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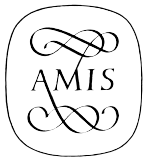

A Spanish Clavichord Tuning of the Seventeenth Century

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IT is easy to forget, given the modern musical emphasis on keyboard instruments with relatively stable pitch, how large the problem of keeping his instrument in tune must have loomed to the keyboard player of earlier times. In seventeenth-century Spain, the clavichord, called *monocordio*, was the most widely used keyboard instrument; not only was it in use among cultivated amateurs, but it was the instrument on which students prepared to play the organ, and even accomplished organists were accustomed to do their practicing upon it.

Cerone tells us that there was no instrument of wider range than the harpsichord, organ, or regal when these had the compass of a clavichord.[1] This compass most commonly extended through forty-two pitches from C to a'',[2] with $B\flat$ as the only chromatic pitch in the lowest octave.[3] Cerone adds that the strings of a harpsichord or clavichord could be expected to hold their pitch for only a few days at a time.[4] Considering the number of these pitches, the

1. Domenico Pietro Cerone, *El Melopeo y Maestro* (Naples, 1613), p. 1041.

2. In this article, pitch nomenclature will adhere to the following plan: $C-B\ c-b\ c'-b'\ c''-a''$, with c' standing for middle C.

3. Juan Bermudo shows such a compass by a chart in *Declaración de Instrumentos musicales* (1555), facs. ed., M. S. Kastner, ed. (Kassel, 1957), fol. lxij. Tomás de Sancta Maria defines the same limits of range in *Libro llamado Arte de tañer fantasia* (1565), facs. ed. (Gregg, 1972), fols. 2^v, 20^v. The same compass is implicit in the statement of Francisco Correa de Arauxo, that when you have tuned from a'' to b, half the instrument is done: *Libro de Tientos y discursos de música práctica y theórica intitulado Facultad orgánica* (1626), M. S. Kastner, ed. (Barcelona, 1948), I, 66ff.

4. *El Melopeo*, p. 1042.

necessity for tuning must have recurred with exasperating frequency.

The extent of the problem is evidenced by the fact that many theoretical works take the trouble to offer a system for tuning the clavichord. Among those procedures, the one proposed by Francisco Correa de Arauxo in his *Facultad orgánica*[5] is uniquely foolproof; yet it appears almost as an afterthought at the end of Correa's discussion of various other matters that he takes less for granted than this. Indeed, this portion of his treatise (which is appended to this article with an English translation) gives the impression that, had it not been for personal requests that he include his method for tuning, Correa would have omitted it altogether.

All tuning procedures primarily intended for the clavichord take into account one feature inherent in the design of the instrument at this period. As Tomás de Sancta Maria, Pedro Cerone, and Correa de Arauxo all agree, in some parts of the keyboard there are three keys, and in others four, that strike the same choir of two strings.[6] In a fretted clavichord of this sort, three or four tangents are aligned with one string at different distances from the bridge. Each tangent, therefore, produces its own pitch because it marks off a different sounding length of string. Tuning any one of these lengths necessarily brings the others to their proper pitch.

Before we turn to examine Correa's inspired use of this principle of construction, let us consider the more ordinary method proposed by Tomás de Sancta Maria in *Arte de tañer fantasia*.

Figure 1 reproduces the chart (fol. 122) by which Sancta Maria demonstrates the steps of his tuning. The text and chart agree as to the four octaves and two fifths which suffice to establish a bearing. The text then goes on to say that the tuning is completed by octaves; on the chart these are specified, but the first two intervals at the beginning of the second stage of the tuning, *d'–d* and

5. 1, 66.

6. Sancta Maria, *Arte de tañer fantasia*, fol. 122v, "en unos lugares hierē tres teclas en unas mesmas dos cuerdas, y en otros lugares hierē quatro teclas tābien unas mesmas dos cuerdas." Cerone, *El Melopeo*, p. 1046, repeats this phrase verbatim. Correa, *Facultad orgánica*, 1, 66, "templado uno quedā temṗlados tres o quatro, para por ellos regirse."

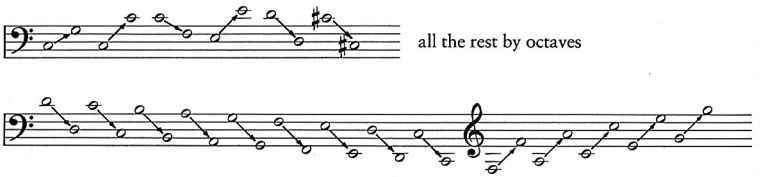

FIGURE 1.

c'–c, appear to be superfluous because they already constitute steps 5 and 2 of the bearing. We will have more to say about this inconsistency after we look more closely to see what the given tuning implies about the way the pitches are allocated to the strings.

If we represent the starting pitch and the second member of each tuned pair by a blackened breve on the appropriate line or space of a staff, and then use white semibreves to fill in the remaining pitches of the standard Spanish clavichord range, we may see at a glance which notes must have become tuned as a result of being fretted with others (Figure 2).

In placing the brackets so that they embrace all those semibreves that were put in tune along with any one breve, two points were borne in mind. First, one must proceed in accordance with the two descriptive clues in the text of the treatise; namely, that the pitches are bound in groups of three and four, and that from *d* down each key strikes its own choir.[7] Second, one must take into account the practical consideration that the extremes of any group should not form a minor third, because that consonance would not, then, be available for the harmony, since one choir of strings cannot sound two pitches simultaneously.[8] Choirs 2, 5, 7, and 9 do not violate the principle because no accidental may stand for its enharmonic equivalent in any of the systems of tuning then in use for keyboard instruments.

7. Fol. 122v, "y ansi tēplada una tecla, estā tēpladas tres o quatro teclas, ecepto desde desolre pa abaxo, đsde el q̄l cada tecla por si hiere dos cuerdas."

8. See Edwin M. Ripin, "The Early Clavichord," *The Musical Quarterly*, LIII (1967), 518–538.

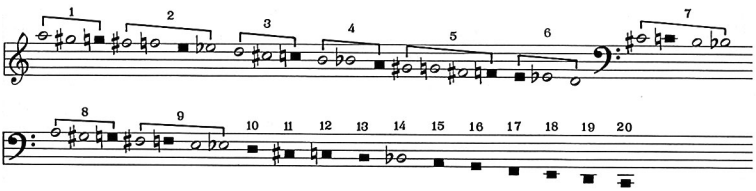

FIGURE 2.

The only pitch unaccounted for in the system thus portrayed is *B♭*. The theorists have told us it is there, and the music of the time certainly uses it, yet there is no provision for tuning it. Nor can it be bound to some other key, since all are independent from *d* down.

The question is all the more intriguing in that Cerone commits the same oversight in his own tuning for the *monocordio*.[9] It is tempting to conclude that in this, as in so much else, Cerone simply copied his predecessor. Yet Cerone does not parrot mindlessly, but often interjects his own clarifications. In the midst of a tuning description taken wholesale from Sancta Maria, for instance, he corrects Sancta Maria's faulty explanation of the mean-tone adjustment that must be made in tuning down a fifth from *c'–f*.[10] Furthermore, the specifics of his tuning method not only differ from Sancta Maria's, they even portray another instrument—one with twenty-four choirs as opposed to Sancta Maria's twenty. The similarities and differences may readily be seen by comparing Cerone's tuning as shown in Figure 3[11] with Sancta Maria's, already

9. *El Melopeo*, p. 1049.

10. Sancta Maria instructs the tuner to lower the *c'* for the sake of the smaller fifth of mean-tone tuning. This *c'* was tuned in the first step, however, and changing it would throw every pitch up to step 8 out of tune. Cerone suggests raising the *f* to accomplish the same end.

11. Instead of tuning the *c♯'* from the *c♯*, it seems likely that Cerone intended the *c♯* to be tuned from *c♯'*. This would provide a tuning, otherwise lacking, for the lower note. The higher one has already been put into tune by tuning the *c'*, which, if the pattern of fretting shown by the other steps of the bearing is consistent, would be on the same choir of strings. If this is indeed a mistake, it is one Cerone would not have made had he been copying Sancta Maria (Fig. 2).

shown in Figure 2. In view of such considerations, it hardly seems likely that Cerone's *B♭* is missing owing to blind copying.[12]

Let us now turn to Correa's "short and certain method," which is diagrammed in Figure 4. It is shorter in number of steps than Sancta Maria's system only by virtue of not repeating any tunings unnecessarily; however, it takes less time to use and is more certain

12. Edwin Ripin has proposed that Sancta Maria's omission may be explained by considering it in conjunction with the inconsistency of the repeated octave tunings, *d'–d* and *c'–c*. He suggests that these were really intended to set tunings for the missing *B♭* and *f*, assuming that Sancta Maria was dealing with an instrument that split the group from *e♭–f* between two choirs as in two Italian instruments of the time. Bermudo refers to a clavichord's having forty-two strings, a number that would fit such an instrument perfectly if it were provided with two strings to a choir as one would expect. Sancta Maria, however, has provided a tuning for *f* in step 3 of the bearing (Fig. 1), and it is from this *f* that the neighboring *e* is tuned for use in the next step of his method. Therefore, both *e* and *f* must have been served by the same choir of strings and Sancta Maria's clavichord must have had only 20 choirs, or a total of 40 strings. There is nothing very concrete to offer as an alternative explanation. One can imagine, however, that the repeated octaves might readily result as an oversight, if the writer had in mind primarily that each of the notes from *d* down had its own choir of strings, and had forgotten that the first two of these had already been tuned. No such simple explanation seems to exist for the missing *B♭*.

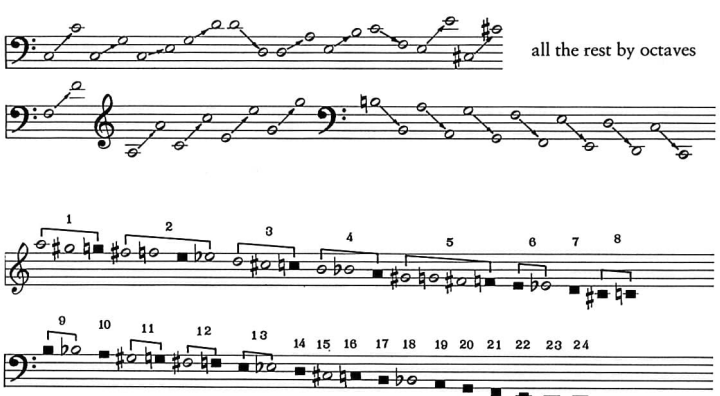

FIGURE 3.

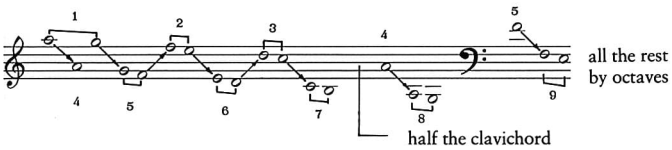

FIGURE 4.

in that it avoids the employment of any interval other than the easily tuned interval of the octave.

Correa gives more information than Sancta Maria on the fretting of the instrument, for he is explicit about exactly which other diatonic degree is put into tune by the tuning of any one pitch. Each second note of a bracket pair in Figure 4 is one of these pitches, and in Figure 5 they are represented on the staff by a blackened semibreve.

Comparison of Figures 2 and 5 discloses that Sancta Maria and Cerone are speaking about instruments with identical allocations of pitches to choirs. Although their procedures are, therefore, comparable, they differ in significant ways. The first point of difference lies in the choice of a starting place. Correa gives two reasons for electing to begin with the uppermost note. One is that the higher strings break more easily. Indeed, it is easy to see that if one followed Sancta Maria's system and started with a *c* for which there is no objective standard of pitch, by the time one reached the upper registers, one might readily be in the position of having to

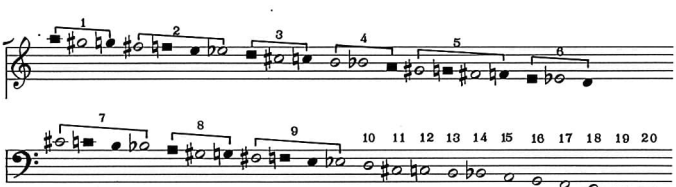

FIGURE 5.

tighten those strings more than their strength would allow. Starting with the highest string, which will be the one under the greatest tension when the instrument is in tune, avoids this problem completely.

The second reason Correa gives for beginning in the treble is that "when one string is tuned, three or four others are put into tune as a result of being controlled by them . . . a thing that does not happen in the basses."[13] Correa's advantage is not exclusive in this respect, however, for Sancta Maria achieves his bearing largely through choirs tuned by one of their pitches, even though he starts in a lower register.

The chief point of difference depends upon the kind of use to which each puts the fretting principle shown in Figures 3 and 5. Correa evidently noticed that a diatonic note that shared the use of a single choir of strings with its neighbor, shared the string with its higher neighbor in one octave, but with its lower neighbor in the next octave. For example, *a″* uses the same choir as *g″*, but in the octave below, *a′* shares a choir with *b′*. Because of this, he could proceed diatonically throughout the entire scale, tuning alternately downward and upward by octaves, with the last tuned note of one octave automatically setting its neighbor in tune for the next. In this way, the whole instrument could be put into tune using no interval other than the octave. The system is inspired in its ingenuity and, as far as is known, was hit upon by no other writer upon the subject, although the possibility of employing it was inherent in the design of clavichords as long as they retained fretting by threes and fours.

13. *Facultad orgánica*, p. 67.

MODO DE TEMPLAR EL MONACORDIO

Algunas personas me pidieron les pusiese en este libro, un breve y acertado modo de templar el monacordio, y a mi ver no ay otro mas acertado que templar por octavas, y començar por los tiples. Por octavas, porque aunque se afinen mucho no sucede lo que en las quintas, que afinandolas viene a quedar destemplado el instrumento: començar por los tiples, porque son los que peligran de quebrarse subiendolos mucho y porque templado uno, quedā templados tres o quatro, para por ellos regirse (como se vera) lo qual no sucede en los baxos.

Templareis a alamire agudissimo, que es tres con comilla 3′ afinando bien ambas cuerdas, y luego templareis con el su octava abaxo [fol. 26] que es alamire sobreagudo 3·. Templados estos teneis templado a gesolreut agudissimo 2′. Templareis con el su octavo abaxu que es gesolreut sobreagudo 2·.

METHOD FOR TUNING THE CLAVICHORD

Several people have asked me if I would include in this book a short and certain method for tuning the clavichord for them, and as I see it, there is no other more certain than to tune by octaves, and to begin with the trebles. By octaves, because, even when they have to be greatly tuned, the result is not, as with fifths, that putting them in tune ends in an instrument that is out of tune; to begin with the trebles, because they are the ones in danger of breaking in the course of raising them greatly, and because, when one string is tuned, three or four others are put into tune as a result of being controlled by them (as will be seen), a thing that does not happen in the basses.

You will tune *a″*, which is a three with apostrophe, 3′,[14] tuning both strings well, and to it you will then tune its octave below, which is *a′*, 3·. When you have tuned these, you have *g″*, 2′ tuned. You will tune its octave below to it, which is *g′*, 2·.

14. Spanish keyboard tablature uses the arabic numbers from 1 to 7 to represent pitch. 5–7=C–E; 1–7=F–e; 1–7=f–e′; 1·–7·=f′–e″; 1′–3′=f″–a″.

Templado este teneis templado a fefaut sobreagudo 1·. Templareis con el fefaut agudissimo 1′. Templado este, teneis templado a elami sobreagudo 7·. Templareis con el a elami agudo 7 Templado este teneis templado a delasolre agudo 6 Templareis con el a delasolre sobreagudo 6·. Templado este teneis templado a cesolfaut sobreagudo 5·. Templareis con el a cesolfaut agudo 5. Templado este teneis templado a befabemi agudo 4 y juntamente teneis templado la mitad de el monacordio, assi teclas blancas como negras, que es dende alamire agudissimo hasta dicho befabemi agudo catorzena abaxo. Templareis luego alamire agudo 3 ajustandolo con el sobreagudo 3· que ya esta templado. Templado aquel agudo dexais ya templado a gesolreut agudo 2. Passareis mas abaxo, y templareis a fefaut agudo 1 con el sobreagudo 1·. Templado aquel dexais ya tēplado a elami grave 7; luego yreis tēplādo las demas teclas blancas y negras, graves y sograves por sus octavas superiores, que ya todas estan tēplados: y con esto, y teniendo el diapason y los toquesillos su legitima cantidad, quedara el monacordio bien templado;

When you have tuned this, you have *f′*, 1· tuned. You will tune *f″*, 1′ to it. When you have tuned this, you have *e″*, 7· tuned. You will tune *e′*, 7 to it. When you have tuned this, you have *d′*, 6 tuned. You will tune *d″*, 6· to it. When you have tuned this, you have *c″*, 5· tuned. You will tune *c′*, 5 to it. When you have tuned this, you have *b*, 4 tuned, and altogether, you have one half the clavichord tuned, both white keys and black, which extends from *a″* to said *b*, a fourteenth below. Then you will tune *a*, 3, adjusting it to the treble a′ 3·, which is already tuned. When you have tuned that treble, you leave *g*, 2 already tuned. You will move farther down, and you will tune *f*, 1, to the treble 1·. When you have tuned that, you leave *e*, 7, already tuned; you will then proceed, tuning the rest of the keys, white and black, basses and sub-basses, by their octaves above, all of which are already tuned: and by this means, providing that the diapason[15] and the tangents have their correct measure, the clavichord will have

15. The diapason is the slotted rack at the back of the clavichord, which determines at what point the tangents will strike the strings.

y si aviendo hecho
esto bien, quedare algun
punto desafinado,
entēded que es falta de el
diapason o toquesillos,
porque en el temple de octa-
vas no puede aver engaño,
como en las demas cōsonancias
lo ay: remediarase este
defeto entortando el toque-
sillo hazia los tiples, si la
voz estuviere baxa, y si es-
tuviere alta hazia los baxos.
Y haziendo esto y guardando
todos los precetos dichos
atras, y que adelante se
advirtieren, tened por
cierto que aprovechareis
mucho en esta facultad.
Todo lo qual sea para hōra
y gloria de Dios, aumento
de su divino culto, y
aprovechamiento espiritual
nuestro, Amen.

Milford, Connecticut

been put into good tune; and if,
when you have done this well, there
remains any note out of tune,
understand that it is the fault
of the diapason or tangents,
because it is not possible to
be mistaken in the tuning of
octaves, as it is with the rest
of the consonances: this defect
will be remedied by bending the
tangent toward the treble if
the pitch is low, and if it is
high, toward the bass. Providing
that you do this and that you
observe all the aforementioned
precepts, as well as those to
come,[16] rest assured that
you will greatly improve
in this skill.
May all of which be to the honor
and glory of God, to the augmen-
tation of His divine worship, and
to our spiritual improvement,
Amen.

16. Correa prefixes a few observations to each composition, pointing out its particular features, among which might be mentioned mode, key signature, registration, rhythm, tempo, dissonance, or ornamentation.