

# Choral Phonetics - Exposé

## Formants can control intonation of professional and semi professional choirs

Wolfgang Saus, 05.08.2012/04/05/2014

Sound information contained in the vocal timbre of the voice affects the intonation of a choir. Those unconscious tone formations consist of two partials, which are amplified by the first two vowel formants. Choir singers can learn to hear and to control these partials deliberately. Thus, the conductor gets controlled access to the timbre and it can optimize intonation and homogeneity targeted.

In an ideal homogeneous sound the formants within a voice section would be identical and they would match partials in the voice spectrum. Simultaneously, in the men's voices the second formant should emphasize those partials, that fit into the musical context and / or match partials in other voices.

This assumes that an awareness of the pitch of formants is available. The result is a new tool for objective and reproducible control of the timbre. As a result, homogeneity and intonation turn into a controllable and even composable factor of the chorus sound.

Vocal pedagogy elements of overtone singing form the basis for this new use of the vowels.

### Tuning formants like a music instrument

The first three formants are controllable. For choral singing especially the second formant is of importance because it evokes the clearest pitch impression. The practice begins with an auditory training that makes the partials of the vocal sound conscious. Then, the tongue and mouth movements are trained to control the second and first formant.

This puts the singers in the situation to tune their formants as

precise as their vocal tones. The pitch-controlled tuning of formants is a vocal pedagogical innovation.

The result is the ability of the singers, to precisely align the formant within a voice section and at the same time tune them on the partials of their singing tone. This gives the freedom to adapt formants in the musical context – within the flexibility that each vowel has in a language. Just intonation can be accessed selectively.

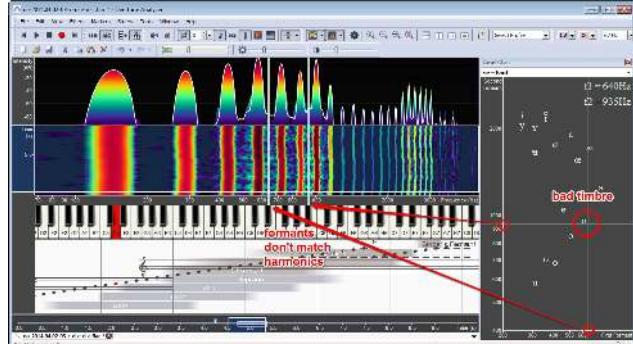
### Vowels with ten times more shades

In the conventional voice training the ways to control choral vowels are limited on the singers' skills in imitating timbres or in interpreting instructions like: „lighter“, „with a smile“, or given word comparisons. In professional choirs the singers sometimes gain experience in *intuitively* (but not knowingly) choosing vowels which are well matched to each other and to the musical context. The better this intuition, the better the choral sound quality.

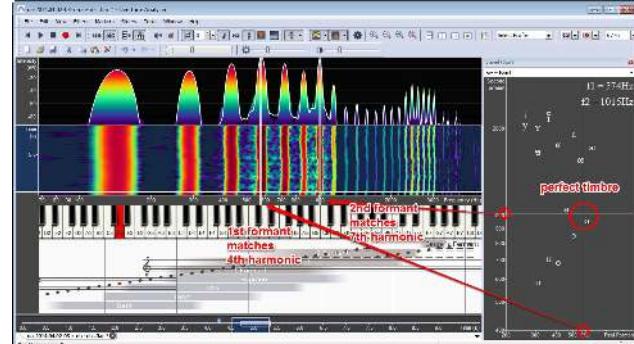
Using choral phonetics vowels are nuanced reproducible, by listening to partials instead of timbre, which makes them adjustable up to 10-fold more precise than in conventional phonetics. Vocal formants turn into a musical instrument.

### Practical example: The word Amen

Within a few hours experienced singers can learn to adjust the second formant to partials. The second formant is regulated by the epiglottis and base of the tongue. The following example shows how this affects the choral sound of the word *Amen* in a D major chord.



Inefficient timbre. Formant don't match harmonics.



Optimal timbre. Formants perfectly amplify harmonics with only slightly adjusting the vowel.



Figure 1: The bass has on the syllable "men" the possibility to emphasize either the 8th, 9th or 10 Partial (harmonic). This results in completely different sound effects.

The syllable *men* is pronounced with the neutral vowel schwa *ə*. In singing, there are several possible colorations of the syllable depending on the tone. The bass can sing *men* on D3 with highlighting of either the 8th, 9th or 10th partial – D6, E6, F#6 – without substantially changing the vowel character.

Listeners without overtone experience describe the difference as a slight lightening of the vowel. Overtone trained ears, however, distinguish clearly the highlighted partials. And they differentiate the vocal qualities just as differentiated as they distinguish the tones D, E and F#.

However, once the bass in measure 6 amplifies the 10 Partial (the natural major third to the tonic) occurs a noticeable change in the intonation of the alto voice: Alto drops to the natural major third (14 cents below the equally-tempered third), without being consciously noticed by the singers. The 10th partial of the bass is identical to the 4th partial of the alto. Alto intuitively adapts two harmonics and sings a relaxed natural major third (provided appropriate choir qualities).

The result is a choir singing in just intonation. The natural minor third to soprano results in D as a difference tone one octave below bass. The whole chord sounds full and stable in itself.

In a minor chord, however, the 10th partial have to be avoided by bass singers, because otherwise the alto is not able to sing the minor third. A minor chord sounds out of tune when the bass amplifies the 10th harmonic, even if all tone are tuned correctly. Special effects can be produced when the bass emphasizes the 9th partial (major ninth) sung as a kind of suspension, that dissolves into the 8th harmonic (octave).

All of these effects can not be perceived by the listener consciously, but they have great influence on the effect of the music. The choristers need to consciously perceive the partials to control these effects.

In the practical test, the whole thing is quickly apparent. You not only hear the choral phonetic effect, but you can feel it physically. It is in practice much easier than it first sounds.