 "Flying Robert" ending (variants from publ. score as sung by the King's Singers' recording overseen by Ligeti)

The ending, and the earlier discontinuity, suggest that D-A is the "proper" final element of the theme, or (more fittingly) that there is no true start or end:



Fig. 15 "Flying Robert" beginning and ending points relative to the passacaglia theme

The final descent to the extreme low end of the vocal register (C^2) and dynamic range (*pppp*) provides an analog to the sense of temporal circularity. The gradual "degeneration" of the harmony into stacked fifths similarly dissolves the more directed and triadic motion of the piece into a blank, entropic state.

In examining Ligeti's sketches for some of the piano etudes, roughly contemporaneous with "Robert", I came across an eclectic list of (presumably) influences or inspirations, among which was Miles Davis' landmark 1959 album *Kind of Blue*. This suggests the tantalizing possibility of a connection between "Robert" and the *locus classicus* of the circular passacaglia genre, Bill Evans' "Blue In Green" (first recorded on *Kind of Blue*). "Blue In Green" combines tonal ambiguity with seamlessness, resulting in a theme with no clear start or end and no certain tonic. The theme contains 11 chord changes, analogous to the 11 note or rest events in the "Robert" passacaglia.



Fig. 16 Evans, "Blue In Green" lead sheet

Many elements contribute to the mysterious circularity of "Blue In Green." The principal melody line includes artful registral transfers that masquerade at first as upper-sixth couplings of a lower fundamental line. When the upper tones turn out to connect to a transferred Urlinie instead (see the A minor line of fig. 17) it is as if the ascents occurred "under the radar"; the effect is of a constantly falling line, a Shepard-scale Urlinie. On nearly every harmonic arrival, indeed on nearly every chord change, the melody dissonates on the strong beat, which helps to blur the harmonic structure. The only bass arrivals that support a consonant melody tone are the D minor chords in m. 3 and m. 10, which, however, are otherwise weakened: in m. 3, the melody cadences on the fifth of the chord and in the middle of a longer stepwise sweep; in m. 10 the melody cadences on the third, and the arrival is further undermined by the fact that the previous chord is the tonicized A minor, rendering the D minor chord at best ambiguously tonic. This A minor cadence is the closest thing to a PAC in the entire progression, but it too is undermined by a supermetrical suspended ninth. Neither A nor D is established as an unequivocal, unitary tonic.



Fig. 17 "Blue In Green" melodic reductions: interweaving Urlinien (reduction indebted to Steve Larson and Henry Martin)

The most convincing melodic reduction is of intertwining Urlinien, one in D and one in A. The D Urlinie suggests two alternative starting points, in. m. 10 and m. 3 of the theme as traditionally numbered. The loop of the traditional passacaglia has been transformed into a more nearly circular shape, or, alternatively, into a Möbius strip: the tune has an A minor and a D minor side, but progresses from one to the other with no discontinuity.

Note that the A minor Urlinie is an augmentation of the first five notes of the melody. This is just one aspect of a deep self-similarity at different temporal and pitch levels, a formal recursiveness that contributes to the composition's formal ambiguity. The unusual structure of the performance, in which the melody and harmonic rhythm are augmented or diminished from chorus to chorus, calls attention to the interrelation of different temporal levels in the composition. There are three different metric feels in the recording as the harmonic rhythm shifts from whole, to half, to quarter notes (fig. 18). (These shifts are usually thought of as tempo changes applied to a notionally fixed meter and rhythm, but I am instead transcribing them as changes in note values against a fixed metronome tempo, in order to highlight the changing temporal ratios.)



Fig. 18 "Blue In Green" melody in successive rhythmic diminution

chorus	solo instrument	harmonic rhythm-
intro	piano	0
1-2	trumpet	0
3-4	piano	0
5-6	tenor sax	0
7-8	piano	•
9-10	trumpet	0
11-12 and tag	piano	

The complete structure of the recording is summarized in the following table.

1

The table does not capture the subtlety of the shifts, however, as the speed and the time-feel of each section do not change in lock-step with the changes in harmonic rhythm. For instance, John Coltrane's second half-note-rhythm chorus ends with rapid sixteenth-note flourishes, making it sound faster and busier than his first chorus. Similarly,Evans' two quarter-note-rhythm piano solos have very different characters: choruses 7-8 are in a breathless quadruple-time feel, while choruses 11-12 have a relaxed, merely double-time feel, despite the rapidly moving chord changes.

The performance's tempo structure uncovers a significant relationship between steps, thirds, and fifths, a pitch relationship that is analogous to the temporal augmentation between choruses. These relationships are summarized in fig. 19.

harmonic rhythm	melodic motion at half-note level	melodic motion at whole-note level
0	descending steps	descending thirds
0	descending thirds	descending fifths
•	descending fifths	descending ninths (= steps)

Fig. 19 Relationship between diminution of harmonic rhythm and intervallic augmentation.

These relationships are implicit in the theme itself, in the intervallic augmentation suggested by different hypermetrical and structural levels of the melody; the tempo shifts of the performance simply make these relationships overt. In the same amount of clock time that the melody of the slowest choruses descends a step, the melody of the double-time chorus descends a third, and that of the quadruple-time choruses a fifth. Note the curious circularity of the process. From downbeat to downbeat, the melody at the slowest speed descends a third, at medium speed a fifth, and at the fastest speed a ninth. (These intervals are only approximate, because the melody is not an unembellished, constantly descending scale.) But because of the octave equivalence of ninths and seconds, in a sense the doubly-sped-up line descends, paradoxically, no more rapidly than the original slow melody. That is, from measure to measure the "fast" (eighth-note) melody outlines the implied descending line E - D (on the last eighth of bar 1) – C (3rd quarter of bar 2) – B (downbeat of bar 3) – A at

approximately the same absolute speed at which the slowest statement outlines the foreground stepwise descent $E-D-C-B\flat-A$. In other words, the quadruple-time tempo makes explicit the identity of the A-minor Urlinie and the opening melody. By accenting the notes that support the Urlinie in presenting the melody (almost unembellished) in the fast seventh chorus, Evans makes the relationship even clearer.

The opening melody itself suggests the successive intervallic augmentation that is both analogous to and brought out by the metric diminution of the performance. The descending stepwise melody accentuates, by virtue of agogic and metric emphasis, a descending-thirds pattern described by every other pitch. The relationship between stepwise motion and motion by thirds—the identity of arpeggio and scale—is a core idea of the modal jazz style pioneered on *Kind of Blue*. At the next higher metric level, every *fourth* note yields a further augmentation to descending fifths, suggesting an identity between melodic and harmonic motion, and foreshadowing the bass line of last part of the theme (E-A-D, and back to G on the repeat); see the circled tones in fig. 17 and 18.

Evans further plays with the connection between tempo and intervallic augmentation in his intro (fig. 20). Evans plays an intervallically augmented (though compared to the first trumpet chorus that follows, metrically diminished) form of the main melody here, using thirds in place of steps, hinting at the composition's hidden interrelationships. (Evans alludes to this augmented melody again in the eighth chorus.) After the initial G, these descending thirds are the pitches that fall on successive downbeats of the theme.



Fig. 20 "Blue In Green" Intro (as played on Kind Of Blue)

Note, however, that the introduction begins on the *third* measure of the theme (as reckoned from the normative 10-bar notation, as in the lead sheet of fig. 16), i.e. at the start of the 5-4-3-2-1 descent of the D minor Urlinie. A case could be made that *this* is the normative start point, on the tonic (or tonic candidate) D minor, and that the progression as traditionally notated and as played in all the following choruses (starting on the subdominant G minor) begins *in medias res*. The final chorus of the piece, played by the piano in doubly diminished time (four times the speed of the initial trumpet chorus) *ends* at this point in the progression as well (i.e. on the D minor chord that is normally the third bar of the progression). Notice the close similarity between the ambiguous "proper" starting and ending points of *Blue In Green* and of "Flying Robert" (compare fig. 21 below with fig. 15). Both themes begin in D minor but modulate to a "sharper" or dominant region, (minor v in *Blue In Green*, the supertonic E-B fifth in "Robert"). And like "Flying Robert," *Blue In Green* ends just after beginning a last iteration of the theme, identically "wrapping around" to its opening D minor.



Fig. 21 "Blue In Green" beginning and ending points relative to the passacaglia theme (cf. fig. 15)

Although Evans' intro employs the same chords as the choruses that follow, it sounds surprisingly different from them, the identity of the progression masked by the "rotation" of what is a profoundly circular sequence. This harmonic phenomenon is analogous to the "rhythmic necklaces" described by Godfried Toussaint. By playing an augmented variant of the *beginning* of the main chorus melody at the start of the intro (rather than the melody associated with bar 3 of the form), Evans reinforces the sense that both the intro and the main chorus melody start at "the beginning" of the phrase, that neither is an anacrusis or syncopation of the other.

sources and items of related interest

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