

Cracking a Centuries-Old Tradition

WHEN I WENT TO Cambridge, England, on sabbatical in 2013–14, I never dreamed I would wind up conducting one of the world’s great choirs, and possibly changing the way they sing early music. My project for the year was to write a follow-up to *Shakespeare’s Songbook* (Norton, 2004), my study of all the songs sung, quoted, or alluded to in the plays of Shakespeare. The sequel is a broader look at songs in English Renaissance comedy, from the 15th century through the plays of Shakespeare’s contemporaries.

Being at Clare Hall at the University of Cambridge allowed me easy access to the resources of the superb University Library across the street, a wonderful advantage for my work. But it also allowed me the option to attend choral services, virtually every day if I wanted, at any of the thirty-one Cambridge colleges. Nowadays, colleges post the music for all the services each term in an online “Term List,” so I could pick out in advance the repertoire I wanted to hear and take a short walk for an hour of choral bliss on any given evening.

While overseas, I was also fortunate to be invited to give talks around Britain. Many of those talks were on historical tuning. In fact, the Faculty of Music at Cambridge asked me to give four talks on various aspects of historical tuning: one on my book, *How*



Equal Temperament Ruined Harmony (and why you should care) (Norton, 2007); one on Just Intonation in the Renaissance; one on keyboard temperament; and one on Just Intonation in the 18th century. So, in spite of the central purpose of my sabbatical, my tuning work was getting a lot of attention, and I was pleased when Stephen Cleobury at King’s College and Andrew Nethsingha at St John’s College each asked me to coach their choral scholars (the men from the men and boys choir) in Just Intonation. By coincidence, it happened that both coachings were to occur on the same day, and that became a red-letter day on my calendar—the expected high point of my entire year in Cambridge.

Just Intonation [see sidebar] is a subject I’ve thought a lot about for decades, and much of the theoretical background is in my article, “Just Intonation in Renaissance Theory and Practice,” in the journal *Music Theory Online* (2006). I’ve worked on Just Intonation with Quire Cleveland and with the Case Western Reserve Early Music Singers, so I know something about the practice as

by **Ross W. Duffin**

Above: The chapel of St John’s College, Cambridge.
Photo by RWD.

well. Just a month earlier, moreover, Stephen Rice of the Brabant Ensemble had mentioned to me that they used my Just tuning article to solve tuning puzzles in their recording of Lasso's complex and chromatic *Prophetiae Sibyllarum* (2011), so I knew my theories about it had practical value as well.

The practical application of Just Intonation has not been universally accepted in modern times, however, with many experts saying that it simply cannot work. The complications of the system were understood even in the 16th century, but what struck me was how unanimous Renaissance writers were in describing intervals according to their ratios in the harmonic series. I just didn't believe the historical writers could be so unanimous and not mean what they said. So, my approach became finding ways for those ratios to be maintained to the furthest extent possible, while very occasionally making passing or momentary compromises that would allow the texture to remain on an even keel. The reason for making the effort is that music in Just Intonation, especially in the live acoustic of some historical church, sounds fantastic—infinately better (to my ear) than music in equal temperament, which, because of the tuning of organs in many churches, is still a widely used standard, even at old colleges like King's and St John's.

In a way, you can understand how this tuning situation developed. Those famous choirs are not exclusively early-music choirs. Sure, when King's College Choir sings Orlando Gibbons, the chaplain can mention that he was "a choirboy in this church," but they are also singing a full repertoire of 19th-, 20th- and 21st-century works that were not designed for Just Intonation, and that mostly need some kind of temperament, if not necessarily equal temperament. And the choirs are often directed by organists in chapels that have equal-tempered organs. But still, a lot of their repertoire is from the Renaissance—Tallis, Sheppard, Byrd, Morley, Weelkes, Gibbons, Palestrina, Victoria, Lassus, and many others—sung *a cappella* with no reference to or need for the organ. That is the music that most benefits from Just Intonation. I would attend services and hear things I knew could be made better—the top part needed to sing a leading tone lower or the basses needed to sing a flatted upper-neighboring tone higher—and that's why I was so pleased to be asked to share what I knew about tuning. Imagine hearing that music with purer intonation in those magical rooms.

Finally, my red-letter day arrived. Just before 10 a.m., I presented myself at Stephen Cleobury's office and walked with him across the grass of King's

front court—a no-no for the public—to the scholars' rehearsal room. It is fair to say that King's and John's get the best young singers in England, so I was really excited. I guessed, however, that the scholars were likely to be ambivalent because, in their place, I would probably be ambivalent, too. They sing about eight services per week, with barely enough time to learn new music, and sing it in front of 300 or more people for every service. They were, moreover, just finishing exams (they're all undergraduates), so an added morning session that did not involve rehearsing required service music was unlikely to be a popular thing.

Still, they were very good sports about it. They sang my G and D Just Tuning Exercises (composed for the CWRU Early Music Singers), learning new melodic and harmonic interval sizes, and hearing the unfamiliar sound of music in Just Intonation. Then they sang the Tallis motet, *Suscipe quaeso Domine* (from which Washington, DC's Suspicious Cheese Lords take their name), and Byrd's *Ave verum corpus*. I made

“Musicians from earlier centuries knew what they were doing.”

specific comments about pitches I thought needed to be higher or lower, and it really sounded good. I went for a celebratory coffee at a nearby café, and three or four of the King's scholars, happening by, came over to say how interesting they found the session. Afterwards, Stephen wrote to thank me and say they looked forward to trying the techniques in the future.

Riding the crest of that wave, I floated into St John's College Chapel at 3:30 the same afternoon for a session with "the Gents of John's," as they call themselves—the gentlemen choral scholars. When the day was over, all the Cambridge people I met wanted me to spill the beans on which group was better. After all, no one ever gets to work with those rivals in such close proximity. The answer: they were both fantastic. John's, however, had the advantage of working in the chapel, rather than a carpeted rehearsal room, so they got a lot more positive feedback from the room. After the first time through a tuning exercise, with unfamiliar melodic interval sizes and new-sounding harmonies, one of the Gents said, "That felt really weird, but wow, it sounded fantastic!" By the end, Andrew Nethsingha was saying they could probably use some elements of it in singing the Rachmaninoff *Vespers*! That's an outcome I wasn't expecting, but it showed that Andrew immediately appreciated the harmonic advantages of tuning in that way and realized it could work on any *a cappella* repertoire that was harmonically based.

I went back to my apartment at Clare Hall, glowing with excitement and exhausted at the effort of concentrating and listening so hard for two intense sessions. That evening, I went to dinner with friends; my time

in Cambridge was ending in a few days and I was scrambling to get in some last-minute socializing. Afterwards, I went back to my apartment to find a message that was so astounding I thought I must have misread it: Andrew was asking if I would be willing to conduct the St John's Choir in evensong the following night. The Gents had been excited about working with me on Just Intonation and hoped they could do more before I left the country.

The service the next day happened to be only the men (no boys). They were already singing all early music, except for the *Preces & Responses*, which could easily be swapped for something early, and Andrew had to miss the pre-evensong rehearsal anyway. It was a "perfect storm" of coincidences that made it possible for me, on twenty hours' notice, to guest-conduct one of the great choirs in the world, one that NEVER has a guest conductor—never mind a random, non-Oxbridge North American interloper like me. It was like a dream come true, except that it would never have occurred to me to have that dream in the first place.

I downloaded all of the music slated for the service and started thinking about what I would ask for in terms of tuning: flats high, sharps low; major 3rds narrow, minor 3rds wide, of course; but also what other notes in these modes needed to be adjusted up or down, depending on the context. After studying the music, I felt I was ready, except I emailed Andrew the next morning and asked if he would conduct the *Preces & Responses*. The timing of the alternation of priest and choir is tricky, so it seemed safest to me not to worry about that.

I arrived fifteen minutes early for the rehearsal, which turned out to be a good thing, because most of the editions they were using were transposed. Instead of *sexti toni* on F, it was *sexti toni* on E, with four sharps in the signature: all of my easy recommendations for the general adjusting of pitches went out the window. At the start of the rehearsal, there were also more singers than had been at the coaching session: because of make-up exams or performance juries or papers, a few singers had not been able to appear the previous day. So there was the added difficulty of getting about a third of them up to speed on Just Intonation. What is it? What does it sound like? How is it achieved?

In the end, I asked them to concentrate on the linear aspects of what they were singing.

What is Just Intonation?

Just Intonation (JI) is a modern term for tuning with all pure intervals (overtone in the harmonic series):

- 2:1 = the pure octave
- 3:2 = the pure 5th
- 4:3 = the pure 4th
- 5:4 = the pure major 3rd
- 6:5 = the pure minor 3rd, etc.

JI uses these same interval sizes for the notes of the scale, with the purpose of creating harmonies that sound completely pure, or beatless.

Beats = interference between notes that are not Just (absolutely pure).

Tempering = deviation from Just Intonation, narrow or wide.

Equal Temperament (ET) = a system in which all of the 5ths are narrowed very slightly by an identical increment, and all of the resulting semitones are equal.

ET is a very useful tuning system, but the major 3rds of ET are a long way from pure and sound really jangly by comparison.

Using Just Intonation in Practice:

- Major intervals, like the 3rd, 6th, and 7th, are all narrower in JI than in ET.
- Minor intervals are all wider in JI than in ET.
- The whole tone exists in two different sizes in JI, major and minor.

These represent the 9:8 and 10:9 intervals in the harmonic series (dividing the 10:8 = 5:4 major 3rd). The difference between the two whole tones is a "syntonic comma."

Syntonic comma = a very small interval (slightly more than 1/5 of a semitone)

This is the difference between a pure major 3rd (C–E in JI) and a major 3rd created from a succession of four pure 5ths: C–G–D–A–E.

Just Intonation using comma-variant notation

The unit of the syntonic comma is critical to thinking about JI, since the increments of adjustment are almost invariably by units of that amount. The variance is from the position of the notes as derived from Pythagorean tuning, where octaves, 5ths, and 4ths are pure, but not 3rds or 6ths.

- Octaves, 5ths, and 4ths that are pure to one another have the same annotation, like C₀–G₀ or C₊₁–F₊₁
- Major 3rds and 6ths are narrow by one comma, like C₀–E₋₁ or B_{b+1}–G₀
- Minor 3rds and 6ths are wide by one comma, like C₀–E_{b+1} or A₋₁–C₀
- Diatonic semitones are normally wide by one comma, like B₋₁–C₀, F_{#-1}–G₀ or A₀–B_{b+1}
- Whole tones may have the same annotation (major tone: 9:8), like C₀–D₀, or be one comma narrow (minor tone: 10:9), like C₀–D₋₁ or B_{b+1}–C₀.

Ave Maria by Josquin Desprez

The A in the top part at m. 5 is initially at 0 to be pure to the D₀ below it, but changes to -1 in the middle of the measure to make a pure major 6th above the C₀ below it. A similar thing happens to the D in m. 10. Up to that point, the D has been at 0 to be pure to G₀, but in m. 10, all of a sudden it needs to be at -1 in order to make a pure minor 3rd with the F₀ above it. What that means is that C–D–E is sometimes C₀–D₀–E₋₁ and sometimes C₀–D₋₁–E₋₁.

Coordinating the choice of

whole tone size is one of the trickiest parts of JI in practice.

The image shows a musical score for 'Ave Maria' by Josquin Desprez, specifically the section from measure 5 to 10. The score is written for four voices (Soprano, Alto, Tenor, Bass) and includes Latin lyrics. Above the notes, there are numerical annotations in red and black, representing Just Intonation (JI) adjustments in terms of syntonic commas. For example, '0' indicates a pure interval, '-1' indicates a narrow interval (one comma narrow), and '+1' indicates a wide interval (one comma wide). The annotations are placed above specific notes to show the required tuning adjustments for Just Intonation. The lyrics include: 'A - ve Ma - ri - a gra - ti - a ple - na, A - ve Ma - ri - a gra - ti - a ple - na, Do - mi - nus te - cum Do - mi - nus te - cum Do - mi - nus te - cum Do - mi - nus te - cum'.

Later that evening, Andrew tweeted:

Andrew Nethsingha @ANethsingha · Jun 11
Invited Ross Duffin, USA Just Intonation expert, to conduct Evensong tonight. @rosswmd Inspiring, revelatory, extremely thought-provoking

The next morning, the Gents themselves tweeted:

Gents of St John's @gentsofjohns · Jun 12
@rosswmd A huge thank you from the Gents for an amazing experience with Just Intonation. Think you might have started something...

By then, the choral Twittersphere in the UK was abuzz, and it seemed like something fundamental had shifted. That evening, I attended the Gents' annual Garden Party at John's and, while they let their hair down and sang *a cappella* arrangements of pop songs, even former choral scholars were coming up to me with congratulations and remarks about how "unprecedented" it all was.

One of the things I've learned about tuning is that no single system is perfect for all music. There are 20th-century pieces that were conceived for equal temperament and sound absolutely fine under that system. Many works from the 18th century, similarly, do not work well in Just Intonation: there are simply too many complex harmonies with seventh chords and diminished triads for Just Intonation to make sense, much less sound good. For that repertoire, I think some kind of extended meantone works best. But it is still worth making every effort to tune in Just Intonation when the music uses primarily triadic

harmonies and when the voices or instruments have the flexibility to adjust the pitches "on the fly." The sound of justly tuned chords in a live acoustic is enough to convince anyone of that. What surprised and excited me

about my experience with the Gents of John's is that they didn't know all of the subtleties and complications of Just Intonation, and yet, using the simple precepts of aiming for Just harmonies and trying to sing with those same intervals melodically, they achieved a magnificent result. Was it perfect? No. But it was absolutely remarkable as a demonstration of what well-trained ensemble singers could achieve with very little preparation. I may have helped to change the tuning culture in Cambridge, but the Gents of John's also changed my conception of what is realistically possible for singers today.

If I have indeed managed to crack the tradition of tuning in Oxbridge choirs, it's due to the courage of Stephen Cleobury and, especially, Andrew Nethsingha in inviting me to work with their supremely talented pre-professional singers and to help demonstrate that musicians from earlier centuries knew what they were doing: that the evolved tuning system of equal-temperament is not necessarily best for all the music they sing. I can hardly wait to hear the results, both in the singing of the college choirs and in the professional work of these young men down the road. Now, to get the boys in those choirs singing in Just Intonation, as well...

St John's Evensong services are web-cast at tinyurl.com/q2nh2tn. Look for June 11, 2014, to hear their service in Just Intonation. ■

Below: The scholars of King's College, Cambridge, with director Stephen Cleobury (left) and the author (center).



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I simply cannot thank Early Music America enough for making this experience possible. This summer will be remembered as a key milestone in my life. I will be spreading the word about these scholarships and I sincerely hope that many students after me can have the same life-changing experiences!

Arlan Vriens, 2014 EMA Summer Workshop Scholarship Recipient

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