

Performing Microtonal Choral Music, Part 2:

Getting Your Hands Dirty

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Emotionalist Preamble

As a choir director, the majority of my experience is with youth and amateur ensembles. Thus, I usually deal with a different set of concerns and priorities from many readers of NMBx might.

The first thing to know about choirs below the professional level is that, in my firm belief, *we are in it for the community* above all. There is pride in the technical execution, too, of course! But much more so, it's about conveying emotion, and *experiencing* the same emotion, and thus creating and maintaining the bonds of community with each other and with an audience.

In addition, it is quite common to encounter experienced choral singers who have limited sight-reading ability, who rely instead on a finely developed skill at retaining and repeating melodies that they hear. The notation then becomes, as it was in medieval Europe, more of a memory aid than a set of explicit instructions.

A facsimile of the manuscript for 'Iubilate deo universa terra' which shows a series of unheightened cheironomic neumes added to psalm verses.

The joy is that it brings the experience of communal music-making into the reach of a very large population. The challenge is that the director is very often, out of

necessity, a teacher. So, for amateur choirs, there is no guarantee that the singers will have the whole-score awareness that is a hallmark of elite ensembles; and for many, there is basically a guarantee that they *won't*!

Why on earth would anyone try to bring microtonal music into this ecosystem? Well, for one thing, it will help hone everyone's intonational awareness—which can be sorely needed – but, on its own terms: there are new worlds of emotion to be explored that are unavailable with 12 equal tones alone!

However, a director in this circumstance needs to *sell* the piece in question to a perhaps skeptical ensemble. Use your entire boundless enthusiasm to support the methodical techniques below. If the singers like you, they'll give it a chance.

With all caveats out of the way, then, let's get to the technical side.

The technical side

For teaching microtonal passages, I advocate a “bimodal, target-based” approach. I chose this name because I needed a title that was both accurate and impressive sounding for a paper proposal. (It worked.) But here's what I mean:

Bimodal – Requiring an integrated awareness of *both the horizontal and vertical aspects* of every pitch change. That is, one must keep in mind a new pitch's relationship to the pitch it just left, and also its context within the sonority in which it arrives. In microtonal music, *these aspects are often independent*.

Target-based – Relying on *anticipating the familiar*, whether melodic or harmonic, or indeed both. When this is done, intervening things can more easily fall into place, even half-

unconsciously.

These two tactics are already necessary for being a good choral musician within standard repertoire, but it's important to make them explicit when we're working with microtonality. A useful step toward using them explicitly in microtonal pieces is using them explicitly for challenging *tonal* passages. So, a director might work on these tactics during the semester immediately *before* a microtonal piece is even on the program.

A tonal example of the bimodal strategy

One illustrative passage is in Poulenc's *O Magnum Mysterium*. Among many intonational trouble spots in this piece, consider the tritone in the opening tenor, which reappears few times afterward:

The first three measures of Francis Poulenc's 4 Motets pour le temps de Noël, FP 152.[1]

Most singers can pull out a tritone, but it's not a reliable interval. It's not uncommon to need to be reminded what it sounds like, using *Maria*[2] or the Simpsons theme[3] as a mnemonic. (Here's a heartwarming comment thread from the Simpsons video:)

Even when everyone has it securely, each individual will execute it slightly differently, especially when neither of the tones involved acts as a leading tone. The resultant group pitch can be fuzzy. And, because it's a "dissonant" horizontal interval, there is often the expectation of a dissonance where it lands.

So, you sing it slowly, tune that chord on a long tone—and it becomes apparent that the "Cb" is in fact a B natural, the third of a G major!

The tenors are now, ideally, experiencing that trouble spot on

two levels. In one sense, they're singing a tritone up from the previous note. But in another sense, they are occupying a very clear "home" in the resultant harmony, which has nothing to do with tritone-ish-ness.

In microtonal music, it's even more important to maintain these two separate levels. This is because such music inevitably calls for singing some unfamiliar horizontal intervals—and the singers' natural instinct will be to land on a verticality that's equally "unfamiliar," i.e. dissonant, and this instinct is likely to be wrong.

A note on targets

We now move on to the "target-based" part of the approach. In microtonal music, for example, if your choir needs to sing an unfamiliar chain of small intervals—then give them a rock-solid idea of the interval they are *encompassing*, and the intervening tones can almost unconsciously fall into place. They can be refined later, in a second step.

To reinforce how easy this can sound when modeled, the below is an excerpt from an interview of Jacob Collier, where he blithely does that sort of thing to a minor third. Try it yourself!

June Lee's transcription of this phrase, from a 2017 interview video. [4]

The target-based approach is not limited to melodically filling in familiar intervals. On a broader scale, it's about providing a series of conceptual anchors throughout a piece—where singers can regain their footing, if they happen to lose it on the way. This can be target melodic intervals as above; but also target harmonic intervals to tune to (e.g. for entrances), or target chords.

The novelty here is that the targets *need not be musically prominent* within the piece—they can occur on weak beats, or at de-emphasized places within a phrase, etc. They only need to be *already familiar* to the singers, who can then use them to recalibrate. For example, an exotic cadential sonority might be the musical *goal*, but does not need to be the conceptual *target*—that role could be an adjacent, less important, more familiar sonority.

Here's an instance of that in a piece I wrote (video of which can be viewed on [NewMusicBox\[5\]](#)):

This goes from a Just A major chord, to a 7:9:11 in the harmonic series of B twelfth-tone-flat, in my preferred notation for 72 equal divisions of the octave (or "72edo"). The latter is surprisingly easy to nail, because you're leaving a very familiar place, each part moving basically by quarter step—a distance which can easily be practiced. The common tone also helps.

Building the scaffold

The other thing that should guide your microtonal teaching is the educational idea of *scaffolding*, or the "zone of proximal development." All this means is that every new concept needs to relate to immediately adjacent concepts; and the adjacent concepts *give rise to insight at the individual level*.

For example: You don't learn to read by someone telling you how to read. There is no way to do it except making the connection *on your own* between individual letter-sounds and the way they combine into words. Your grade-school teacher just provided the conditions for you to make that leap, by making you memorize the letter-sounds, then confronting you with easily decoded combinations (and then, not-so-easy ones).

The principle here is important. Despite the appeal of a

“brute force” method, such as learning a piece by rote from a synthesized recording (newly easy to produce, due to technology!), that tactic *will not succeed for most people*—because they haven’t internalized the building blocks to make the new intervals “stick.” And many might be unwilling to make that huge technical leap in the first place; it’s not why they’re in choir.

So, we need to look at how we can provide the scaffolding.

We’ve already covered two important things which happen in normal choral singing, and can be applied to microtonal singing. What now follows is a list of additional concepts, each building on the previous, and some resources to master them. There are two pathways, a Just Intonation path and an equal-division path.

Just Intonation Path: Expressive Intonation

Ironically, this path begins with the opposite of Just Intonation: “expressive intonation[6].”

None other than Ezra Sims, the great exponent of 72 equal divisions of the octave, was set upon the microtonal path[7] by his undergraduate *choral* conductor, Hugh Thomas. Thomas insisted on his ensembles singing very high leading tones when resolving to tonics, and very low 4ths when resolving to 3rds, among other things. Under such influence, says Sims, “you are liable to find it hard ever again to believe (no matter how much the keyboard instruments may try to convince you it is so) that there is, for example, one thing which is G-sharp, one frequency that defines it for ever and ever, Amen.”

Expressive intonation, at its crudest, is very intuitive. (Exaggerate the tendency of the tendency tones!) So, if it can achieve the goal of knocking singers out of a fixed-pitch way of thinking, then it smooths the way forward considerably.

Actual Just Intonation

Fahad Siadat has a series of articles, to be continued, on the website of his publishing company,[8] which introduce the subject of Just Intonation for choirs. Some fuller resources currently available include *Harmonic Experience* by W. A. Mathieu, which I mentioned in the last article; and *The Just Intonation Primer* by David B. Doty, which is rather more direct.

A practical choir director might choose only a few intervals to work on. Major thirds and harmonic 7ths are useful to start with, because they are easy to demonstrate. Bring in a cellist to play natural harmonics and compare them with the piano! Bring in a high-level barbershop quartet to “ring” some chords! At first, you’re just developing the idea that there are several available “flavors” for a given interval, each with a different function.

Use what’s relevant to the piece at hand. If your choir adds only the harmonic seventh to their vocabulary, then that’s enough to start working on something like Ben Johnston’s *I’m Goin’ Away*. Indeed, Jeff Gavett, the director of the contemporary vocal ensemble Ekmeles, has successfully led college ensemble clinics on Johnston’s *Rose* – again, a piece in which the only “new” sound is the harmonic seventh.

Quantifying Comma Shifts

Ross Duffin is well-known for his book on meantone and well temperaments, *How Equal Temperament Ruined Harmony (And Why You Should Care)*. But he also wrote a wonderful defense of, and method for, Just Intonation practice, which hinges on locating and using the syntonic comma. This is a very helpful way of thinking systematically about tuning thirds, sixths and

sevenths compared to fourths and fifths. It is freely available online.[9] He even includes exercises for practicing typical problematic intonation situations that can occur.

The Hilliard Ensemble and Nordic Voices regularly incorporate this basic system[10] (different in the particulars) into their practice. If your choir sings Renaissance counterpoint one semester, looking at intonation through this lens, then the following semester could extend the microtonality further:

Extended Just Intonation

Now we get into the weird stuff. It is possible, with much repetition and a rock-solid reference, to memorize and reproduce intervals of the *higher* overtones of the harmonic series.

One possible reference is overtone singing,[11] which—on a low fundamental—can reliably produce harmonics at least up to the fourteenth, and perhaps further. A retuned digital keyboard is another potential resource.

However, there is a remarkable set of exercises available, too: Andrew Heathwaite devised a system for singing through every possible interval that occurs between members of a given group of overtone-based pitches, charmingly called Singtervals.[12] Others have elaborated on this.[13] It is surprisingly logical and intuitive, using a slight alteration of Kodaly's movable-*do*, chromatic solfège syllables.

If a singer were to make listening to, understanding, and singing this type of matrix a part of their daily practice, they would soon be able to approach a strictly overtone (or undertone) piece like Henk Badings' *Contrasten* without much trouble.

Quarter-Tone Path: In-Between Tones

Starting again at the beginning of a different path, we can use people's ability to sing equal-ish tones in between the pitches of a small and familiar interval, to begin to develop a true quarter-tone framework. At first, you could simply add an exercise to normal warmups: Sing F – G_b, then F – F quarter-sharp – G_b, and then the same in the opposite direction. The outer tones are, of course, easily checked on the piano.[14]

Full 24-Tone Scale

Where it gets interesting is extrapolating this simple technique to *all* intervening positions in the chromatic scale. Robert Reinhart, who teaches music theory and aural skills at Northwestern University, assigned intermediate vowels to the quarter-tonal pitches between solfège notes, such as (in IPA) /ra/ /rɛ/ /re/ /rɪ/ /ri/[15] for all varieties of the second scale degree *re*. He then designed—and used in the classroom—progressive exercises to train the ear on the new intervals. In many cases, these involve first singing known intervals; then filling in the gaps with quarter tones; and then ultimately singing *only* the altered pitches, while audiating the more familiar surrounding pitches.

This is just an extension of sight-singing pedagogy in movable-*do* systems! For example, to teach the pattern *do-fa-la* (difficult for beginners), one can repeatedly sing a major scale, and gradually remove the intervening tones *re*, *mi* and *sol*; first audiating them, and then making the cognitive leap to simply singing *do-fa-la* without any crutch.

Reinhart has presented on this subject and is currently working on a systematic collection of quarter-tone solfège exercises, graded by difficulty.

You, too, could use this basic framework to divide, say, semitones into groups of three sixth-tones—or whole tones into fifth-tones, if you're singing Renaissance enharmonic music.[16] The specific vowels in your extended solfège don't matter that much, as long as they're consistent.

Going Deeper: 72-Tone Scale

Julia Werntz is the current bearer of the 72edo aural skills tradition at the New England Conservatory, succeeding Joe Maneri. She teaches students to hear, perform, and compose with twelfth tones—that is, quarter-tones each further divided into thirds. Her class begins by developing a quarter-tone framework, and elaborates from there. The course textbook, *Steps to the Sea*, is both highly accessible (with plenty of audio examples) and readily available.

By the time we're getting into twelfth tones, the Just Intonation and equal-division paths begin to merge. For singers specifically, the simpler Just Intonation intervals correspond so precisely with pitches in the gamut of 72 tones per octave, that the difference—a maximum of about 5 cents, and usually under 3—is literally impossible to produce with the voice.

In fact, a recent study by Matthias Mauch et al.[17] shows that, even for experienced singers, the Just Noticeable Difference and the median pitch production error on a given note *both* hover around 18 to 19 cents—a bit over an entire twelfth-tone! The study dealt with solo melodic singing, and intonation accuracy can be somewhat higher in harmonic singing[18] (especially in barbershop[19]); but not by as much as you think.

(Different sources give different amounts for the Just Noticeable Difference in various contexts, and 5-8 cents is the usual value cited. But in the case of sung pitches, a

little more chaos seems to reign.)

Thankfully, in case you were wondering, microtones really can be learned,[20] and ear-training in 72edo really does have the effect of increasing pitch discrimination and production ability. It tames some of the latent chaos of music-making.

The End Result

If you have gone through *all* of this with your choir, then you're obsessive, and they're all saints. What you should really do is pick and choose among these possibilities, based on what's going on in the piece itself. This is what I have done. However, where I might not yet have used a particular technique myself, it has been field-tested by others. They all really do what they claim.

Conclusion: Practicalities

Here are a few miscellaneous suggestions I can give about teaching microtones to choirs.

Use warmups to reinforce new musical concepts, if that wasn't clear already. Why waste time singing major scales or arpeggios the whole warmup, when you could be practicing quarter tones by repetition, or building harmonic-series chords? This reduces the teaching time on the microtonal piece itself.

Absolutely do not play a tone cluster in place of an intervening tone, if you are modeling a microtonal melody on a standard piano. This does nothing for imagining the pitch (do

we “hear” a D, when C-E is played? Hell no! So why would we hear a D quarter-sharp when D-Eb is played?), and it models a dissonance, which the choir will obligingly give you. Better to skip over the altered pitch—or better yet:

Model with the voice whenever possible. This is not only easier to follow than a keyboard, but it also demonstrates that the passage is, in fact, performable.

Retune the keyboard, if it’s digital. The task is now basically trivial, with available technology; but it may not be so for you personally. If that’s the case, and you’re the kind of person who would read this, then you assuredly have friends who are big nerds like you, except with computers. You can ask them a favor or hire them to do it for you. BitKlavier[21] is free software with an easy learning curve; if they can program in Max/MSP, then they should be able to use Pure Data[22] without much fuss, which is also free; or you could shell out for PianoTeq Standard,[23] which has professional-quality sound and very good microtonal tuning controls. There are many other options, but these are a start.

Working closely with your accompanist is critical, especially if any keys are remapped drastically! But again, if you are the kind of person who’s reading this, your accompanist is probably game for it.

Do all the normal choral stuff first – speak the piece in rhythm, aim for precise cutoffs, use expressive phrasing, interpret the lyrics – so that they realize how much they already know how to do.

Proper breath support is absolutely indispensable. Unfamiliarity causes lack of confidence, and lack of confidence causes improper support, and improper support causes sagging pitch and bad timbre, which makes the project infinitely harder. So, never lose sight of that bedrock of a well-supported sound and come back to it often.

Most importantly, you have to convey *joy* in the music. And isn't that what it's always about?

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[1] <https://www.youtube.com/watch?v=c0VAJI7SLXE>

[2] <https://www.youtube.com/watch?v=DyofWTw0bqY&t=31>

[3] <https://www.youtube.com/watch?v=Xqog63K0ANc>

[4] June Lee, *Interview: Jacob Collier, Part I*. <https://www.youtube.com/watch?v=DnBr070vcNE> – His full discussion of this subject starts at 10:12, but come on, go watch the whole thing. The guy is so hip, it's surreal.

[5] Robert Lopez-Hanshaw, *Vokas Animo (Performing Microtonal*

Choral Music: The End Product).

<https://nmbx.newmusicusa.org/vokas-animo/>

[6] Pamela Hind O'Malley, *Cellist Pablo Casals on Expressive Intonation*.

<https://www.thestrad.com/playing/cellist-pablo-casals-on-expressive-intonation/1434.article>

[7] Ezra Sims, *Yet Another 72-Noter*. *Computer Music Journal*. Vol. 12, No. 4 (Winter, 1988), pp. 28-45

[8] <https://www.seeadot.com/>

[9]

<https://casfaculty.case.edu/ross-duffin/just-intonation-in-renaissance-theory-practice/>

[10] Frank Havrøy, 'You Cannot Just Say: "I Am Singing The Right Note"'. *Music & Practice*, Volume 1. <https://www.musicandpractice.org/volume-1/intonation-neue-vocalsolisten-stuttgart/>

[11] <https://www.youtube.com/watch?v=vC9Qh709gas>

[12] Andrew Heathwaite, *Singtervals*. https://soundcloud.com/andrew_heathwaite/11-limit-singtervals

[13] Casey Hale, *N-Odd-Limit Diamond Solfege*. https://archive.org/details/n-odd-limit_diamond_solfege

[14] Here is a clip of the Tucson Symphony Chorus doing this activity, while warming up for rehearsing my piece *vokas animo*: <https://www.youtube.com/watch?v=yRHH1ZYZEx8>

[15] This vowel distinction is present in English and German, but absent in many other languages. For these languages, other intermediate vowels might be substituted, such as /ra/ /rø/ /re/ /ry/ /ri/.

[16] Elam Rotem and Johannes Keller, *Emilio de' Cavalieri's*

mysterious *enharmonic* *passage.*

<https://www.youtube.com/watch?v=-tyIvhv1hc0>

[17] Matthias Mauch, Klaus Frieler, and Simon Dixon, *Intonation in unaccompanied singing: Accuracy, drift, and a model of reference pitch memory*. Journal of the Acoustic Society of America 136 (1), July 2014.

[18] S. D'Amario et al., *A Longitudinal Study of Intonation in an a cappella Singing Quintet*. Journal of Voice 2020 Jan; 34(1):159.e13-159.e27.

[19] B. Hagerman and J. Sundberg, *Fundamental frequency adjustment in Barbershop singing*. Speech Transmission Laboratory Quarterly Progress and Status Reports. 21 (1) 1980: 28-42.

[20] Charles Norman Bates, *Developing the ability to recognize microtones*. PhD dissertation, 1992.

[21] <https://bitklavier.com/>

[22] <https://puredata.info/>

[23] <https://www.modartt.com/pianoteq>