

# Six Degrees of Tonality

## The Well-Tempered Piano

The piano is an untunable instrument. With only 12 notes in an octave, their combinations (intervals) cannot all be perfectly “in tune” at once. Tuning a note to perfect one interval will spoil others which use that same note. Therefore, compromises are used to create the maximum number of usable intervals. These compromises (*tempering*) result in a *temperament*, i.e., an octave’s worth of pitches that produce harmony according to one or another set of principles.

Of particular interest to pianists is the fact that these principles have changed during the piano’s history, creating different intonational “eras” in keyboard music. During the past 300 years, pianos have been tuned in three significantly different styles. This recording surveys the piano’s harmonic evolution via six different temperaments from one of these eras.

Before 1700, Renaissance and Baroque keyboards were tuned so that some intervals were very consonant (also called “Just” intervals) and others totally unusable (“wolf” intervals). With permutations, this tuning lasted from approximately 1400 to the early-1700’s and is now known as Meantone tuning. The wolf intervals limited composers to certain keys, so it was a “restrictive tuning.” Pure harmony is quite expensive from a modulatory point of view.

Meantone's use on the earliest pianos is likely, and even though it was used on organs into the 1800’s, its dominance faded with the end of the Baroque era. Between 1700 and 1900, temperament became non-restrictive, but not quite “equal.” All keys could be used, but some offered more harmony than others. The importance of modulation in Classical and Romantic keyboard music proves that temperaments with wolves in them were not in use. What is becoming obvious today is that keyboard compositions of this era make strong use of “key color”, a quality found in the tunings called now called “Well Temperaments.”

20th Century pianos were tuned almost exclusively in Equal Temperament, creating a sameness to the keys’ tonal characters that is unavailable in any other tuning. It is this total and democratic allotment of dissonance that makes Equal Temperament

useful as a universal tuning, but at no small cost. The price of convenience is the loss of historically recognized tonal variety and contrast known as key color, or “The Character of the Keys.” As the 21st century begins, Equal Temperament is under energetic review. The source of this examination is a combination of two factors: the programmable tuning computer for piano technicians and the research of Owen Jorgensen at Michigan State University.

Research by Jorgensen and others strongly indicates that from 1700 to 1900, the age of Bach, Mozart, Haydn, Beethoven, Chopin, Brahms, et. al., a style of tuning was in use that was more complex than those which came before or after. The Well Temperaments of this period differ profoundly from Meantone or Equal. Not only do they allow full modulation, they create a predictable variety of consonance and dissonance, providing an acoustical palette of tonal “colors” for the composer’s use.

Keyboard compositions written during this period appear to make use of harmonic values which do not exist in the other temperaments. The evolving art of modulation, the development of sonata form with its harmonic rules, and the known emotional-affective nature of tempering variety, all indicate the use of a commonly accepted form of Well-tempered keyboards.

Not only do the Well Temperaments provide tonal contrast, they also offer a higher degree of consonance than is available in Equal Temperament. They can, when called upon, be far more “in tune” than today’s norm. (By the same technique, if the composer desires, they can produce sounds as dreary and tense as a funeral dirge, it all depends on the choice of key).

Temperament thus forms the keyboard’s intonation, and that it has changed so profoundly has strong implications for musicians and audiences who seek the fullest expression of a composer’s work. Substitution of a different intonation will necessarily change any composer’s harmonic organization, and it is reasonable to expect music performed in non-original temperament to lose something of the composer’s intention. In Classical and Romantic repertoire, this loss translates into reduced emotional impact of the music itself, for without tonal variety, contrast between the purer intervals (with their sedative effects) and highly tempered ones (with their more stimulative results) doesn’t occur. The result is that important emotion-control circuitry, apparently built into the music originally, is left unplugged.

Where did this “circuitry” come from? In 1681, a German theorist, Andreas Werckmeister, published tuning rules that eliminated the restrictions of Meantone. By tempering the once-sacrosanct thirds and spreading the dissonance of the wolf over more intervals, none were tempered past an acceptable level and modulation throughout the scale was possible.

In Werckmeister’s temperament, the keys used most often were spared most of the dissonance, while the rarely used keys absorbed more. This variety was not random,

the rise and fall of dissonance follows the circle of fifths from the home key of C. As one modulates farther from “home,” harmony becomes more “expressive,” i.e., the more accidentals in the key signature, the more dissonance or “color” there will be in the tonic thirds of the key.

The differences among the Well Temperaments are in how evenly the tempering changes from one key to the next and how much contrast between keys is allowed, but the overall form of the genre is near constant. Thus, the two distinguishing features of a Well Temperament are the lack of wolves and the predictable variety of dissonance, or “color” in the keys.

The shaping of harmonic variety on the keyboards was refined over the following 200 years, before becoming a moot point with the acceptance of Equal Temperament. There is debate about when Equal Temperament became widespread, with estimates ranging from 1850 to 1900. There is no definitive answer, but there is much evidence that widespread use of Equal Temperament is a 20th century phenomenon, and scant support to indicate that it was even possible before 1850.

Debated for thousands of years, temperament is an arcane subject to most musicians today. This may be due to 20th century use of Equal Temperament. With equal harmony and dissonance everywhere in the scale, there is little to debate about different keys’ characters. As a result, most modern ears have become accustomed to an ever-present, mild dissonance in keyboard harmony, never hearing a harsh third or a pure one, either.

This recording (*Six Degrees of Tonality*) uses four tunings from the Well Tempered era and two from its “boundaries.” The first (Meantone for Scarlatti) demonstrates how a composer could avoid the wolf and enjoy pure thirds. The last (Coleman 11) was written in 1998 and idealizes a Victorian approach to temperament, closely resembling the “equal” temperaments used at the Broadwood Piano factory in 1885. In between are the variations. The use of the Kirnberger and Young temperaments were widely documented in their time, while the DeMorgan is a radical departure from the normal order.

Temperaments are new territory for 20th century ears. The first-time listener may find it shocking to hear the harmony change “color” during modulations or too subtle to immediately notice. Many notice the increased clarity that comes from lessened dissonance. Some passages more “edgy” than usual, while others offer previously unheard, consonant harmony. Like the calm and the storm, it is contrast between these values that helps increase the emotional attraction of the listening experience. This is the true shape of tonality.

Appreciating this tonal perspective is an easily learned skill and yields powerful rewards. A second listening is usually all that is required to begin recognizing newly restored harmonic textures in old, familiar music. Once discerned, the Well-tempered,

tonal colors of the piano's earlier days create a new acoustical vista for the listener, a soundscape in which the intellectual, sensual, and emotional intentions of the composers are allowed their maximum expression.

