

Week 4: Conceptual Debates: Key-Finding

Why is Key-Finding Interesting?

When we hear this ringtone, it sounds as though it's in C, but why?

- It doesn't begin with C, it begins with G.
- C isn't the most common note—in fact, it only occurs once before the final bar, and it's on the “and” of 2 in the third measure (a pretty weak position metrically).
- Is a key just whatever key the piece ends in? If we ended this on A, would it sound like it's in A minor? It would be the same key signature, and we'd actually have a nice cadential ascent to the final A from the G in the third measure.

So what gives? Why do we hear this as being in C?

Perhaps a follow-up question might simply be: what makes us hear something as being in a key?

A Brief History of Key Finding

Longuet-Higgins and Steedman

This approach used what we might call an *exclusionary approach*, eliminating different key possibilities as pitch classes were introduced over the course of a musical passage.

For example, with the Nokia theme, the opening G would fit into seven major keys (G, C, D, F, B, A, E); six of those keys would include the opening two notes; and three of those six would still be possible when presented with the first three notes. By the end of the first measure, however, the only major key that would encompass all four melody notes would be C major. If more than one key was still available however, the algorithm would place more weight on the pitches present at the start of the piece. This worked quite well on pieces that were overtly tonal, but it was less effective for pieces that contained non-diatonic pitches (**which is most pieces!**)

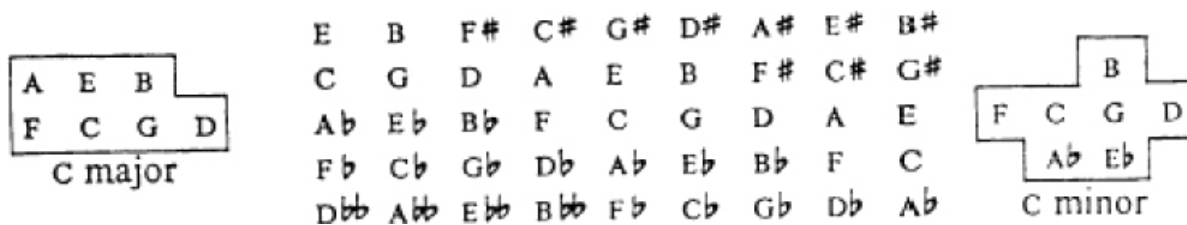


Figure 1: Longuet-Higgins and Steedman's 1971 Key-Finding Algorithm

The Krumhansl-Schmuckler Key-Finding Weightings

later devised an algorithm that tallied up the pitch classes of an excerpt and compared the distribution of these pitch classes to ratings from earlier probe-tone research (Krumhansl and Kessler, 1982; see above).

```
major_key <-  
  c(6.35, 2.23, 3.48, 2.33, 4.38, 4.09, 2.52, 5.19, 2.39, 3.66, 2.29, 2.88)  
minor_key <-  
  c(6.33, 2.68, 3.52, 5.38, 2.60, 3.53, 2.54, 4.75, 3.98, 2.69, 3.34, 3.17)
```

The Temperley (Kostka-Payne Corpus) Weightings

Aarden's Folk Song Key-Profiles

For example, Aarden (2003) generated key-profiles from the Essen Folksong collection,

```
major <- c(17.7661, 0.145624, 14.9265, 0.160186, 19.8049, 11.3587,  
          0.291248, 22.062, 0.145624, 8.15494, 0.232998, 4.95122)  
  
minor <- c(18.2648, 0.737619, 14.0499, 16.8599, 0.702494, 14.4362,  
          0.702494, 18.6161, 4.56621, 1.93186, 7.37619, 1.75623)
```