

A Clear and Practical Introduction to Temperament History

8 Jorgensen's "Tuning"

Owen Jorgensen's first two books were discussed briefly in the very first article of this series, but since then his work has barely been mentioned. His later book, Tuning, Containing the Perfection of Eighteenth-Century Temperament, the Lost Art of Nineteenth-Century Temperament, and The Science of Equal Temperament Complete with Instructions for Aural and Electronic Tuning¹ (which I will refer to simply as "Tuning" hereafter) has been essentially absent from this account so far. It will be obvious to those who are familiar with that book, or with many of Jorgensen's articles in the Journal, that Jorgensen's account of the history of temperament is very different from what I have presented. It is time to explain the differences.

Jorgensen worked extraordinarily hard researching the history of tuning, travelling to England on several occasions, and unearthing a great deal of original material from English sources. Based on those original materials, he analyzed, interpreted, and calculated a great many temperament patterns, and developed precise aural procedures to reproduce them, as well as cents offset numbers for use with electronic tuning devices.

The title of Tuning implies that it covers universal European practice, but, in fact, it is based almost entirely on documents he unearthed himself in his own research. Those documents were all in English, and were published in England, or, in a few cases, in the United States. He only cited original sources from Continental Europe when they were either referred to, or translated and published, in English sources, which usually occurred some years after the original publication.

Jorgensen should be applauded for his energy in undertaking such a mammoth research project, and for his insistence on reaching his own conclusions based on his analysis of original materials, as opposed to relying on the interpretations of others. Unfortunately, as we have seen in the preceding article, the history of tuning in England was quite distinct from that of the remainder of Europe. In general, temperament developments took place in England a few decades later, and there were many trends that were unique and unconnected. Jorgensen seems to have believed that European practices were fairly homogenous, and came to his conclusions based on that belief. His belief was mistaken, and it led to a great deal of misunderstanding.

Let us take for example the tuning practices of Germany and Austria in the 18th century. This is an extraordinarily important time and place for the history of western music, as it covers composers as prominent as Bach, Haydn, Mozart, and early Beethoven.

In Germany of the 18th century, the idea of circulating temperaments was predominant from the beginning of the century, and mean tone was disparaged by almost all important musical figures. Furthermore, the idea of equal temperament was very prominent from very early in the century, and as we have seen, one can

¹ Lansing: Michigan State University Press, 1991.

make a good case for its acceptance by a majority of musicians by about the middle of the century (though it continued to be somewhat controversial in the musical press). By contrast, in England during this century, most of the evidence demonstrates that mean tone was used almost universally, with minor exceptions, and there was very little mention of equal temperament.

With respect to practical tuning instructions, those of 18th century England were almost all aimed at a mean tone in the 1/5 to 1/6 comma area, with a pattern that left a wide wolf fifth at G#Eflat. In Germany, most 18th century instructions aimed at a circular temperament with no wide fifths (Werckmeister's instructions of 1698 are the exception with respect to somewhat wide fifths). There were several patterns published for producing equal temperament, including patterns that began by dividing the octave into contiguous major thirds. Considerable thought was given to establishing the size of the equal tempered fifth, with both Marpurg and Sorge proposing sequences of just intervals that would result in a 1/12 Pythagorean comma fifth.

Clearly a strong case can be made for equal temperament as the likely tuning for Haydn, Mozart and Beethoven, and even possibly for Bach.² Reading Jorgensen, you would certainly not receive that impression. He ignores completely the work of Werckmeister, Neidhardt, Sorge and Marpurg (and of the other major German writers of the era), and was not familiar with any tuning instructions published at the time in Germany or Austria. He seems to have assumed that during that period people were talking about equal temperament, but that nobody actually had given thought as to how to achieve it in practice, and that English tuning instructions were representative of tuning instructions throughout Europe. While many of the surviving German/Austrian instructions are rather imprecise and lacking in detail, others make clear that there were at least some people who had developed reasonably good methods for achieving a very fair approximation of equal temperament by the last half of the 18th century.

Jorgensen read the temperament instructions of Keller and Prelleur from the first half of the 18th century in England, clearly written with the intention of creating a 1/5 to 1/6 comma mean tone, and tried to find in those instructions something that would correspond to the movement towards circulating temperaments that musicians on Continental Europe were talking about. Keller's instructions from 1707 he interpreted as mean tone. While Prelleur's instructions are obviously a literal plagiarism of Keller's, published a couple decades later, Jorgensen created an interpretation that turned it into a circulating temperament – with no justification in the words used by Prelleur, nor any other solid evidence. He simply states that the later date made it obvious the Prelleur “must have” intended a circulating temperament.

Jorgensen's treatment of the 19th century is similarly limited and skewed. Kirnberger's temperament proposal finally reached England about 30 years after he

² It is noteworthy that a prominent temperament scholar from the Netherlands, Rudolph Rasch, considers that the evidence shows equal temperament to be as likely for Bach as an unequal pattern. We will look more closely at that question in the next article.

first published it, and the Earl of Stanhope responded to it by proposing a modification (dividing the comma among three instead of two fifths). Stanhope's modification is not terribly important for English temperament history, and was completely unknown on continental Europe, but it is duly recorded in Tuning as a temperament method of 1806, as if it were perhaps a norm for that time throughout Europe. In the same way, Jean Jousse's prescription for a tuning in the style of French Ordinaire, published in England in 1832, is reported as if it were a standard tuning for that time. In fact, that tuning style had nearly disappeared in France by that time, and the style was never common outside France.

The late arrival of equal temperament to England, and its sketchy and often inadequate instructions in the earlier published materials led Jorgensen to believe that equal temperament was similarly late and inaccurate in Continental Europe. This conviction was reinforced by his interpretation of the tunings measured and documented by Alexander Ellis, the translator of Helmholtz' On the Sensations of Tone. It seems that the evidence he found in these tunings provided the major underpinning for Jorgensen's major assertion in Tuning, repeated throughout the book, that equal temperament was not practiced before the 20th century. So a close look at this evidence is in order.

Alexander Ellis provided considerable supplemental material in his "translator's appendix" to Helmholtz' work, including the results of research that he undertook himself. He developed and tuned a large set of tuning forks calibrated very carefully (after a pattern developed by J. H. Scheibler), capable of measuring pitch to a tolerance of about one cent through the use of precise beat counting over several seconds. He used these forks for a number of purposes, including some of the earliest research into historical standards of pitch, based on measurements of historical tuning forks, organs, and other artifacts.

One of the projects Ellis undertook using the set of forks was that of measuring a sampling of temperaments from four pianos, two harmoniums, and one organ, documentation that essentially provides our only precise concrete evidence of actual tuning practice prior to the 20th century. Jorgensen found traces of what he called a "Well Temperament style" in some of these tunings. However, his methodology in analyzing them left much to be desired, to put it mildly.

Ellis' method required listening for several seconds. Hence, he measured the notes C3 to C4, because higher notes lacked enough sustain, and he measured the fundamental only. There are several issues that should be raised before looking seriously at the numbers Ellis obtained. First, while we have good reason to believe he was very careful in his measurements, we do not know the margin of error using his methodology. He provided figures to the resolution of one cent, but it could well be at a margin of plus or minus one cent. Second, the range from C3 to C4 usually covers a portion of the piano scale that has large discrepancies of inharmonicity, including the break between wound and plain strings, so conclusions drawn from this area are not particularly reliable as a measure of temperament. We are given no information as to the size or type of piano Ellis measured, so we have no information as to scaling or position of the bass to tenor break. Thirdly, use of raw data for pitch measured at the fundamental is suspect, as those of us who have been involved with the PTG tuning test are well aware. Aural tuners listen to beats

produced by upper partials, and pitch curves for the first partial in the temperament area are rarely if ever smooth.

Jorgensen makes no allowance for error on the part of the tuners of the instruments. He assumes that they were extraordinarily skilled, and that every note was precisely where they wanted it. Except that in two of the tunings, known from Jorgensen's writing as "Broadwood's Best IV" and "Broadwood Ordinary Tuner," he decided that some notes had "obviously slipped." He made corrections, moving three notes in one, two notes in the other, in amounts from two to 7.5 cents. We are asked to trust his judgment in reading the minds of the tuners, recreating what he believed were their intentions.

When all these factors are taken together, it is clear that Jorgensen's analysis of the Ellis tunings is deeply flawed. While there may be traces of unequal temperament tradition to be found in the Ellis tunings, the "Victorian tunings" Jorgensen provided us based on the Ellis measurements should be taken with a grain of salt, as should the conclusions he drew from them.

Many piano technicians have been introduced to unequal temperaments through electronic tuning devices, most of which include many preloaded templates for alternate tunings. The labels for these temperament templates are largely based on the names used in Jorgensen's books, and this leads to considerable misunderstanding and confusion.

One problem is that of dating. Jorgensen meticulously recorded the date of publication for each of his historical temperaments, but that date lacks context. Since they were published in England, the dates only correspond to English tuning practices, and even then serious questions could be raised as to how common or well known many of these temperaments were. And because he did not document some of the more commonly used temperaments, like Werckmeister III, they are missing from the libraries of many devices.

A second problem arises from Jorgensen's very eccentric terminology, which doesn't correspond to the common terminology used by the majority of temperament scholars and early music specialists. Thus, in his 1979 book, the very common $1/4$ comma mean tone is called "Pietro Aron's $1/4$ Syntonic Comma Meantone in the Acoustic Tonality of C Major and A minor" in both "theoretically correct" and "equal beating" versions (as well as versions "whereby three notes must be retuned" and the like). In 1991, this title was expanded to "Pietro Aron's restrictive regular noncirculating one-fourth syntonic meantone keyboard temperament of 1523 in the theoretically correct manner."

All the extra verbiage possibly adds some precision for the temperament theoretician, but it is quite simply needlessly confusing for the rest of us. It should be noted that the equal beating versions are aural tuning sequences Jorgensen developed using intervals that beat at nearly the same rate as test intervals. He made small changes in the temperament patterns in order to make various intervals beat at precisely the same speed (assuming the tuner is skilled enough to make it so). These have become popular among some tuners in the past few decades, but they are entirely Jorgensen's creation and have nothing to do with historical practices.

One of the major themes of Tuning is the assertion that equal temperament was not practiced before the 20th century. Early in the book, in the introductory chapters, Jorgensen sets out some of the reasons he believes this to be true. Among his claims are statements like the following: “In the past, tuning by ear meant that one judged the relationships between the two notes of an interval by listening to the two notes melodically only.” A familiarity with any of countless basic sources from continental Europe would make it obvious that this is simply not true. Arnolt Schlick in 1511, Jean Denis in 1643, and Werckmeister in 1698 are three sources that have been mentioned in earlier articles, each of whom described vividly the playing of two notes of an interval, and the beats that may be produced. Once again, reliance on English sources, and unfamiliarity with other sources, led to misinformation, and to misconceptions about the past.

Much of Jorgensen’s argument about the impossibility of equal temperament before the 20th century is based on a very narrow definition of equal temperament, where any deviation of as much as one cent in the temperament is enough to make it something different. Hence, much of the book is taken up with analysis of temperament sequences Jorgensen says can only produce “quasi-equal” temperament, based on his interpretation. He was a product of the 20th century style of tuning based on precise beat rates for every interval (given at a resolution of tenths of a beat per second), and he claimed that the lack of such beat rates and a wide range of test intervals made precision impossible.

These are matters of interpretation, looking at the 19th century with a 20th century mind set. Jorgensen assumed that minor deviations from “precise” equal temperament are significant, and that procedures other than those of the 20th century could not achieve such precision. Both assumptions are subject to question. We simply do not know how much variance from precisely defined equal temperament is necessary before it is noticed by musicians or audiences, as no rigorous testing has been done in that area. In any case, it is difficult to define “precise equal temperament” for purposes of practical application. As for what procedures work best, and whether results of a more “scientific” method differ significantly from those of more “intuitive” methods, opinions differ, as evidenced by many articles in these pages over the years.

I hope that this discussion has covered enough ground to reveal some of the major shortcomings of Jorgensen’s work. While his energy and enthusiasm were commendable, the limitations of his scholarship led to grave errors of interpretation, and to misunderstandings that will probably persist for many years to come.

In the next article we will wrap up this series, trying to tie things together into a larger picture, and providing some discussion of the practical application of historical temperaments.