

How Melody Engenders Cadence in the Chorales of J. S. Bach: A Corpus Study by Trevor de Clercq

Hi. I'm Trevor de Clercq. You may remember me from such previous NEMCOG talks as "A corpus analysis of rock harmony" or "A corpus of melodic transcriptions for rock songs." Today I am reporting another corpus study, this time about cadence types in the Bach chorales.

In a recent article, Eastman music theorist Bob Gauldin laments that music students, when harmonizing a chorale, often have a kind of "tunnel vision" that causes them to interpret melodic fragments only in terms of the global tonic. In other words, students tend to avoid cadences that involve modulation. [NEXT]

For example, consider a C-major chorale melody with a phrase that ends A-A-G. [NEXT] A student with "tunnel vision" might employ a plagal cadence in tonic here. My shorthand for this cadence is "I-PL5", [NEXT] which indicates the key area of the cadence, the type of cadence, and the chordal member of the soprano at the cadence. [NEXT] As an antidote to "tunnel vision," Gauldin offers examples of what he calls "scale-degree reinterpretations," showing how this C-major phrase ending could be reinterpreted in a few different closely-related keys.

Using scale-degree reinterpretation to break out of "tonic-key tunnel vision" is a good thing, but it does come at a cost. [NEXT] For example, I can imagine ten different cadential possibilities for this melodic fragment. Admittedly, ten is not an overwhelming number, but it would be nice to know which are most typical.

With this goal in mind, I conducted a corpus study of the cadences in Bach's 371 chorale harmonizations. I analyzed the music at each fermata by ear and encoded that event using the shorthand I described earlier. I then encoded the melody up to and including each fermata as a sequence of scale degrees with respect to the global tonic. I could then investigate to what extent the melodic structure engendered a particular cadence type.

Let's begin by examining the results for the melodic fragment 6-6-5. [NEXT] Of the 90 instances of this phrase ending in the chorales, what percentage do you think employ a tonic half cadence? (This could be any tonic half cadence, not just the specific harmonization shown here.) [NEXT] The answer: zero. I find this result somewhat surprising, since a half cadence seems like a reasonable harmonic and contrapuntal choice. A follow-up question: What is the most common cadence given the melodic pattern 6-6-5? [NEXT] The answer, perhaps less surprising, is a perfect authentic cadence in the dominant, the clear frontrunner at 83.3%. [NEXT] It turns out that, despite the various possibilities for this phrase ending, only a handful of cases account for the observed events.

This correlation between melodic structure and cadence type can be found throughout the chorales. In fact, "tonic-key tunnel vision" is not always a bad thing. [NEXT] Consider the melodic pattern 2-2-1. Since this phrase ending can occur in both major and minor keys, there are a number of cadential possibilities. [NEXT] Of course, if located at the end of a chorale, we would expect this melodic pattern to engender a perfect authentic cadence in tonic. But even when 2-2-1 occurs as an internal cadence, there is little evidence of scale-degree reinterpretation: [NEXT] over 97% of the 153 internal cadences that involve 2-2-1 occur in the tonic key.

We could keep investigating specific melodic phrase endings and the events that most often associate with them, but we don't have that kind of time. Instead, I would like to offer a general model.

[NEXT] Here is a chart showing the most common and second-most common cadences for the major-key chorales, given the scale degree – as measured in terms of the global tonic – of the melody at the fermata. (I have excluded final cadences since they are so predictable.) You can see that most cadence types fall into the categories of [NEXT] perfect authentic cadence, half cadence with the chordal fifth in the soprano, and imperfect authentic cadence with the chordal third in the soprano.

[NEXT] I would thus like to propose the simplified conceptual model of cadence types for major-key chorales, as shown here. The key areas are organized by their typicality, from left to right. This simplified model essentially proposes that a harmonization default is to interpret the soprano note at the fermata as scale degree 1, 2, or 3 in some closely-related key area. So if a melodic phrase ends on scale-degree 7, for example, it is much more stylistic to modulate to the dominant or to the relative minor than to have a half cadence in tonic. [NEXT] Indeed, I-HF3 cadences are fairly rare in the major-key chorales.

[NEXT] If we look at the data for the minor-key chorales, we find a similar distribution of cadence types. Again, the same cadence types prevail. [NEXT] One notable difference is that half and phrygian cadences are the default choice for a raised scale-degree 7. But it is easy to explain this exception, since it is impossible to reconcile raised scale-degree 7 in minor with any closely-related key area.

[NEXT] Thus for minor-key chorales, we can create a simplified conceptual model similar to the one proposed for major-key chorales. Again, key areas are organized from left to right by their typicality. Interestingly, while more cadences overall occur in tonic, there is a tendency to modulate to the relative major whenever possible. We find evidence of that relative-key thinking elsewhere, as the subtonic (i.e., the dominant of the relative major) is a more probable key destination than the minor dominant.

Generally speaking, the simplified model approach does a decent job of accounting for cadential choices. [NEXT] Its success rate overall sits at 80.6%; good, but not great. The success rate turns out to be closely linked to the melodic interval leading into the cadence. [NEXT] For example, most melodies descend by step into the fermata, and the model fares better in this situation, at roughly a 90% success rate; but it is less successful at handling other intervallic patterns. Some additional concepts are obviously required. The trick is how to extend the model without sacrificing too much of its simplicity. I found that by adding only four special cases, we can boost the overall success rate well above 90%.

The first two special cases are not surprising. [NEXT] These are the deceptive and the plagal cadence, each of which accounts for 2.5% of cadences overall. Note that – aside from the upper-neighbor-motion plagal cadence – these first two special cases retain the basic advice to conceptualize the melody note at the fermata as scale-degree 1, 2, or 3 in some local key area.

The remaining two cases are more intriguing. [NEXT] The first I call the “subdominant stop,” which involves tonic to subdominant motion at the fermata, most commonly harmonizing a scale degree 3 to 1 melodic descent. And the last special case I refer to as “expansion to the octave,” since it involves an ascending melody and a descending bass line, each moving stepwise into the final chord.

As I mentioned, if we extend the simplified model with these four special cases, our ability to account for cadences in the chorales is boosted above the 90% mark. [NEXT] We can even create a flowchart of fermata event choices, as shown here. Although this flowchart may look complicated, it represents a relatively straightforward conceptual approach to scale-degree reinterpretation. In essence, it suggests that the final note in the melody be interpreted as scale-degree 1, 2, or 3 in some closely-related key area, unless the final note is raised scale-degree 7 in minor, part of an upper neighbor motion around scale-degree 5, or ascended to by whole step as a phrygian cadence.

With this advice, we can cure “tonic-key tunnel vision” because we know what scale-degree reinterpretations are most typical. Of course, focusing on the typical is its own kind of tunnel vision. But that’s the point: this study finds that cadences in the Bach chorales are determined less by the global key center and more by the local key implications of each melodic fragment. [NEXT] Thank you!