Harpsichord & fortepiano

Vol. 15, No. 2 Spring, 2011

© Peacock Press.
Licensed under CC BY-NC 4.0.
You are free to share and adapt the content for non-commercial purposes, provided you give appropriate credit to Peacock Press and indicate if changes were made. Commercial use, redistribution for profit, or uses beyond this license require prior written permission from Peacock Press.

Musical Instrument Research Catalog
(MIRCat)

CLAVICHORDS, FRETTED & UNFRETTED:

Musical And Mechanical Functions

By Richard Troeger

Over the course of the last 120 years, certain elements concerning the musical usage of various types of clavichord seem to have been overshadowed by the piecemeal way in which information has come to light. Limiting myself to Northern European instruments and repertoire from the later seventeenth, eighteenth, and early nineteenth centuries, I would like to offer considerations concerning the capabilities of fretted and unfretted clavichords, in coordination with points concerning the historical timeline of the latter type. The overall view is, perhaps, new, although some of the data presented here is not. (Those familiar with this subject will forgive my re-traversing certain material as a basis for presenting my own suggestions.) As a sort of disclaimer, let me state at the outset that I have no strong prejudice for fretted (*gebunden*) or unfretted (*bundfrei*) clavichords, but try to use each type for the appropriate music.

Definition

For the clavichord novice: Fretting involves sharing strings between adjacent keys, in a way analogous to no other keyboard instrument. On a given course of strings (clavichords being normally double-strung), the tangent(s) of one, two, three or up to four adjacent keys may strike the same course of strings, each tangent at a different point, marking off different sounding lengths and hence producing different pitches. The tangents must be positioned with great exactitude to allow the proper pitch relationships; and as one may readily imagine, the desired temperament must therefore be built into the design. The temperament cannot be altered, except to a minor degree by bending the tangents, a procedure that can eventually lead to metal fatigue and other problems.

Fretting of course makes a full legato between fretted notes impossible. A legato effect can be contrived by careful release and dynamic shading, but remains hazardous because of the always imminent production of a strident clanking noise (what Praetorius called a "cacophony") when two tangents simultaneously strike a course, or one attacks before the other key has been released. Naturally, too, one cannot sound simultaneously any notes fretted together. Thus, certain suspensions and dissonances involving a minor or even major second cannot be played. A common myth, quoted and requoted over the last 90 years, holds that pairwise-fretted clavichords can accommodate the full *Well-Tempered Clavier* with only two or three unplayable spots. In fact, Book One alone contains over two dozen unplayable dissonances. Another problem with promoting fretted instruments for the "48" is that during Bach's lifetime, fretted clavichords seem largely to have been set for meantone or other temperaments that did not allow free usage of all tonalities.

Modern Views Of Fretted Vs. Unfretted Clavichords

The triple- (and quadruple-) fretted clavichord appears gradually to have given way, in the late seventeenth and early eighteenth centuries, to duple-fretted and unfretted instruments. Yet, triple-fretted clavichords were still built in the late eighteenth century, for instance a 1783 specimen by Christian Gotthelf Hoffmann (lost in World War II; Henkel No. 18).[1] The change from triple- to duple-fretted clavichords to fully unfretted designs, has often been viewed in modern times as progress — a series of improvements.

Certainly, the revival period (c. 1890-1950) took the unfretted clavichord for granted as the preferable type to cultivate (while often building wildly unhistorical variations on it). This outlook was rightly challenged by Edwin Ripin in his groundbreaking 1970 article "A Reassessment of the Fretted Clavichord." He pointed out that within the limits of meantone or other temperaments and the range of tonalities bounded by key signatures of two flats and three sharps and some of their relative minors, duple-fretted clavichords were, effectively,

fret-free, in accordance with Jacob Adlung's broader definition of "*bundfrei*" (see below). [2]

Proper appreciation of the fretted instrument was already overdue when Ripin's article appeared. However, only quite recently is the actual position of the unfretted instrument in the early eighteenth century beginning to be fully appreciated. This neglect stems in part from the dearth of surviving examples; indeed, a relatively small number of clavichords of any type survive from before 1740. The common notion, repeated even in quite recent publications, follows the line that unfretted clavichords only came into their own around the 1740s.

It is also often asserted or implied that the 18th-century clavichord, especially the unfretted variety, became more robust toward mid-century. This view is apparently propounded to account for textures other than the "moonlit" *Empfindsamer* style, which seems to remain as the general historians' main image for the clavichord. But the clavichord was used for a multiplicity of tasks in the historical period, and good clavichords had always included robust specimens; several impressive examples survive from reasonably early in the eighteenth century.[3]

Certainly, the number of extant unfretted instruments known from before 1740 is small, but the survival rate of antique instruments is clearly nothing on which to base estimates of their actual usage when new. (Karl Lemme's instruments were of high repute, yet out of more than 800 keyboard instruments built by Karl Lemme and his father, only three are extant.[4] In fact, like articles of clothing, the most frequently used instruments may sometimes be those that were "used to death.")

The idea that unfretted clavichords were hardly common until mid-century is confuted by several facts, which will appear below. Further, the unfretted instruments appropriate to the more evolved art-music of the time would be important to that music even if use of them was less widespread than that of fretted clavichords. (Later in the century, the production of English square pianos outnumbered that of English grands by something like four to one.) As Johann Speth's oft-quoted preface to his publication of keyboard music already indicates in 1693, the unfretted clavichord allowed a temperament free from the confines of the usual meantone-fretted instruments.[5]

Adlung And The Meaning Of "Bundfrei"

As is well known, Speth's recommendation of the *bundfrei* clavichord is echoed by authors of keyboard treatises throughout the eighteenth century. (I know of no period text advocating fretted clavichords over unfretted.) With the growth of interest in fretted clavichords during the late twentieth century, however, Adlung seemed to provide a new interpretation of these authors' recommendations, via his oft-quoted description of "*bundfrei*" clavichords. Adlung is writing in 1726-27, although the text was not published until 1768:

> Furthermore it is to be seen as a perfection, if a clavichord is *bundfrey*. Many are so arranged, that 3 to 4 tangents strike on one string or choir of strings: bundfrey however signifies, that at least for each diatonic [natural] key there is a separate string choir ["*Chor System*"], that the chromatic keys share....

This is, of course, a description of a pairwise-fretted clavichord. Adlung proceeds to demonstrate the limitations of triple/quadruple fretting. He then describes the conventional definition of *bundfrei:*

> If one wishes, however, to take the word bundfrey in its narrower meaning, that it should signify so much as that one could make all fretting free; so then one must also have for each chromatic key a separate choir of strings: and that is good; for then the harmony can in no way be distorted. But this requires more strings; also more time for tuning, and because of the many strings the case must be much wider. But such clavichords are commonly made these days, and one does not mind the effort and expense that such a clavichord requires, becauseit has long been recognized, that this type has a great advantage over all others.[6]

The first portion of this passage can appear to suggest that the frequent advocation of unfretted instruments for art music in contemporary treatises actually supports pairwise-fretted clavichords. However, Adlung's broader definition of *bundfrei* (as including pairwise fretting) appears to be idiosyncratic to Adlung himself, and it should of course be clear from the concluding remarks that he, in common with other writers, considered completely unfretted instruments to be the best choice, having "a great advantage over all others." Definitions of "*bundfrei*" (also "*bundfrey*") from the eighteenth century, other than Adlung's, refer unequivocally to fully unfretted instruments. Thus Johann Walther in his *Musikalisches Lexicon*:

> *Bundfrey* means: when the strings of a clavichord are so disposed, that, if one strikes together two adjacent-lying diatonic ["natural" or "white"] keys, or also even a diatonic key with either its preceding or following chromatic, then two different sounds or seconds are heard."[7]

Elaine Fuller has suggested to me that Walther's definition, although allowing only Adlung's "narrower meaning," may contain a fossil memory of a 17th-century definition of what today we sometimes call "diatonically *bundfrei*," from which Adlung's broader definition would obviously derive.

- Already in 1693, however, in a little preface to his publication of keyboard music, Johann Speth describes a completely unfretted action thus (without any use of the terms "*bundfrei*" or "*gebunden*"). "For a correct performance" of his music,

  > "...a well-made and well-tuned Instrument or Clavichord is required, and in particular this latter must be built thus, that each key has its own strings and not perhaps 2, 3, or 4 keys depend upon one [string choir]."[8]

- Daniel Gottlob Türk says essentially the same thing as Walther, when recommending unfretted actions:
  "Every key must have its own strings (choirs), so that for example not C and C sharp, or C sharp and D are sounded by means of the same strings."[9]

- Johann Samuel Petri, in his *Anleitung zur praktischen Musik* (1782), comments that a clavichord

  > "must be unfretted. That is: each whole and half tone must have its own stringchoirs, and must not strike two or more tones upon the same strings, because with fingers left resting on the keys extremely vile sounds result."[10]

These definitions completely rule out Adlung's broader account of the term "*bundfrei*" as including pairwise fretting.

Modern Arguments

On the supposition that unfretted clavichords had little real place in the early eighteenth century, arguments have frequently been advanced in modern times regarding the advantages of fretted clavichords (particularly duple-fretted), with an often disparaging attitude toward their unfretted relatives.

The first four points are utilitarian. Fretted clavichords usually take up less space than unfretted instruments; they are less costly; they are better for travel, because smaller; and they are easier and less time-consuming to tune. There is no argument here, excepting the fact that specially designed unfretted traveling clavichords exist (cf. a very compact example, C-f^3, by Johann Andreas Stein, of 1787). As to tuning, the majority of good clavichords stay in tune very well (much longer than harpsichords), so having perhaps 15 fewer courses to tune on a C-d^3 fretted instrument than on an unfretted one of the same range is not especially advantageous, except for those quite unskilled in tuning. However, those challenged by tuning might find a greater difficulty in setting the bearing of one or another unequal temperament so as to match perfectly the temperament built into the fretting scheme. (Some temperaments however, e.g. quarter-comma meantone, present the tuner with no difficulties because of the way they relate to the fretted action.)

Tuning Issues

On another level, however, Türk comments that "a clavichord that is not *bundfrey*, can never be purely tuned."[11] It is not clear whether he dislikes the usually irregular temperaments or finds the tangent setup typically distorted (see below). He goes on to voice other disapproval: "Of two tones struck together on one choir of strings one hears only the higher tone; certain passages cannot be managed, or only become distorted."[12]

Türk's stricture, and the reality behind it, are perhaps explained by C.F.G. Thon in his manual for keyboard instruments of 1817.

He strongly advocates *bundfrei* clavichords, and comments that "through the frequent bending of the tangents, frequent repairs are necessary" on fretted instruments.[13] The distortions so frequently found on the tangents of antique fretted clavichords, then, might often have been incurred during the late historical period, as amateur (and even professional?) tuners unfamiliar with the built-in temperaments (at least on older instruments still in use) struggled to compensate with tangent adjustments for the out-of-tune intervals that resulted from not correctly setting the built-in temperament in the first place. (I myself have encountered this same situation when adjusting fretted clavichords for other people.)

Karl Lemme's comments on the same subject (1802), although not specifying fretted clavichords, seem to bear out the foregoing: he refers to "the bad habit of some clavichord tuners that, if they have not tuned a clavichord in the correct temperament, in order to assist themselves, they bend the tangents...either to the right or left in order to raise or lower the pitch."[14]

Despite distorted tangents in so many extant clavichords, there is plenty of evidence to suggest that even pairwise-fretted clavichords tended to be conservative in temperament, from meantone in the first half of the eighteenth century to some more flexible but unequal temperament later on.[15] Türk's comment, therefore, probably refers to the fact that equal temperament or something near it was rare on fretted clavichords, and surviving instruments seem to confirm this point. This conservative approach corresponds perfectly with the range of keys that the action allows one to traverse without difficulty: as already discussed, the duple-fretted clavichord is essentially *bundfrei* within the tonalities for which the action is designed.

Retuning of selected unisons is sometimes considered as a recourse for the limits of fretted meantone intonation. Ripin argues that the unusual fretting pattern of several Iberian clavichords is designed to accommodate enharmonic retuning of certain accidentals, e.g. B-flat/B-natural.[16] Apart from the fact that the argument too readily dismisses the resultant mistuning of the adjacent naturals, one must ask, which would be more nuisance: such intermittent retuning here and there among the strings, or having extra courses that are established with the basic tuning, as on a *bundfrei* instrument? Further, such retuning creates instability in the pitch as the strings refuse to settle.

Action Issues

A primary modern argument concerning the advantages of fretted clavichords is that, with the narrower string band, the treble keys are shorter than on unfretted clavichords and hence the action feels more uniform from bass to treble. This is a reasonable point. Ripin goes so far as to assert that the fretted action provides a "sensitivity and snappiness of attack that no unfretted clavichord can approach."[17] However, unfretted actions can also feel quite immediate and, if sometimes smoother than fretted actions, most certainly afford their own sense of intimacy with the sound production. The difference in feel between fretted and unfretted actions in a four-octave clavichord is less apparent than between a five-octave *bundfrei* clavichord and a four-octave pairwise-fretted instrument.

Further, the advantage of nearer-to-equal keylever length can be adjusted somewhat with balance points on the action of a larger instrument, and is in fact lost by one factor or another in some surviving fretted instruments whose builders seem not to have had the point especially in mind. (For example, the front-to-back measurements of the cases of three C-d^3 clavichords, from the same workshop, and of essentially the same design, differ only slightly, although one is *bundfrei* and the other two fretted.

The fretted 1741 Specken [Nordiska Museet, Stockholm, No. 33932] measures 404 mm front to back; the same measurement on a fretted 1758 Specken & Rosenau [Hälsinglands Museum, Hudiksvall,Sweden, No.5137] is 414 mm.[18] A c.1740 *bundfrei* Specken [private ownership] measures 438 mm front to back; it differs in this measurement from the 1758 instrument only by some 25 mm, and is 35 mm wider than the 1741 Specken. The layouts of these three clavichords seem to utilize essentially the same, perhaps "classic," design [also found in the 1716 Heinitz; see below] for both fretted and unfretted purposes.

The difference in string band width between the two earlier Speckens is only approximately 45 mm.[19] The keylever lengths, even in the treble, are certainly "within hailing distance" of one another.) The feel and responsiveness of a clavichord action depends also upon many other factors: string prelengths (from hitchpin to tangent), string diameters, string tension, pitch level, distance from tangent to strings, and even the wood chosen for the key levers. In fact, I might add that antique actions, on

all sorts of clavichords, are often more prone to blocking and other difficulties than is the case on many modern "reproductions," whose actions are often subtly modified.

One more argument claims that fretted clavichords are inherently louder than those that are unfretted, because of better proportions in the soundboard and fewer strings putting tension on it. (It has also been asserted in the modern literature that unfretted clavichords, especially the larger ones, tend to be louder than fretted clavichords. But size is no guarantee of greater resonance.) However, clavichords tend to have the greatest string tension in the bass, the zone where fretting is mechanically unfeasible; so the lack of 15 to 16 courses in the middle and upper ranges is perhaps not in itself overwhelmingly significant. (Whatever advantage fretting has in this sense is somewhat lost in the late five-octave fretted clavichords, built in a time when even the diatonic repertory appropriate to them expanded into the fashionable wider compass.)

The blanket assertion has also been made that the balance of the treble against the lower range is superior in fretted designs. In all but the best clavichords, fretted or unfretted, a slightly weak treble is a common fault. Based on my own experience with many antique and modern clavichords, I would say that "it all depends," in respect to both overall volume and treble balance. It is probably true that it is more difficult to build a fully successful *bundfrei* clavichord, but the good ones have at least as much volume as the most comparable fretted clavichords. (The latter often have a brighter sound, which can give the effect of loudness.) It is also of course fully within human capabilities to make an unsuccessful fretted clavichord. And generally speaking, some clavichords, like other instruments and voices, and like certain animals, produce a smaller sound that carries further than one that appears at close range to be louder.

Historical Use Of *Bundfrei* Clavichords

Another layer of confusion arises from misleading appearances regarding "early *bundfrei* clavichords." A misunderstanding of an 18th-century text caused generations of history books to state that Daniel Tobias Faber invented the unfretted clavichord in 1725.[20] Also, several early surviving unfretted clavichords possess diversely splayed keylevers that match the splaying typical of fretted designs. As Lance Whitehead has shown, the same keyboard ruler seems to have been used for four surviving instruments, two fretted and two unfretted, by the younger Johann Fleischer. Thus, the keys of the *bundfrei* clavichords are grouped as if the instruments were fretted.[21] The same may have been the case with a 1726 *bundfrei* clavichord (GG-c^3) by Johan Petter Roos, which also shows key-splaying of the fretted type.[22] That these look like transitional or experimental instruments has encouraged the idea that unfretted clavichords were not common until later in the century. Perhaps they were still experimental for the northern builders.

However, the earliest surviving unfretted clavichord yet discovered, by Johann Michael Heinitz (1716), shows no "experimental" splaying of the keylevers or anything else; rather, that and many other elements of Heinitz' instrument are reflected in many later unfretted clavichords of generally Saxon origin. As I have discussed elsewhere, this instrument, discovered only relatively recently, is not in itself altogether a particularly distinguished piece of work, but is clearly based on a fully worked-out design, already mature by 1716, that reappears in the early 1740s in several surviving clavichords of the same C-d^3 range by Philip Jacob Specken, a Saxon maker (trained by Gottfried Silbermann) who removed to Sweden. Some of the same features continue in the later Saxon tradition.[23]

Preference for unfretted

Against the modern, often specious arguments so vehemently favoring the fretted clavichord, there must be set the fact, already mentioned, that writers from 1693 and into the nineteenth century unanimously state that the best choice of clavichord is a *bundfrei* instrument. These authors include Johann Speth (who, as is commonly pointed out, does not appear to think the unfretted design at all novel in 1693); Adlung (who considers fully unfretted the best of all, and c. 1726 remarks that it has long been recognized as such); Samuel Petri; D.G. Türk (who clearly dislikes fretted clavichords, at least for art music); and C.F.G. Thon (who strongly advocates the *bundfrei* design and says fretted clavichords should be rejected on every ground; he cites cacophonies, and "disadvantages in playing and also in tuning."[24]

By 1802, maker Carl Lemme was offering clavichords of nearly every conceivable compass, but all unfretted.[25] It is interesting that C.P.E. Bach does not specify *bundfrei* clavichords in his 1753 treatise, but he advocates a temperament which, although only loosely described, sounds like equal temperament or something close to it, allowing use of all tonalities.[26] That he appears to assume easy

adoption of such a system suggests that he had unfretted clavichords primarily in mind. As is well established, composers who are known to have owned unfretted clavichords include C.P.E. Bach, Haydn, and Mozart.

Bach and the Unfretted Actions

The issue of fretted versus unfretted clavichords has caused much discomfort concerning the music of J.S. Bach, since his works sometimes require a *bundfrei* action to be fully realized on the clavichord. With unfretted clavichords somehow shunted by historians into the mid-eighteenth century, the seeker after authenticity either struggles with frets that will not deliver suspensions and that make legato playing awkward in "remote" tonalities, or seeks comfort in the harpsichord, which offers none of these problems.

Further, use of fretted clavichords for the art music of C.P.E. Bach and others can land the player in similar difficulties. In apparent support of such problems, it has sometimes been suggested that C.P.E. Bach's famous Silbermann clavichord (sadly not extant) was possibly a duple-fretted clavichord. However, Bach's Farewell to the instrument (*"Abschied von meinem Silbermannischen Claviere,"* Wq. 66) is written in the key of E Minor, a rather uncomfortable tonality for the usual type of pairwise fretting of the time and place. Notably, Bach slurs paired figures that would be fretted on a typical German fretted action (e#^{1} to f#^{1}, b. 23; b^1 to a#^{1}, b. 38; c#^{1} to b#^{1}, b. 51), creating a very awkward situation for the player, were the instrument actually fretted. The range of the piece, BB-e^3, coordinates with a contemporary mention of the instrument as having e''' for its highest note.[27]

C.P.E. Bach's Sonata in F Major, Wq. 55/2, from the first *Kenner und Liebhaber* collection, features extremely long tones with correspondingly extensive *Bebung* (vibrato) notations in its first movement, and the work was identified in a 1779 review (Hamburger Correspondent) as written specifically for Bach's Silbermann clavichord.[28] The sonata extends to f^3 in the treble and AA in the bass. If only the first movement is "Silbermann-specific," that movement's range of C-d^3 would obviously be congruent with a top note of e^3 on Bach's clavichord. If the entire Sonata were indeed for the clavichord in question, the instrument's compass must have been at least AA-f^3 or conceivably even FF-f^3; FF is commonly found on larger *bundfrei* clavichords even in the 1720s.

These compasses would not be unusual for an unfretted instrument made in the early-to-mid 1740s, as the Silbermann appears to have been. (Opinions vary as to its year of origin.) AA-f^3 is certainly a known range for pre-1750 fretted clavichords (cf. Henkel No. 21), but the tonality and details of the *Abschied* would appear to rule out the likelihood of the instrument being fretted, as do slurs over, and the simultaneous sounding of, f^2 and g- flat^2 in b. 27-30 of the second movement of the Sonata in F Major just cited.

A Change In Perspective

If, as modern authors have insisted, fretted instruments were so fine, why did the unfretted type evolve? As no one disputes, they developed because of a need for unrestricted use of different tonalities (one could temper them variously) and unhampered access to legato playing in all keys. On the other hand, if the fretted clavichord's advantages were not so extreme as is sometimes claimed, and since the treatise writers supported the unfretted clavichord so thoroughly, why did the fretted type coexist with the unfretted instrument for so long a time? As Ripin put it in 1970, Why was "the ultimate replacement of the fretted clavichord by the unfretted instrument so long delayed?" His answer was that the advantages and disadvantages of each were "very evenly matched" and the importance of the unfretted clavichord's unrestricted range of tonalities and legato finally allowed it to replace the fretted clavichord.[29]

With all respect to Mr. Ripin, since both types continued to be made well into the nineteenth century, and with even triple-fretted instruments appearing as late as the 1780s, the unfretted clavichord never superseded the pairwise-fretted instrument; neither type completely eclipsed the triple-fretted design, which likely operated off in its own corner. (Both fretted and unfretted clavichords appear to have been built even into the 1830s. Certainly, the 1807 fretted Schmahl clavichord at Finchcocks is well within the period of historical usage.) Competition or superseding are not to the point. Rather, it seems to be far more likely that each type of clavichord fulfilled its own function.

Specific Repertoires

That fretted clavichords seem so rarely to have been set in equal temperament suggests that these instruments were associated, perhaps primarily associated, with the comparatively clean intonation of meantone and other temperaments favoring the "natural" keys. If full

flexibility of temperament was desired, unfretted clavichords were of course available. To make even the fretted instruments equal-tempered would be to abandon what was, perhaps, their true main attraction: purer intonation in diatonic music by means of the unequal temperaments.

What point would there be in buying a more expensive *bundfrei* clavichord, if only to tune it in a system that worked perfectly well on less expensive (and often elegant) fretted clavichords? Repertory that did not stray from the established tonal boundaries hardly showed the disadvantages of fretted pairs. On this basis, perhaps the 20th-century arguments regarding action, soundboard loading, etc. were not the focus of those who used fretted clavichords.

The matter of musical function, however, would have remained a fundamental issue. Rudolf Rasch and others have argued persuasively for earlier use of equal temperament than has often been recognized; perhaps the fundamentals of fretted versus unfretted clavichord lay not in mechanics, but in preferences regarding intonation and specific repertory.[30] From the perspective of intonation, fully unfretted instruments were required for the most advanced and/or complex art music, from some time in the seventeenth century and throughout the eighteenth century. Pairwise-fretted clavichords must have found their *metier* with less adventurous art music, lighter repertory, devotional music in the home, amateur playing; and triple-fretted survivors were likely used for family music making, practice and/or travel instruments and, perhaps, something for the musically ultra-conservative.

With a more realistic positioning of the unfretted clavichord's timeline back into the seventeenth century, and consideration of the different likely functions of the different clavichord types, the modern player interested in authenticity need no longer agonize over playing Bach's Forty-Eight on a *bundfrei* clavichord, nor go through pyrotechnics to render C.P.E. Bach's more recondite music on a fretted clavichord.

1 Hubert Henkel, *Clavichorde.* (Leipzig 1981) (Musikinstrumenten-Museum der Karl-Marx-Universität Leipzig Katalog Band 4), 45.

2 Edwin Ripin, "A Reassessment of the Fretted Clavichord," *Galpin Society Journal* 23 (1970):41-42.

3 Although 18th-century fretted clavichords have greatly occupied modern builders, I would like to suggest that more attention is due those of the preceding century. A 17th-century short-octave clavichord in the Leipzig collection, Henkel's No. 6, is of a peculiarly interesting design, with the treble hitchplank some 5mm above the level of the treble bridge, strong side-draft, and a fairly heavy bridge. When examining this instrument, I was allowed to pull one unison up to pitch (c^2 at an A=415 level), and the tone's warm color, fullness, volume, and above all the very long sustaining power were amazing. No. 6 is a most impressive, powerful, and lyrical clavichord, an early counterpart to similar 18th-century instruments. It represents a style different from the light-bridged instruments of the same compass and era, whose bright, rather thin tone is concentrated in the attack, decaying rapidly thereafter. On the subject of the clavichord's prevalence in the Baroque and Classical eras, see Richard Troeger, "The Role of the Clavichord," in *Klavikordikirja*, ed. Pentti Pelto (Sibelius Academy, 2001):22-30; and of course Bernard Brauchli, *The Clavichord*, (Cambridge: Cambridge University Press, 1998).

4 Thomas McGeary, "Karl Lemme's Manual on Fortepiano and Clavichord Maintenance (1802)," *Early Keyboard Journal* 8 (1990):112.

5 Johann Speth, *Ars magna consoni et dissoni.* (Augsburg, 1693).

6 Jacob Adlung, *Musica mechanica organoedi* (Berlin, 1768), Book 2; facs. ed. Christhard Mahrenholz, (Kassel: Bärenreiter, 1961):148-149. This and other translations in this article are by the author unless otherwise indicated.

7 Johann Gottfried Walther, *Musikalisches Lexicon oder musikalische Bibliothek* (Leipzig: 1732; facs. ed. Richard Schaal, (Kassel & Basel: Bärenreiter, 1953): 118, col. 1.

8 Original text given in Ripin,"A Reassessment of the Fretted Clavichord2, 47-48, Note 10; and Brauchli, *The Clavichord,* 317 (quoting Ripin).

9 Daniel Gottlob Türk, *Klavierschule* (Leipzig and Halle, 1789; facs. ed. Erwin R. Jacobi, (Basel, London, New York: Bärenreiter, 1962), 5.

10 Johann Samuel Petri, *Anleitung zur praktischen Musik* (Leipzig, 1782; facs. ed. Bieging über Prien am Chiemsee: Emil Katzbichler, 1969), 332.

11 Türk, 5.

12 *Ibid.*

13 Bernard Brauchli, "The Clavichord in Christian Friedrich Gottlieb Thon's Keyboard Manual, *Ueber Klavierinstrumente* (1817)," *Journal of the American Musical Instrument Society* 9 (1983):81. Translation by Bernard Brauchli.

14 Thomas McGeary, "Karl Lemme's Manual":123. Translation by Thomas McGeary.

15 Five antique clavichords are discussed in this regard in Hans Erik Svensson, "Comments on the Tuning of some Fretted Clavichords in the Stockholm Music Museum," *Clavichord International* 10/1 (May 2006):17-20. The tangents of the first three instruments were so distorted that no firm conclusions could be drawn as to the original temperament, although meantone was seen as likely for all of them. A 1741 Specken had minimal tangent distortion and seems clearly to be set for quarter-comma meantone. A 1766 Rosenau appears to have been set originally for 1/6 comma tempering; further details are not given.

16 Ripin, "A Reassessment," 43-45.

17 *Ibid.*, 46.

18 Donald H. Boalch, *Makers of the Harpsichord and Clavichord, 1440-1840*, 3rd ed., ed. Charles Mould (Oxford: Clarendon Press, 1995), 639, 642.

19 Boalch, 3rd ed., 56.

20 Richard Troeger, "Bach, Heinitz, Specken, and the Early *Bundfrei* Clavichord," in ed. Thomas Donahue *Music and its Questions, Essays in Honor of Peter Williams*, ed. Thomas Donahue (Richmond, Virginia: OHS Press, 2007), 148. I have not examined in person the two fretted instruments.

21 Lance Whitehead, "The Clavichords of Johann Fleischer the Younger," *Clavichord International* 3/1 (May 1999):6.

22 Property of Jacobstads Museum, Jacobstad, Finland, No. 384. There is a photograph of the Roos instrument in Eva Helenius-Öberg, *Svenskt Klavikordbygge 1720-1820* (Stockholm: Almqvist and Wiksell International), 118.

23 Troeger, "Bach, Heinitz, Specken," 143-66.

24 Brauchli, "Thon's Ueber Klavierinstrumente," 81. Translation by Brauchli.

25 Thomas McGeary, "Karl Lemme's Manual," 126.

26 Carl Philipp Emanuel Bach, *Versuch über die wahre Art das Clavier zu Spielen* (Berlin, 1753 [Part 1]; facs. ed. Wiesbaden: Breitkopf & Härtel, 1986), 10.

27 Cited in David Schulenberg, "Why did the Clavichord Become C.P.E. Bach's Favorite Instrument?" in *De Clavicordio IV, Proceedings of the IV International Clavichord Symposium*, ed. Bernard Brauchli, Susan Brauchli, Alberto Galazzo (Musica Antica a Magnano, 2000): 51.

28 *Ibid*, 52.

29 Ripin, "A Reassessment," 45-46.

30 Rudolf Rasch, "Does 'Well-Tempered' mean 'Equal-Tempered'?" in *Bach, Handel, Scarlatti, Tercentenary Essays,* ed. Peter Williams (Cambridge University Press, 1985), 293-310.