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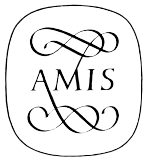

# Ramos de Pareja's "Brief Discussion of Various Instruments"

STANDLEY HOWELL

WRITING ABOUT MUSICAL INSTRUMENTS was one of the new elements of music theory that emerged during the last quarter of the fifteenth century, most conspicuously in the works of Johannes Tinctoris.[1] Earlier in the century instruments had received some notice in such sources as the biblical glosses of the French theologian Jean de Gerson, Paulus Paulirinus's encyclopedic dictionary of the arts and sciences, and best of all a workbook in mechanical design compiled by the Burgundian physician and astrologer Henri Arnaut de Zwolle;[2] but among music theorists, instruments were held to be of little account. The change in attitude is generally associated with Tinctoris's *De inventione et usu musicae* (1481–83), whose surviving fragments discuss not only instruments but performers and performing styles as well. But it is also noteworthy that Tinctoris's contemporary Bartolomé Ramos de Pareja made musical instruments an integral part of his *Musica practica,* published in 1482.

Ramos's treatise is justly famous for challenging several fundamental tenets of medieval theory. He discarded the ancient Pythagorean method of tuning the monochord as too complicated, favoring instead a simpler procedure that approximated mean-tone temperament. He also proposed replacing the traditional solmization system based on the hexachord, which had accrued to the name of Guido of Arezzo, with one of his own based on the octave. Even more sensational than Ramos's new ideas was the tone in which he expressed them. He dared suggest that the revered Guido was "perhaps a better monk than musician,"[3] and was openly contemptuous of

1. This transition is discussed with an emphasis on Tinctoris in Edward E. Lowinsky, "Music of the Renaissance as Viewed by Renaissance Musicians," in *The Renaissance Image of Man and the World,* ed. Bernard O'Kelly (Columbus: Ohio State University Press, 1966), pp. 129–77.

2. See Christopher Page, "Early 15th-Century Instruments in Jean de Gerson's 'Tractatus de canticis'," *Early Music* 6 (1978): 339–49; Standley Howell, "Paulus Paulirinus of Prague on Musical Instruments," this *Journal* 5–6 (1979–80): 9–36; George Le Cerf and E. R. Labande, *Instruments de musique du XV^e siècle: Les traités d'Henri Arnaut de Zwolle et de divers anonymes* (Paris: Éditions Auguste Picard, 1932).

3. Bartolomé Ramos de Pareja, *Musica practica,* ed. Johannes Wolf, Publikationen der Internationalen Musikgesellschaft, Beiheft no. 2 (Leipzig, 1901; reprint ed., Wiesbaden:

later theorists who followed slavishly in Guido's footsteps. To his contemporaries such flouting of hallowed tradition amounted to little less than heresy.

In such a context the milder innovation of Ramos's inclusion of instruments tends to be overshadowed. His main treatment of them comes early in *Musica practica* (book 1, treatise 1, chapter 6; henceforth indicated as chapter 1.1.6), following expositions of his monochord division, Greek note names, and the Guidonian hand. It was introduced at this point so that the reader could learn to use instruments other than the monochord as aids in learning to sing, which is the topic of subsequent chapters. Because instruments had only this limited function within the overall structure of *Musica practica,* chapter 1.1.6 is restricted to explaining how to identify the pitches generated by a few common instrumental types. But for these few instruments, and especially the lute and clavichord, Ramos provides some of the most detailed information we have concerning the tuning practices of his time. This article offers a brief introduction to Ramos's life and work, a text and translation of chapter 1.1.6, and a commentary on it that incorporates Ramos's remarks about instruments from other parts of *Musica practica.*

What we know about Ramos's life comes from his treatise and from the testimony of his disciple Giovanni Spataro.[4] He was born at Baeza in the Castilian diocese of Jaén, probably between 1435 and 1440. Concerning his education we are told only that he learned the rudiments of music from Juan de Monte, who was later (1447–57) a singer at the papal court. For a time Ramos lectured on Boethius at the University of Salamanca and even wrote a treatise, now lost, in Spanish. He boasted that Pedro de Osma, a distinguished theologian who was also known as an authority on music, had to admit upon reading this tract that Ramos's knowledge of Boethius was superior to his. Osma was a professor at Salamanca University from 1463 to 1478, and these dates suggest a time frame for Ramos's presence there. During this period Ramos also wrote a Latin treatise, *Introductorium seu Isagogicon,* which he recommended for further reading in the colophon of *Musica practica.* It has likewise not survived to the present.

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Breitkopf & Härtel, 1968), p. 11 (all page citations from Ramos's treatise in the present article refer to this edition).

4. The best summary of documents pertaining to Ramos is still Johannes Wolf's introduction to his edition of *Musica practica,* (ibid., pp. xi–xvi); additional information about Spanish musicians mentioned by Ramos is collected in Robert Stevenson, *Spanish Music in the Age of Columbus* (The Hague, 1960; reprint ed., The Hague: Martinus Nijhoff, 1964), pp. 55–56.

According to Spataro, *Musica practica* took ten years to write. Because that treatise makes reference to a number of contemporary Italian theoretical works, some unpublished, it is generally assumed that Ramos spent those ten years in Italy. All we know for certain is that he gave public lectures in Bologna for some time prior to *Musica practica*'s publication. Spataro, who attended these lectures, tells us that Ramos came to Bologna hoping to be appointed to a music professorship at the city's university. In anticipation of obtaining this position Ramos conceived an elaborate plan to publish his musical ideas in three parts: *Musica practica, Musica theorica,* and *Musica semimathematica.*

Unfortunately the Bolognese mathematics faculty was implacably opposed to the very idea of a chair in music and prevented its establishment. Ramos learned of this setback at about the time *Musica practica* was published, and in his disappointment he abandoned Bologna and eventually went to Rome. He took the unfinished manuscript of *Musica theorica* with him, intending to complete at least that much of his grand scheme, but Spataro relates that in Rome he fell into a dissolute way of life that precipitated his premature death. Apparently he never finished *Musica theorica*; certainly he made no further attempt at publication, even when Nicolo Burzio lashed out at his theories in 1487 with his own *Musices opusculum.* The task of defending Ramos against his critics was left to Spataro, whose *Honesta defensio* (1491) marked the beginning of a lifelong effort on behalf of his teacher's ideas. When Spataro wrote his book, Ramos was still living in Rome; of his later life and his death we have no record.

*Musica practica,* then, is Ramos's only surviving treatise. It is preserved in three printed copies, each of them slightly different: Bologna, Civico museo bibliografico musicale, A80 and A81, and Florence, Biblioteca nazionale centrale, A-7-35.[5] Bologna A80 and A81 bear the colophon dates May 12 and June 5, respectively. The final leaf, four internal pages, and the legend to one figure were reset for the second issue. Florence A-7-35 has the same final leaf as Bologna A80, but otherwise is essentially the same as Bologna A81. All three incunabula are full of spelling and grammatical errors; the reset pages in Bologna A81 and the Florence copy correct some mistakes, but introduce about as many more. In addition many diagrams and notational signs are incomplete or not printed at all. In Bologna A80

5. Concerning these editions see Albano Sorbelli, "Le due edizioni della 'Musica practica' di Bartolomé Ramis de Pareja," *Gutenberg-Jahrbuch* 5 (1930): 104–114; and Federico Ghisi, "Un terzo esemplare della 'Musica practica' di Bartolomeo Ramis De Pareia alla biblioteca nazionale centrale di Firenze," *Note d'archivio per la storia musicale* 12 (1935): 223–27.

and to a lesser extent in Florence A-7-35, these lacunae are filled in by hand, but the manuscript insertions do not always agree with the printed text.

My text is based on the edition by Johannes Wolf (see note 3), which normalizes spelling and silently corrects a variety of obvious printing errors. However, I have checked that edition against a facsimile of Bologna A81,[6] and this has permitted several new readings. All my emendations of Wolf's text, as well as Wolf's own emendations, are recorded in lettered footnotes. I wish to thank Patrick Gallagher, who prepared preliminary translations of much of the Ramos material included here in 1975, for allowing me to use his translations as a starting point for my own. Any remaining errors are mine.

## *Bartolomé Ramos de Pareja:* Musica practica, *book 1, treatise 1*

Capitulum sextum. Diversorum instrumentorum brevis notitia.

Ostensa mediocriter regularis monochordi divisione reliquum est, ut ad huius regulam vocem humanam redigentes alternatim elevare deprimereque doceamus. Hoc autem melius assequemur, si prius nobis diversorum instrumentorum, dum summa sequimur vestigia rerum, notitia declaretur, ut cum aliis etiam instrumentis organum naturale contemperare sciamus.

Horum autem alia[a] sunt, quae extensione nimia voces extenuant aut laxatione easdem obtundunt[b] et ad gravitatem remittunt. Sunt etiam chordae diversae et in longitudine et in grossitie, ut in cithara et lyra, polychordo, clavichordo, clavicimbalo, psalterio et in aliis pluribus instrumentis, quibus a posteritate nova sunt imposita vocabula et quo-

Chapter 6. A brief discussion of various instruments.

Having explained the division of the regular monochord in a tolerable fashion, it remains for us to teach how alternately to raise and lower the human voice in accordance with this rule. However, we always try to approach subjects in the best possible way, and we will understand [singing] better if first [some] knowledge of instruments is conveyed to us, so that we may learn how to combine the natural organ with other instruments.

Some instruments make pitches high by an extreme stretching [of strings] or lower them by a relaxation [of tension] and allow them to return to the low [register]. There are strings which also differ in length and thickness, as on the harp, lute, polychord, clavichord, harpsichord, psaltery, and many other instruments which have

*a.* alia] aliae

*b.* obtundunt *Wolf*] obtundant

6. Bartolomé Ramos de Pareja, *Musica practica,* facs. ed., ed. Giuseppe Vecchi, Bibliotheca musica Bononiensis, section 2, no. 3 (Bologna: Forni, 1969).

rum in secundo libro planam faciemus mentionem.

Omnia tamen haec nostram divisionem fugere non possunt. Etenim chordae monochordi, quae eiusdem sunt grossitiei, longitudinis et extensionis, si in eadem distantia fuerint percussae, eundem necessario sonum emittent, quemadmodum monochorda repperimus antiqua. Sed secundum quod propinquius vel distantius a loco, ubi torquentur, unaquaeque percutitur, acutiorem gravioremve[c] secundum proportionem divisionis superius datam sonum emittit.

Nunc autem non omnes chordae eiusdem grossitiei nec eadem extensione sunt temperatae. Ideo si a memoria caderet creberrimus musicae usus, consonantiarum veritatem per ista monochorda minime invenire possemus, sed ad priorem divisionem recurrentes sonos connotaremus. Si quis enim istud concorditer aptare voluerit, ad nostri instrumenti sonum convertatur, et illo perpenso istud cognoscet.

Sunt tamen aliqua ex novis monochorda unam habentia diapason ad partem acutiorem isto modo divisam; quoniam sex saltem chordae illo modo sunt temperatae et eiusdem sunt grossitiei, et tunc acumen aut gravitatem parva vel magna chordarum intercapedo tonorum aut aliarum specierum secundum commensurationem proportionis efficit. Sed quae ita sunt

been given names by the modern generation, and which we will discuss clearly in [our] second book.[7]

None of these instruments can escape our [monochord] division. Monochord strings that have the same thickness, length, and tension necessarily emit the same pitch when struck at the same place, as we find on old monochords. Depending on whether [a string] is struck nearer or farther from the place where it is wound [i.e., the peg], it emits a higher or lower pitch in accordance with its proportion in the [monochord] division given above.

But not all strings are equally thick or tuned with the same tension. Hence if [our] oft-mentioned discipline of music [i.e., Ramos's monochord division] were to fail the memory, monochords with such [unequal] strings would allow us to discern very little about the true nature of consonances; but we can understand the sounds [of these strings] by returning to the preceding division. If someone wants to tune such an instrument concordantly he should be directed to the sound of our instrument [i.e., the one-string monochord], and he will come to understand the former by examining the latter.

There are some monochords among the new [instruments] that have one octave in the upper register tuned in such fashion. Since a maximum of six strings are tuned in that manner and are equally thick, a small or large portion of these strings produces high or low [pitch] according to the symmetry of proportion for whole-tones or other intervals. [Instruments] made in this way

*c.* acutiorem gravioremve] graviorem acutioremve

7. The reference is to Ramos's *Musica theorica,* which was never completed.

facta, facillime temperantur, quoniam unicuique sono eiusdem diapason sua octava facillime concordatur.

Sunt et alia, quorum chordae sunt contrario modo dispositae, quoniam quanto digitus superpositis ad locum, in quo torquentur,[d] appropinquat, tanto sonos reddunt graviores et e contra, ut lyra. Sed hoc nostrae divisioni non obstat, quoniam chordarum impulsio non fit ex parte mediae chordae—a loco scilicet, a quo torquetur, ad *h*—, sed a loco ligaturae ad *h*. Sic ergo quanto digitus superpositus magis appropinquat ligaturae chordae, tanto sonus acutior erit, quoniam chorda brevior; et quanto magis ad locum, in quo torquetur, appropinquat, tanto gravius sonat, quia longior chorda est. Si hoc igitur instrumentum dividere voluerimus, permutatis litteris transpositisque idem eveniet, hoc est: *h* littera, ut prius erat, media remanente transponatur *q* ad locum *a* et *a* ad locum *q* et reliquae litterae unaquaeque in alterius locum transferantur.

Est autem tonus in duo semitonia divisus in quolibet novorum instrumentorum perfecto, sicuti nostro[e] meses et parameses per trite synemmenon, de qua divisione paulo post dicemus. Quando vero tonum in talibus facere

There are other [instruments], such as the lute, whose strings are arranged in the opposite manner [from the monochord], because the closer the stopping finger approaches the place where the strings are wound, the lower the pitches they yield, and vice versa. But this does not invalidate our [monochord] division, because the striking [of a lute string] does not occur below the middle of the string—that is, between the place where it is wound and the middle—but rather between the place where it is tied [i.e., the bridge] and the middle. Hence the closer the stopping finger approaches the place where the string is tied, the higher the pitch will be, because the sounding length will be shorter; and the closer the finger approaches the place where the string is wound, the lower it sounds, because the sounding length is longer. If we wish to tune an instrument in this [way], the same [division] will result after the letters have been exchanged and transposed; that is, the letter *h* will be where it was before, since it will remain the middle; *q* is transferred to the place where *a* was, and *a* to the place where *q* was [see fig. 1]. All of the remaining letters are transferred to the opposite places.

A whole-tone is divided into two semitones on all of the new fully chromatic instruments, just as *a* and *b* are divided by *b*♭ on our [monochord], a division we will discuss a little later.[8] When we wish to span a whole-tone on such

*d.* torquentur] torquetur

*e. Wolf adds* tonus *after* nostro

8. See *Musica practica,* pp. 34–36.

voluerimus, duas chordarum divisiones transire nos decebit. In hoc igitur instrumento usque ad semitonia sic diviso plures chordae ponuntur, aliae scilicet grossiores, aliae vero subtiliores. Utuntur autem nunc quinque sic dispositis, ut grossior in tota sua extensione sonet tono sub proslambanomeno, quod dicimus *Γut*, secunda parhypate hypaton diatessaron distans ab ea, tertia hypate[f] meson ditono altior ista; sed quarta mesen pronuntiet, quinta paraneten diezeugmenon, sive netes synemmenon sonum emittat, diapason et diapente sonans cum prima. Nec tamen hoc de necessitate fit. Aliis enim modis diversis concorditer disponi possunt, ut prima sit proslambanomenos, secunda lichanos, tertia mese et aliae alibi, et istae similiter alibi locari possunt ad arbitrium pulsantis. Sed quia hoc nunc magis in usu est, sic potius posuimus.

In aliis vero instrumentis, quae spiritu sonant, calamorum amplitudo secundum superius datam proportionem acumen faciet et gravitatem. Itaque calami, qui in duplo fuerint ampliores, diapason gravius sonent, et alii intermedii secundum maiorem minoremve longitudinem[g] graviores acutioresve sonos efficient, dum tamen apertura, ubi causatur sonus, et longitudini et grossitiei correspondeat.

Sunt et fistulae et sambucae, in quibus longitudo facit differentiam; nam istae[h] saltem octo foraminibus aperiuntur, ut digitis omnia possint obturari. Nam si plura essent, aut frustra

instruments it will be necessary for us to pass over two divisions of the strings. On this instrument [i.e., the lute] continuously divided into semitones many strings are employed, some thicker, some thinner. Now five are used, tuned so that the entire length of the thickest string sounds a whole-tone below *A*, which we call *gamma ut* [*G*]. The second string sounds *c*, a perfect fourth above the first; the third, *e*, a major third higher than that. The fourth will sound *a*, and the fifth should emit *d'*, which sounds an octave plus a perfect fifth with the first string. However, this is not done out of necessity. The strings can also be arranged harmoniously in various other ways; for instance, the first could be *A*, the second *d*, the third *a*, and the rest other pitches. Similarly, they can be tuned otherwise at the player's discretion. But we prefer this [first tuning] because it is now in wider use.

Among other instruments, which sound by means of the breath, the size of shawms will make [their pitch] high or low according to the proportion given above. Therefore shawms that have been made twice as long [as others] must sound an octave lower, and others of intermediate size will produce lower or higher sounds according to [their] greater or lesser length, provided that the hole in which the sound is produced also corresponds in length and width.

There are also recorders and pipes on which length makes a difference [in pitch]. Recorders are pierced by a maximum of eight holes, so that all can be covered by the fingers. If there were

*f.* hypate *Wolf*] lichanos *(see Commentary)*
*g.* longitudinem] grossitiem *(see Commentary)*
*h.* istae *Wolf*] ista

essent, quia claudi non possent inferiora, aut superiora discoperta manerent et sonum, quem non vellemus, emitterent. Quanto igitur foramina magis ad orificium accedunt, tanto sonos reddunt graviores, et quanto ad os pulsantis magis appropinquant, tanto acutius clamant. Sed si uniuscuiusque foraminis medietas digito claudatur, semitonium faciat[i] ad totam aperturam.

Sunt et alia huiuscemodi, diversa tamen, quoniam[j] quatuor tantum foramina cum orificio tenent et illis quatuor quemcunque cantum in acumine et gravitate comprehendunt, quod maxime mirandum est. Sed hoc fit, quia foramen idem sonum diapente et sonum diapason et utriusque et bisdiapason sub ad[k] supra potest facere et hoc, si spiritus emittitur in duplo vel in[l] triplo aut in quadruplo vel in trienti.

Sed de his quidem instrumentis plenam notitiam desiderantes et de eorum inventoribus qualiterque ad perfectionem paulatim devenerint, speculationem seu theoricam nostram inquirant, in qua mira et cognitu suavissima reperient. Quae si parvo huius primi libri volumine conclusissemus,[m] doctrinam fecissent impeditionem.[n] His igitur dimissis ad reliquum, ut polliciti sumus, naturale instrumentum deveniemus.

more, either they would serve no purpose because the lower ones could not be covered, or the higher ones would remain uncovered and emit a sound that we would not intend. The closer the holes come to the open end of the instrument, the lower the pitches they yield; and the closer they come to the player's mouth, the higher they sound. But should any of the holes be half covered by a finger, it would produce a semitone adjacent to [the pitch of] the open hole.

The other instruments of this kind [i.e., pipes] are different, however, because they have only four holes, counting the opening [at the end], and with these four can encompass any song in high or low [register], which is quite remarkable. This is possible because the same hole can produce a perfect fifth, an octave, those two combined [i.e., a twelfth], and a double octave from below to above if the breath is emitted in a double, triple, or quadruple amount, or [increased] by thirds.

Those wishing a complete account of these instruments, of their inventors, and of how they gradually reached perfection, should inquire into our *Speculation, or Theory*, in which they will discover wonders [that are] delightful to investigate.[9] If we had included these things in a small part of this first book, they would have constituted a hindrance to teaching. Setting these matters aside for the future, then, we will go on, as we promised, to the natural instrument.

*i.* faciat] facit
*j.* quoniam] *Bologna A80 has* quo nam *(Wolf)*
*k.* ad] aut *(see Commentary)*
*l.* in] *omitted in Bologna A81 and Florence A-7-35*
*m.* conclusissemus *Wolf*] conclusisemus
*n.* impeditionem] impeditiorem
9. Another reference to Ramos's lost *Musica theorica.*

### *Commentary*

Ramos's object in this chapter is to illustrate how the pitches he had discussed earlier in terms of the regular monochord—"regular" in the sense that it establishes a rule for measuring pitches—are produced on a variety of other instruments. His first task is to point out that strings on stringed instruments are not all identical to the monochord's string. Some instruments vary the tension with which the strings are tuned; others have strings of differing tension, length, and thickness. In the latter category Ramos lists the harp, lute, polychord, clavichord, harpsichord, and psaltery.

*Clavichords.* Next Ramos focuses on an instrumental type that could be particularly confusing to the student. This group consists of what he calls "old monochords" and "new monochords" (literally, "some monochords among the new [instruments]"). Neither of these is the one-string regular monochord, for which he consistently uses the singular form *monochordum.* Rather, both instruments, designated by the plural *monochorda,* seem to have been types of clavichord. (I have preserved this singular-plural distinction in my translation.) Walter Nef showed that the critical factor in identifying these instruments as clavichords is Ramos's statement that different pitches are produced when one of their strings is struck at different places along its length. "This can only happen when the sounding length is cut off at the same time that the string is struck, and there is only one instrument that works like this—the clavichord."[10]

That Ramos had keyboard instruments in mind is confirmed by a passage in chapter 3.2.4:

> Has etenim chordas sive tractus, quibus chordae percutiuntur, qui vulgariter teclae[o] sunt nuncupati, in monochordis[p] sic disponunt contemporanei nostri, ut tractus ordinis naturalis recto modo procedant[q] abiecto synemmenon, ut in prima mensurata ostendimus figura. At vero teclae[r] synemmenon et ordinum accidentalium aliquantulum super his elevatae ponuntur diverso depinctae colore, ut patet in figura.[11]
>
> Our contemporaries arrange those levers or extensions (called "keys" in the vernacular) which strike the strings on monochords in such a way that the extensions of the natural order (excluding B♭) proceed in a straight line, as we show in the first measured diagram [fig. 1]. The keys for B♭ and the accidental order, marked by a different color, are placed somewhat higher than these, as is clear from the diagram [fig. 2].

*o.* teclae] *Wolf reads* taedae
*p.* monochordis] monochordo *(see Commentary)*
*q.* procedant *Wolf*] procedunt
*r.* teclae] *Wolf reads* taedae

10. Walter Nef, "The Polychord," *Galpin Society Journal* 4 (1951): 22.
11. *Musica practica,* p. 101.

FIGURE 1.

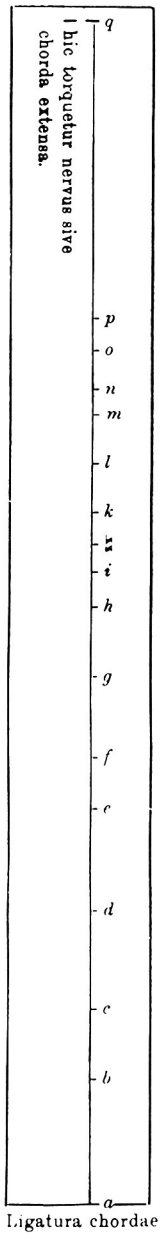


FIGURE 2.

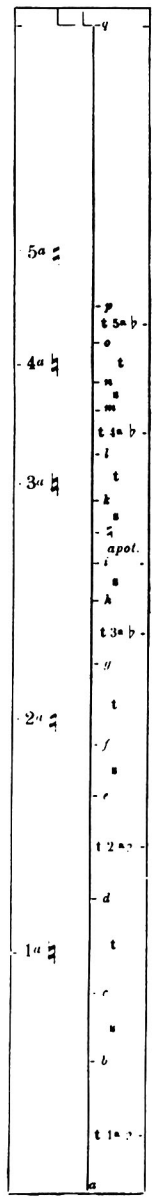


FIGURE 1. Ramos's diatonic division of the monochord (from Johannes Wolf's edition of *Musica practica,* Publikationen der Internationalen Musikgesellschaft, Beiheft no. 2 [Leipzig, 1901; reprint ed., Wiesbaden: Breitkopf & Härtel, 1968], p. 5). The legends read "here the stretched string is wound" (top) and "binding of the string."

FIGURE 2. Ramos's chromatic division of the monochord (from Wolf's edition of *Musica practica,* p. 36).

This is plainly a description of white and black keys on a keyboard. The original prints of *Musica practica* give the singular form *monochordo* here, but the phrase "strike the strings" shows that a multi-stringed instrument is intended. I have therefore emended to the plural form *monochordis* in conformance with Ramos's usage elsewhere. Ramos had some difficulty finding a Latin term for "key." The usual word was *clavis,* but Ramos reserved that term for the meaning "clef."[12] Both *chorda* and *tractus* are ambiguous, so he resorted to the Spanish equivalent for "key," *tecla,* to clarify his meaning. Chapter 3.2.4 features an explanation of the "good" and "bad" melodic intervals characteristic of Ramos's monochord division, which is illustrated in its most complete form by figure 2.[13] But figure 2 shows flats and sharps on both sides of the column representing the natural order, which does not match Ramos's description of accidentals raised above the natural scale. This may have been an error in typesetting for the printed edition.

Later in the same chapter Ramos's discussion of whether *a*♭ should make a "good" melodic interval with *a* or *g* caused him to mention that some of his contemporaries made both intervals "good" by utilizing different pitches for *a*♭ and *g*♯, achieved on keyboards by splitting the black key between *a* and *g*.

Quidam vero volentes utrique satisfacere parti aliam chordam inter tertiam ♭ et *h* interserunt, quam a tertia ♭ per commatis spatium distare faciunt. Hoc tamen non laudatur propter hoc, quia esset tunc aliud genus mixtum et non diatonicum simplex. Tristanus vero[s] de Silva, amicus noster, inter *f* et secundam ♮ aliam chordam dicebat esse interponendam.[14]

Some people, wishing to have it both ways, insert another pitch between *a*♭ and *a,* which they make a comma distant from *a*♭. However this is not recommended, because then another genus besides the simple diatonic would be mixed in. Our friend Tristano de Silva said that another pitch should be inserted between *f* and *f*♯.

Even this suggestion by Silva, a fellow Spanish theorist, did not meet with Ramos's approval, although he was clearly familiar with the practice. Ramos speaks here of adding an extra *chorda.* Because *chorda* normally meant "string," Mark Lindley assumed that Ramos had the harpsichord in mind, since the fretted clavichords of the time did not ordinarily have separate

*s.* vero *Wolf*] varo

12. See ibid., p. 27.

13. This chapter is discussed and in large part translated in Mark Lindley, "Fifteenth-Century Evidence for Meantone Temperament," *Proceedings of the Royal Musical Association* 102 (1975–76): 37–51.

14. *Musica practica,* p. 102.

strings for individual pitches.[15] But Ramos also used *chorda* to mean "pitch" and, as we have seen above, "key." Since this *chorda* is defined in terms of its distance from the pitch *a♭*, it is undoubtedly also a pitch. And since the only instruments mentioned in this chapter are the monochord and clavichord, Ramos probably had the latter in mind when he wrote about split keys.

Returning to chapter 1.1.6, let us consider the differences between "old" and "new" monochords. "Old" monochords are mentioned in conjunction with "monochord strings that have the same thickness, length, and tension." In other words, all their strings are tuned in unison. This was the earliest type of clavichord, and the name "old monochords" derives from the circumstance that all its strings were identical to that of the regular monochord.

"But," Ramos says, "not all strings are equally thick or tuned with the same tension." Since he does not mention a variation in length, he is probably still talking about strings identical in length to those on "old" monochords. "New" monochords have an extra group of six strings with varying thickness and tension, encompassing an octave in their topmost register. The implication is that the rest of their strings are still equivalent to those on "old" instruments; otherwise the highest six would not be exceptional. The six strings are "equally thick." It is not clear whether this means that they are consistent as a group and different from the rest or whether all strings on "new" instruments have the same thickness. Given the context of Ramos's presentation, however, the former possibility is more likely: if all the strings were of equal thickness, his earlier warning about inconsistent thickness would have been unnecessary. Finally, when he remarks that on instruments strung in this way "each pitch can easily be matched to the sound of its octave," he seems to be saying that each of the six strings is tuned to a different pitch. What we seem to have in the "new" monochords, then, are instruments whose main body of strings still matches that on "old" monochords, but whose highest register contains six thinner strings, each tuned to a different pitch.

"Old" and "new" monochords also differed at the lower extremes of their range. In chapter 1.2.7 Ramos proposes replacing the traditional Guidonian solmization system, which started on *G*, with a three-octave system of his own, starting from *C*. To justify this change he argues for the primacy of *C* among musical pitches, and concludes:

| | |
|---|---|
| Cum igitur octavam sub *c* ponimus vocem, ne mirentur Italici, quia constat | Therefore when we place a note an octave below *c* the Italians should not be |

15. Lindley, "Fifteenth-Century Evidence," p. 48.

non esse novum, sed frequentissime usitatum et omnia fere polychorda neotericorum illud habent. Antiquorum vero monochorda in eadem *c* gravi fecisse principium reperitur per instrumenta.[16]

astonished, since it is certainly not a novelty, but something very often used. Nearly all the polychords of modern musicians have it. We know from the instruments [themselves] that the monochords of earlier musicians began on *c*.

The opposition of "monochords of earlier musicians" and "polychords of modern musicians" here is much the same as that of "old" and "new" monochords in chapter 1.1.6. Are "new" monochords then polychords, or is "polychord" a generic term for multi-stringed instruments? Ramos's usage is not always clear, but at the beginning of chapter 1.1.6, in his list of instruments with strings of varying length, thickness, and tension, Ramos includes the polychord as a separate instrument among others that are generically polychords.

We learn more about polychords in chapter 1.2.5. The first half of this chapter is devoted to adding accidental sharps and flats to the traditional monochord gamut calculated in chapter 1.1.2 (see fig. 1).[17] The results of this process are represented in figure 2. Up to this point in his treatise Ramos had limited his discussion of the monochord to the range of the ancient Greek Greater Perfect System (*A* to *a'*), although his treatment of the Guidonian solmization system had caused him to mention pitches as high as *f''* and as low as *F*. After adding accidentals to the traditional range of the monochord, however, he confronted the decision whether to calculate any further pitches.

Si enim quintam habere voluerimus, tertia ♮ *q* quantitatem medio dividamus et erit supra *p* per duos tonos. Verum quia nihil sub proslambanomenon non nec supra neten hyperboleon in mensurata figura addere volumus, non eam ponimus, non ex eo, quod fieri non posset, sed quia ista tenuerunt antiqui et a Boetio sic traditam reperimus doctrinam.

If we wish to have a fifth [accidental sharp (i.e., *c*♯″)], we may divide the distance from the third sharp [i.e., *c*♯′] to the tuning pin in half, and [the fifth sharp] will be two whole-tones above *a'*. But because we wish to add nothing below *A* or above *a'* in the measured diagram [fig. 2] we will not put this [accidental] down,[18] not because it cannot be made, but because the ancient writers conceived this teaching, and we find it transmitted thus by Boethius.

16. *Musica practica*, p. 45.

17. Ibid., pp. 4–5, trans. Oliver Strunk, *Source Readings in Music History* (New York: W. W. Norton & Co., 1950), pp. 201–202.

18. The inclusion of *c*♯″ in figure 2 therefore seems to have been an error.

Quando ergo addere aliquid sub aut supra voluerimus non in eadem chorda, sed in diversis, facere poterimus concordantes illas chordas cum his divisionibus in una recte factis in diapason correspondentes ut puta: si unam chordam addere sub proslambanomenon voluerimus, taliter disponemus, quod in sono diapason aequisonet lichanos meson et erit *Γut*, et si aliam sub ista, cum parhypate meson aequisonabit in diapason, diapente cum parhypate hypaton, diatessaron cum prima coniuncta. Haec chorda erit, quam dicunt moderni retropolis, ut supra iam diximus, in qua paene omnia modernorum instrumenta, quae polychorda, in Italia reperimus incepta, etiam organa et alia instrumenta completa, quae per semitonia sunt divisa.

In Hispania vero nostra antiqua monochorda et etiam organa in *c* gravi reperimus incepisse. Sed modernorum polychorda et etiam organa octo voces sub *c* gravi in ordine ponunt naturali. Non tamen habent voces coniunctas ♮ quadrati sive ♭ mollis sub proslambanomenon, sed tantum est diapente recta sub *Γut*, ita ut *Γut* sit octava *g sol-re-ut*, retropolis octava sive diapason *f fa-ut* et alia diapason *e la-mi* aliaque *d sol-re* et alia *c fa-ut*. Octavam sub *d sol-re* id est diapason iam[t] hic Bononiae repperimus polychordum, sed sub *c fa-ut* non nisi in Hispania. Verum non refert, ubi quis incipiat, modo chordarum modi et divisiones semitoniorum et tonorum observentur.[20]

When we wish to add something above or below [these limits], not on the same string but on different ones, we can make those [additional] strings concordant with these correctly made divisions of one string [by] harmonizing in octaves. If we wish to add one string below *A*, we will tune it so that it sounds an octave with *g*, and it will be *G*. If we want another below that, it will sound an octave with *f*, a fifth with *c*, and a fourth with the first accidental [i.e., *B*♭]. This will be the pitch that modern musicians call *retropolis* [*F*], as we said above.[19] In Italy we find that nearly all the instruments of modern musicians which are polychords begin on this [pitch]; so do organs and other fully chromatic instruments which are divided into semitones.

In Spain we find that our old monochords and organs began on *c*, but the polychords and organs of modern musicians place eight notes below *c* in the natural order. However, they do not have accidental sharps or flats below *A*, but only the diatonic pentachord below *G*. Therefore, just as *G* is an octave below *g*, *F* is an octave below *f*. The other notes are those an octave below *e*, an octave below *d*, and an octave below *c*. Now we have found a polychord here in Bologna with an octave below *d*, but those with an octave below *c* are found only in Spain. However, it does not matter where one starts so long as he adheres to the [correct] measurements of strings and divisions of semitones and whole-tones.

Ostensibly Ramos had been discussing the regular monochord in this chapter. But when he speaks of adding pitches, "not on the same string but on

*t. c fa-ut.* Octavam sub *d sol-re* id est diapason iam] *Wolf reads c fa-ut* octava sub *d sol-re* idest diapason. Iam

19. *Musica practica*, p. 30.

20. Ibid., pp. 36–37.

different ones," he is clearly referring to a multi-stringed instrument, with at least one string (but probably more) tuned in unison with the monochord and others, at the lower extreme of its range, tuned to various pitches. No instrument is named, however, until Ramos begins again to compare modern polychords, which possess these low strings, to "old" monochords, which evidently do not. Now we also learn that polychord ranges varied with national origin as well as time. "Old" monochords and organs in Spain started on *c*; no low note is specified for old Italian instruments. But at the time Ramos was writing, most Italian polychords, organs, and other fully chromatic instruments (keyboards?) began on *F*, while their Spanish counterparts descended to *C*. Ramos also mentions coming across a polychord in Bologna that possessed a low *D*, but this was apparently exceptional.

As I have translated them, Ramos's remarks about the lowest octave on Spanish polychords constitute an unequivocal description of a short octave, whose salient characteristic is the omission of sharps and flats (excepting B♭). Ramos's account has long been accepted as the earliest evidence for this technical feature, which is supposed to have become common on stringed keyboard instruments during the sixteenth century. However, Nicolas Meeùs has disputed this assumption.[21] He argues that the short octave did not evolve fully much before 1550, and that Ramos's comments are not specific enough to preclude the availability of accidentals in the lowest register. Because this is a rather important point for our understanding of the development of sixteenth-century keyboards, I think it is worth a digression in order to examine the matter carefully.

Meeùs's preferred translation of the passage in question runs as follows:

> But modern polychords and organs have eight tones below *c* in the natural order. However, they do not have the tones pertaining to hexachords there, neither the soft or hard [hexachord], below *A*, but only a normal fifth below *G*. . . .[22]

In this rendering Ramos says nothing in particular about the presence or absence of accidentals. As Meeùs would have it, he is simply pointing out

21. Nicolas Meeùs, "Bartolomeo Ramos de Pareja et la tessiture des instruments à clavier entre 1450 et 1550," *Revue des archéologues et historiens d'art de Louvain* 5 (1972): 148–72; idem, *The New Grove Dictionary of Music and Musicians*, s.v. "short octave."

22. "Mais les polycordes modernes et les orgues ont huit sons sous le *c* dans l'ordre naturel. Ils n'en ont pourtant pas des sons appartenant à des hexacordes, ni par bémol ni par bécarre, en dessous du *A*, mais il y a seulement une quinte régulière sous *G* . . ." (Meeùs, "Bartolomeo Ramos," p. 166).

that the hexachord system of solmization syllables, which traditionally did not extend below *G*, does not apply to the pitches at the bottom of the polychord. This reading hinges primarily on the meaning of *coniunctas*, which I have given as "accidentals" and Meeùs as "hexachords." Some fifteenth-century theorists sought to account for the existence of accidentals other than B♭, which lay outside the Guidonian hexachord system, by imagining an additional set of hexachords that incorporated chromatic degrees. For example, to account for E♭ it was necessary to construct a hexachord on B♭ (B♭–C–D–E♭–F–G), because a flatted note was always sung with the solmization syllable *fa*, and *fa* was the fourth scale degree of every hexachord. Such hexachords were called *hexachorda coniuncta*, or "conjunct hexachords."

However, while theorists paid lip service to the idea that accidentals existed within a system of conjunct hexachords, most of them simply used the adjective *coniuncta* as a noun referring to the accidentals themselves. Tinctoris, for example, gave the following definition:

> Coniuncta est dum fit de tono regulari semitonium irregulare aut de semitonio regulari tonis irregularis. Vel sic.
>
> Coniuncta est appositio b rotundi aut bquadri in loco irregulari.[23]

> *Coniuncta* is when an abnormal semitone is made out of what is normally a whole-tone, or when an abnormal whole-tone is made out of what is normally a semitone. Or:
>
> *Coniuncta* is the application of a flat or sharp to an abnormal scale degree.

In the second part of this definition Tinctoris is definitely speaking of pitches, not hexachords. Meeùs makes much of a passage from *Musica practica* in which Ramos disapproves of this particular definition, and concludes, "It is clear that Ramos does not intend the term *coniuncta* in the same sense as Tinctoris. . . . The fundamental difference between [them] . . . is that whereas for [Tinctoris] *coniuncta* is the chromatic degree by which a whole-tone is divided into two semitones, for [Ramos] it is the hexachord through which this chromatic degree may be constructed in theory."[24]

Unfortunately Meeùs did not investigate sufficiently Ramos's reasons for disagreeing with Tinctoris. Ramos begins his treatment of accidentals

23. Johannes Tinctoris, *Dictionary of Musical Terms* [Terminorum musicae diffinitorium (1472–73)], ed. and trans. Carl Parrish (New York: Free Press of Glencoe, 1963), p. 14 (my translation).

24. Meeùs, "Bartolomeo Ramos," pp. 159–60.

by quoting a rule that he attributes to the followers of Guido.[25] It specifies that accidental flats may be added only to those scale degrees that carry the syllable *mi* in the Guidonian system (i.e., *B, e, a, e', a'*[26]), so that *mi* is changed to *fa*. Similarly, accidental sharps are permissible only where the syllable *fa* is found (i.e., *c, f, c', f', c''*). "They call these *coniunctae*," he says.

Diffiniuntque hoc modo: Coniuncta est facere de semitonio tonum et de tono semitonium, sic et de semiditono ditonum et de ditono semiditonum et de aliis speciebus similiter. Et sic bene dicunt, quia ad modum diezeugmenon et synemmenon tetrachordorum se habent ista hexachorda coniuncta.

And they define the term in this way: "*Coniuncta* is to make a whole-tone out of a semitone and a semitone out of a whole-tone; also, to make a major third out of a minor third and a minor third out of a major third; and similarly for other kinds [of intervals]." And they are right, because these conjunct hexachords are constituted after the manner of the *diezeugmenon* and *synemmenon* tetrachords.

Semotus a vera cognitione Johannes Tinctoris sic ait: Coniuncta est positio [sic] ♭ aut ♮ in loco irregulari. Nam si signum ♭ mollis poneretur in *c sol-fa-ut* vel in alio loco, ubi *fa* esset, irregulariter esset positum et tamen coniuncta non esset, ita si ♮ quadrum ubi *mi*.

Johannes Tinctoris was far from the truth when he said: "*Coniuncta* is the placement of a flat or sharp on an abnormal scale degree." For if a flat sign were placed on *c sol-fa-ut* [*c'*] or on another degree where there is a *fa*, it would be so placed abnormally, yet it would not be a *coniuncta*; and similarly if a sharp sign were placed where there is a *mi*.

In other words, *c'* is an abnormal place for a flat, as is every pitch other than *b*♭ and *b*♭*'*. But a flat can produce a *coniuncta* only on a scale degree that carries the syllable *mi*, and *c sol-fa-ut* has no *mi*. So we see that Ramos objected not to Tinctoris's definition of *coniuncta* as an accidental, but to the imprecision of that definition, which permits a flat or sharp on any scale degree.

Here, and once more in a later chapter,[27] Ramos makes passing reference to the similarity between conjunct hexachords and the *diezeugmenon* and *synemmenon* tetrachords in the Greek Greater Perfect System.[28] Other-

25. *Musica practica,* pp. 29–30.

26. Since *b*♭ and *b*♭*'* were a normal part of the Guidonian system, they were not considered accidentals.

27. *Musica practica,* p. 37.

28. The *diezeugmenon* tetrachord (*a–b*♮*–c'–d'*) was part of the original Greater Perfect System; the *synemmenon* tetrachord (*a–b*♭*–c'–d'*) was added later to introduce *b*♭ and thus make modulation possible. The relationship between these tetrachords is analogous to that between Guidonian and conjunct hexachords.

wise the phrase *hexachorda coniuncta* is not used. In chapter 1.2.3 he explains how to construct hexachords that will accommodate accidentals, but there and everywhere else in *Musica practica* he consistently applies the term *coniuncta* to specific accidental pitches. In his description of the bottom octave on Spanish polychords he leaves no room for doubt of his meaning by using the phrase *voces coniunctas*. *Voces*, in its connotation "syllables," was universally employed by medieval theorists to designate solmization syllables and, by extension, the pitches to which those syllables belonged. Thus *voces coniunctas* unambiguously refers to accidental pitches, not conjunct hexachords.

Meeùs also questions the connotation of two other phrases in Ramos's polychord discussion: *ordo naturalis* and *diapente recta*. Ramos equates the "natural order" with the pitches contained within the Guidonian hand, which excludes all accidentals except B♭.[29] *Musica recta* normally encompassed the same pitches, so that a *recta* fifth would not ordinarily have contained accidentals. Meeùs contends that because the Guidonian hand did not reach below *G* (or sometimes *F*) these terms could not be applied in their technical meaning to any lower notes. For the polychord's lowest register, he insists, they could be used only in a very general sense, and do not suggest the absence of accidentals.[30] We have seen, however, that in later chapters of *Musica practica* Ramos expands the Guidonian gamut to include *C*, and it is apparent, though never explicitly stated, that he regarded these additional low notes as a normal part of *musica recta* and the *ordo naturalis*. But even if Ramos's usage of these terms left some room for debate, his statement that Spanish polychords have only eight notes below *c* does not. He names five of these pitches: *C, D, E, F,* and *G*. The other three are *A*, *B*♭, and *B*♮, which had been calculated earlier and are included in figure 2. There is no other way to interpret this statement; there is no room for accidentals below *A*. Hence none of Meeùs's arguments obscure the fact that Ramos is describing a short octave.

Having determined what Ramos has to say about clavichord types, we must now investigate how this information corresponds with what we know from other sources about the instrument's evolution in the fifteenth century. Clavichords with all their strings tuned in unison—Ramos's "old monochords"—were described for the first time in 1434 by Georgius Anselmi and remained in use long enough to be mentioned in Sebastian Virdung's *Musica getutscht* of 1511.[31] Such instruments appear to have had

29. *Musica practica*, p. 34.

30. Meeùs, "Bartolomeo Ramos," p. 153.

31. Georgius Anselmi, *De musica*, ed. Giuseppe Massera, Biblioteca degli "Historiae mu-

fewer than a dozen strings, each struck by three or four keys, and a maximum range of about three octaves. Because of the unison tuning, the tangents at the inner ends of the keys had to be placed so as to strike the strings at intervals conforming to strict monochord ratios.

This design is simple to lay out and easy to keep in tune; but, as Edwin Ripin has made clear, it imposes severe physical restrictions on the instrument's range.[32] If the compass is extended much beyond three octaves, the distance between tangents in the uppermost register becomes so small that the corresponding keys are too thin to support the tangents. To provide the minimum necessary space between tangents, the strings must be tuned to a lower pitch. But any such increase in sounding length at the top of the range is magnified eight times in the low register, where the tangents on a three-octave instrument are already so widely spaced that the keys are sharply bent. Lowering the strings' pitch any further would bend the bass keys to the point where they would not operate.

Both of these problems vanish when the strings are not all tuned in unison. The earliest evidence we have that this alternative was being explored is found on a clavichord depicted in the intarsiated *studiolo* of the Ducal Palace at Urbino, Italy.[33] The intarsia was executed between 1479 and 1482, or about the same time Ramos was writing *Musica practica.* Its images are so detailed and precise that Ripin was able to diagram the clavichord's stringing and tangent layout.[34] The instrument had a range of *F* to *f‴* (lacking *F*♯ and *G*♯) and seventeen pairs of strings, each tuned to a different pitch. Independent tuning of the strings not only allowed room for additional keys in the treble, but eliminated all wasted space between keys that strike adjacent strings. Moreover, each bass note below *c* had its own string. Because the distance between notes on a single string tuned to *F* is more than an inch in this register, this innovation saved a great deal of space and permitted downward expansion of the compass without excessive bending of the keys.

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sicae cultores," no. 14 (Florence: Leo S. Olschki, 1961), p. 126; Sebastian Virdung, *Musica getutscht* (Basel, 1511), facs. ed., ed. Klaus Wolfgang Niemöller, Documenta musicologica, ser. 1, vol. 31 (Kassel: Bärenreiter, 1970), fol. E iii.

32. Edwin M. Ripin, "The Early Clavichord," *Musical Quarterly* 53 (1967): 531–34; idem, *The New Grove Dictionary,* s.v. "clavichord."

33. Reproduced in Ripin, "The Early Clavichord," plate 2, and idem, *The New Grove Dictionary,* s.v. "clavichord," plate 3.

34. Ripin, "The Early Clavichord," fig. 3B; Mark Lindley, "Pythagorean Intonation and the Rise of the Triad," *Research Chronicle* (Royal Musical Association) 16 (1980): 13, concludes that this intarsia utilizes the same meantone temperament that Ramos advocates for his monochord.

Ramos's polychord possessed most of the Urbino intarsia's essential characteristics. It too had separate strings for each note in the extreme bass, although this arrangement began below *A* rather than *c*. Ramos's six treble strings tuned to different pitches must have been intended to permit spreading of the highest tangents. If he was being precise in stating that these six strings covered only an octave, they would have carried an average of just two tangents each, which is extravagant compared to the three, four, and even five tangents per string on the intarsiated instrument.

Despite these similarities there is a fundamental difference in concept between Ramos's polychord and the Urbino clavichord. Although the polychord utilized multiple tunings for the strings in extreme registers, it apparently retained the older method of unison tuning for its central body of strings. It was therefore a hybrid, incorporating those innovations necessary for an expansion of range without abandoning the older tuning entirely. It is difficult to tell whether the polychord represents a transitional stage between the "monochords" and a true clavichord or simply a compromise that coexisted with the more efficient method. Ramos's treatise and the Urbino intarsia are contemporary, and there is no evidence to show that the polychord tuning came first. Ramos may have been familiar with both arrangements: at the beginning of chapter 1.1.6 he listed both polychord and clavichord among instruments with strings of varying length, thickness, and tension. A difference in tuning very likely distinguished these instruments in his mind, and perhaps he reserved the name "clavichord" for the instrument with each string tuned to a different pitch.

*Lute.* Turning to another kind of stringed instrument, Ramos used the *lyra* to illustrate that the same proportions of sounding length that generate pitches between stopping point and tuning peg on the monochord also apply in reverse to strings whose sounding length lies between stopping point and string fastener. We are told that the *lyra* had five strings, which were struck (or plucked), stopped by the fingers, and divided into semitones, apparently by frets. This information, together with the tunings Ramos supplies, are sufficient to identify the *lyra* as a lute. One other contemporary treatise, Tinctoris's *De inventione et usu musicae,* employs *lyra* as a name for the lute.[35] It is not surprising that there should be shared terminology between these two authors. We have seen that Ramos cited Tinctoris's *Diffinitorium,* which was written in the early 1470s but not published until about 1494. Ramos must have known the *Diffinitorium* in manuscript, and it is

35. See Anthony Baines, "Fifteenth Century Instruments in Tinctoris's *De inventione et usu musicae,*" *Galpin Society Journal* 3 (1950): 21.

quite possible that he also had access to *De inventione et usu musicae* prior to its publication.

The original text of Ramos's primary lute tuning contains one important conflict. It stipulates that the third string should sound *g* (*lichanos meson*), and states that this is a major third higher than the second string. But the second string sounds *c*, and a major third above this would be *e*, not *g*. If the third string's pitch is correctly identified, we would have the tuning *G–c–g–a–d′*, an inefficient but not impossible arrangement. On the other hand, if the interval is accurate the tuning would be *G–c–e–a–d′*. To resolve this conflict, it will be instructive to look at other contemporary evidence for lute tunings.

In his recent article on the fifteenth-century lute, Christopher Page surveys sources for period tuning practices.[36] He includes a translation of the passage under dispute from *Musica practica,* but he does not consider the first alternative given above and twice renders the second incorrectly as *G–c–f–a–d′*. Only one of the other sources Page mentions, Elio Antonio de Nebrija's *Vocabulario español-latino* (1495?),[37] appears to supply specific pitches. Nebrija defines each of the lute's five strings with Latinized Greek words (*nete, paranete, hypate, parhypate, mese*) that resemble the first elements (only *mese* is self-sufficient) of Greek note names. Several completions are possible for each name, so Page chose the ones that result in the nearest approximation to a familiar lute tuning: *B–f–a–d′–a′*. Even with multiple choices available Page could not produce a better interval than a tritone between the bottom two strings, and he found it necessary to alter *B* to *c*. At this point one might well ask if there is another way to interpret this text. In fact there is: if we translate the meaning of these Latinized Greek terms rather than their possible connotation as incomplete note names, we find that they say the same thing as the parallel Spanish:

| | |
|---|---|
| Cuerda de laud[38] primera. | Principal string of the lute. |
| *Nete, es.* | *Lowest [string].* |
| Cuerda cerca de aquesta. | String next to that one. |
| *Paranete, es.* | *Next-to-lowest [string].* |
| Cuerda de arriba o bordon. | Top (or bass) string. |
| *Hypate, es.* | *Highest [string].* |

36. Christopher Page, "The 15th-Century Lute: New and Neglected Sources," *Early Music* 9 (1981): 13–16.

37. Facsimile in the series Academia española, Madrid, Colección de facsimiles, ser. 2, vol. 4 (Madrid: Talleres tipogràficos de la Editorial Castalia, 1951).

38. Later in the *Vocabulario* Nebrija defines *laud* as *testudo* ("tortoise shell"), a term Tinctoris and some later writers used as a name for the lute.

| | |
|---|---|
| Cuerda cerca de aquesta. | String next to that one. |
| *Parhypate, es.* | *Next-to-highest [string].* |
| Cuerda de medio. | Middle string. |
| *Mese chorda.* | *Middle string.* |

What we have here are Greek names, not of pitches, but of the lute strings themselves.

Page indicates that Tinctoris fixed the intervals between strings of a five-string lute at fourth–third–fourth–fourth, matching the layout in the second of the possible Ramos tunings. But Tinctoris mentioned both five- and six-string lutes, tuned in fourths with a third between "two middle strings,"[39] an ambiguous statement applied to a five-string instrument. The last of Page's sources, however, does confirm the second Ramos alternative. This is a set of instructions on how "to sette a lute" in a notebook believed to date from the 1490s (Cambridge, Trinity College, Ms. 0.2.13, fol. 97$^{v}$), which calls for five strings in a fourth–third–fourth–fourth configuration. This same arrangement is required for a group of lute tablatures in a fascicle of the Königstein Song Book copied around 1470–73.[40] Hans Tischler considers *d–g–b–e′–a′* the most plausible tuning for the realization of these tablatures,[41] but other pitches (including Ramos's) are possible. These two pieces of evidence suggest that a major-third interval between the second and third strings in Ramos's first tuning is correct, and that the pitch-name *lichanos meson* (*g*) should read *hypate meson* (*e*). Wolf already suggested this emendation, and I have adopted it in my edition.

Ramos's second tuning indicates pitches for only three strings (*A–d–a*), leaving the "other pitches" for the last two strings unspecified. It is not clear whether Ramos has not finished giving us an actual lute tuning in use at his time, or whether he is simply illustrating the fact that other tunings are possible. But certainly we may infer that he was familiar with more than one tuning, whether the alternatives were in any way standardized or not.

*Shawm.* Wind instruments of varying length also correspond to one another's pitch in accordance with monochord proportions, and Ramos uses the *calamus* family as an example of this. In general, *calamus* meant "reed," but in the Middle Ages it was commonly used to designate the shawm. (English "shawm" is ultimately derived from *calamus*.) Since reeds alone do not

39. Baines, "Fifteenth Century Instruments," p. 22.

40. *Das Königsteiner Liederbuch: Ms. germ. qu. 719 Berlin,* ed. Paul Sappler, Münchener Texte und Untersuchungen zur deutschen Literatur des Mittelalters, vol. 29 (Munich: C. H. Beck, 1970), pp. 326, 375, 377, 379.

41. Hans Tischler, "The Earliest Lute Tablature?" *Journal of the American Musicological Society* 27 (1974): 100.

generate definite pitches, Ramos is undoubtedly referring to shawms. His vocabulary for comparing shawm sizes is confusing. *Amplitudo* and *amplius* are general terms for "size" and "larger," but *grossities,* found in the 1482 prints of this passage, is elsewhere consistently used by Ramos to mean "width." The pitch of wind instruments depends on sounding length, not width, so I have altered *grossitiem* to *longitudinem.* Ramos's closing comment about aperture size apparently has to do with the practice of fine-tuning woodwind instruments by increasing or decreasing the size of finger holes.

*Recorder and three-hole pipe.* Finally, Ramos considers two other woodwinds, the *fistula* and *sambuca. Fistula* (literally "tube") was a broad term for members of the flute family and sometimes for organ pipes. The eight holes on Ramos's instrument—presumably seven finger holes and a thumb hole—identify it as a recorder, since cross flutes lacked thumb holes in this period.

*Sambuca* was the name of a stringed instrument in antiquity, but to some medieval authors it signified a woodwind.[42] Ramos gives an unmistakable description of a three-hole pipe. This recorder type had only two finger holes and a thumb hole, usually manipulated by the left hand while the right beat a small drum in the familiar pipe-and-tabor combination. Its tapering bore enabled the player to generate several harmonics above the fundamental of each finger hole by overblowing. As a result it was possible to play a substantial diatonic scale utilizing only three holes, and this exceptional capacity for note production prompted Ramos's fascination with the instrument. His list of available harmonics is incomplete, and one phrase in that list makes little sense as it appears in the original prints. There Ramos seems to be saying that a single hole can produce a fifth, octave, twelfth, and double octave "below or above" (*sub aut supra*) an unspecified starting pitch. A four-octave range is not plausible for such an instrument, however, so I have conjectured that *sub aut supra* should be *sub ad supra* ("below to above"), meaning that the intervals Ramos names proceed successively from low to high register.

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At the conclusion of chapter 1.1.6 Ramos notifies the reader that extensive information about the history and technological development of musi-

42. See Howell, "Paulus Paulirinus of Prague," pp. 21–22.

cal instruments is available in his *Musica theorica.* Earlier in the same chapter he had indicated that this book was to include material on the harp, lute, polychord, clavichord, harpsichord, and psaltery. We have Spataro's testimony that *Musica theorica* was at least partly written, but it was never published and is now entirely lost. If this treatise was all Ramos advertised, its loss must be considered as costly to organology as the loss of most of Tinctoris's *De inventione et usu musicae.* Even in his brief chapter in *Musica practica* Ramos provided important data on an otherwise unknown clavichord tuning and the earliest specific five-string lute tuning. If in addition we had *Musica theorica* at our disposal, a great deal of what remains guesswork in our studies of fifteenth-century instruments might well be certain knowledge.

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