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ACCURATE MEANTONE TUNING BASED ON FOGLIANO

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Fogliano's temperament in meantone history

Fogliano's approximate meantone temperament, based on tempering two contiguous fifths by 1/2 a syntonic comma ("s.c.") each, is hardly mentioned in modern discussions on the origin of meantone. This is because it was published as late as 1529.[1]

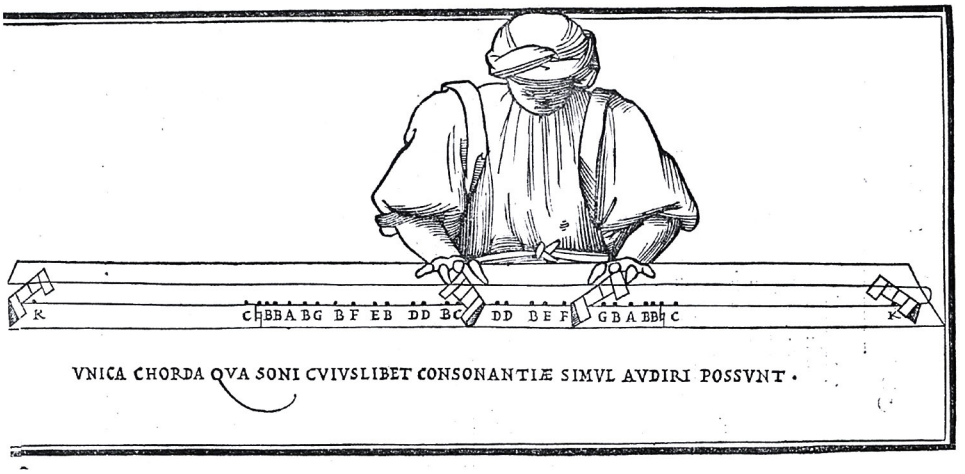
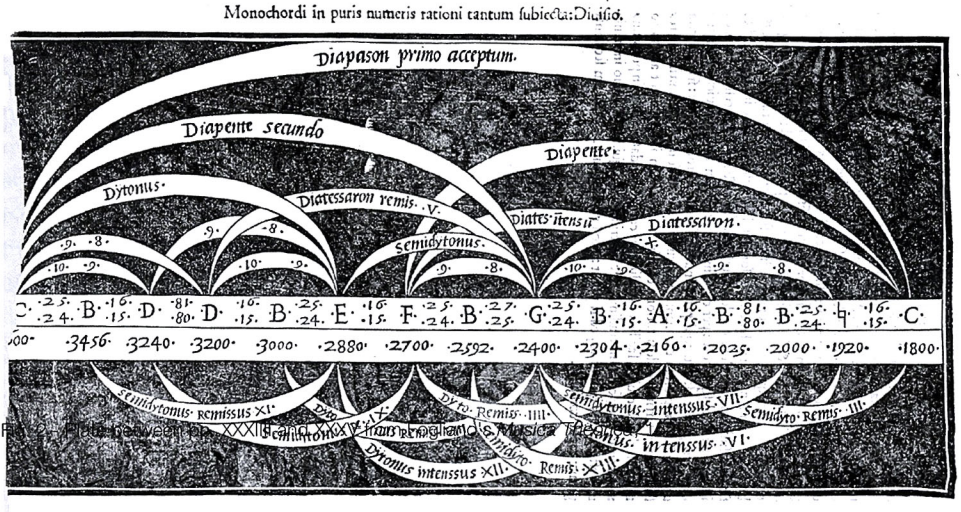


Fig. 1 - Musician setting up a monochord, from p. XXXIX of Fogliano's *Musica Theorica*, 1529.

From Ramos [2] we know that a form of meantone tuning was in use as early as 1482, almost half a century earlier. Another account that can only refer to meantone was published by Aron in 1516, [3] and his well-known meantone tuning directions are found in a treatise published in 1523. [4] Although we have to wait to 1571 for Zarlino's mathematically-correct formulation of 1/4 s.c. meantone, [5] it is apparent that, by the time of Fogliano's publication in 1529, 1/4 s.c. meantone had been widely practised for years and possibly decades. Fogliano's tuning ideas had therefore no practical following, and in fact we have to wait more than two centuries for a publication to advocate again the use of two contiguous fifths tempered by 1/2 s.c. [6] In spite of the above considerations, however, a useful tuning method can be deduced from Fogliano's ideas.

Fogliano's temperament procedure

Having discussed Just Intonation, Fogliano also suggested to "divide the proportion of the comma into two halves". This idea by Fogliano has been discussed by different modern writers. [7]



In the Plate shown in Fig. 2 Fogliano included two different D's and two different Bb's. His temperament is obtained by averaging both pairs of notes, yielding an alternation of pairs of pure fifths with pairs of fifths tempered by 1/2 s.c., equivalent to 10.8 Cent. This is an easy modification of Standard Just Intonation to carry out geometrically on a monochord, and is also easy to tune by ear. Starting from C, 1) tune a pure major third up from C yielding E, 2) tune a pure fifth up from C yielding G, 3) tune a pure fifth down from E yielding A, 4) tune D by similarly-tempered fifths G-D-A. (See Fig. 3.)

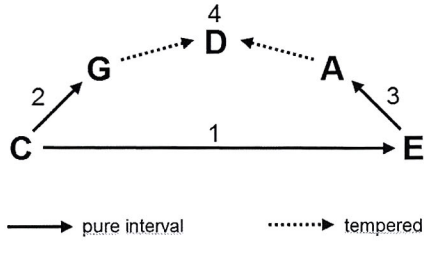


Fig. 3 - Tuning the fifths C-G-D-A-E following Fogliano (1/2 s.c.)

In the Baroque era this way of inserting a note by similarly tempered fifths became common fare: Italian musicians described it as tuning a note "in mezzo" ("in the middle"): we find an example in Scorzi's spinet, see Fig. 4.[8]

One way to tune this note "in mezzo" very accurately is to use two consecutive fifths with no fourths (e.g. G-d-a): the beats of the upper fifth should be almost exactly 1.5 times faster than the lower fifth. Note however that these and similar "beat counting" procedures are not found in any Baroque source.

Fig. 4 – Tuning directions in the nameboard of the Scorzi spinetta, Macerata 1778. Museo Nazionale degli Strumenti Musicali, Rome, Italy. The note "A" is to be tuned "in mezzo".
(Photograph taken by the present author with special permission by the museum's Director)

Fogliano's temperament had no historical consequence, not only because of its late date, but also because fifths tempered by 10.8 Cent are very dissonant, against the perfectly acceptable 1/4 s.c. fifths of meantone, tempered by only 5.4 Cents.

Historical 1/4 s.c. meantone tuning procedures

Historical (i.e. Renaissance and Baroque) tuning procedures for 1/4 s.c. meantone are quite varied: some start very near to "the flats" region in the Circle of Fifths, tuning therefore a few flats and mostly naturals and sharps, while other procedures start nearer to "the sharps". There are also many other differences, but all the historical procedures can be abridged as follows:

"Start by tuning a pure major third, for example C-E. Then split it into four equally tempered fifths C-G-D-A-E. Then proceed to tune by fifths both towards the flats and towards the sharps, checking that the fifths are similarly tempered and the major thirds are pure".

Some accounts suggest the opposite order, i.e., tuning by pure major thirds and checking the fifths, but obviously the results are very similar.[9] Some sources mention a relevant detail, which has always been common practice when tuning by ear (as opposed to tuning using a monochord): if at some point during the partition you find that something is really wrong, you should go back to the beginning, check and correct possible inaccuracies. This "feedback" is inevitable in the tuning of meantone's initial four fifths, and is important because it is easy to demonstrate that any errors in their tuning are cyclically propagated to all the other fifths.[10]

Using Fogliano's idea to improve the accuracy of meantone tuning

Fogliano's 1/2 s.c. idea provides a useful way for tuning 1/4 s.c. meantone by ear with high accuracy. Although his temperament proposal is flawed because of the dissonance of 1/2 s.c.-tempered fifths, it is undeniable that both the pure fifths and the 1/2 s.c.-tempered fifths can be tuned very accurately by ear (without counting beats). It is also obvious that Fogliano's G and A are both different from meantone (because they were tuned using pure fifths instead of tempered ones): nevertheless, D does have the same pitch as in meantone, because in both systems the fifths pairs C-G-D and D-A-E total the same 1/2 s.c. of deviation.

At this point the final solution for tuning meantone with accuracy (achieving the otherwise unattainable four accurately regular fifths) is quite obvious: we just have to complement Fogliano's idea by retuning both G and A "in mezzo".

Meantone tuning procedure using Fogliano's 1/2 comma

You should start by tuning a pure major third, for example C-E. Then, following Fogliano, tune up from C the pure fifth C-G, then tune down from E the pure fifth A-E, and finally tune D "in mezzo" by similarly-tempered fifths G-D-A. So far you have followed the steps 1) to 4) in Fig. 3 above.
Now you will apply the "in mezzo" idea to both G and A: 5) retune G by similarly-tempered fifths C-G-D and 6) retune A by similarly-tempered fifths DAE. Needless to say, when tuning any of these fifths, in order to stay within the "temperament range", you either (1) tune octaves up or down as needed or (2) sometimes use a fourth instead of a fifth.

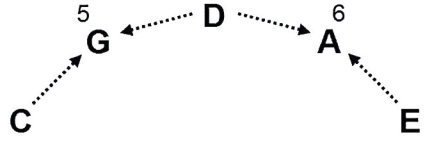


Fig. 5 - Retuning G and A "in mezzo", achieving four 1/4 s.c. fifths. [11]

Now you can proceed as per the usual meantone tuning procedure, both towards the flats and towards the sharps: you tune pure major thirds and check the tempered fifths (or vice versa), but now with the increased precision produced by the initial accurately-tempered four fifths.

Needless to say, this tunng procedure is also valid for the well-known "French" modified meantone temperaments (such as Mersenne-Chaumont and J.-J. Rousseau's ordinaire), in which fewer than 11 fifths (and accordingly less than 8 major thirds) follow 1/4 s.c. temperament.

Two caveats about the historicity of the procedure

The above-mentioned tuning procedure has been in use by some present day tuners: it is very accurate and does not use any beat counting. Historically, however, there are two caveats:

1. Although based on the historical meantone temperament and the equally historical Fogliano's 1/2 comma idea, this tuning procedure is not found in any extant historical source from the meantone era.

2. When (as per Fogliano and Scorzi's spinet for note E) we tune D "in mezzo", D had not been tuned before. In the above-described procedure instead, when we tune G and then A "in mezzo", we are actually *retuning* notes that had previously been tuned by pure fifths. Sure enough, as mentioned above, "feedback loops" had been used from very ancient times. However, here we have something conceptually different: we are now tuning two notes wrong on purpose, because this is helpful in the procedure, and then we retune them to their final

pitches. The problem is, however obvious it may seem nowadays, this idea of "tuning a note wrong on purpose to be retuned later" is first documented in the second half of the eighteenth century, when the use of meantone was fading away.

In spite of the above caveats, the meantone-Fogliano is a practical way to tune 1/4 s.c. meantone with very good accuracy using non-beat-rate historical methods, even if the historicity of the retuning trick cannot be guaranteed.

The Fogliano idea in meantone variants

Temperaments with comma fractions different from 1/4 are notoriously difficult to tune without counting beat rates, because they lack any pure interval to be used in the partition. Therefore, the "Fogliano trick" seems prima facie even more useful in these variants.

Historical accounts on meantone variants were much more concerned with achieving 11 similarly tempered fifths and 8 similarly tempered major thirds, than with having them following a precise comma fraction. Accordingly, we can start by tuning a tempered major third C-E and apply to it the three Fogliano-inspired "in mezzo" tunings, yielding four regular, identicallytempered fifths C-G-D-A-E. Unfortunately this result is much less useful than in 1/4 s.c. meantone because 1) there is no check on the temperament of the initial major third and 2) not having pure major thirds, there is no practical accurate way to "propagate" the temperament of the initial fifths and major third to the remaining fifths and major thirds.
There are, however, other methods (always by ear and without counting beats) that allow tuners to improve the accuracy of tuning meantone variants that have no pure intervals.[12]

1 Lodovico Fogliano, *Musica theorica docte simul ac dilucide pertractata*, Nicolini da Sabbio, Venice 1529.

2 Bartolomé Ramos de Pareja, *Musica practica. Baltasar de Hiriberia*, Bologna 1482.

3 Pietro Aron, *Libri tres de Institutione Harmonica*. Bologna 1516. The short statement about temperament is found in Liber III, Caput XVI.

4 Pietro Aron,*Toscanello in Musica*. de Uitali, Venice 1523.

5 Gioseffo Zarlino, *Dimostrationi armoniche*. Francesco Senese, Venice 1571.

6 Johann Philipp Kirnberger, *Die Kunst des reinen Satzes in der Musik*. (Decker & Hartung: Berlin & Königsberg, Part 1, 1774).

7 e.g. Patrizio Barbieri, Acustica Accordatura e Temperamento nell'Illuminismo Veneto. Torre d'Orfeo, Roma 1987, p. 243.

8 Claudio Di Veroli, *Unequal Temperaments: Theory, History and Practice*. 4th revised edition, eBook (Bray Baroque: Bray (Ireland) & Lucca, It., 2017). http://temper.braybaroque.ie, section 21.15. http://temper.braybaroque.ie.

9 On harpsichords, as well as organ, Principal ranks, giving priority to pure thirds, yields a very good accuracy. In other instruments where the 4th and 5th harmonic are not that audible, such as lutes and small organs with no 8' or 4' principal ranks, tuning by tempered fifths and checking by pure major thirds is likely to be easier.

10 See Di Veroli, *Unequal Temperaments*, section 13.3, p. 218.

11 Full directions for meantone tuning using Fogliano's idea, starting from both A and C, are included in Di Veroli, *Unequal Temperaments*, section 13.3, p. 220.

12 See the procedures in Di Veroli, *Unequal Temperaments*, for 1/5 and 1/6 s.c. meantone (p. 228-233). Both use clever suggestions by Paul Poletti.