

Andreas Werckmeister

The Historical Positioning of his Writings

Pieter Bakker

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Da wir nun deutlich spüren/ daß die Musica Ihren Ursprung von dem Allmächtigen Schöpfer habe/ und daß wir denselben allein damit loben und pfeisen sollen/wie uns auch dasselbe an viel Orten der Heil. Schrift klar/ und deutlich befohlen ist/ so wird (5) Auch der Mißbrauch derselben hietinnen vorgestellt/ und wie erstlich die Heydenischen Philosophi, wie ernstlich/ und ängstlich Sie auch darinnen gesucht/weil Sie das wahre Erkantniß von Gott nicht gehabt/den rechten und reinen Weg/ die Music zu excoliren nicht finden können. (6) Wird Historicè gezeiget/ daß die Music allezeit eine Begleiterin der Theologia sey/ und wie dieselbe beschaffen/ also ist auch die Musica gewesen: Ist die Theologia gut gewesen/ also auch die Music, wie bey Davids, und Salomonis Zeiten. Ist Sie unrein/ und unvollkommen gewesen/ so haben Sie auch eine verwirrte Music gehabt/ und getrieben/wie bey den Heyden und andern Unreinen Theologis, und Barbaris.

Darauf kommen wir (7) Auf die Music wie Sie sich im Christenthum zwar einfältig angefangen/die aber hernach ebenmäßig in Verwirrung gerathen und viel unnütze Geissen mit eingelauffen/dabey wir denn dem Curiosen Leser/die unnützen/und weitläufftigen Procelle so wir von den Alten zum theil noch ererbet/ vorzustellen Gelegenheit gemöhen. (8) Haben wir erwiesend daß die Musicaischen Proportional-Zahlen. 1. 2. 3. 4. 5. 6. - 8. die wahren Radical-Proportiones der Harmoniæ sind/ und nicht die Temperirten (welche sich in infinitum erstrecken) oder die/ Commate abundantes oder deficientes/ woran sich einiae gestossen haben. Hiebey werden noch unterschiedliche nachdrückliche Lehren von einigen Irthümern inseriret. Und sind bey d'ieser Gelegenheit/ diese Radical-Zahlen in etliche nachdrückliche Theologische Allegorien zuverfassen veranlassen worden:wel-

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In the twenties and thirties of the last century, composers and musicians increasingly turned away from the romantic tradition. Against this background the Organ Reform Movement arose in Germany that championed objective music. It was especially aligned with pre-classical music, the music that nowadays is referred to as ancient or early music. The desire for historical authenticity in the areas of organ building, tuning and performance put the spotlight on the music-theoretical writings of Andreas Werckmeister (1645–1706). The first article solely dedicated to Werckmeister was written in the 1930s by Walter Serauky. In the 1950s, there followed an important article by Rolf Dammann. Since that time the name Werckmeister appears more and more often in music-historical literature. Yet it isn't quite clear from modern publications what exactly Werckmeister's special position is, compared to other musical theorists of his time. Just from a simple list of the works Werckmeister mentions, quotes or paraphrases one gets a picture that isn't consistent with the image that is painted by the most important modern literature.

Ursula Hermann, in a lecture, aptly summarized what has been written about Werckmeister's work in the last century.¹ According to her, the three main pillars on which his whole oeuvre rests are his mathematical starting point, a theology anchored in scholasticism and post-Lutheran orthodoxy, plus his focus on the doctrine of affects. Yet when one reads Werckmeister's work carefully, it soon becomes clear that there is no reason to think that these pillars are resting on firm ground. Rolf Dammann's assumption that Werckmeister is reacting against both the after-effects of humanism and the early Enlightenment is not tenable either.² From Werckmeister's writings one can in fact conclude that they themselves are part of the late-humanistic tradition. No trace of Thomistic philosophy from the heyday of scholasticism can be found there. That Werckmeister would have an opinion about the early Enlightenment is highly debatable. At several places, in particular in the commentary to his translation of *Quanta certezza habbia da suoi principii la musica* by the Roman Catholic priest and diplomat Agostino Steffani, Werckmeister brings up the contrast between sense and ratio and the theory of Aristoxenos.³ This is where he remarks that the only certainty is found in numbers. He voices his disapproval of the music of his time that is only based on per-

sonal sensations rather than on rational thought.⁴ He throws himself up as a defender of the objective against the subjective. Nowhere here is it apparent that he is acquainted with the philosophical background of the early Enlightenment, let alone that he rejects it. Compared to contemporaries like Leibnitz or Thomasius, for example, Werckmeister is a representative of an unimportant sub-culture.

When modern authors examine Werckmeister's cultural-historical surroundings they encounter complicated linkages. Werckmeister's writings have to be read against a background of theological and philosophical contradictions, that can largely be traced back to the dispute about universals between Neoplatonic realists and the more empirical nominalists that dominated the Middle Ages from the late classical period on. To the realists ideas are real while to the nominalists only physical objects are real. *Universalia ante res* versus *universalia post res*. The rejection of Thomism by early Lutheranism and by the humanists, as well as the contrast between the pietistic tendencies of early Lutheranism and an orthodoxy that saw its scientifically tenable theology as the pinnacle of knowledge, we have to see in this context. In music theory these poles are apparent in the difference between *canonici* and *harmonici*. Within this complex Werckmeister's theory is especially linked to Neoplatonic realism, humanism and early Lutheranism. The political and social history can partly explain Werckmeister's one-sided preference.

Historical connections

At the end of the Thirty Years' War in 1648, the area between the Harz Mountains and Elbe River, where Werckmeister lived, was in pretty bad shape. Still, the disintegration and decline of Germany had already begun before this war. For intellectuals like Werckmeister, who belonged to the middle class, it had become very difficult to get an education. After 1600 only a few middle class students still studied at German universities. Their mobility was limited. Exchange with foreign countries had more or less ceased. But the influence of Paris as the artistic centre of Europe did eventually also reach the periphery of the developed world. The culture of the courts and the universities at the end of the 17th century became more and more influenced by trends from abroad, especially from France. But a big gap existed between this culture and people like Werckmeister. There

was no social mobility to speak of. French influences are therefore mostly absent from Werckmeister's work. Although he did protest against the influences of modern Italian music at the courts.

Werckmeister could only avail himself of the books he himself possessed or could consult at the town library. From these books he built his own spiritual home. All his work rests on the speculative thought that all numbers of the harmonic ratios can be traced back to the number one or to Unity. The closer a number is to one, the more perfect its ratio will be. This is not only the basis of his harmonic theory, but also of his tuning propositions, where he rejects the use of sub-semitones. He gives a symbolical interpretation to these ratios. Thus the major triad stands for the Trinity of Father, Son and Holy Ghost.

The most important sources for Werckmeister's interval theory are Johannes Lippius, Gioseffo Zarlino and Johannes Kepler. Pythagorean harmony of the spheres, good Christianity and musical practice are all mixed into one, inviting comparison with Boetius' *musica mundana, humana* and *instrumentalis*. Music-theoretical works by important contemporaries aren't read by Werckmeister. Nor is he acquainted with the work of Descartes or Mersenne.

Werckmeister's writings are not very systematic. Especially when he brings up his speculative theory, he writes with a lot of emotion. That actually makes his work a lot more attractive, from a literary viewpoint, than the music-theoretical writings of his contemporaries which are written from a more belletristic perspective. But the scholars of his time didn't regard him as a serious conversation partner. Abroad he was hardly known. Still, Christian Huygens must have seen a copy of *Musicalische Temperatur*, for in the margin of a manuscript he characterizes Werckmeister as an 'author ineruditus ac parvi pretii'.⁵

Sources

An inventory of Werckmeister's sources shows an interesting picture. In his books he mentions fourteen classical, fifteen late-classical and early Christian and twelve medieval writers, twenty-nine writers from the first part of the 17th century and nineteen contemporary ones. From the period between 600 and 1400 only six writers are mentioned, among them the realist Anselmus and the Franciscans Roger Bacon and Nicolaus de Lyra,

who opposed Thomism. Werckmeister rarely mentions his contemporaries and his work is barely influenced by them, with the exception of Johann Caspar Trost junior, whose book about the Weissenfels organ served as an example for his *Orgelprobe*. Werckmeister's most frequent sources are writers from the 15th and 16th century. Sources from this period show the whole spectrum of the Renaissance. Among them are humanists like Marsilio Ficino, Bruno, Erasmus, Arius Montanus and Cornelius Agrippa, and writers from early Lutheranism like Mathesius, Selnecker and Johann Arndt. Rejection of Thomism is what unites them. Luther, for that matter, also regarded any philosophizing, even metaphysics itself, as an utmost folly. The arrogant Aristotle, the arch-slanderer, was anathema to him.

There is hardly any mention of foreign writers from after the 16th century in Werckmeister's writings. It is clear that the period of decline at the end of the century and the Thirty Years' War that followed was a cut-off date here. Since the eastern part of German suffered especially from disintegration and destruction, it apparently was no longer easy to keep one's library up to a certain standard. To Werckmeister the most important writers from this period are Gibelius and Baryphonus, who served as secondary sources to Lippius, and Calvisius, a secondary source to Zarlino, and Johannes Kepler and Abraham Bartolus. From all the one hundred and twenty-seven writers Werckmeister mentions in his writings, Gibelius resembles Werckmeister the most, as far as education and social status are concerned. Mattheson particularly praises Gibelius because he is, like Werckmeister, self-taught.⁶ In spite of limited circumstances both have come quite a long way. Werckmeister isn't so much a prototype representing the most important writers of his time and surroundings, but rather an example of the group of organists and cantors who didn't write.

Artes liberales

In contrast to the nominalistic character of Thomism stands the preference of the humanists for Neoplatonic realism, which did not correspond with the official teachings of the church, although it could be encountered at some monastic orders, for example the Franciscans. The contradiction between nominalism and realism in the Middle Ages can be seen as a continuous dogmatic struggle. But those different points of view are also rela-

ted to the way the *artes liberales* from the late classical era were set up. For the nominalists the trivium was central and for the realists the quadrivium. It is an important fact that around 1600 a neo-scholastic philosophy developed at Lutheran universities. After Thomism had been thrown overboard, the disciplines eventually lacked a theoretical basis. The scholars derived their philosophy from the Italian philological study of Aristotle. Later, the work of Lutheran scholars was also influenced by Spanish neo-scholastic metaphysics. This was the philology and metaphysics that was practised by Jesuits.⁷ Knowing this, we understand why Andreas Hirsch, for example, in his preface to his translation of Kirchers *Musurgia Universalis* says that he finds it a pleasure to sit down at the feet of Jesuits to listen.⁸ But Werckmeister, who didn't have a university education, was hardly or not at all influenced by this neo-scholasticism that had provided a metaphysical basis for orthodox theology. This is one reason why we shouldn't see Werckmeister as a typical representative of Lutheran orthodoxy. As far as the position of church music goes, Werckmeister represents a pragmatic point of view. His position was threatened by different and, as it must seem to contemporary onlookers, very complicated contradictions. Especially the struggle between the orthodox and the Pietists isn't always easy to fathom. There is a affinity with pietistic tendencies in early Lutheranism and reform-orthodoxy at the end of the 17th century. But this Pietism is again different from the enlightened Pietism of the 18th century, or rather from what is generally called Pietism. On top of that there is a contradiction between the Lutherans and the Reformed. An important point of dispute is the acceptability of art in church. This comes down to the question of how the outward should relate to the inward in the church service. Protestant churches are still grappling with this problem today.⁹ In his defence of church music Werckmeister refers back to St. Augustine.¹⁰ Werckmeister derives most of what he writes from sources. And he doesn't hide this work method.¹¹ He may vehemently defend his speculative interval theory, but this theory, about the closeness or distance to unity or perfection, was really based on Lippius. But originality is not what he is after. The ideal of originality as something to strive for came from the Enlightenment and was unknown to him. Nonetheless, in the area of temperament, he came up with the new idea of non-equal circular tuning.¹² Up till then only the equal temperament had been circular. The way in which Werckmeister achieved this result was not especially revolu-

tionary or methodical. He was not acquainted with the use of logarithms in the calculation of intervals, as was being practised by Christiaan Huygens and Joseph Sauveur, and later, in the second decade of the 18th century, by Christoph Albert Sinn from Werningerode.

Affects

With the doctrine of affects a rather liberal approach is taken in both music theory and musicology. This doctrine of affects includes Greek sources, the character of the modes and their use by Boetius, the *musica reservata* and the theory of ornamentation, the cathartic dissertations of Athanasius Kircher, as well as the linkage of consonance degree and text treatment by Vincenzo Galilei, and much more.

When one takes into account that Werckmeister is especially interested in quadrivial music, it isn't strange that we find little in his writings that relates to rhetoric.¹³ The absence of Joachim Burmeister or comparable authors among his sources makes for an interesting gap in that regard. In addition he only shows a passing interest in Kircher's cathartic treatises. Physics in general, which in Thomism one would rather look for in the area of the trivium, is only rarely brought up by Werckmeister. The knowledge he has about this subject comes from Kircher's *Musurgia Universalis* and the works of the Italians Julius Caesar Scaliger and Augustino Steffani, whose philological view of nature is based on Aristotle.

Werckmeister adds substantial comments to his translation of Steffani's book *Quanta certezza habbia da suoi principii la musica*. The publication makes for a curious encounter between two worlds, with a big and very noticeable difference between text and commentary. Each writer really speaks about totally different things.

There is no all-embracing theory of affects to be found in Werckmeister's writings. In his treatment of church modes he concludes that there are actually only two modes left in his time: major and minor. The affect of the minor key is sad, the one of the major key is *not* sad. Since any further differentiation is lacking, this remark more likely relates to the crystallization of the dualism of major and minor than to the affects of the twelve modes of the Dodecachordon.¹⁴ Werckmeister compares the major and minor triad with the two natures of Christ, where major stands for

majestic and minor for humble.¹⁵ As in all his theoretical work an emblematic explanation accentuates his statement. Butstett later adopts Werckmeister's comparison of major and minor with the two natures of Christ. Butstett also makes a liberal use of Werckmeister's translation of Steffani, whereby, because of a printing error in the foreword, he confuses Werckmeister with Steffani. Apparently Butstett did *not* notice any difference between the two authors. Walter Blankenburg, for that matter, later copied Butstett's mistake, even though Mattheson had already pointed it out more than two hundred years earlier.¹⁶ It is interesting that Butstett, brought up as a Catholic, did not notice the difference, just like he didn't understand Werckmeister's interval theory properly. Other than in Werckmeister, a lot of Kircher's theory of affects can be found in Butstett's work *Ut, mi, sol, re, fa, la*. Here there are still glimmers of the big contradiction that influenced Western thinking for such a long time. The end of the Thirty Years' War had affirmed the schism in Christianity. In the North heresy would reign from now on and in the South idolatry.

Tuning

In order to better determine Werckmeister's place within the international spectrum, we could for example compare his treatment of the tuning problem with writings about this theme by an English and a French author. The English cleric and mathematician Thomas Salmon (1648–1706) and the French mathematician Joseph Sauveur (1653–1716), who just like Descartes studied with the Jesuits at La Flèche, are Werckmeister's contemporaries.

Werckmeister describes several non-equal circular tunings that are the direct result of practical experience. The ratio numbers of just intervals are in the context of his speculative theory the most important principle. The necessity of a temperament he underpins with a theological basis. At several places in his writings, in *Musicalischen Temperatur* as well, he emphatically points out the equal tuning, even though he doesn't describe it at length. He also remarks that he thinks that this temperament will be the most important one in the future. It is for that matter not unthinkable that there is a relationship between the acceptance of the equal temperament and the further crystallization of the duality between major and minor. For this simultaneous development is also touched on in Werck-

meister's writings. In this tuning, major thirds sound a bit higher and sharper, while the minor thirds sound somewhat lower and wryer, which accentuates the dualism.

Joseph Sauveur (1653–1716) wrote from a very different viewpoint about the theme of tuning and temperament. Although he originally followed an ecclesiastical career, he turned away from theology and scholastic philosophy to educate himself in Cartesian physics. He built on the work of Mersenne and was very familiar with the work of Christiaan Huygens, especially with his division of the octave into 31 tones. Contrary to Werckmeister, Sauveur was able to interpret the phenomenon of sound vibration correctly and completely understood the idea of frequency, was able to define absolute pitch and to describe a sound consisting of harmonic overtones. For the measurement of intervals he introduced a logarithmic scale that represented the interval ratio optically. The tuning of the harpsichord according to Sauveur came close to equal tuning, because of the proportion between the chromatic and diatonic half-tone $3 : 4$ in a logarithmic division.

At the same time in England Thomas Salmon (1648–1706) pleaded for the use of just tuning. Just like Werckmeister he pointed out the divine order of the cosmos, but added that the intention of that order is to be an aid to our lacklustre perception. To him musical entertainment takes first place. Besides classical writers he mentions Descartes as one of his most important and informed sources. As a practical measure Salmon proposes to place the frets of the viola da gamba in such a way that the instrument sounds just, that is to say, according to the diatonic tuning on A and C, and to use interchangeable fingerboards in the case of a necessary transposition. It is clear that this system would greatly limit composition but he is not concerned with that. Salmon simply gets rid of the tuning problem of keyboard instruments with the remark that the solution should be left to the genius of the builder.

As far as their starting point is concerned, Werckmeister and Salmon are perhaps closer to each other than Werckmeister and Sauveur. In the case of the old contradiction between *canonici* and *harmonici* Salmon opts for a synthesis of viewpoints. Sauveur's view is much more directed to the subject. He mentions Aristoxenos but not Pythagoras. Werckmeister, in the end, prefers the objective over the subjective, since human hearing is after all imperfect. He therefore often refers to the teachings of the mytho-

logical Pythagoras. But as far as the result of their calculations goes, Sauveur and Werckmeister are closer to each other than Werckmeister and Salmon. Both Sauveur and Werckmeister realize that in practice the solution of the temperament problem must be found in circular tuning. Especially where the opposition between sense and ratio is mentioned, the difference between the three writers becomes obvious. Sense is given a metaphysical colour by Salmon, although he makes no effort to plumb the depth of this concept philosophically. Sauveur continues building on a Cartesian foundation. He distances himself from metaphysics, so that the concepts of sense and ratio merge into one. Werckmeister mentions both concepts in his later work, but gives them a very different meaning, more like the original one. Ratio he connects with numbers and sense with objects, not with the subject. In their treatment of the tuning problem we actually encounter the three main strands in European thinking: rationalism, subjectivism and empiricism.

A new age

At the background of all contemporary discussions about tuning there is always, just like in science or art history, the added question about the historic determination of our perception. One can't perceive something that isn't already present in the mind. William Harvey discovered blood circulation and heard the beating of the heart. Contemporaries didn't hear that or hadn't yet. Earlier generations saw and heard things differently. We could therefore also speak of a history of perception.¹⁷ This view has become tacitly accepted and may be partly true.

Everyone involved in the history of music theory, for example, seems to take it for granted that it was impossible for someone who lived before Tartini to observe the combination tone. Sadly no one, except Ursula Herrmann, has pointed out that Werckmeister already clearly described this phenomenon in his *Erweiterte Orgelprobe*. Herrmann sees this as an important finding, since Werckmeister's contemporaries didn't perceive this combination tone. She therefore concluded that this phenomenon had already been observed before the Enlightenment.

Werckmeister, in contrast to the theorists on which he based his work, was a man of practical experience. In his writings, the universal music of the quadrivium is connected with things of the world. This combination

doesn't only lead to a broad-minded view of history, whereby Werckmeister differs from the earlier Praetorius and the later Mattheson in that he doesn't regard his own time as the absolute highpoint, but also explains his progressiveness in music-technical matters. He respects older writers and composers and at the same time thinks that the future still has lots of good things in store. Music had not yet achieved its ultimate goal.¹⁸

Werckmeister's contribution to the solution of the tuning problem is generally known, even though it is often wrongly interpreted. But within the context of the history of music theory it is also important to state that Werckmeister already speaks of the fundamental tone of a triad and the inversion of a chord.¹⁹ Although Werckmeister bases himself on older sources he certainly doesn't lag behind his time as far as the inner, technical, side of composing is concerned. In the decades after him, the main outward changes to compositions will be the added gallantry.

At the end of the 17th century a big change begins to occur. Although Werckmeister and Salmon are contemporaries, the new general attitude, which will take possession of all areas of spiritual life, can be seen more clearly in Salmon than in Werckmeister. In several ways the foundation for art's existence fundamentally shifts as the Enlightenment sets in. Charles Burney, in his *General History of Music* of 1776 already speaks about music as a harmless luxury that isn't necessary for existence per se, although it is still useful since it provides pleasure to the ear.²⁰ Mattheson already nearly completely adheres to this view.²¹

After Werckmeister, the quadrivial point of view seems to have disappeared from music theory. Mattheson appreciated the part of Werckmeister's writings that could be used in practice, but rejects his treatises about mystical numbers, as well as the authors with their magical thinking from whom Werckmeister had adopted this mysticism.²² In the 19th century one can perhaps still find some remnants of this theological foundation in, for example, *Die Natur der Harmonik und Metrik* from 1853, by the cantor of the Thomaskirche, Moritz Hauptman. In the 20th century quadrivial music rallied again, for example in the Pythagoreanism of Hans Kayser. Just like Werckmeister, Kayser gives numbers not only a quantitative but also a qualitative meaning. Kayser makes the case that not only does quality depend on its quantity, as happens in science, but that quantity can also be experienced as quality, as is the case in music.²³ The concept of harmonics that Kayser uses embraces not only the proportions of numbers in music.

According to his theory, musical proportions can be encountered in several other areas as cosmology, biology and architecture. Just like Werckmeister, Kayser points to Kepler and Vitruvius.²⁴ Werckmeister, however, worked in a cultural environment in which he was at home. Kayser stands alone. Still, others have built on his harmonics, like the staff members of the Institut für harmonikale Grundlagenforschung in Vienna, which has since merged with the conservatory. But it begs the question how much further this institute can carry Kayser's torch.

Yet it is a fact that many 20th-century composers have to some degree, and more or less hidden, occupied themselves with number interpretations, with analogies and derivations from the Fibonacci sequence and other such matters. But this has not led to discoveries that are accessible to the public at large, nor are they generally accepted. In that regard a drastic and now apparently permanent change occurred in the 18th century. The seemingly uninhibited attitude to authority and the cherishing of one's own freedom and individuality have contributed to this situation.

Notes

1. Ursula Herrmann, 'Andreas Werckmeister'. Lebensweg und geistiges Umfeld', in: *Bericht über das Werckmeister-Kolloquium aus Anlass des 340. Geburtstages von Andreas Werckmeister am 30. November 1985*, ed. E. Thom, Michaelstein/Blankenburg 1986, p. 4.
2. Rolf Dammann, 'Zur Musiklehre des Andreas Werckmeister', in: *Archiv für Musikwissenschaft*, Trossingen 1954, p. 213.
3. Andreas Werckmeister, *Sendschreiben* (Übersetzung von Agostino Steffani, Quanta certezza habbia da suoi principii la musica), Quedlinburg und Aschersleben 1699, p. 19.
4. Andreas Werckmeister, *Musicae mathematicae bodegus curiosus*, Quedlinburg 1687, p. 152. '[...] leider nicht mehr nach rationibus geurtheilet wird/ sondern nur nach eines jeden Gefallen/ und wie eines sein Gemüthe ist/ so singet/ saget/ spielet/ urtheilet und beliebt er die Music [...]'
5. Andreas Werckmeister, *Musicalische Temperatur*, hrsg. v. Rudolf Rasch, Utrecht 1983, p. 13.
6. Andreas Werckmeister, *Harmonologia Musica*, Quedlinburg 1702, S. 142. '[...] gute Autores so da gründlich von der Music geschrieben/ mangelten mir auch/ musste also zu frieden seyn/ biss mir GOtt andere Gelegenheit gab [...]'
7. Auch innerhalb des Orden der Jesuiten war am Ende des sechzehnten Jahrhunderts eine italienische und eine spanische Richtung entstanden.
8. Athanasius Kircher, *Musurgia Universalis*, Deutsche Ausgabe, Schwäb. Hall 1662. Preface.
9. Andreas Werckmeister, *Der Edlen Music-Kunst*, Quedlinburg 1691, p. 1. 'Denn hat uns Christus nicht auf äusserliche Dinge gewiesen, wodurch wir das inner innerliche sollen erkennen lernen?'
10. Andreas Werckmeister, *Der Edlen*, S. 31. 'Als der H. Augustinus ist bekehret worden/ hat ihn die geistl. Music so bewogen/ daß ihn die Thränen häufig vom Backen geflossen: Und dieses wird vor die erste Ursache seiner Bekehrung gehalten.'
11. Werckmeister, *Musicae mathematicae*, S. 153. '[...] dass ich diese Dinge als collectanea, was ich gelesen/ und mir darzu eingefallen/ vor mich aufgezeichnet [...]'
12. Already in the year 1614 a circular tuning in which all keys can be used was considered desirable by Abraham Bartolus in his *Musica Mathematica*. His own temperament, after Andreas Reinhard, however caused a 'wolf'.
13. Andreas Werckmeister, *Cribrum Musicum*, Quedlinburg 1700, p. 4. 'Nun beste

- het ja der Grammaticorum fundament auf der blossen Autorität/ und gewohnheit der Autorum: Unsere Fundamenta Musica aber beruhen nicht allein auf der Autorität/ sondern haben auch guten Grund in der Natur [...]
14. Andreas Werckmeister, *Harmonologia*, p. 56. '[...] man könnte heutiges Tages wohl mit zween modis auskommen [...]
15. Andreas Werckmeister, *Musicae mathematicae*, p. 148. 'Wie kan dieses besser vergleichen werden als mit der Göttlichen und Menschlichen Natur unsers Mittlers JEsu Christi [...]
16. Johann Mattheson, *Das Beschützte Orchestre*, Hamburg 1717, p. 40.
17. J.H. van den Berg, *Zien*, Nijkerk 1972.
18. Andreas Werckmeister, *Hypomnemata musica*, Quedlinburg 1697, p. 36 and 41. 'Den GOtt würde unsern Nachkommenden noch viel Wunder erzeigen [...]' 'GOtt offenbahret seine Wunder, immer, nach einer Zeit zur andern, uns anders und weiter, als unsern Vorfahren.'
19. Werckmeister, *Harmonologia*, p. 6. 'Die Versetzung der Triadum werden darnach Syzigiae genennet [...]
20. Donald J. Grout, *A History of Western Music*, London 3/1981, p. 448.
21. Johann Mattheson, *Das neu-eröffnete Orchestre*, Hamburg 1713, p. 24.
22. Mattheson, S. 287. '[...] und wie die Music sey: Scientia circa numerum sonorum, oder in sono, wieder und gegen diejenigen, die statuiren, sie sey: Sonus numeratus, und was dergleichen Alfanzereyen mehr sind [...]' '[...] und es ist gar keine Hexerey oder Wunderwerck daran [...]
23. Hans Kayser, *Akróasis*, Basel 5/1989, p. 14.
24. In Werckmeisters writings *Musikbau* relates to harmony. Rolf Dammann began greatly expanding its meaning. The word suddenly didn't just apply to intervals, but also to the form and the number of measures, things it had nothing to do with in the original context.

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- MM = *Musicae mathematicae* Hodegus curiosus, 1687
MT = *Musicalische Temperatur*, 1691
EM = *Der Edlen Music-Kunst Würde, Gebrauch und Mißbrauch*, 1691
HP = *Hypomnemata Musica*, 1697
EO = *Erweiterte Orgelprobe*, 1698
CM = *Cribrum Musicum oder Musicalisches Sieb*, 1700
HM = *Harmonologia Musica*, 1702
OG = *Organum Gruningense ridivivum*, 1705
PD = *Paradoxal-Discourse*, 1707
NA = *Die nothwendigsten Anmerckungen und Regeln*, 2/1715
AS = *Comment on translation of A. Steffani's Quanta certezza*, 1699

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Tunings in cents

	equal	just	mean tone	Wrckm III	Sauv
C	0	0	0	0	0
Cis	100	92.2	76.1	90.2	85.4
D	200	203.9	193.2	192.2	194.3
Es	300	315.7	310.3	294.1	311.8
E	400	386.4	386.3	389.9	395.7
F	500	498.1	503.4	498.0	502.3
Fis	600	590.3	579.5	588.3	587.2
G	700	702.0	696.6	696.0	697.2
As	800	813.8	772.6	792.2	807.7
A	900	884.4	889.7	888.0	893.3
Bes	1000	996.2	1006.8	996.1	1009.9
B	1100	1088.4	1082.9	1091.9	1090.3
C	1200	1200.0	1200.0	1200.0	1200.0

This table uses a logarithmic division in cents. An equal tempered semitone has a value of 100 cents. The difference between twelve pure fifths and seven pure octaves, the so-called Pythagorean comma, has a size of 23.5 cents. In a tempered tuning the comma has to be distributed over several intervals. Just intonation, of course, knows only pure intervals. The calculation of the minor seventh in the second column of this table follows Zarlino. Moreover, the natural seventh measures 968.9 cents. Salmon only calculates the major minor seventh on A with a size of 1017.7 cents. The mean tone tuning in the third column corresponds with the calculations of the quarter comma mean tone temperament of Aaron. The tuning in the fourth column is the well-known Werckmeister III temperament. The last column shows Sauveurs *Système temperé du Clavecin* based on a division of the octave in 43 parts.

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The desire for historical authenticity in the areas of organ building, tuning and performance put the spotlight on the music-theoretical writings of Andreas Werckmeister. During the last century his name appears more and more often in music-historical literature. Yet it isn't quite clear from modern publications what exactly his special position is, compared to other musical theorists of his time. Just from a simple inventory of Werckmeister's sources one gets a picture that isn't consistent with the image that is painted by modern literature.