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Johann Sebastian Bach's Pitch Standards: The Woodwind Perspective

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AS LATE AS 1752, two years after Johann Sebastian Bach's death, Johann Joachim Quantz wrote in his authoritative book on the flute,

Die verschiedenheit des Tones, in welchem man stimmt, ist der Musik sehr schädlich. Bey der Singmusik verursacht er die Unbequemlichkeit, dass die Sänger diejenigen Arien, die an einem Orte, wo die Stimmung hoch ist, für sie gemacht waren, an einem andern Orte, wo man tief stimmt, und umgekehrt, die Arien, die nach einer tiefen Stimmung eingerichtet sind, an einem Orte, wo die Stimmung hoch ist, kaum brauchen können. Es wäre daher sehr zu wünschen, dass an allen Orten einerley Ton bey der Stimmung eingeführet werden möchte.¹

(The diversity of pitches used for tuning is most detrimental to music in general. In vocal music it produces the inconvenience that singers performing in a place where low tuning is used are hardly able to make use of arias that were written for them in a place where a high pitch was employed, or vice-versa. For this reason it is much to be hoped that a single pitch for tuning may be introduced at all places.²)

During Bach's lifetime, two relative pitch standards were generally recognized in northern Germany: one was known as *Chorton* ("choir pitch"), and the other was called *Cammerton* ("chamber pitch"). These were not absolute pitches like the present standard of A=440, but rather a relationship: whatever *Chorton* was, *Cammerton* would be lower by a whole-tone or a minor third. *Chorton* was usually the pitch of organs and often brass instruments, while *Cammerton* was generally associated with the other in-

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1. Johann Joachim Quantz, *Versuch einer Anweisung die Flöte traversiere zu spielen* (Berlin, 1752), facsimile of the 3d ed. (Berlin, 1789; identical in text to the 1st ed.) (Kassel: H. P. Schmitz, 1953), p. 241; facsimile of the French translation, *Essai . . .* (Berlin, 1752) (Paris: A. Zurfluh, 1975).

2. Quantz, *Versuch*, trans. Edward R. Reilly as *Essay of a Method for Playing the Transverse Flute*, in *On Playing the Flute* (New York: Free Press; London: Faber and Faber, Ltd., 1966), p. 267.

struments, especially the woodwinds. When a composer wrote music using organ and woodwinds together, he had to decide which set of instruments was in “concert pitch” and which was “transposing” (like horns and clarinets in the modern orchestra). Almost all of Bach’s church music was originally written in two different keys, to accommodate Chorton and Cammertont instruments.

The Chorton–Cammerton system was discussed by many German writers of Bach’s day, including Johann Gottfried Walther (1732):

Cammer-Ton heisset; wenn ein musicalisches Stück nicht nach dem alten Chor- oder Cornet-Tone sondern hauptsächlich um der erwachsenen Sopranisten, so die Höhe nicht wohl haben können; und so dann, um der Instrumente willen, und damit die Saiten desto besser halten mögen, entweder um einen gantzen Ton oder gar um eine kleine Terz tieffer executiert wird.³

(Chamber pitch means: when a piece of concerted music is performed not at the old Choir or Cornet Pitch, but rather, mainly on account of the adult [male] sopranos, who cannot well sing in the highest range, and also for the sake of the instruments so that the strings may hold better, a whole tone or even a minor third lower.⁴)

Johann Mattheson (1713):

Ob nun, oder warum dieser oder jener Thon, a, oder b Cammer- Chor- und Opern-Thon heist, daran liegt im Grunde nichts. Der Chor-Ton ist 9 bis 14 Commata höher als der Opern- und Cammer-Thon.⁵

(Now why this or that pitch is called a or b, chamber, choir, and opera pitch, has no actual basis. Chorton is 9 to 14 commas [= a major second to a minor third] higher than opera pitch and Cammertont.⁶)

and Jacob Adlung (1768 and 1758):

Man stimmt die Orgeln im Chorton, wie man es itzt nennt, welcher 1 oder 1^{1/2} Töne höher ist, als Kammerton. . .⁷

(Organs are tuned to Chorton, as it is now called, which is 1 or 1^{1/2} tones higher than Cammertont.)

3. Johann Gottfried Walther, *Musicalisches Lexicon* (Leipzig, 1732), facsimile ed., ed. Richard Schaal (Kassel: Bärenreiter-Verlag, 1953), p. 130.

4. Translated by Arthur Mendel, “On the Pitches in Use in Bach’s Time, *Musical Quarterly* 41 (1955): 337.

5. Johann Mattheson, *Das neu-eröffnete Orchestre*, (Hamburg, 1713), p. 74.

6. The German term for “chamber pitch” was not standardized in spelling; I have decided to use *Cammerton*, as does Mendel.

7. Jacob Adlung, *Musica mechanica organoedi*, 2 vols. (1726), ed. Johann Lorenz Albrecht with additions by Johann Friedrich Agricola (Berlin, 1768), facsimile ed., ed. Christhard Mahrenholz (Kassel: Bärenreiter, 1931), 2: 55.

An manchen Oertern differirt Chor- und Kammerton nur um einen Ton, an andern um anderthalb Töne.⁸

(In some places Chorton and Cammerton are only one tone apart; in others, a tone and a half.)

In der hiesigen Gegend ist es gewöhnlich denjenigen Ton zu nennen hohen Kammerton, welcher 1 grosse Secunde tiefer ist, als der Chorton; der tiefe Kammerton ist um 1 und einen halben Ton tiefer, als der Chorton.⁹

(In this region it is normal to call that pitch *hoher Kammerton* which is a major second lower than Chorton; *tiefer Kammerton* is a tone and a half lower than Chorton.)

From these comments, we can see the normal relationship between the pitches, as well as the possibility of different levels of each one.

How and why did the use of Chorton and Cammerton develop? In fact, it was the result of the meeting of two historic streams: one, that of the German organ tradition with its roots going back into the Renaissance (and perpetuated by its honored and expensive instruments); and the other, the latest orchestral practices imported from France, and with them the new woodwinds. German organs had been tuned high for centuries, whereas French instruments in general were already low in the sixteenth century.¹⁰ The use of two different pitch levels simultaneously was one of the ad hoc accommodations in the inevitable process of assimilation, one that lasted several generations (in fact, almost exactly the duration of Bach's lifetime).

Origins of the Chorton–Cammerton System

The terms *Chor-ton* and *Cammer-ton* were already used by Michael Praetorius in his *De organographia* of 1619.¹¹ Although there has been considerable difference of interpretation concerning Praetorius's comments on pitch, Herbert W. Myers has recently shown that Praetorius does relate the terms in a consistent way.¹² Despite ambiguities, Myers believes that their

8. *Ibid.*, 1: 194.

9. Jacob Adlung, *Anleitung zu der musikalischen Gelahrtheit* (Erfurt, 1758), facsimile ed., ed. Hans Joachim Moser (Kassel: Bärenreiter-Verlag, 1953), p. 387.

10. W. R. Thomas and J. J. K. Rhodes, "Pitch," *The New Grove Dictionary of Music and Musicians* (1980), 14: 783.

11. Michael Praetorius, *Syntagma musicum*, vol. 2, *De organographia* (Wolfenbüttel, 1619), facsimile ed., ed. Wilibald Gurlitt (Kassel: Bärenreiter, 1958), pp. 14–18.

12. Herbert W. Myers, "Praetorius's Pitch," *Early Music* 12, no. 3 (August, 1984): 369–71.

pitches can be established fairly certainly in absolute terms. In his study, which brings into question the previous researches of both Arthur Mendel¹³ and W. R. Thomas and J. J. K. Rhodes,¹⁴ Myers shows that Praetorius's main reference pitch was "the fairly well-standardized North German organ pitch known generally there as *Chor-Ton*."¹⁵ Praetorius's text and scale illustrations provide several clues to the exact level of this pitch standard. Through comparison of these data with surviving instruments, Myers concludes that this standard was near A-460—slightly less than a semitone above A-440.¹⁶ This conclusion is at variance with those of some previous authors.

Since singers and string players may find this pitch too high for sustained liturgical use, Praetorius recommends downward transpositions of both a major second and a minor third. In fact, he would like to adopt the practice found in "Prague and some other Catholic chapels," in which his standard (North German) *Chor-Ton* was known as *Cammer-Ton*, and *Chor-Ton* was a major second lower.¹⁷ However, there is no evidence of the general adoption of this terminology in North Germany. As Myers points out, "it is important to note that at no point does Praetorius himself mention the existence of a North German *Cammer-Ton*, let alone any relationship it may have had to (North German) *Chor-Ton*."¹⁸ Thus it seems that Praetorius's standard pitch "is the one which survived into the eighteenth century as the *Chor-Ton* of Kuhnau and Bach."¹⁹ The concept of *Cammerton* as a low pitch emerged only in the 1680s with the arrival of French baroque woodwinds in Germany.²⁰

Some years after the appearance of Praetorius's work, the French-German composer and organist Georg Muffat (1653–1704) was in Paris

13. Arthur Mendel, "Pitch in the 16th and Early 17th Centuries," *Musical Quarterly* 34 (1948): 28–45, 199–221, 336–57, 575–93; idem, "On the Pitches in Use in Bach's Time," *Musical Quarterly* 41 (1955): 332–54, 466–80; idem, "Pitch in Western Music since 1500: A Re-examination," *Acta musicologica* 50 (1978): 1–93, 328.

14. Thomas and Rhodes, "Pitch," pp. 779–85.

15. Myers, "Praetorius's Pitch," p. 369.

16. *Ibid.*, p. 370. Myers bases this conclusion on the pitches of surviving instruments of the period, including recorders, trombones, shawms, dulcians, cornetti, and racketts, all giving close to the same pitch.

17. *Ibid.*, p. 369.

18. *Ibid.*

19. *Ibid.*, p. 371. It also survived as the normal pitch at Venice and Cremona (see below, Appendix C).

20. Myers's findings agree with those of Nicholas Bessaraboff, *Ancient European Musical Instruments* (Cambridge, Mass.: Harvard University Press, 1941), pp. 357, 378. Adlung, *Musica mechanica organoedi* (vol. 2, p. 55) also cites this passage in Praetorius.

studying with Lully and others just at the time that the newly invented oboe was making its first appearances under Lully's patronage in the 1660s.²¹ Muffat played for a time in Lully's orchestra²² and later wrote,

Le ton, auquel s'accordent les François est ordinairement d'un ton, & même pour les *Operas* d'une tierce mineure plus bas, que celui d'Allemagne, dit *du Cornet*, qu'ils treuvent trop haut, trop piaillant, & trop forcé. Pour moy s'il m'étoit libre de choisir, lors qu'aucun autre égard n'y mettroit obstacle, je me servirois du premier, qu'on nomme en Allemagne l'ancien ton du choeur avec des cordes un peu plus épaisses, nè manquant pas de vivacité avec sa douceur.²³

(The pitch to which the French tune their instruments is usually a whole tone lower than our German one [called cornet pitch], and in operas, even one and a half tones lower. They find the German pitch too high, too screechy, and too forced. If it were up to me to choose a pitch, and there were no other considerations, I would choose the former [of the French pitches], called in Germany old Chorton, using somewhat thicker strings. This pitch lacks nothing in liveliness along with its sweetness.)

If the German pitch to which Muffat refers, "cornet pitch," is the same one as Praetorius's standard German Chorton (A sounding about modern B♭), French pitches must have been about the same as modern A♭ and G.

Johann Kuhnau (1660–1722), Bach's predecessor as Kantor at Leipzig, wrote in 1717,

Ich habe aber fast von der ersten Zeit meiner Direction der Kirchen-Music den Cornet-Ton abgeschaffet, und den Kammer-Ton, der eine Secunda oder kleine Tertia, nachdem es sich schikken will, tieffer ist, eingeführet. . . .²⁴

21. Susan Wollenberg, "George Muffat," *The New Grove Dictionary*, 12: 760–62.

22. Wilfrid Mellers, *François Couperin and the French Classical Tradition* (New York: Dover Publications, Inc., 1968), p. 279.

23. Georg Muffat, *Florilegium secundum* (Passau, 1698), Preface, written in Latin, German, Italian, and French; ed. Heinrich Rietsch, *Denkmäler der Tonkunst in Österreich*, vol. 4 (Vienna, 1895; reprint ed., Graz: Akademische Druck- und Verlagsanstalt, 1959), p. 48. This statement raises the question why Muffat's "old Chorton" is not the same as Praetorius's "Chorton." Passau, where Muffat wrote, is in southern Germany. Praetorius uses the term "Chorton" to mean different pitches, and he implies that the southern Chorton is a low pitch, a tone lower than the North German Chorton (*De organographia*, pp. 14–15). This lower form of Chorton would be the same as Muffat's "old Chorton." Another resident of Passau, the court Kapellmeister Benedict Anton Aufschneider, later published a work (1728) calling for two *hautbois in tono gallico*; the oboe parts are notated in C major, while the strings and trombones are in B♭, indicating that the oboes, in a species of "French pitch," were tuned a whole-tone below the other instruments. See Hans Oskar Koch, "Sonderformen der Blasinstrumente in der deutschen Musik vom späten 17. bis zur Mitte des 18. Jahrhunderts" (Ph.D. diss., Heidelberg, 1980), pp. 55, 236.

24. Quoted by Johann Mattheson, *Critica musica*, vol. 2 (Hamburg, 1725), p. 235. Charles Sanford Terry's statement "At Leipzig, during the Cantorate of Bach's predecessor Kuh-

(Almost from the moment I took over the direction of church music [at the Thomaskirche in 1702], I eliminated the use of cornet pitch and introduced Cammerton, which is a second or minor third lower, depending on the circumstances.)

Again, if Kuhnau's *Cornet-Ton* is the same as Muffat's and as Praetorius's German standard, then his two Cammerton levels would have been about the same as the two pitches used in France in Lully's time, as described by Muffat. These would have been brought to Germany with the arrival of the new French woodwinds. The pitches discussed above can be tabulated as follows:

1. Chorton/cornet pitch	460 Hz (just below modern B♭, which is 466 Hz)
2. _____	One-half tone lower (about modern A)
3. Cammerton (higher form)	One-half tone lower (about modern A♭)
4. Cammerton (lower form)	One-half tone lower (about modern G)

Quantz also discusses the history of pitch:

Der Ton, in welchem die Orchester zu stimmen pflegen, ist nach Beschaffenheiten der Orte und Zeiten immer sehr verschieden gewesen. Der unangenehme Chorton hat einige Jahrhunderte in Deutschland geherrscht, welches die alten Orgeln sattsam beweisen. Man hat auch die übrigen Instrumente . . . darnach eingerichtet. Nachdem aber die Franzosen, nach ihrem angenehmen tiefern Tone, die deutsche Querpfeife in die Flöte traversiere, die Schallmey in den Hoboe, und den Bombart in den Basson verwandelt hatten; hat man in Deutschland auch angefangen, den hohen Chorton mit dem Kamertone zu verwechseln: wie auch nunmehr einige der berühmtesten neuen Orgeln beweisen.²⁵

(The pitch to which orchestras tune has always varied very much with place and time. The unpleasant choir-pitch prevailed for some centuries in Germany, as old organs bear plentiful witness. Other instruments, too, . . . were arranged accordingly. But when the French, with their pleasantly lower pitch, had transformed the German fife into the transverse flute, the shawm into the oboe, and the bombard into the bassoon, the high choir-pitch began to be replaced by chamber pitch, as again some of the most famous new organs bear witness.²⁶)

nau, the flutes and oboes were at low Cammerton pitch, a semitone below high Cammerton" (*Bach's Orchestra* [London: Oxford University Press, 1932], p. 97) is not entirely accurate.

25. Quantz, *Versuch*, p. 241.

26. Translated by Mendel, "On the Pitches in Use in Bach's Time," p. 470.

French Musicians and French Instruments in Germany

The woodwinds that Bach knew were still recent inventions of musicians at the French court;²⁷ as far as we know, the oboe was the first of these instruments to appear in the late 1650s. It had reached Germany about the time Bach was born.²⁸ Like most of his German contemporaries, he regularly called it by its French name, *Hautbois*, probably to distinguish it from the earlier German shawm (*Schallmey*).²⁹ Johann Mattheson writes (1713):

Der gleichsam redende *Hautbois*, Ital. *Oboe*, ist bey den Frantzosen, und nunmehr auch bey uns, das, was vor diesem in Teutschland die Schallmeyen (von den alten *Musicis Piffari* genandt) gewesen sind, ob sie gleich etwas anders eingerichtet.³⁰

(The [as it were] discoursing *Hautbois* [Italian *Oboe*] is to the French, and lately also to us, what in Germany the shawms used to be [called *Piffari* by older musicians]; although their construction is somewhat different.)

In 1732, the instrument still appeared under the name *Hautbois* in Walther's *Lexicon*.

Most of the records we have of first-generation players of the oboe in Germany (and often second-generation as well) indicate that they were French. In the latter part of the seventeenth century there was a great exodus of French musicians and other artists to other parts of Europe. There was considerable interest in French style in the North, not only in Catholic courts like Dresden, but in the many small Protestant principalities, where Huguenots could find refuge after the revocation of the Edict of Nantes by Louis XIV in 1685.³¹ As Jesse Read has written:

27. Philip Bate, *The Oboe* (London: Ernest Benn Limited; New York: W. W. Norton & Company Inc., 1975), p. 40.

28. Andrew Dalgarno McCredie, "Instrumentarium and Instrumentation in the North German Baroque Opera" (Ph.D. diss., Hamburg, 1964), p. 148.

29. For Bach's terms for the oboe, see Bruce Haynes, "Questions of Tonality in Bach's Cantatas: The Woodwind Perspective," *Le Tic-Toc-Choc* 6, nos. 3 and 4 (Montreal, March and May, 1985): 33, n. 22. Both Kusser and Steffani were using the term *Hautbois* as early as the 1690s (McCredie, "Instrumentarium and Instrumentation," p. 159). Four years before Kuhnau's appointment as Kantor at Leipzig, the oboe was also called there a *französische Schalmei* (Arnold Schering, "Die Leipziger Ratsmusik von 1650–1775," *Archiv für Musikwissenschaft* 3 [1921]: 47; see also Reine Dahlqvist, "Taille, Oboe da caccia and Corno inglese," *Galpin Society Journal* 26 [1973]: 70). An early anonymous cantata at Schwerin (*Sich in Glück und Unglücksfällen*) demands both *Oboe* and *Hautbois* for the same piece. See also Koch, "Sonnerformen der Blasinstrumente," p. 57.

30. Mattheson, *Das neu-eröffnete Orchestre*, p. 268.

31. A clear example of this influence can be seen in the work of Huguenot silversmiths, who after 1685 "brought new standards of taste and craftsmanship wherever they settled"

The French oboe moved into Germany in the 1680's as cities such as Celle, Darmstadt, and Hannover became oriented toward French culture as a result of marriages of German Princes to French women, and the more frequent visits and appointments of French musicians to the various courts and cities. Shortly thereafter the oboists formed into ensembles and succeeded in establishing themselves as independent court and town bands. . . .³²

Among the known French oboists who were active in Germany starting in the 1680s were F. Beauregard (Berlin, 1681–1701);³³ C. and J.-B. Henrion (Dresden, 1709);³⁴ Labuissière (Berlin, 1693–1700);³⁵ the renowned F. LaRiche, teacher of several important German oboe virtuosi of the early eighteenth century (London, 1685; Dresden, 1700–ca. 1730);³⁶ J. A. Marchand (Munich, 1715);³⁷ P. Maréchal, teacher of J. E. Galliard (Celle);³⁸ P. Potot (Berlin, 1681–1701);³⁹ C. Aubry (Dresden, until 1728);⁴⁰

(John F. Hayward, "Metalwork. Renaissance to Modern," *Encyclopedia Britannica*, 15th ed., 11: 1106). Italy (with the exception of Turin) did not benefit from strong French influences, and perhaps for this reason it developed independent woodwind schools relatively late; Giuseppe Sammartini (1695–1750) was the first great oboist to come out of Italy, and it is probably no accident that his father and teacher was Alexis Saint-Martin (fl. 1711), a French oboist (Bathia Churgin, "Giuseppe Sammartini," *The New Grove Dictionary*, 16: 457). Sammartini's fame as a player began about 1715–20. Quantz, who heard him in 1726, found him the only wind player of note in Venice, although Quantz also mentions meeting Alessandro Besozzi, who later became a great virtuoso (Johann Joachim Quantz, "Herrn Johann Joachim Quantzens Lebenslauf von ihm selbst entworfen," in Friedrich Wilhelm Marpurg, *Historisch-kritische Beyträge zur Aufnahme der Musik*, vol. 1 [Berlin, 1754/55; facsimile ed., Hildesheim: Georg Olms, 1968], pp. 232, 235).

32. Jesse Read, ed., introduction to *Music from the Court of the Sun King* (selected pieces for double-reed quintet) (London: Nova, 1981).

33. Louis Schneider, *Geschichte der Oper und des königlichen Opernhauses in Berlin* (Berlin, 1852), pp. 48, 52; Curt Sachs, *Musik und Oper am Kurbrandenburgische Hof* (Berlin: J. Bard, 1910), pp. 61–62, 172.

34. Moritz Fürstenau, *Zur Geschichte der Musik und des Theaters am Hofe zu Dresden* (Dresden, 1861; facsimile ed., Hildesheim: Georg Olms, 1971), p. 50.

35. Sachs, *Musik und Oper*, p. 182; Werner Braun, "The 'Hautboist': An Outline of Evolving Careers and Functions," in Walter Salmen, ed., trans. Herbert Kaufman and Barbara Reisner, *The Social Status of the Professional Musician from the Middle Ages to the 19th Century* (New York: Pendragon Press, 1983), p. 129.

36. On the lives of LaRiche and his students Böhm, Glösch, and Richter, to all of whom Georg Philipp Telemann dedicated his *Kleine Cammer-Music* (Frankfurt am Main, 1716), see the foreword by Bruce Haynes to the facsimile edition of this work (The Hague: Musica Musica, 1983).

37. Robert Eitner, *Biographisch-bibliographisches Quellen-Lexicon* (New York: Musurgia, n.d.), 6: 313.

38. David Ronald Lasocki, "Professional Recorder Playing in England, 1500–1740," p. 155 (privately commissioned manuscript, 1978; later included in his Ph.D. diss., University of Iowa, 1983).

39. Schneider, *Geschichte der Oper*, pp. 48, 52; Sachs, *Musik und Oper*, pp. 61, 172.

40. Marcelle Benoit, "Versailles et les musiciens du roi, 1661–1733" (doctoral diss., Sor-

C. Prévost, Liénar, and Jean (Arolsen, from 1699);⁴¹ Normand (Munich, until 1726);⁴² J. Loeillet (Munich, 1715–32);⁴³ and J. Minje. French players were dominant on other woodwinds as well: Quantz studied the flute with P. G. Buffardin (ca. 1690–1768) at Dresden,⁴⁴ and Bach's bassoonist at Cöthen was J. C. Torlée. German musicians were also sent to France for training. Four players from the Munich court studied with one of the Hotterres at Paris in 1684–85.⁴⁵ French woodwind players were also prominent in the musical life of other countries in the last quarter of the seventeenth century. The "French hoboy," as James Talbot (ca. 1692–95) called it,⁴⁶ was introduced to England by James Paisible,⁴⁷ and other French players in England included Boutet (1675), M. de Bresmes (1675), P. J. Bressan (from 1691),⁴⁸ P. LaTour (early eighteenth century), and J. B. Loeillet.⁴⁹

The Royal Orchestra at Dresden under August II is an example of the French influence in Germany at this time. From about 1710, this orchestra was perhaps the finest in Europe, and it included many of the greatest performers then living.⁵⁰ As August's taste generally favored French art, it was this style of playing that was cultivated, under the direction of musicians from France.⁵¹ Quantz, who entered service at this court in 1716, wrote of the Dresden orchestra in 1755:

Durch die, von dem damaligen Concertmeister Volumier eingeführte französische egale Art des Vortrags, unterschied es sich bereits von vielen andern.
 ...⁵²

bonne, 1971), pp. 332, 374; Roberte Machard, *Les musiciens en France au temps de Jean-Philippe Rameau*, Recherches, 11 (Paris: Picard, 1971), pp. 51, 52, 55, 65, 69, 74.

41. Diether Rouvel, *Zur Geschichte der Musik am Fürstlich Waldeckischen Hofe zu Arolsen* (Regensburg: G. Bosse, 1962), p. 10.

42. Hans Joachim Nösselt, *Ein ältest Orchester 1530–1980* (Munich: Publisher not named, 1980), p. 80.

43. *Ibid.*, p. 233.

44. Buffardin was also briefly the teacher of the oboist Johann Jacob Bach (1682–1722), J. S. Bach's brother (Christoph Wolff, "Bach," *The New Grove Dictionary*, 1: 779).

45. Nösselt, *Ein ältest Orchester*, p. 64.

46. Oxford: Christ Church Music Ms 1187. See Anthony Baines, "James Talbot's Manuscript," *Galpin Society Journal* 1 (1948): 9–26. This manuscript now appears to be dated 1692–95; see Maurice Byrne, "Pierre Jaillard, Peter Bressan," *Galpin Society Journal* 36 (1983): 5.

47. Lasocki, "Professional Recorder Playing in England," p. 93.

48. Byrne, "Pierre Jaillard, Peter Bressan," pp. 2–28.

49. Lasocki, "Professional Recorder Playing in England," p. 131.

50. Charles Burney, *A General History of Music*, 2 vols. (London, 1776–89), ed. Frank Mercer (New York: Dover Publications, Inc., 1957), 2: 949–50.

51. Wolfram Steude and Ortrun Landmann, "Dresden," *The New Grove Dictionary*, 5: 619.

52. Quantz, "Herrn Johann Joachim Quantzens Lebenslauf," p. 206.

(Through the French uniform style of execution introduced by Volumier, the concertmaster at that time, it already distinguished itself from many others.)

Even as late as 1714, the principal oboist of this illustrious orchestra, J. C. Richter (1689–1744), was sent to Paris to finish his training (he had originally studied with the former principal, François LaRiche).⁵³

In 1752 Quantz still considered the “very low French chamber pitch” to be the “most advantageous for the transverse flute, the oboe, the bassoon, and some other instruments.”⁵⁴ It seems reasonable to assume that when French players arrived in Germany, they used the same instruments they had played in France; they would have had no reason to begin playing others, especially as they were exhibiting and teaching this latest Parisian “mode.” It also seems likely that the German woodwind makers who immediately began copying these instruments made them in their original pitches, at least at first.⁵⁵ Johann Christoph Denner (1655–1707), the most famous German woodwind maker of his time and probably the first to begin making French instruments, is an example. Denner began his career in Nuremberg about 1678, just before the arrival of the new woodwinds.⁵⁶ In 1694, his only surviving instrument bill describes two *frantzesische Fletten*, which, on the back of the document, are also called *Opera-Flöten*.⁵⁷ These would probably have been recorders in French opera pitch (J. C. Denner apparently made no transverse flutes).⁵⁸ In 1696 he and his colleague Johann Schell applied for an exceptional type of *Meisterrecht*, namely, permission to make for sale the

. . . französische Musikalischen Instrumenta . . . die ongeföhr vor 12 Jahren in Frankreich erfunden worden.⁵⁹

(. . . French musical instruments . . . which were invented about 12 years ago in France.)

53. See n. 36, above.

54. Quantz, *Versuch*, p. 241; trans. Reilly, *Essay*, p. 268.

55. Guy Oldham, “Cammer-Ton,” *The New Grove Dictionary*, 3: 652; idem, “Pitchpipe,” *ibid.*, 14: 789.

56. Ekkehart Nickel, *Der Holzblasinstrumentenbau in der freien Reichstadt Nürnberg* (Munich: Musikverlag Katzbichler, 1971), p. 206.

57. *Ibid.*, p. 199.

58. Phillip T. Young, “Woodwind Instruments by the Denners of Nürnberg,” *Galpin Society Journal* 20 (1967): 9. Several recorders pitched very low have survived; see Appendix A.

59. Nickel, *Der Holzblasinstrumentenbau*, p. 206. 1696 minus 12 is 1684; if Denner’s date is correct, he must have been referring to the date of either the development of the recorder or the introduction of the oboe into Germany. Cf. Edgar Hunt, *The Recorder and Its Music* (London: Herbert Jenkins, 1962), pp. 38–39; Jane Bowers, *A Catalogue of French Works for the Transverse Flute, 1692–1761*, *Recherches*, 18 (Paris: Picard, 1978), p. 9; and McCredie, “Instrumentarium and Instrumentation,” p. 137.

The two craftsmen were granted this new right (in the face of longstanding tradition) in apparent recognition of the importance of this new type of instrument. Denner, Schell, and many other master builders in Germany⁶⁰ adopted the new models and made French instruments for the rest of their working lives. Recorders by these makers that have survived have a nominal A ranging in modern pitch from about G to as high as B♭.⁶¹

Given the success of the new influences from France, why were old organs not simply retuned to the new low chamber pitch? The organ, as a symbolic religious instrument, and the one on which the director of the music normally played, had a privileged place. The organ builders' art was also, as Mendel put it, "of ancient lineage, and their traditions tenaciously clung to."⁶² Probably the most important reason, though, was the expense involved. To bring the pitch of an organ down meant building "two or three very large (and correspondingly expensive) pipes for the lowest notes"⁶³ of each stop and somehow finding room for them in the organ case. It was cheaper and simpler to hire an organist who could transpose at sight or copy out a transposed part.

Some accommodation to the lower pitch began to be made on organs during Bach's lifetime, however. A number of new organs began to be built at Cammerton, notably by Gottfried Silbermann (1683–1753), including two at Dresden on which Bach played. Six years after Bach's death, the new Positiv installed at the Thomaskirche at Leipzig was pitched at Cammerton.⁶⁴ Another expedient for the problem was the provision on some organs for an alternate Cammerton pitch on a limited number of stops.⁶⁵ Adlung discusses this possibility, as well as keyboards that move up or down as a unit, similar to transposing keyboards on the modern harpsichord.⁶⁶

The Development of a German Cammerton Standard

Ich will eben nicht die Parthey von dem ganz tiefen französischen Kammertone nehmen; ob er gleich für die Flöte traversiere, den Hoboe, den Basson, und einige andere Instrumente der vortheilhafteste ist: ich kann aber auch den

60. Including Gahn, Walch, J. H. Eichentopf, Poerschmann, Sattler, Kinigsperger, Kress, etc.

61. See Appendix A.

62. Mendel, "Pitch in Western Music since 1500," p. 91.

63. *Ibid.*

64. Terry, *Bach's Orchestra*, p. 19.

65. Mendel, "Pitch in Western Music since 1500," p. 39.

66. Adlung, *Musica mechanica organoedi*, 1: 193–94, 260.

ganz hohen venezianischen Ton nicht billigen; weil die Blasinstrumente in demselben allzu widrig klingen. Ich halte deswegen den deutschen sogenannten A–Kammerton, welcher eine kleine Terze tiefer ist, als der alte Chorton, für den besten. Denn dieser ist weder zu tief, noch zu hoch, sondern das Mittel zwischen dem französischen und venezianischen: und in diesem können sowohl die mit Saiten bezogenen, als die Blasinstrumente, ihre gehörige Wirkung thun.⁶⁷

(I do not wish to argue for the very low French chamber pitch, although it is the most advantageous for the transverse flute, the oboe, the bassoon, and some other instruments; but neither can I approve of the very high Venetian pitch, since in it the wind instruments sound much too disagreeable. Therefore I consider the best pitch to be the so-called [German] A–chamber pitch, which is a minor third lower than the old choir pitch. It is neither too low nor too high, but the mean between the French and the Venetian; and in it both the stringed and the wind instruments can produce their proper effect.⁶⁸)

This discussion by Quantz is supported by the comments of Johann Friedrich Agricola that “former French pitch” (as he calls it) is lower than “the so-called A chamber pitch that has been introduced in many places in Germany.”⁶⁹ Joseph Friedrich Bernhard Caspar Majer also makes an indirect comparison of French and German pitch when discussing chalumeaux: “. . . some in French, some in German pitch.”⁷⁰ And Johann Andreas Silbermann, in a letter dated 1772, writes that *Kammerthon*

. . . scheint allgemein und vollkamen eingeführt zu seyn, denn alle Musikalische Instrumenten sind darein gestimmt. . . . In Frankreich war der Thon noch einen 1/2 Thon tiefer weder der Kammerthon, und hiess der Französische Thon, wird aber selten mehr gebraucht. . . .⁷¹

(. . . appears to be generally and completely accepted, as all musical instruments are tuned to it. . . . In France, the pitch was yet again 1/2 step lower than Cammerton and was called French pitch, but is seldom used anymore.⁷²)

67. Quantz, *Versuch*, p. 241.

68. *Ibid.*, trans. Reilly, *Essay*, p. 268.

69. “. . . ehemaligen französischen Stimmung . . . ist noch einen halben Ton tiefer als der an vielen Orten Deutschlands eingeführte sogenannte A-Kammerton.” Johann Friedrich Agricola, *Anleitung zur Singkunst* (Berlin, 1757), facsimile ed., ed. Erwin R. Jacobi (Celle: Hermann Moewig Verlag, 1966), p. 45.

70. “. . . theils mit dem Französischen, theils mit Teutschem Ton.” Joseph Friedrich Bernhard Caspar Majer, *Museum musicum theoretico practicum* (Schwäbisch Hall, 1732), facsimile ed., ed. Heinz Becker (Kassel: Bärenreiter-Verlag, 1954), p. 32, par. 6.

71. Quoted in Mendel, “Pitch in Western Music since 1500,” p. 34, n. 23.

72. Silbermann ignores the other French pitch level noted by earlier sources such as Muffat. Presumably, the lower level he is discussing was the most general. Cf. Quantz’s report (*Versuch*, p. 241) that French pitch rose presumably between ca. 1726 (when he visited Paris) and 1752.

These comments all suggest the possibility that a pitch standard was consciously agreed upon among German musicians, beginning in the second decade of the eighteenth century.⁷³ The period before had evidently seen some confusion about pitch standards, arising from the introduction of the new French instruments. To quote Georg von Dadelsen,

Die Differenz zwischen den im Kammerton gestimmten Holzblas-Instrumenten und der im Chorton, d. h. im allgemeinen eine Sekund bis eine kleine Terz höher stehenden Orgel bereitete den Kantoren des 17. und 18. Jahrhunderts immer wieder Schwierigkeiten. Sie wurden in verschiedener Weise gelöst: durch Heraufstimmen der Streicher auf den Chorton und transponierende Notation der Holzbläser, oder durch transponierende Notation der Orgel, die sich damit dem Kammerton der übrigen Instrumente anglich.⁷⁴

(The difference between the woodwinds, tuned at Cammertone, and the organ at Chorton—i.e., a second to a minor third higher—continually plagued the Cantors of the seventeenth and eighteenth centuries. It was resolved in various ways: by retuning the strings to Chorton and using a transposed notation for the woodwinds; or by transposing the organ part, making it consistent with the other instruments in Cammertone.)

The situation at Weimar during Bach's tenure there (1708–17) is an example of a lack of pitch standard. As at Mühlhausen and Leipzig, Bach wrote his cantatas at Weimar with the woodwinds notated at a lower pitch than the organ. But unlike the other places, at Weimar the interval between the parts is normally a minor third rather than the more usual major second. Bach used recorders, oboes, and bassoon at Weimar. Since, as we shall see below, his Chorton there was probably about A–460 (the usual old German standard), the woodwinds at Weimar were apparently still at the low French pitch, a minor third below this.

Weimar was not the only place, however, where records indicate that Chorton and Cammertone were a minor third apart rather than a major second. The cantatas of Friedrich Wilhelm Zachow (1663–1712) written for Halle between 1684 and 1712 were normally notated in this way,⁷⁵ and

73. See the next paragraph below for an explanation of this date.

74. Georg von Dadelsen, *Beiträge zur Chronologie der Werke Johann Sebastian Bachs* (Trossingen: Hohner-Verlag, 1958), p. 37.

75. Friedrich Wilhelm Zachow, *Gesammelte Werke*, ed. Max Seiffert, rev. Hans Joachim Moser, *Denkmäler deutscher Tonkunst*, vols. 21–22 (Wiesbaden: Breitkopf und Härtel, 1958). One cantata, *Nun aber gibst du, Gott*, is notated (unlike the others) with all the instruments in the same key. This piece was composed on June 17, 1712 (just two months before Zachow's death), while preparations were being made for a new organ at the Liebfrauenkirche. It is possible that Halle, too, was experimenting with the introduction of a

two cantatas by Vincent Lübeck (1654–1740; at the time of composition Kantor at Stade, near Hamburg, where he worked until 1702) are written with a difference of one and one-half tones between the wind and string parts.⁷⁶ Kuhnau at Leipzig wrote his woodwind parts sometimes a tone, sometimes a tone and a half lower than the Chorton parts, depending on which method resulted in a more suitable woodwind key.⁷⁷ Bach also took advantage of the existence of woodwinds at the lower pitch when he first arrived at Leipzig, in Cantatas 23 and 194.⁷⁸

All these examples of woodwinds at low French pitch appear fairly early in the century: Weimar until 1716, Halle until 1712, Stade until 1702, and Leipzig until 1723. This must have been just the period that a movement for a standard pitch in Germany began, and in fact it can be seen in the scores of Bach's works at Weimar. While his woodwind parts are normally set a minor third above the organ (implying a woodwind pitch a minor third below the organ), in five cantatas that he apparently wrote consecutively in 1714, the oboe part is only a major second higher. The cantatas in question are nos. 12, 21, 172, 185, and 199, all involving a single oboe

standard Cammerton pitch. Cf. Alfred Dürr, *Studien über die frühen Kantaten Johann Sebastian Bachs*, 2d ed. (Wiesbaden: Breitkopf und Härtel, 1977), p. 62; Philipp Spitta, *Johann Sebastian Bach*, 3 vols. (Leipzig, 1873–80), trans. Clara Bell and J. A. Fuller-Maitland (London: Novello & Co., Ltd.; New York: Dover Publications, Inc., 1951), 1: 515.

76. This information kindly supplied by Pieter Dhont of Utrecht, Holland.

77. See n. 24, above.

78. Cantata 194 was written to dedicate the organ at Störmthal (near Leipzig) and was based on Cantata 194a (now lost). Cantata 194a had been written at Cöthen, where pitch was probably lower; this is suggested by the exceptionally high range of the vocal parts, both choral and solo. These are on the average about one-half step higher than usual (Mendel, "On the Pitches in Use in Bach's Time," p. 347). Bach used Cantata 194 for later performances at Leipzig: one a few months after the Störmthal performance, others in 1726 and 1731 (Johann Sebastian Bach, *Neue Ausgabe sämtlicher Werke*, ser. I, vol. 15, "Kritischer Bericht," ed. Alfred Dürr [Kassel: Bärenreiter, 1968], p. 23). Some of the parts to the first of these Leipzig performances were marked, in Bach's handwriting, *tief-Cammerthon*. A fragment of a continuo part in G (a minor third below the other parts in Bb) also survives. This suggests that Bach's experience at Störmthal using the high vocal ranges caused him to resort to the expedient of lowering the whole performance one-half step, by asking the band to tune down. The woodwinds were apparently still able to do this in 1723 and 1724. But the later performances were evidently at normal, high Cammerton, since the organ part to the 1726 version is back up to Ab. The piece was altered for these later performances, however, to make the voice parts easier (Mendel, "Pitch in Western Music since 1500," p. 78). We may therefore assume that the higher Cammerton became standard after Bach's first months at Leipzig. (Could the thorough overhaul of the Thomaskirche organ in 1721 have influenced this course of events? See Arnold Schering, *Musikgeschichte Leipzigs*, vol. 2, *Von 1650 bis 1723* [Leipzig: Kistner & Siegel, 1926], p. 108). Cantata 23 is discussed in Haynes, "Questions of Tonality in Bach's Cantatas," part 2.

part.⁷⁹ If we assume that the same organ was used for these cantatas as for all the others,⁸⁰ since we know it could not have been retuned as much as a half-tone downwards,⁸¹ it appears that Bach's solo oboist had an instrument at the higher Cammerton level, about A-410, especially for these pieces.⁸²

We are not certain of the identity of Bach's solo oboist at Weimar,⁸³ but among the list of Capelle members for 1714–16 is a "Johann Georg" Hoffmann, violinist and "musician," who "lives in Jena. But when he is here he boards at Court."⁸⁴ We know that Gerhard Hoffmann (1690–ca. 1756) was a student at Jena (21 km. from Weimar) during this time, and that he was a wind player. Two years after Bach left, in 1719, Hoffmann was appointed to the Weimar court as "Architect/Surveyor." Evidently of an inventive frame of mind, he is reputed to have made important improvements to both the flute and oboe, although the credit he has traditionally been given by earlier writers⁸⁵ for adding G♯ and B♭ keys to the oboe is generally looked on with reservation nowadays, as no surviving instruments of the period possess such keys, nor were they the first ones to be added some three-quarters of a century later.⁸⁶ Speculation on this subject was inspired

79. The dating is not certain for all of these cantatas, but according to Dürr (*Studien über die frühen Kantaten*, pp. 64–65), no. 12 was written for April 22, followed by nos. 172, 21, (54?), and 199. Although Cantata 185 was definitely performed on July 14, 1715, two original versions survive at both a minor third and a major second (the same applies to no. 172); perhaps no. 185 was also performed experimentally in this series, possibly as Bach's first piece as Concertmeister on March 4. This could explain why there are parts in two different keys. See Dürr, *ibid.*, p. 32; and n. 75, above.

80. Dürr, *ibid.*, p. 71.

81. *Ibid.* and Mendel, "On the Pitches in Use in Bach's Time," p. 354.

82. Cf. n. 75, above.

83. The only indication I have been able to find of a possible oboist at Weimar other than Gerhard Hoffmann (see below) is a David Hoffmann, who was appointed to the court there together with Bach in 1703, and who had previously been a *Pfeiffer unter der Garde* in 1699 (Reinhold Jauernig, "Johann Sebastian Bach in Weimar," in Heinrich Bessler and Günther Kraft, eds., *Johann Sebastian Bach in Thüringen* [Weimar: Thüringer Volksverlag, 1950], p. 52).

84. Hans T. David and Arthur Mendel, eds., *The Bach Reader* (New York: W. W. Norton & Company, Inc., 1945), p. 70.

85. For instance Leo Bechler and Bernhardt Ramm, *Die Oboe und ihr verwandten Instrumente* (Leipzig, 1914; reprint ed., Walluf bei Wiesbaden: Sändig, 1972), p. 35. Several other similar books are mentioned by Adam Carse, *Musical Wind Instruments* (London, 1939; reprint ed., New York: Da Capo Press, 1965), p. 133.

86. See Philip Bate, "Oboe," *The New Grove Dictionary*, 13: 462–75; *idem*, *The Oboe*, p. 194; Bruce Haynes, "Oboe Fingering Charts 1695–1816," *Galpin Society Journal* 31 (1978): 68–93; and Carse, *Musical Wind Instruments*, pp. 133–34.

by a chain of writers beginning in 1732 with Walther,⁸⁷ who lived in Weimar, was a close friend of Bach, and would probably have known of Hoffmann's work at first hand. These sources are all unfortunately ambiguous about the precise nature of Hoffmann's improvements, although they apparently involved changes in intonation, particularly to the G \sharp and A \flat (*sic*) in both octaves. Intonation is not particularly improved in the first instance by the addition of keys;⁸⁸ it would seem more reasonable to associate Hoffmann's work on woodwinds with pitch changes (G \sharp and A \flat are, of course, a half-step lower than A, the traditional tuning note.⁸⁹ One wonders if Hoffmann was perhaps the oboist in question, who inspired Bach's pitch experiments with these cantatas. In the same sources, mention is made of a device that Hoffmann invented for dealing with a similar problem on the violin: it allowed the player to switch instantly between Chorton and Cammertone.

In any case, Hoffmann's experiments were not taking place in a vacuum: the second decade of the century saw radical innovations to woodwinds in Germany. It was at this time that the transverse flute developed from its original three-piece French form to the more practical (if less beautiful) four-piece one,⁹⁰ thus making it capable of playing in a range of pitches.⁹¹ (It is from this period that Bach began to use the traverso regularly; at Weimar and before, he had preferred the recorder.) This same period also produced the new oboe d'amore and oboe da caccia.⁹²

87. In his manuscript notes to a projected second edition of his *Musicalisches Lexicon*, used as a basis for the article on Hoffmann in Ernst Ludwig Gerber's *Historisch-biographisches Lexicon der Tonkünstler* (2 vols. [Leipzig, 1790–92]), and used in turn in Gustav Schilling's *Encyclopädie der gesamten musikalischen Wissenschaften oder Universal-Lexikon der Tonkunst* (6 vols. [Stuttgart, 1835–38]). Walther's notes are now located in the archive of the Gesellschaft der Musikfreunde in Vienna, according to George J. Buelow, "Johann Gottfried Walther," *The New Grove Dictionary*, 20: 193.

88. When they were later added, keys were primarily intended to make it easier for the player to venture into more extreme tonalities (Haynes, "Oboe Fingering Charts," p. 79). Although an added key similar to Quantz's D \sharp /E \flat invention for the flute might have helped the oboist's finger technique, it would not have solved the more fundamental intonation problems of, for instance, the low f \sharp ' or bb', and this therefore seems an unlikely interpretation of the wording. Carse (*Musical Wind Instruments*, p. 134) points out that the word used by Gerber, *Ventil*, was and is not the normal one for "key" in German (which is *Klappe*).

89. Cf. Mendel on the Taskin tuning fork ("Pitch in Western Music since 1500," p. 82).

90. Jane Bowers, "New Light on the Development of the Transverse Flute between 1650 and about 1770," this *Journal* 3 (1977): 32; Quantz, *Versuch*, pp. 31–32.

91. According to Friedrich von Huene (letter to the author, 1983), one surviving flute by Jacob Denner (1681–1735) has two center joints, pitching it at "392 and 415 more or less" (Nuremberg, no. MI 257).

92. No surviving examples of these latter instruments are, to my knowledge, playable significantly lower than A–410. The first known piece for oboe d'amore, written by Chris-

It seems evident that a single pitch standard was the wish of performers and theorists alike. French instruments themselves (as Muffat pointed out) were not all at the same pitch; woodwinds at about modern A \flat existed alongside instruments at modern G.⁹³ Thus, attempts to establish a standard German pitch did not involve a new invention but rather an agreement as to which pitch to use. Why then, if woodwinds could be made at different tunings, wasn't their A simply pitched to the organs at Chorton? Quantz had a good deal to say about that:

Der ganz hohe Ton würde machen, dass obgleich die Figur der Instrumente bleibe, doch endlich aus der Flöte traversiere wieder eine Querpfeife, aus dem Hobeo wieder eine Schallmey, aus der Violine eine Violino piccolo, und aus dem Basson wieder ein Bombart werden würde. Die Blasinstrumente, welche doch eine so besondere Zierde eines Orchesters sind, würden hiervon den grössten Schaden haben. Dem tiefen Tone haben sie eigentlich ihren Ursprung zu danken. . . . Man könnte zwar allenfalls kleinere und engere Instrumente, zum Vortheile des hohen Tones, verfertigen lassen: allein die meisten Instrumentmacher arbeiten nach ihrem einmal angenommenen, nach dem tiefen Tone eingerichteten Modelle; und die wenigsten würden im Stande seyn, die Mensur nach gehörigem Verhältniss so zu verjüngen, dass das Instrument zwar hoch würde, doch aber auch seine Reinigkeit behielte. Geriethe auch endlich eins und das andere, so wäre doch noch die Frage, ob die obgemeldeten Instrumente, wenn sie auf den hohen Ton eingerichtet sind, noch eben die Wirkung thun würden, welche sie thun, wenn sie bey ihrem alten ihnen eigenen Maasse bleiben?⁹⁴

(Although the shape of the instrument would remain, the very high pitch would finally make a cross-pipe again of the transverse flute, a shawm of the oboe, a violino piccolo of the violin, and a bombard of the bassoon. The wind instruments, which are such a special ornament of an orchestra, would suffer the greatest harm in consequence. Indeed they owe their existence to the low pitch. . . . To be sure, smaller and narrower instruments could be made [in the interests of] the high pitch; but the majority of the instrument-makers work according to accustomed models that are adjusted to the low pitch, and very few would be in a position to reduce the measurements in a sufficiently correct ratio that would make the instrument high yet also retain its trueness. And even if some were finally to succeed, the question would still remain: would the above-mentioned instruments, if adjusted to the high pitch, produce the same effect as with the old measurements peculiar to them?⁹⁵)

toph Graupner probably for the oboist Michael Böhm, is dated near the end of 1717 (Koch, "Sonderformen der Blasinstrumente in der deutschen Musik," p. 63).

93. Cf. Appendix A, and n. 23, above.

94. Quantz, *Versuch*, p. 242.

95. *Ibid.*, trans. Reilly, *Essay*, p. 268. The words in square brackets are my changes in Reilly's translation.

This brings us to the question of timbre and carrying power. Even in today's relatively standardized symphony orchestra, there are different clarinets in both B♭ and A and horns in F and B♭. Modern players have no wish to abandon this somewhat impractical custom, because differences in pitch of this degree⁹⁶ have a remarkable effect on the tone quality of woodwind instruments, comparable to that of open and stopped strings. Praetorius comments on this in 1619:

. . . die Flötten and andere *Instrumenta* in solchem niedern Thon lieblicher, als im Rechten Thon lauten, und fast gar eine andere art im gehör (sintemahl sie in der tiefe nicht so hart schreyen) mit sich bringen.⁹⁷

(. . . flutes and other instruments in such a low pitch sound sweeter than at the regular pitch, and make an entirely different effect on the ear [since when they are low they do not cry out so loud].⁹⁸)

And Mattheson writes:

Der Chor-Thon . . . so viel beschwehrlicher vor die Sänger, und ungeschickter vor *Hautbois, Flutes*, und andere neue *Instrumenten*, als der niedrige und *commode* Cammer- und Opern-Thon. . . .⁹⁹

(Chorton . . . [is] so much more difficult for singers and unsuitable for oboes, flutes, and other new instruments than the low and comfortable chamber and opera pitch.)

Quantz also adds:

In Rom . . . spielten doch damals die Hoboisten auf solchen Instrumenten, die einen ganzen Ton höher stunden. . . . diese hohen Instrumente thaten, gegen die übrigen tiefgestimmten, eine solche Wirkung, als wenn sie deutsche Schallmeyen wären.¹⁰⁰

(In Rome . . . the oboists then played on instruments that were a whole tone higher. . . . these high instruments produced an effect like that of German shawms against the others that were tuned low.¹⁰¹)

96. Even a smaller difference can be clearly heard, as for instance in the sound of the oboes in the present Berlin Philharmonic, who are attempting to play at about A–446.

97. Praetorius, *De organographia*, p. 16.

98. Translated by Mendel, "Pitch in the 16th and Early 17th Centuries," part 2, p. 205.

99. Mattheson, *Das neu-eröffnete Orchestre*, p. 74.

100. Quantz, *Versuch*, p. 243.

101. *Ibid.*, trans. Reilly, *Essay*, p. 268. The term *deutsche Schallmey* could also refer to the transition instrument of that name, made by such makers as Richard Haka. Cf. Phillip T. Young, *Twenty-five Hundred Historical Woodwind Instruments* (New York: Pendragon Press, 1982), p. 63; Koch, "Sonderformen der Blasinstrumente in der deutschen Musik," p. 85. This instrument was also called a *Piffaro* (Mattheson, *Das neu-eröffnete Orchestre*, p. 268).

In discussing historical clarinets at different pitches, Colin Lawson writes:

The difference in tone-quality among the instruments in A, B flat and C was perceived by virtually all 18th- and 19th-century writers on the subject. . . . The continued use of the various sizes of clarinet was recommended (at the Paris Conservatoire in 1812) not on technical grounds . . . but because the exclusive use of a single instrument would deprive composers of an important tonal resource.¹⁰²

In my own experience, the oboe at A–392, for instance, is relatively soft and veiled in timbre, blends easily with other instruments (including the flute), and is ideal for chamber music. At A–415, it is a more aggressive and brilliant instrument, carries better, is more agile, and may have been regarded as generally more successful in larger settings. As we have seen, Muffat remarked in 1698 that the French considered cornet pitch “too high, too screechy, and too forced.”¹⁰³ This may have been one of the factors that caused the woodwind instruments to be developed first in France, where a low pitch contributed to their acceptance and suitability for playing with other instruments.

Evidence of Historic Pitches from Early Instruments

There was of course no particular reason in Bach's time to provide a record of absolute pitch for posterity. Chance has left us, however, a number of written descriptions of pitches in relation to each other, as well as some original instruments that are directly relevant to the question. Fortune has also bequeathed us the studies of a remarkable scholar with a lifelong interest in the subject, Arthur Mendel (1905–79). Among Mendel's studies was one on Bach's pitch (1955)¹⁰⁴ and a final summary published in 1978.¹⁰⁵ Any subsequent work on historical pitch (including the present one) benefits from his writings, though it may not agree with all of his conclusions.

It was my privilege to have provided a small part of the instrumental data used in Prof. Mendel's last study (although I now credit that information with less certainty than I did then; see “Early Oboes and Bassoons” in

102. Colin Lawson, “The Authentic Clarinet: Tone and Tonality,” *Musical Times* 124 (June, 1983): 357.

103. Muffat, *Florilegium secundum*, ed. Rietsch, p. 48.

104. Mendel, “On the Pitches in Use in Bach's Time.”

105. Mendel, “Pitch in Western Music since 1500.”

Appendix A, below). Despite a temptation to take his thorough work as the final word on pitch, my own experience in playing and studying historical instruments has continued to suggest that not all of his conclusions concerning Bach's pitch can be correct. This has led me into the thorny job of disassembling his brilliant logical structure and putting it back together with some added elements. The most important of these is a careful examination of surviving musical instruments.

There is more historical evidence available than Mendel suggested. Although it may be useful as background material on the period, of course not all of it relates directly to Bach. This section will examine the most relevant instrumental data: it includes the pitches of original flutes, recorders, and cornetti (especially those with some connection to Bach), and the experience of modern players in using original instruments and exact copies.¹⁰⁶ Further information is given below in Appendices A and B.

Before examining this information, we must consider the way instrument scales were tuned in the early eighteenth century. Keyboard instruments used a variety of temperaments when they played alone,¹⁰⁷ since (as Quantz explained it)¹⁰⁸ they were unable, unlike most other instruments, to make distinctions between enharmonic notes (such as D#/Eb or G#/Ab; split keys on some early harpsichords were developed to partially solve this problem). For non-keyboard instruments, however, the most common tuning throughout the eighteenth century was a form of meantone generally known as "1/6-comma." The identifying aspect of this temperament is the difference of a comma (about 22 cents) between enharmonic equivalents. As in all meantone tunings, the fifths are slightly small (in this case, 3.773 cents less than pure) in order to make the major thirds more nearly in tune. Temperament is a necessary factor to keep in mind when looking at original accounts of tuning relationships, and especially when measuring scales on original woodwinds.

106. Two other kinds of original instruments that were considered for this study were clarinets and automatic instruments (such as music boxes). Although the clarinet might have been useful, the instrument was in its formative stages during Bach's lifetime. No clarinets by Leipzig makers are known to survive, and Bach apparently wrote no music for the instrument. Automatic instruments do preserve their original pitches, but they were not normally meant to be played together with other instruments. Their pitch would probably have been determined by factors such as their size or method of construction. In a letter to the author dated May 31, 1984, Prof. David Fuller, who has made a particular study of these instruments, agrees that their value to the present study is dubious.

107. See David and Mendel, *The Bach Reader*, pp. 290, 443; Oldham, "Pitchpipe"; and John Hind Chesnut, "Mozart's Teaching of Intonation," *Journal of the American Musicological Society* 30, no. 2 (summer, 1977): 254-71.

108. Quantz, *Versuch*, trans. Reilly, *Essay*, p. 260.

Because of inherent physical inequalities in woodwind scales, there is a natural tendency toward meantone. The most common tonalities are usually the best in tune. An example is the over-narrow semitone between F and F \sharp on the traverso and the oboe. The F in $1/6$ -comma meantone is about 2 cents higher and the F \sharp about 11 cents lower than in equal temperament—in other words, the tuning system asks for an over-narrow semitone at this point. These notes would be out of tune, of course, if judged by the standards of equal temperament. We must therefore beware of generalizing the overall pitch of an early woodwind instrument on the basis of one note. For example, the A on every woodwind of the period will tend to be flatter than the average pitch of the scale, especially on F-instruments like the recorder and bassoon, where this note is the third of the primary scale.¹⁰⁹

Woodwinds in General

Because wood shrinks to a different degree in different directions, original woodwind bores are now oval rather than round, and somewhat smaller overall than when originally made. Attempts have been made to develop formulas to extrapolate original bores from existing ones, but little practical experiment has been done to determine what these dimensional differences mean in practical terms.¹¹⁰ How significant have these dimensional changes been in their effect on pitch? The little evidence we have is inconclusive. If anything, woodwinds may have originally played slightly lower than they do now. Several years ago, two twin flutes by the Belgian maker G. A. Rottenburgh (ca. 1750) were discovered, apparently in new condition. Careful measurements of their pitch and dimensions were made before they were played. Several years later, after considerable use by their owner, Frans Brügger, no change in pitch could be detected.¹¹¹ On the other hand, Fred Morgan writes:

In order to get as close as possible to the likely diameter of the bore when new, I always take the maximum axis size as my dimension when making reamers for

109. An interesting study of the internal tuning of various early recorders is reported in Eugène van Eijken, "Een onderzoek naar getempereerd spel op houtblasinstrumenten in de 17e en 18e eeuw, in het bijzonder op de blokfluit," *proefschrift* for B-diploma in recorder, Royal Conservatory, The Hague, 1982. Chesnut ("Mozart's Teaching of Intonation") cites Tosi, Telemann, Silbermann, Sauveur, Türk, Quantz, Leopold Mozart, and Wolfgang Amadeus Mozart as advocates of $1/6$ -comma meantone for non-keyboard instruments.

110. Cary Karp, "Woodwind Instrument Bore Measurement," *Galpin Society Journal* 31 (1978): 9.

111. This information kindly supplied by the flute maker Rod Cameron of San Francisco. Bob Marvin, recorder maker, reports a "small pitch change with aging (of boxwood) and uniform bore shrinkage" (letter to the author, June, 1984).

copies. . . . Working to the larger axis will cause the instrument to sound at a slightly lower pitch than the original does, with its oval bore, but this lower pitch will be closer to the original's pitch when new than is its present sounding pitch. An example of this from my own experience concerned the beautiful Jacob Denner treble recorder in the Musikhistorisk Museum in Copenhagen. This excellent instrument sounds at exactly A415, according to my tuning measurements. I measured it very carefully, made my first trial copy, and it sounded at A410, because of the effectively slightly more capacious bore.¹¹²

No general study of early woodwind pitch has yet been made, so the data for this article remain more sketchy than we could wish.

Transverse Flutes

The pitch of an early flute can vary 10–15 cents (2–4 Hz at A–440), depending on the player's blowing technique. Alterations to original traversos that would raise their pitch are detectable, however. Enlarging an embouchure hole ruins the tone; a better method of raising is to shorten the upper middle joint, but this adversely affects the intonation and can be detected later.¹¹³

An indication of the comparative inflexibility of flute pitch is the development in about 1720 of the *corps de rechange*. The earliest baroque flutes were made in three pieces, with a long center joint. The new model divided this center joint into two parts and often provided a number of alternate lengths for the upper one. This resulted in a variety of pitches, spaced usually, according to Quantz,¹¹⁴ in increments of about one-fifth of a semitone, with a total range from largest to smallest of a "large semitone." A flute made by Quantz for Frederick the Great,¹¹⁵ for instance, has six alternate middle joints, the longest showing the most wear.¹¹⁶ This joint makes the instrument play almost a whole-tone below A–440, while the shortest makes it about a semitone below A–440. With a flute of this type, one or two of the joints (usually somewhere in the middle, but on flutes made by

112. Fred Morgan, "Making Recorders Based on Historical Models," *Early Music* 10, no. 1 (January, 1982): 17, 18. Cf. Karp, "Woodwind Instrument Bore Measurement," p. 18: "The original pitch of a 'shrunken' woodwind can . . . not be extrapolated solely on the basis of bore-measurement analysis. I suspect despite this that generally accepted historical pitch levels as established on the basis of characteristics of surviving woodwinds may in light of future research need revision 'downwards.'"

113. There is normally a short blank section on the tenon beyond the thread grooves, which would be missing on a shortened joint.

114. Quantz, *Versuch*, trans. Reilly, *Essay*, p. 32.

115. Michael Seyfrit, comp., *Musical Instruments in the Dayton C. Miller Flute Collection at the Library of Congress: A Catalog*, vol. 1, *Recorders, Fifes, and Simple System Transverse Flutes of One Key* (Washington, D.C.: Library of Congress, 1982), no. 208 (p. 210).

116. Mendel, "Pitch in Western Music since 1500," p. 20.

Quantz, usually the longest joint) will have the best internal intonation.¹¹⁷

The inflexibility of flute pitch works to our advantage in studying historical pitches, of course. A list of pitches for three-piece flutes can be found in Appendix A. Flute pitch can be regarded as reasonably accurate historical evidence. While some flutes may have been raised in pitch, there is no way to lower them, so we are reasonably certain that the present pitch of early specimens cannot have been higher, although it might once have been lower. Flutes can also serve as a control and reference to other instruments, such as recorders, by the same maker.

Recorders

Of all the woodwinds, recorders are the least flexible in pitch and are therefore the most useful for our purposes. As with traversos, differences in wind pressure are only possible within a narrow range, and there are no missing parts, such as reeds, to take into account. A recorder whose scale is reasonably in tune cannot have been shortened. An enlarged window will raise a recorder's pitch, but such work would be easy for an expert to detect. And from a historical point of view, since the recorder fell into disuse during the course of the eighteenth century, there would have been no reason to have attempted to raise its pitch.

Recorders can therefore be considered, as Friedrich von Huene once said, reliable eighteenth-century pitchpipes.¹¹⁸ And any recorders that have survived from the workshops of Leipzig makers during Bach's time would be primary evidence for this study. We will examine recorders and flutes by Leipzig makers below. A list of pitches for some early recorders may be found in Appendix A.

Cornetti

The core of Bach's orchestral forces at Leipzig were the four *Stadtpfeiffer* and four *Kunstgeiger* of the city, who were under his direct supervision as "Director Musices Lipsiensis."¹¹⁹ By guild law, the *Stadtpfeiffer* were required to be proficient on the cornetto, among a variety of different instruments. Bach's principal oboist, the *Stadtpfeiffer* Johann Caspar Gleditsch (1684–1747), is known to have owned one.¹²⁰ Bach used the instru-

117. Cary Karp, curator of the Stockholm Musikhistoriska Museet, has written: ". . . on all the transverse flutes I've seen with lots of joints for multiple pitch use, only one of the alternate joints ever shows any real signs of wear" (letter to the author, 1984).

118. Given that they are in original playing condition.

119. Schering, *Musikgeschichte Leipzigs*, 2: 261; Terry, *Bach's Orchestra*, pp. 7–22.

120. Schering, *Musikgeschichte Leipzigs*, 2: 34.

ment in a number of cantatas,¹²¹ once together with oboes in Cantata 95.¹²²

Among the cornetti now in the possession of the Musical Instrument Museum of the Karl Marx University in Leipzig are three curved trebles of the type played by the Stadtpfeiffer in the late seventeenth and early eighteenth centuries; they may even be the instruments used by Bach.¹²³ It is remarkable that all three are at the same pitch, A–466, which corresponds closely to our hypothetical lower Chorton. According to Dr. Herbert Heyde, the three instruments belong together originally, along with four others now in other museums.¹²⁴ The latter four are pitched at A–465, 460, 465, and 465.

As Edward Tarr has written,¹²⁵ the influence of the particular player can vary the pitch of a cornetto noticeably. This obliges us to take all pitch information on this instrument *cum grano salis*. The pitches quoted above, however, show surprising consistency for having been measured by three different players.

Modern Use of Historical Instruments

The last generation has seen the development on a large scale of professional performers on historical instruments (freely interchanged with carefully made copies). The pitches used by these players are somewhat arbitrary, but are limited to the inflexibility and general tendencies of the instruments themselves. They must therefore give some indication of their original levels. Among present-day players and makers of these instruments, the following pitches are generally recognized:

1. A–425 to 430: gaining acceptance in the last few years as a standard pitch for classical music (post ca. 1770).
2. A–410 to 420: by far the most general “baroque” pitch, with 415 being the common standard.
3. A–ca. 405: so-called “English pitch”; associated with woodwinds by early eighteenth-century makers, primarily English, although there are indications that it was used elsewhere as well.¹²⁶ This pitch is seldom used today.

121. Werner Neumann, *Handbuch der Kantaten Joh. Seb. Bach's* (Leipzig: VEB Breitkopf & Härtel Verlag, 1971), p. 278.

122. Given as *Horn* in Neumann, *ibid.* (p. 118), but actually for cornetto, according to Nikolaus Harnoncourt in his notes to the Teldec recording of Cantata 95 (*Das Kantatenwerk*, vol. 24, 1979; no. 6.35442 Ex).

123. Catalogue nos. 1563, 1564, and 4030. Apparently Saxon, exact dating unsure. See Edward H. Tarr, “Ein Katalog erhaltener Zinken,” *Basler Jahrbuch* 5 (1981): 136–38.

124. Braunschweig, Städtisches Museum, no. 62; Basel, Historisches Museum, no. 160; and Sigmaringen, Hohenzollern-Museum, nos. 4958 and 4959.

125. Tarr, “Ein Katalog erhaltener Zinken,” p. 12.

126. Thomas and Rhodes, “Pitch,” p. 782.

4. A–392 to 400: known as “French pitch”; gradually coming into use because of its unique tone quality and character.

A–415, or modern A \flat , originally became a standard because of its convenience when using modern “transposing” harpsichords (whose keyboards could be shifted downwards one jack) and its simple relation to A–440. The sources reviewed in this study indicate that the higher Cammerton—the historical precedent for this pitch—was probably originally slightly lower, about A–410. It would seem suspiciously neat that a common eighteenth-century pitch should just happen to have been an exact equal-tempered semitone below an arbitrary twentieth-century pitch. (A–440 is a relatively recent standard agreed upon just before World War II; a similar standard 5 Hz lower—A–435—existed from 1859 and was known as the “Diapason Normal.”¹²⁷ The most common modern oboe used today in symphony orchestras, the Lorée A6 Conservatory system model, was designed for this lower pitch.)

In my own opinion, the natural tendency of modern players, when playing early instruments, is to use more pressure and tension than necessary (in the form of tenser stringing, faster air-streams, tighter embouchures, and heavier reeds). The longer players work with eighteenth-century instruments, the more relaxed their technique becomes. This is, I think, a measure of the distance they are able to take from their backgrounds on modern instruments. Modern instruments serve a different function: they are expected to project and define themselves in a way unnecessary for earlier music. In general, higher tension and pressure result in higher pitch. The logical conclusion is that, coming from a matrix of modern technique, contemporary players are more likely to play early instruments higher than they were originally meant to be played, rather than lower. That A–415 has become a standard “baroque” pitch, therefore, probably means that pitch was at least that low originally, and certainly no higher.¹²⁸

Surviving Instruments Connected with Bach

Can any original instruments whose pitch we know be directly related to Bach? We have no data for any of Bach’s regular organs. We do know that the two at the Thomaskirche and Nikolaikirche in Leipzig were at the same level.¹²⁹ Kuhnau may have had them tuned an exact tone above the prevailing Cammerton in Leipzig, so that the organ would be at the pitch of the

127. Mendel, “Pitch in Western Music since 1500,” p. 90.

128. Karp, “Woodwind Instrument Bore Measurement,” p. 18.

129. Arnold Schering, *J. S. Bachs Leipziger Kirchenmusik* (Leipzig: Breitkopf & Härtel, 1936), p. 58; Terry, *Bach’s Orchestra*, p. 156.

other instruments when transposed down a tone.¹³⁰ On the basis of the pitches of surviving traversos and recorders made in Leipzig at the time (see “Leipzig Woodwind Makers Contemporary with Bach” in Appendix A), this Cammerton must have been A–410 to 415. This would have put the organs at A–460 to 466. We have seen above that several cornetti from Leipzig (traditionally tuned to Chorton) are pitched at exactly this level. We do know the original pitch of an organ at Störmthal, near Leipzig, where Bach performed Cantata 194 for its dedication: this is A–464.¹³¹ We would expect smaller towns in the region of a city to conform to its pitch standard for practical reasons, and therefore the pitch at Störmthal suggests that Bach’s regular organs were also at this pitch.

Another line of reasoning that indicates this pitch involves strings. We know from the notation of the parts that Bach’s string band at Weimar was tuned up to the organ at Chorton. It is also fairly certain from a comparison of voice ranges and notation that Chorton was the same at Weimar and Leipzig.¹³² If we accept a level higher than A–415 for Cammerton at Leipzig, we are also making Chorton higher, as the two are one step apart. It is questionable whether the strings could regularly have played much higher than A–460; it would have been theoretically possible, perhaps, with bridges moved upwards,¹³³ but it cannot have been pleasant to do or to hear.¹³⁴ The notion that Cammerton could have been A–440 would make Chorton A–494, which is probably a semitone higher than the instruments were originally built to play.¹³⁵ Walther, in the statement quoted at the beginning of this article, explains that Cammerton is used partly for the comfort of the sopranos and also “for the sake of the instruments so that the strings may hold better.” All of this indicates that Weimar Chorton was the lower type at about A–460 (Praetorius’s old standard); if this was true, then

130. According to Thomas and Rhodes, “Pitch,” p. 784. Unless tuning was included in the repairs of 1702, no other sources mention this. See Schering, *Musikgeschichte Leipzigs*, 2: 108.

131. Mendel, “On the Pitches in use in Bach’s Time,” p. 478.

132. Mendel, “Pitch in Western Music since 1500,” p. 77.

133. Ephraim Segerman, “On German, Italian and French Pitch Standards in the Late 17th and 18th Centuries,” *FOMRHI Quarterly* 30 (spring, 1984): 28.

134. This is the opinion of the early-violin specialists Sigiswald Kuyken and Lucy van Dael (conversations with the author, May, 1983). Praetorius (*De organographia*, p. 14) objected to a pitch one-half step higher than A–460 for exactly this reason: “. . . strings must be tough to stand such a pitch. And this is how it happens that often in the middle of the singing the fifths go out of tune, and one is left in the mire” (trans. Mendel, “Pitch in the 16th and Early 17th Centuries,” p. 202).

135. Cf. Appendix C.

Chorton at Leipzig would have been about the same (with Cammerton a step lower).

As for woodwinds, we have seen that both the traverso and the recorder are useful indicators of historical pitch. Leipzig possessed a thriving community of woodwind makers in the early eighteenth century, famous well beyond its own borders.¹³⁶ There are archival records linking some of these makers to J. C. Gleditsch (who probably played recorder and sometimes traverso in the cantatas when he wasn't needed on the oboe). We can therefore assume that the pitches of any surviving recorders or traversos by these makers would have a direct relevance to our study. As it happens, there are a number of these instruments still in existence. Several are in sufficient condition to give reliable pitches, notably those by J. H. Eichentopf, J. Poerschmann, and J. C. Sattler. Although we could wish to have a larger sample of surviving instruments, all of those included in the list in Appendix A give about the same pitch, near A–415.

Since current interest in early instruments is growing, we may hope that more complete and accurate data on pitches of woodwinds will appear in the future. What is now available can be used, however, to compare and corroborate early descriptions of pitch relationships, to be examined in the next section.

Other Indications and Descriptions of Historical Pitches

Throughout this study, there has been an unspoken assumption that the terms *Chorton* and *Cammerton* can be related to absolute pitches expressed in Hz values. Yet some of the original sources we have quoted seem to give the impression that pitch was so variable that the best we can hope for is an understanding of relationships rather than absolute standards.¹³⁷

Even now, pitch is in a state of flux; surely this was also true then. Is the

136. Paul Rubardt, "Johann Heinrich und Andreas Eichentopf," *Wissenschaftliche Zeitschrift der Humboldt-Universität* 15, no. 3 (1966): 411; Schering, *Musikgeschichte Leipzigs*, 2: 393ff.

137. "The diversity of pitches used for tuning is most detrimental to music in general. . . . For this reason it is much to be hoped that a single pitch for tuning may be introduced at all places" (Quantz, *Versuch*, trans. Reilly, *Essay*, p. 267). "Now why this or that pitch is called a or b, chamber, choir, and opera pitch, has no actual basis" (Mattheson, *Das neu-eröffnete Orchestre*, p. 74). See also the comments by Rousseau and Adlung quoted below, respectively, in the sections "Opera Pitch" and "Chorton." Note also the variation in pitches among French traversos listed in Appendix A; this is balanced, however, by the consistency in the larger sampling of recorders also given in Appendix A.

notion of absolute pitch standards in the baroque period therefore illusory, the product of our modern assumption that pitches can be measured and communicated by means of tuning devices that did not exist then?

I believe enough material can be assembled to establish Chorton and Cammerton pitches with reasonable certainty in absolute terms.¹³⁸ There can be little doubt from Quantz's wording in many passages in his *Versuch*, for instance, that he is discussing absolute as well as relative pitches.¹³⁹

The eighteenth century was not without objective devices for comparing pitches in different places, notably in the form of wind instruments.¹⁴⁰ Indeed, the woodwinds may have been the cause of the need for standards, since the other stabilizing factor, the organs, by themselves would have had a tendency to creep upwards with time.¹⁴¹ Organs seem in fact more often to have been tuned to the local woodwinds, rather than vice-versa.¹⁴²

138. We began with Praetorius's description of a standard that survived as Kuhnau's and Bach's Chorton. It also seems probable that the first German baroque woodwinds were either of French provenance and played by Frenchmen, or were German copies of French instruments, presumably at established French pitch standards (see the section "French Musicians and French Instruments in Germany"). As we have seen, J. A. Silbermann says in 1772 that "*Kammerthon* . . . appears to be generally and completely accepted, as all musical instruments are tuned to it" (quoted in Mendel, "Pitch in Western Music since 1500," p. 34, n. 23); and Mattheson implies the existence of a standard in the following: "Chorton . . . [is] so much more difficult for singers and unsuitable for oboes, flutes, and other new instruments than the low and comfortable chamber and opera pitch" (Mattheson, *Das neu-eröffnete Orchestre*, p. 74). Praetorius (*De organographia*, p. 16) and later Quantz (*Versuch*, p. 242) are also firmly against the idea of changing the pitch of woodwind instruments, implying the existence of common recognized standards.

139. "The unpleasant choir-pitch prevailed for some centuries in Germany . . . the French, with their pleasantly lower pitch . . ." (Quantz, *Versuch*, trans. Mendel, "On the Pitches in Use in Bach's Time," p. 470); "I do not wish to argue for the very low French chamber pitch . . . but neither can I approve of the very high Venetian pitch" (Quantz, *Versuch*, trans. Reilly, *Essay*, p. 268).

140. As we have seen, both the recorder and the traverso would be sensitive to pitch differences of the smallest degree, and any individual player of other winds such as double reeds and brass would be equally aware of such discrepancies.

141. "Choir pitch was probably [less standardized than chamber pitch], since it was determined on a local basis by the pitch of the organ at hand. Since the open flue pipes of the organ of that day could not easily be lowered in pitch, the pitch of any organ would climb on repeated tuning. When necessary the organ could be 'repitched' and brought down to a pre-determined level. The diversity of choir pitches is understandable but does not, in itself, imply a similar lack of standardization of chamber pitch." Cary Karp, *The Pitches of 18th Century Strung Keyboard Instruments, with Particular Reference to Swedish Material* (Stockholm: SMS-Musikmuseet, 1984), p. 94, n. 22.

142. Mendel, "Pitch in Western Music since 1500," p. 22, cites an example of this, and it is claimed in Thomas and Rhodes, "Pitch," p. 784, that Kuhnau had the organs at the Thomaskirche and Nikolaikirche in Leipzig tuned an exact whole-step above the prevailing Cammerton there (presumably determined by woodwind instruments). See n. 130, above.

Appendix B discusses the numerous scientifically accurate reports of tuning measurements made in the eighteenth century, which can be converted to Hz values. The tuning fork was also in existence by at least the beginning of the century, and it was in regular use in Bach's lifetime, together with pitchpipes and monochords.¹⁴³ It is true, as we have seen, that in the brief period under examination, pitch standards were indeed in flux (cf. "French" and "German" pitch, and Quantz's description of Parisian pitch immediately below). We are fortunately able to follow these changes with some accuracy, however.

There are two particularly complete eighteenth-century reports of various pitches which share our assumption that there were absolute standards that could be objectively compared. These were written by Quantz and Agricola, respectively:

Der venezianische Ton ist itziger Zeit eigentlich der höchste, und unserm alten Chortone fast ähnlich. Der römische Ton war, vor etlichen und zwanzig Jahren, tief, und dem pariser Tone gleich. Anitzo aber fängt man an, den pariser Ton dem venezianischen fast gleich zu machen.¹⁴⁴

(Venetian pitch is really at the present time the highest, and almost equal to our old choir-pitch. Roman pitch twenty-odd years ago was low, and equal to Parisian pitch. But now the pitch of Paris is beginning to approach that of Venice.)¹⁴⁵

In der Lombardey, und sonderlich in Venedig werden die Clavizimbale und andere Instrumente sehr hoch gestimmt. Ihr Ton ist fast nur einen halben Ton tiefer als der gewöhnliche Chor- oder Trompetenton. Was also auf der Trompete *c* ist, das ist bey ihnen ungefähr *cis*. In Rom ist die Stimmung sehr tief, fast der ehemaligen französischen Stimmung gleich, eine grosse Terz tiefer als der Chorton: so dass das *c* auf der Trompete mit dem *e* der andern Instrumente fast überein kommt. Sie ist noch einen halben Ton tiefer als der an vielen Orten Deutschlandes eingeführete sogenannte A-Kammerton: bey welchem das *a* der chortönigen Instrumente mit dem *c* der Kammertönigen gleich lautet.¹⁴⁶

(In Lombardy, and especially in Venice, harpsichords and other instruments are tuned very high. Their pitch is hardly more than a half-tone lower than the

143. Mendel, "On the Pitches in Use in Bach's Time," p. 468, cites a fork tuned to A=415 chained to a Silbermann organ in Dresden. In "Pitch in Western Music since 1500," pp. 81–83, he lists other eighteenth-century tuning forks. See also Appendix B, below.

144. Quantz, *Versuch*, p. 241.

145. Translated by Mendel, "On the Pitches in Use in Bach's Time," p. 469. On Roman pitch, see Appendix C, below. Quantz was in France in 1726–27.

146. Agricola, *Anleitung zur Singkunst*, p. 45.

ordinary choir- or trumpet-pitch, so that what is *c* on the trumpet is about *c*# for them. In Rome the pitch is very low, almost like the former French pitch, a major third lower than choir-pitch; so that *c* on the trumpet almost coincides with *e* on the other instruments. This pitch is a half-tone lower even than the so-called A chamber-pitch that has been introduced in many places in Germany, in which the *a* of the choir-pitch instruments sounds the same as the *c* of the chamber-pitch ones.)¹⁴⁷

This information may be easier to comprehend in the form given here in table 1.

TABLE I
Pitches Described by Quantz (1752) and Agricola (1757)

	<i>Quantz</i>	<i>Agricola</i>
Highest Pitch	Venice, "almost equal to our old choir-pitch"	"ordinary choir- or trumpet-pitch"
One-half tone lower	—————	Lombardy and especially Venice
One-half tone lower	—————	—————
One-half tone lower	A-Cammerton, "a minor third lower than the old choir-pitch"	A-Cammerton, "in which the <i>a</i> of the choir-pitch instruments sounds the same as the <i>c</i> of the chamber-pitch ones"
One-half tone lower	Rome and Paris, "twenty-odd years ago"	Rome, "almost like the former French pitch, a major third lower than choir-pitch," a half-tone lower than A-Cammerton

We are apparently dealing with four general pitches, in semitone increments,¹⁴⁸ fitted within the range of a major third (the discrepancy of a semitone in Venetian pitch is discussed below). Obviously, if we are able to determine the level of any of these pitches, the others will also fall into place. The two extremes, as we have seen, cannot reasonably be higher than about modern B for the highest or modern G for the lowest. If we use these pitches as a working hypothesis, the other pitches can be "triangulated" in relation to them. Where intervals are used to describe pitches, we

147. Translated by Mendel, "On the Pitches in Use in Bach's Time," pp. 469–70.

148. In order for these pitches to be transposable, they must have been in a relationship of whole- or half-steps to each other, at least for any given place and set of instruments.

will base our calculations on a $1/6$ -comma meantone scale rather than equal temperament, as explained above.

French Pitch

The following data are relevant to French pitch:

1. A pitchpipe that may have been made by the seventeenth-century woodwind maker Dupuis (fl. 1682) gives an *a'* at ca. 395 Hz.¹⁴⁹
2. The Taskin tuning fork (1783) gives a pitch of A–409, for either the Opéra or the Chapel.¹⁵⁰
3. Three non-French physicists in the eighteenth century measured pitches of about A–390 (see “Scientific Reports of Pitch in the Eighteenth Century” in Appendix B).
4. Joseph Sauveur (Paris, 1701) reported by inference an organ pitch at A–400; twelve years later, he put the *a'* for a harpsichord at 405 Hz.¹⁵¹
5. The data on French organs given in Appendix B indicate that the most common pitches for these instruments were approximately a semitone and a whole-tone below modern A (or about A–415 and 392).
6. A modern reconstruction of an organ, carefully following the detailed instructions of Dom Bedos (1766–78), produced a pitch about one whole-tone below modern A.¹⁵²
7. The highest pitch recorded for German organs averages about A–488 (cf. Appendix B). If French pitch was a major third below German Chorton, it would have been approximately A–389 (modern G = 392 Hz).
8. Mendel indicates that pitches lower than about a tone below A–440 would have been regarded as exceptional even by Frenchmen of the period.¹⁵³
9. Among surviving French traversos, pitch seems to fall into two categories: about A–400 and about A–410 (see Appendix A).
10. Early French recorders range in pitch from about A–392 to about A–420. A number of recorders by the German makers J. C. Denner and H. Schell, who were copying French instruments, are pitched at about A–392 (see Appendix A).
11. Quantz, who believed that “the very low French chamber pitch . . . is the most advantageous for the transverse flute, the oboe, the bassoon, and some other instruments,¹⁵⁴ built a number of flutes for Frederick the Great that play best in a range of A–392 to 402.¹⁵⁵

149. Measured by the author, April, 1984.

150. Mendel, “Pitch in Western Music since 1500,” p. 82.

151. *Ibid.*, p. 89; Thomas and Rhodes, “Pitch,” p. 782; Cary Karp, *The Pitches of 18th Century Strung Keyboard Instruments*, p. 16; and Clifford Truesdell, “Joseph Sauveur,” *The New Grove Dictionary*, 16: 524.

152. Mendel, “Pitch in Western Music since 1500,” p. 43.

153. *Ibid.*, p. 75.

154. Quantz, *Versuch*, p. 241; trans. Reilly, *Essay*, p. 268.

155. Rod Cameron, conversations with the author, November, 1983, and February, 1984; Mendel, “Pitch in Western Music since 1500,” p. 20.

12. Andreas Silbermann (1678–1734) built a number of organs at Strasbourg, where he lived from 1702. His Cathedral organ there was pitched at about A–392. Among his other organs was one at St. Margarethen (1703), which he himself described as being “one and one-half tones higher than French Cammerton, which was very low.”¹⁵⁶ Taking French pitch as Silbermann’s bottom standard, and assuming it to be the pitch of the Cathedral organ (which has been described as “a fine example of French influence on German organ building”¹⁵⁷), Silbermann’s French pitch would presumably have been about A–392.
13. Roman pitch was equated to French pitch by both Quantz and Agricola. Confirmation of a Roman pitch around A–392 is provided by material in Appendix C.

There appears, then, to have been a range of pitches used in France during the late seventeenth to late eighteenth centuries from about A–392 to 420. Of course, any of these pitches qualifies as “French.” But considering that we are attempting to fit these pitches into Quantz’s and Agricola’s major third, whose top extreme is probably not higher than modern B, the other extreme is presumably close to modern G (= 392 Hz). This is a pitch that would probably have been singled out for its exceptional lowness by German writers and termed “French.”

Opera Pitch

Another term that signified very low pitch was “opera pitch.”

1. Jean-Jacques Rousseau, for instance, writes in 1768 that the *Ton de Chapelle* and the *Ton d’Opéra* are employed in concerted instrumental music. “The latter has no fixed reference; but in France it is usually lower than the former.”¹⁵⁸ In other words, by French standards, opera pitch seems to have been the lowest standard in general use for instrumental music.
2. This is supported by Muffat’s statement, quoted above, that “the pitch to which the French tune their instruments is usually a whole tone lower than our German one . . . and in operas, even one and a half tones lower.”¹⁵⁹
3. Even as late as 1828, François-Joseph Fétis commented that the pitch of the Opéra at Paris was very low until about 1770; the pitch of the Opéra comique was somewhat higher, but was in turn lower than that of the Théâtre italien.

156. “1½ Ton höher als Französischer Kammerton, der sehr tief war” (quoted in Mendel, “Pitch in Western Music since 1500,” p. 34).

157. Thomas and Rhodes, “Pitch,” p. 783.

158. “Ce dernier n’a rien de fixe; mais en France, il est ordinairement plus bas que l’autre.” Jean-Jacques Rousseau, *Dictionnaire de musique* (Geneva, 1767; reprint ed., Hildesheim: Olms, 1969), p. 516.

159. Muffat, *Florilegium secundum*, ed. Rietsch, p. 48.

Fétis assumed that this low pitch was preferred to avoid tiring the singers.¹⁶⁰

4. J. A. Silbermann wrote in 1772 that he built three organs from 1736 to 1750 at "Opera, or French pitch."¹⁶¹
5. We have already noted the statement by J. C. Denner (1694) concerning two *frantzesische Fletten*, also called *Opera Flöten*.¹⁶²

The terms "opera pitch" and "French pitch" were sometimes used interchangeably. Since the French themselves used different pitches, apparently their own term for their lowest pitch was "opera pitch," and it seems likely that this became known outside of France as "French pitch." Thus, "opera pitch" and "French pitch" are probably synonymous terms.

Chorton

As we have seen, Chorton was a pitch inherited by the eighteenth century from organs built long before, which would have been impractical and expensive to alter. For example, the organs at the Nikolaikirche and Thomaskirche at Leipzig, where both Kuhnau and Bach worked, had been built in 1597 and at the beginning of the sixteenth century, respectively. As Mendel wrote, "Both had been repaired and enlarged many times, but nothing indicates that their pitch had been significantly changed."¹⁶³

From Myers's recent study of Praetorius's writings on pitch,¹⁶⁴ and from earlier studies as well,¹⁶⁵ it appears that Praetorius, writing in 1619, was discussing a standardized North-German pitch, known there as Chorton or sometimes Cornet-Ton. These studies have concluded that this pitch was about A-460 (modern B \flat = 466 Hz). Praetorius mentions, however, that there were advocates of a pitch standard a half-step higher than this, to which he himself objected.¹⁶⁶ There is evidence that both of these levels of Chorton existed in North Germany in Bach's time.

From the original pitches of North-German organs described in Mendel¹⁶⁷ and summarized here in Appendix B, we can derive three general pitches, all above A-440:

160. François-Joseph Fétis, "Sur le diapason," *Révue musicale* 2 (Paris, 1828): 204. My thanks to William Waterhouse for providing me with a copy of this article.

161. Quoted in Mendel, "Pitch in Western Music since 1500," p. 34.

162. Nickel, *Der Holzblasinstrumentenbau in der freien Reichstadt Nürnberg*, p. 199.

163. Mendel, "On the Pitches in Use in Bach's Time," p. 472; see also Schering, *Musikgeschichte Leipzigs*, 2: 108–111.

164. Myers, "Praetorius's Pitch."

165. Bessaraboff, *Ancient European Musical Instruments*; Willi Apel, "Pitch," *Harvard Dictionary of Music*, 2d, rev. ed. (Cambridge, Mass.: Harvard University Press, 1969), p. 678.

166. See n. 134, above.

167. Mendel, "Pitch in Western Music since 1500," pp. 30–31.

1. About a semitone above A–440, ranging from 455 to 464 Hz.
2. About one and one-half semitones above A–440, or about 480 Hz.
3. About a whole-tone above A–440, ranging from 484 to 495 Hz (modern B = 494 Hz).

The first and third of these pitches would seem to represent examples of a lower and higher Chorton, while the middle pitch may be regarded as either one or the other. Adlung commented in 1768:

Wie hoch aber unser Chorton sey, ist wegen der Varietät nicht zu melden. . . .¹⁶⁸

(It is not possible to report how high our Chorton is, however, because of the variety.)

And the 1783 edition of his *Anleitung zu der musikalischen Gelahrtheit* he comments that “it is known that organs are not alike.”¹⁶⁹

Several sources are ambiguous about the relationship of the terms “Cornet-Ton” and “Chorton.” For some writers, the names were apparently synonymous; for others, Cornet-Ton was higher.¹⁷⁰ Johann Samuel Petri mentions a Feld-Ton a semitone higher than his Chorton,¹⁷¹ and Christoph Gottlieb Schröter distinguishes a “high Chorton” and an ordinary Chorton.¹⁷² Mendel also cites an organ builder’s estimate in 1713 for lowering the pitch of an organ partly to a high Chorton and partly to a low, or else all to low Chorton.¹⁷³ J. A. Silbermann writes in 1772 that *Cornet Thon* was replaced by Chorton, which was one-half step lower, as the former was too high for singers.¹⁷⁴ In 1828, Fétis also considered the *diapason de cornet* higher than *chorton*.¹⁷⁵

Mattheson’s comment on pitch (quoted at the beginning of this article) is ambiguous: “Now why this or that pitch is called a or b, chamber, choir, and opera pitch, has no actual basis. Chorton is 9 to 14 commas [= a major

168. Adlung, *Musica mechanica organoedi*, 2: 55.

169. “Es ist bekannt, dass die Orgeln nicht überein sind.” Jacob Adlung, *Anleitung zu der musikalischen Gelahrtheit*, 2d ed., ed. Johann Adam Hiller (Dresden and Leipzig, 1783) p. 373.

170. Mendel, “Pitch in Western Music since 1500,” p. 15.

171. Johann Samuel Petri, *Anleitung zur praktischen Musik* (Leipzig, 1782), p. 138.

172. Christoph Gottlieb Schröter, *Deutliche Anweisung zum Generalbass* (Halberstadt, 1772), p. 21; quoted in Mendel, “On the Pitches in Use in Bach’s Time,” p. 472.

173. Mendel, “Pitch in Western Music since 1500,” p. 15.

174. Silbermann, letter of 1772, quoted in Mendel, “Pitch in Western Music since 1500,” p. 34.

175. Fétis, “Sur le diapason,” p. 205.

second to a minor third] higher than opera pitch and Cammertone."¹⁷⁶ Let us consider the second of these two sentences first.

If (1) opera pitch and Cammertone were thought of by Mattheson as the same pitch, there must have been two Chortons, a major second and a minor third above them; (2) on the other hand, Chorton could have been the fixed concept, in which case opera pitch and Cammertone would have been a major second and a minor third below it, and one-half step different from each other (from the evidence presented above, opera pitch would presumably have been the lower).

Either of these two interpretations makes sense and fits our historical data. Mattheson was writing in Hamburg. Since we know the original Chorton of two Hamburg organs (A-480 and 489),¹⁷⁷ if he meant the first of our possible interpretations, we can deduce that opera pitch/Cammertone was about A-410, and that the other lower Chorton would have been about A-460. The Hamburg Jacobi organ, generally at A-489, had one 8' Gedackt pitched at 411 Hz: this stop was referred to explicitly by both Mattheson (1721)¹⁷⁸ and Adlung (1768)¹⁷⁹ as Cammertone. If, on the other hand, the second interpretation was the intended one, since we know that Cammertone was A-411, opera pitch would have been 5 commas lower (386.5 Hz) and Chorton 9 commas higher (460.8 Hz). The point of this reasoning is that, using either possible interpretation of Mattheson's statement, we must unavoidably conclude that he was describing a lower form of Chorton at about A-460. And since we know also of a higher form at Hamburg, there were evidently two Chortons in existence there.

Church organists naturally tended to define Cammertone by its relation to Chorton. This could be a key to understanding Mattheson's first sentence. Was there indeed a "B-Cammertone"? The term "A-Cammertone," as used by Agricola and Quantz, suggests that there was another kind of Cammertone, and this would likely be Mattheson's "b," or "B-Cammertone." (In English, this would be called B \flat chamber pitch and would be one-half step

176. Mattheson, *Das neu-eröffnete Orchestre*, p. 74. Mattheson's word *Thon* has, like its equivalent in English, several meanings. A comparison of his use of the word in the index of his book indicates that he considered it variously to mean "step" (as in "whole step"), "pitch" (as in "chamber pitch"), and "note" (as in C and D). In the present quotation, there is always the possibility that he meant "note" instead of "pitch" for the sixth word.

177. Mendel, "Pitch in Western Music since 1500," p. 78.

178. Johann Mattheson, *Neidens musicalischer Handleitung andrer Theil* (Hamburg, 1721), p. 176.

179. Adlung, *Musica mechanica organoedi*, p. 193.

above A-Cammerton.) The designations A and B would have been necessary to an organist, if he thought in terms of a Chorton that varied one-half step. As Agricola explains, A-Cammerton derived its name from the fact that “the *a* of the choir-pitch instruments sounds the same as the *c* of the chamber-pitch ones.”¹⁸⁰ Since both Quantz and Agricola generally referred to a Chorton a minor third above their Cammerton, they naturally called it “A-Cammerton.” But in the case of an organist whose Chorton was one-half step lower than this, he would have had to play one-half step higher to produce the same Cammerton *c*. This would then have been B-Cammerton, although in fact it would have been the identical sounding pitch as A-Cammerton.

The answer to our original question about how to interpret Mattheson’s second sentence, then, is that there was probably not only a difference between Cammerton and opera pitch, but between two levels of Chorton as well. No wonder not only Mattheson but also other writers such as Walther and Adlung were vague in their descriptions of the relationship of these pitches.

Telemann gives us some advice on the subject. In the introduction to his *Harmonischer Gottes-Dienst* (begun in 1725), he writes:

Die Stücke des sämtlichen Jahr-Ganges sind nach dem Cammer-Tone eingerichtet, wesswegen nötig ist, dass der General-Bass für die Organisten in den Kirchen, wo man sich der Cammer-Tonstimmenden Instrumente bedient, jedesmal transponiret werde, und kann man nach folgendem Entwurfe, welcher die in diesem Werke etwa vorkommenden Töne enthält, aufs leichteste verfahren. . . .¹⁸¹

(The pieces in the entire liturgical year are set in Cammerton, and therefore it is always necessary for the basso continuo to be transposed by organists in churches in which [other] instruments tuned in Cammerton are used. One can most easily proceed according to the following scheme, which includes the keys that may occur in this work.)

The chart that he then provides shows the proper transposition for standard keys, not only a major second but a minor third lower as well. Since Telemann, like Mattheson, was writing in Hamburg, where by chance we know of an original Cammerton at A–411, and since Telemann referred to Cammerton in the singular, the implication is that he assumed the possibil-

180. Agricola, *Anleitung zur Singkunst*, p. 45; trans. Mendel, “On the Pitches in Use in Bach’s Time,” pp. 469–70.

181. Georg Philipp Telemann, *Harmonischer Gottes-Dienst* (Hamburg, 1725–26).

ity of two different Chortons, a tone and a tone and a half above Cammertone.

We have already noted that Andreas Silbermann built an organ at Strasbourg in 1703 that he said was one and one-half tones higher than French pitch. Since he also built an organ there at about A–392,¹⁸² we can reasonably assume that the other organ was pitched at about A–460.

There is also reason to believe that Quantz was thinking of two different Chortons. Both he and Agricola describe Venetian pitch in relation to Chorton (see table 1) and, as Ephraim Segerman also noticed, it is the only pitch on which they appear to disagree.¹⁸³ According to Agricola, Venetian pitch was “hardly more than a half-tone lower than the ordinary choir- or trumpet-pitch.”¹⁸⁴ This would put it at about the same level as the lower Chorton we have been discussing. Quantz, however, wrote that Venetian pitch was “almost equal to our old choir-pitch,” which would put it up close to modern B (494 Hz).¹⁸⁵ The difference is too large to be explained away by Agricola’s “hardly” and Quantz’s “almost.” It suggests that Quantz was referring to a second Chorton, since it makes more sense to equate Venetian pitch to Chorton if the latter were the lower form at about A–460;¹⁸⁶ this would then reconcile his statement with Agricola’s and give us a more plausible Venetian pitch as well.

As we have seen, Adlung writes in 1758: “In this region it is normal to call that pitch *hoher Kammerton* which is a major second lower than Chorton; *tiefer Kammerton* is a tone and a half lower than Chorton.”¹⁸⁷ In 1768, he reverses the reference point and defines Chorton as “1 or 1 1/2 tones higher than Cammertone.”¹⁸⁸ Which of the reference pitches did he consider fixed? In the later book, he also referred to the pitch of the Frauenkirche

182. Mendel, “Pitch in Western Music since 1500,” p. 29.

183. Segerman, “On German, Italian and French Pitch Standards in the 17th and 18th Centuries,” p. 33. As Quantz acted the part of mentor to Agricola at Berlin, where they both wrote their descriptions, a disagreement is improbable. See E. Eugene Helm, “Johann Friedrich Agricola,” *The New Grove Dictionary*, 1: 164–66.

184. Agricola, *Anleitung zur Singkunst*, p. 45; trans. Mendel, “On the Pitches in Use in Bach’s Time,” pp. 469–70. Notice the use of the word “ordinary”; this would have been unnecessary had there not been another Chorton, perhaps less common in Berlin.

185. Quantz, *Versuch*, p. 241; trans. Mendel, “On the Pitches in Use in Bach’s Time,” p. 469. As seems clear by now, Quantz’s A-Cammerton was about modern A♭, and by his account Chorton was a minor third higher.

186. Let us hope this is true; otherwise Vivaldi must have played a whole-tone above modern A!

187. Adlung, *Anleitung zu der musikalischen Gelahrtheit*, p. 387.

188. Adlung, *Musica mechanica organoedi* (1768), 2: 55.

organ at Dresden as Cammerton,¹⁸⁹ and we know that the pitch of this organ is and was about A–415. At least in this case, Adlung must then have been referring to two Chortons at about our modern B \flat and B \natural .

Of the original recorder pitches we have collected (see Appendix A), those of J. C. Denner show an interesting pattern. The majority play at about A–410 and A–460, with a few at other pitches. By now, we can classify the instruments at 410 and 460 with some assurance at high Cammerton and low Chorton, respectively. “Alto” recorders in G (i.e., at A–460) are not unusual during the early eighteenth century and could have been used both as “F” recorders at Chorton and as “G” recorders at Cammerton. (The specific range of the first recorder part to Bach’s Brandenburg Concerto no. 4 suggests that it was intended for such an instrument in G.)

We have noted above that seven curved treble cornetti of the type used by musicians who played under Bach are all pitched around A–465. These instruments originally belonged together, and three are still in Leipzig. Their pitch is evidently the lower species of Chorton.

Cammerton

There is also direct and implied evidence for the level of Cammerton. In 1772, J. A. Silbermann wrote: “In France, pitch was yet again $\frac{1}{2}$ step lower than Cammerton and was called French pitch, but is seldom used anymore.”¹⁹⁰ If, as seems clear now, French pitch was about A–392, then Silbermann’s Cammerton would have been about A–412 to 417. Agricola also puts French pitch one-half tone lower than A-Cammerton, as shown above. We have also noted above that the 8’ Gedackt stop on the Hamburg Jacobi organ, which was called Cammerton by both Mattheson and Adlung, was at A–411.¹⁹¹

Several organs built by the innovative builder Gottfried Silbermann (1683–1753) whose original pitches have survived are at about A–415. Silbermann was in regular contact with Bach and his pupil Johann Ludwig Krebs. Three of his Dresden organs, those of the Frauenkirche (1732–36), the Sophienkirche (1718–20 and 1747), and the Katholische Hofkirche (1750–54; his last and greatest organ, completed by his pupil Hildebrandt¹⁹²) were originally tuned to about A–415 or a little lower.¹⁹³ Bach’s

189. *Ibid.*, p. 193.

190. Silbermann, letter of 1772, quoted in Mendel, “Pitch in Western Music since 1500,” p. 34, n. 23.

191. Mendel, *ibid.*, p. 30.

192. Hans Klotz and Howard Schott, “Silbermann,” *The New Grove Dictionary*, 17: 313–16.

193. Mendel, “Pitch in Western Music since 1500,” pp. 30–31.

famous recital in 1725, before the musicians of the Dresden Orchestra, was on the organ at the Sophienkirche. It is now thought that he may have produced the first part of the B-Minor Mass there in 1733, where his son Wilhelm Friedemann was organist. Adlung refers to the "fine new organ" at the Frauenkirche as in Cammerton;¹⁹⁴ this was the organ on which Bach played another recital in 1736, in honor of his new post as Dresden court composer.¹⁹⁵ Silbermann built other organs between 1710 and 1753 at about this same pitch, including that of the Cathedral at Freiberg in Saxony.¹⁹⁶

Many of the early flutes and recorders listed in Appendix A are pitched at about A-410 to 415, or about A-392 to 400. These instruments would normally have been tuned at Cammerton, almost by definition. All of the flutes and recorders made by Leipzig makers contemporary with Bach whose pitches have survived give a pitch of about A-415. A-415 is now accepted as a world standard for performers on early eighteenth-century instruments, although this has come about partly by chance. Still, a large number of early instruments have been found that can be played successfully at this pitch.

Finally, it is unlikely that Bach's Cammerton could have been higher than about A-415, since strings at Weimar were tuned a whole step above this Cammerton, and a pitch higher than about A-460 would have been unpleasant and impractical.

Conclusions

Sufficient original indications exist to allow us to establish Chorton and Cammerton plausibly as absolute pitch standards. In order to understand their relationship fully, however, we must first examine their historical and geographical origins.

The woodwind instruments that were current in Bach's time had originally been developed in France about a generation before his birth. The pitch used by the French was lower than the then-standard German organ pitch by both one and one and one-half steps. The system developed to accommodate this pitch discrepancy involved transposing either the woodwind or the organ parts so that they played in tonalities either a major sec-

194. Adlung, *Musica mechanica organoedi* (1768), p. 193.

195. David and Mendel, *The Bach Reader*, p. 151.

196. Mendel, "On the Pitches in Use in Bach's Time," p. 468; idem, "Pitch in Western Music since 1500," p. 35.

ond or a minor third apart from each other (Chorton/Cammerton). From about 1715, there are signs that the use of the lower of these pitches (known as French pitch) began to die out in Germany, and one begins to read about a German Cammerton pitch that must have been close to A–410, about one-half step below modern A–440. This pitch was the higher of the usual French woodwind pitches and gradually became the accepted standard for ensembles of mixed instruments. Older instruments with venerable traditions, such as the brass and organs, were slow to adapt to this standard, but by the end of Bach’s lifetime, even they were beginning to be commonly played at the lower pitch.

A certain amount of pitch data from Bach’s time has survived, including a number of instruments whose original pitch is plausible. Some of these can be connected directly or indirectly to Bach. This information supports the hypothesis above and indicates that the lowest current pitch in Bach’s time was about A–392, the highest about A–490. These pitches correspond fairly closely to modern G and B, a range of a major third.

Contemporary descriptions of pitch in Bach’s time also place pitches in a relationship of a major third. From these descriptions, it is evident that there were two varieties of both Cammerton and Chorton, the lowest Cammerton being a major third below the highest Chorton. The most plausible Hz values for these pitches are given in table 2. It will be noted that most of these original pitches are about a comma ($= 1/9$ whole-tone) below their closest modern equivalents.¹⁹⁷

We know from the notation of Bach’s Leipzig works that his Cammerton there was a major second below his Chorton. Looking at table 2, we see that there is only one set of Cammerton/Chorton pitches that are a major second apart: this is the middle set, Chorton at about A–460 and Cammerton about A–410. (There are almost no historical indications for the existence of a pitch near A–440; had this been the case, our choices of pitches one step apart would have been larger.)

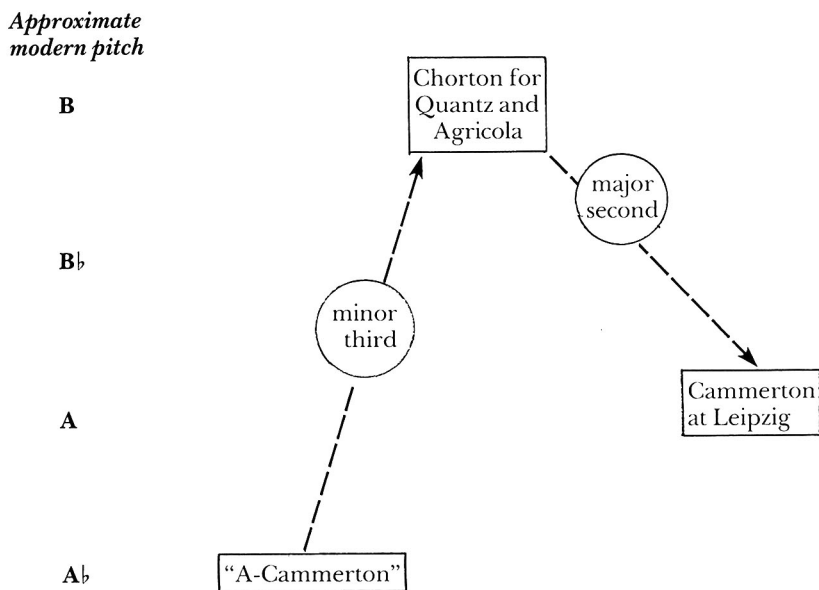
The conclusions drawn by Mendel are similar to those summarized in table 2. It is only on the question of the level of Bach’s Cammerton that his studies and the present one part ways. Mendel concluded that this pitch

197. Morgan (“Making Recorders Based on Historical Models,” p. 14) states: “I believe that this A415 pitch is slightly too high to give the best tonal results with recorders. . . . Most of the old instruments I know play appreciably lower than A415 and they would have been, in my opinion, somewhat lower still when they were new.” It should be noted that Apel (“Pitch”), a generation ago, listed the pitches in the same relationship as they are shown here in table 2; he based his information on Bessaraboff’s *Ancient European Musical Instruments*.

TABLE 2
Historical Pitches and their Hz Values

<i>Pitch name</i>	<i>Approximate original value</i>	<i>Closest modern equivalent</i>
Chorton, higher variety	A-489	<i>b'</i> (494 Hz)
Praetorius's "North German Chorton"; Venetian pitch; Chorton, lower variety	A-460	<i>bb'</i> (466 Hz)
<hr/>		<i>a'</i> (440 Hz)
Standard Cammerton; high Cammerton; A- (and B-) Cammerton	A-410	<i>ab'</i> (415 Hz)
French pitch; opera pitch; "low Cammerton"	A-392 to 400	<i>g'</i> (392 Hz)

TABLE 3
Schematic Depiction of Mendel's Deduction of Bach's Cammerton at Leipzig



was about A–440, which, in the face of the evidence we have reviewed, seems unlikely. Mendel’s reasoning was this: having established, as we have here, (1) that the pitch Quantz and Agricola called “A-Cammerton” was about modern A♭, (2) that Chorton was a minor third higher than this (as it is for these authors), and (3) that Bach’s notation clearly indicated that Cammerton was one step (rather than a step and a half) below his Chorton, then Bach’s Cammerton must have been modern A. Mendel’s deduction can be depicted schematically as shown in table 3. This is, of course, logical, but it ignores the possibility that the Chorton at Leipzig could have been the lower variety (about modern B♭), in which case the Leipzig Cammerton (one step lower) would have been about modern A♭. This conclusion fits the totality of facts discussed above much better. We have reviewed an abundance of evidence indicating that (1) there were two recognized levels of Chorton in Germany in Bach’s lifetime, and (2) the lower one (approximately modern B♭) was as common or more common than the higher one.¹⁹⁸ We have only to think of Telemann’s transposition scheme for both a major second and a minor third to realize the necessity of keeping two possible Chorton levels in mind.

Mendel was also bothered by the gap between modern B♭ and A♭ (see table 2) and thought that it could be filled with a possible “B-Cammerton” that would have been one-half step above A-Cammerton, or about modern A–440. We have seen above, however, that the terms “A-Cammerton” and “B-Cammerton” were probably necessary just because Chorton *did* vary, and Cammerton was described in relation to it: hence the designations A and B for what would actually have been the same pitch. We know with certainty that there was a pitch at about A–392 used by Cammerton instruments in Germany, but no source mentions three Cammerton levels. We are therefore probably safe in calling 392 Hz, or about modern G, “low Cammerton.” High Cammerton would then have been one-half step higher, at about A–410 to 415.

No isolated fact or piece of evidence in the above review is sufficient by itself to prove the absolute pitch levels we have discussed. But we have by now assembled many convincing indications of a Leipzig Cammerton at about modern A♭. At the same time, we have been unable to find evidence indicating a higher Cammerton in Bach’s region and period.¹⁹⁹ It asks a lot of our credulity to accept the accumulated evidence, but then make a spe-

198. Mendel takes the higher Chorton as an absolute in his further deductions, ignoring the possibility of a lower one.

199. Appendices A and C indicate the existence of a pitch around A–440, probably used in a part of Italy (cf. Anciuati and J. C. Denner). But there is no link with Bach or northern

cial exception for Bach, as Mendel would have us do. That Bach's Leipzig Cammerton was about A–410 to 415 simply fits the available evidence better. Using this level, it becomes easier to understand how the concepts of low and high Cammerton originated, and also explains why the majority of surviving woodwinds from the first half of the eighteenth century appear to play optimally at pitches near modern A \flat and G, and virtually none are at a pitch near our modern A.

Bach's Pitch at Leipzig

If Bach's regular Cammerton was about A–410, his Chorton, a whole-tone higher, was about A–460. Bach used a lower "tief-Cammerton" several times when he first arrived at Leipzig, and Kuhnau also used it occasionally. This would have been the same as French pitch, about A–392. Since this pitch was associated with opera, it is possible that it was used in the performances of operas at Leipzig starting in the 1690s (Telemann, who later managed the theater there, wrote some twenty operas for Leipzig.²⁰⁰) But this lower pitch was apparently abandoned at Leipzig after about 1720.

Bach's Pitch at Mühlhausen

If Chorton was about A–460 at Leipzig, it was probably the same at Mühlhausen and Weimar.²⁰¹ We know from the notation of the Mühlhausen cantatas that the woodwinds were pitched a whole-tone lower than the organ, as at Leipzig.

Bach's Pitch at Weimar

At Weimar, the woodwinds were normally one and one-half tones lower than Chorton, with the exception of certain single oboe parts. Using a Chorton level of about A–460, normal Cammerton would have been about A–392. The oboe pieces were apparently experimental and would have been at high Cammerton, or about A–410.

Bach's Pitch at Cöthen

Cöthen was exceptional in Bach's career, as all the parts to his music written there are in the same key. Clearly, there was no problem of pitch discrepancy between the organ and the other instruments. The use of French pitch at Cöthen is a definite possibility. The emphasis of his work

Germany. Of the approximately forty original organ pitches from Bach's region, none is at A–440.

200. Percy M. Young, "Leipzig," *The New Grove Dictionary*, 10: 634–42.

201. Dürr, *Studien über die frühen Kantaten J. S. Bachs*, pp. 76–77; Mendel, "On the Pitches in Use in Bach's Time," p. 352; and idem, "Pitch in Western Music since 1500," p. 77.

there was instrumental chamber music, free from the influence of either high-pitched organs or the need for brilliance and projection. The voice ranges of cantatas written at Cöthen are sometimes unusually high,²⁰² which suggests that they were written for a lower pitch than Bach's other vocal works. (This may explain why, when he used material for Cöthen later at Leipzig, Bach took the unusual expedient of playing it at "low-Cammerton."²⁰³) There were also regular and steady influences on Cöthen from Berlin, where pitch was sometimes about A–392. Bach bought a "large harpsichord with two keyboards made in 1719 by Michael Mietke" of Berlin for the court at Cöthen.²⁰⁴ Gustav Leonhardt believes the surviving harpsichord by Mietke at Berlin could not have played much above A–392 (A–405 at the highest), based on string lengths.²⁰⁵ Several of Bach's principals at Cöthen had come from Berlin after Freidrich Wilhelm fired his band in 1713. These included the oboist Johann Ludwig Rose and the bassoonist Johann Christoph Torlée. It is tempting to imagine the Brandenburg Concerto no. 2, which was probably written at Cöthen in 1717–18, played at A–392, so that the trumpeter's high notes would be a half- to a whole-step lower than we presently hear them.

* * *

To sum up our conclusions, the probable pitches used by Bach during his lifetime would be as follows (expressed in terms of their closest modern equivalents):

	Chorton Cammerton	
Mühlhausen	B♭	A♭
Weimar	B♭	G (normally, except for some oboe parts at A♭)
Cöthen	—	G and/or A♭
Leipzig	B♭	A♭

Although this study has been focused on Bach and on North Germany during Bach's lifetime, indications of pitches at other places have also come to light in the process. Appendices C and D include pitch material on Venice, Rome, Berlin, Dresden, and Hamburg.

Ste-Anne la Palud, France

202. Cantatas 173a, 194, and 194a are about one-half step higher than the average at Leipzig. See Mendel, "On the Pitches in Use in Bach's Time," p. 346.

203. See n. 78, above.

204. *Bach-Dokumente*, ed. the Bach-Archive, Leipzig, vol. 2, *Fremdschriftliche und gedruckte Dokumente zur Lebensgeschichte Johann Sebastian Bachs, 1685–1750* (Kassel: Bärenreiter; Leipzig: VEB Deutscher Verlag für Musik, 1969), pp. 73–74.

205. Gustav Leonhardt, conversation with the author, August, 1984.

APPENDIX A

Pitches of Some Early Wind Instruments

French Transverse Flutes

The following list is limited to three-piece instruments, as these represent the normal form of the traverso during the period in which France had direct influence over German woodwind design (ca. 1680–1715).²⁰⁶ After each maker's name in this and the following lists, each instrument is identified by its present owner or location (with its catalogue number if pertinent) and the pitch of its *a'* (given in Hz), followed by any additional comments.

Anonymous. Assisi, 392.

Chevalier. Boston, ca. 410.

Hotteterre (no initial; working dates of various family members, 1655–1763). Berlin (no. 2670), 398–402, embouchure probably original, low notes too low; Leningrad, lower than the Berlin instrument; Graz, ca. 396, perhaps later than the preceding two instruments.

Naust (?*Pierre*; fl. early eighteenth century). Berlin, 398–402, embouchure probably original.

Rippert, Jean-Jacques (ca. 1664–after 1722). Glasgow, ca. 410, embouchure probably altered.

French Recorders and Recorders by J. C. Denner and H. Schell

The following list is far from complete, but it gives a sample of surviving recorders illustrating pitches that were presumably current during Bach's lifetime.²⁰⁷ Although woodwind instruments were generally not dated, we know that the popularity of the recorder began to wane starting about

206. Cf. Bowers, "New Light on the Development of the Transverse Flute," p. 14; Bowers lists three other early traversos on pp. 12 and 24. Sources for the present list are Bowers, *ibid.*; Filadelfio Puglisi, "A Three-Piece Flute in Assisi," *Galpin Society Journal* 37 (1984): 6–9; Young, *Twenty-five Hundred Historical Woodwind Instruments*; and Rod Cameron, conversations with the author, November, 1983, and February, 1984.

207. Sources for this list are Bowers, "New Light on the Development of the Transverse Flute"; Friedrich von Huene, letters to the author, May 16, 1983, September 1, 1983, and April 14, 1983; Lyndesay G. Langwill, *Index of Wind-Instrument Makers*, 6th ed. (Edinburgh: The Author, 1980); Bob Marvin, "Recorders and English Flutes in European Collections," *Galpin Society Journal* 25 (1972): 30–57; Philip T. Young, "Some Further Instruments by the Denners," *Galpin Society Journal* 35 (1982): 78–85; *idem*, *Twenty-five Hundred Historical Woodwind Instruments*; and measurements made by the author, April, 1984.

1715,²⁰⁸ indicating that the majority of these instruments were probably made by that date.

Among the French recorders, pitch ranges between A–392 and about A–415, with some instruments at an intermediate level around A–406 (cf. the so-called “English pitch”). (Recorder pitch can vary as much as 6–7 Hz, depending on temperature.) A list of surviving recorders by J. C. Denner and H. Schell is provided because both makers apparently made recorders at so-called “French pitch.”²⁰⁹ These two makers, who at the end of the seventeenth century consciously set out to copy French woodwinds, have left recorders ranging in pitch from about A–392 to about A–460 (and possibly even higher in the case of Denner).

Anonymous. Formerly D. Munrow, 392.

Bizey, Charles (fl. 1716–52). Washington (Library of Congress), ca. 392.

Dupuis (fl. 1682). Paris (no. 368), 420 or 372, barely plays.

Hotteterre (*working dates of various family members, 1655–1763*). Rosenbaum, ca. 392, middle register sharp; Paris (no. 979), 434 or 386; Paris (no. 979.2.9), 406; Paris (no. 979.2.10), 415; Paris (no. 589), ca. 404, poor condition.

Lissieu (fl. 1672). Location unknown, 415.

Rippert, Jean-Jacques (ca. 1664–after 1722). Paris (no. 1515), 415, barely plays; Paris (no. 247), 410; Paris (no. 185), 406; four recorders listed by Bob Marvin (see note 207), all at ca. 415.

Rouge. Brussels (no. 438), 415.

Villars, Paul (fl. 1741–76; *pupil of Bizey*). London (Royal College of Music), 392.

J. C. Denner. Rosenbaum, ca. 440, not in good condition; Munich (Deutsches Museum, no. 63053), ca. 460, also partially by Hotteterre; Private collection in Bavaria, two altos and two basses at 430, 460, 430, and 430, respectively; Linz (no. 157), ca. 415, poor condition; Linz (no. 158), ca. 415, fair/good condition; Linz (no. 156), ca. 460, good condition; Basel (no. 1878-19), over 415, fair condition; Munich (Bayerisches Nationalmuseum, no. 179), ca. 415, good condition; Nuremberg (no. 88), over 460, fair condition; Nuremberg (no. 214), ca. 494, foot not original; Nuremberg (no. 213), ca. 440, fair/good condition; Nuremberg (no. 208), ca. 415, good condition; Berlin (no. 92), ca. 415, poor condition.

H. Schell. Oldham, ca. 405; Bologna, ca. 392, excellent condition; Washington (Library of Congress), ca. 415; Linz (no. 159), ca. 415, good condition; Innsbruck (no. 2,85), ?392, fair condition; Basel (no. 1956,632), over 415, fair condition; Nuremberg (no. 95), ca. 415, fair/good condition.

208. Maurice Byrne, “More on Bressan,” *Galpin Society Journal* 37 (1984): 108.

209. J. C. Denner by his own statement (see the section “French Musicians and French Instruments in Germany” and n. 59, above) and the existence of several instruments, not included in this list for lack of sufficient data, at or about A–392 (communication to the author from Friedrich von Huene).

Leipzig Woodwind Makers Contemporary with Bach

Johann Poerschmann (ca. 1680–1757) worked in Leipzig from at least 1708, and from 1746 at the same address as J. C. Hoffmann, who made a violoncello piccolo for Bach.²¹⁰ Poerschmann was an active bassoonist and oboist, and could well have been the bassoonist for whom Bach wrote several solos at Leipzig.²¹¹ He was apparently close to both Eichentopf and Gleditsch, as these latter both stood godfathers to children of his. Poerschmann is also notable as the teacher of the woodwind maker August Grenser (1720–1807).

Johann Heinrich Eichentopf (1678–1769) worked in Leipzig from 1710 to 1749. As he was married in the Thomaskirche in 1710, he may have been in both Kuhnau's and Bach's congregations at this church. An inventory of instruments for the court chapel at Cöthen, which includes five of his instruments, suggests that Bach may have purchased them from him or recommended them after his move to Leipzig.²¹² Eichentopf is represented by an unusually large number of surviving oboes d'amore (10) as well as two beautiful oboes da caccia (both dated 1724; Bach arrived in Leipzig in 1723, and immediately began using oboe da caccia in that year.)²¹³

Johann Cornelius Sattler (fl. Leipzig, 1718–45) probably lived in Leipzig most or all of his life. Twelve of his instruments survive: 5 oboes, 2 oboes d'amore, 4 recorders, and 1 bassoon.

The circle of instrument makers and players in Leipzig must have been close: Sattler, Poerschmann, Eichentopf, and a daughter of Gleditsch were all godparents to children of another maker, Gottfried Ebicht. There is a clear connection with Bach through both Gleditsch and Hoffmann. It

210. Paul Rubardt, "Johann Pörschmann," *Die Musik in Geschichte und Gegenwart*, vol. 10, cols. 1366–67; and Howard Mayer Brown, "Viola pomposa," *The New Grove Dictionary*, 19: 818. Walter Serauky (*Musikgeschichte der Stadt Halle*, vol. 2 [Halle and Berlin: Buchhandlung des Waisenhauses, 1939], p. 554) mentions an instrument maker in Halle named Joh. Rom. Pürschmann, but it seems unlikely that Poerschmann would have moved from Leipzig to Halle and back again.

211. He was solo bassoonist with the *Grosses Konzert*, successor to Bach's Collegium Musicum, from which eventually the Gewandhaus Orchestra emerged.

212. The inventory is dated 1773, but the instruments must have been purchased earlier. See Rubardt, "Johann Heinrich und Andreas Eichentopf," p. 412.

213. Young, *Twenty-five Hundred Historical Woodwind Instruments*; Cary Karp, "Baroque Woodwind in the Musikhistoriska Museet, Stockholm," *Galpin Society Journal* 25 (1972): 85; Schering, *Musikgeschichte Leipzigs*, 2: 296; Rubart, "Johann Heinrich und Andreas Eichentopf"; and Bruce Haynes, *Music for Oboe, 1650–1800: A Bibliography* (Berkeley: Fallen Leaf Press, 1985), s.v. "J. S. Bach," items 14.5, 15.1, 15.3.

seems unlikely that instrument makers would have missed Bach's performances each Sunday or would not have had direct connections with him, in his position as the city's Kantor and Musical Director.

The following is a list of surviving recorders by Poerschmann, Eichentopf, and Sattler.²¹⁴ It will be noted that all of these instruments give a pitch in the region of A–415. On the other hand, our sample cannot be called representative; we have seen, for instance, that J. C. Denner made recorders in a variety of pitches. At a conservative estimate, each of these Leipzig makers probably made 100 recorders in their long careers, and we have information on only seven of them. We can therefore draw no final conclusions from this information. It is significant, though, that all of the instruments appear to give about the same pitch.

Poerschmann. Claudius (no. 417), alto recorder, 410, well used, but in reasonable condition.

Eichentopf. Nuremberg (no. MIR 200), alto recorder, 421, good condition; Stockholm (no. 165), tenor recorder, 415, fair condition, out of tune.

Sattler. Stockholm (no. 159), soprano recorder, 415 and higher, poor condition; Stockholm (no. 162), alto recorder, ca. 415, badly out of tune; Stockholm (no. 161), alto recorder, unplayable but appears to be the twin of the preceding, so it probably also played at the same pitch; Ann Arbor (no. 505), alto recorder, 415, good condition (restored).

Early Oboes and Bassoons

Every competent player of the early oboe is fairly sure, within a narrow range, of the ideal pitch of an instrument that has been played for some time. When the same oboe with the same reeds is used by another player, however, the pitch can vary as much as 10 Hz. Some early oboes that are particularly flexible can even be played by the same player (using different

214. I am obliged to Eric Hoepflich for checking the pitches of the Sattler instruments at Stockholm in May, 1983, with the assistance of the museum's curator, Cary Karp, and to the latter for information on the Claudius recorder (letter to the author, December 20, 1984). On the Sattler recorder at Ann Arbor, see Robert A. Warner and Friedrich von Huene, "The Baroque Recorders in the Stearns Collection of Musical Instruments," *Galpin Society Journal* 23 (1970): 69–81. Other instruments by these makers that have survived but are not included in this list are: *Eichentopf*. Leipzig (no. 1244), four-piece flute, "drastically shortened," according to a letter from the museum's director, September 22, 1983. *Poerschmann*. Leningrad (no. 453), four-piece flute, information unavailable; Zürich, W. Burger, four-piece flute, but probably not by Poerschmann, according to a letter to the author from Friedrich von Huene, September 1, 1983; Berlin (no. 107), flute, lost in World War II; Berlin, Dr. W. Thoene, flute.

reeds) in pitches varying as much as a semitone.²¹⁵ Insofar as practical experience can be a guide, my own reluctant conclusion is that the evidence of individual players of the early oboe is not accurate enough to allow us to make any conclusions about historical pitch.

The above applies also to the bassoon, in which, because the instrument is physically larger, pitch tolerances are also larger.²¹⁶ The following statement by Eric Halfpenny gives another factor to consider with this instrument:

Bassoons being what they are . . . namely, rather expensive instruments of fairly robust constitution, many of the earlier ones were preserved in use even after the general pitch of instrumental music began to rise, as it did in England from about 1770. Consequently it is rare to find an English baroque [*sic*] bassoon in an original state of preservation. It was a comparatively simple matter to raise the pitch of such an instrument by a small amount without loss of any essential playing characteristics.²¹⁷

This was usually accomplished by shortening the bottom of the wing joint. It was, of course, often the better instruments that would have inspired this operation.

215. I am able to play my own copy of an oboe by Jacob Denner, which I have used in regular performances for the last fourteen years, convincingly in a range of pitches from 392 to 415 Hz.

216. I once heard of a professional bassoonist who played an early instrument in a concert a semitone different before the interval (intermission) and after, with the same reed and bocal! Cf. also Quantz's opinion that "poor intonation is not as apparent to the ear in the low register as in the high" (Quantz, *Versuch*, p. 233; trans. Reilly, *Essay*, p. 261).

217. Eric Halfpenny, "The Evolution of the Bassoon in England, 1750–1800," *Galpin Society Journal* 10 (1957): 31.

APPENDIX B Other Historical Pitch Indicators

Original Organ Pitches

Surviving French organs built between 1601 and 1789 yield the following range of pitches:²¹⁸

About three semitones lower than A-440:	1 instrument
One whole-tone lower than A-440:	6 instruments
Three-quarters of a tone lower than A-440:	1 instrument
About one-half tone lower than A-440:	5-6 instruments

All of these organs are at least a semitone below modern pitch. The intervals of one-half tone and a whole-tone below A-440 predominate. The Cathedral organ at Strasbourg (1716) and that at Marmoutier (1710) were built by Andreas Silbermann, whose son Johann Andreas provided interesting information on pitch relations noted above. Both of these instruments were built at about A-392. The Versailles chapel organ was lowered to A-396 by F.-H. Cliquot in 1789; it was therefore presumably higher when first built in 1711.

Indications of the original pitches of approximately 40 North German organs are as follows:

About one-half tone lower than A-440:	11 instruments
About one-half tone higher than A-440:	7 instruments
About three-quarters of a tone higher than A-440:	14 instruments
About one whole-tone higher than A-440:	7-8 instruments

This confirms the general notion discussed above that German pitch was traditionally higher than French, whence the origin of the concepts of Chorton and Cammerton. Note that no surviving instruments in the above list are pitched at A-440.

Tuning Devices

Although pitchpipes are not as accurate as tuning forks, a large number of early ones have survived, and they have several advantages. Instead of one note, they give a whole scale and thus the temperament; and as they are sometimes stamped by the maker, they can more often be accurately

218. The information given here is summarized from material in Mendel, "Pitch in Western Music since 1500," pp. 25-36; and Thomas and Rhodes, "Pitch," pp. 779-85.

placed and dated. The pitchpipe was like a small recorder fitted with a movable piston on which a scale of about one octave was marked. No pitchpipes apparently exist that relate directly to Leipzig in Bach's day, but Bach's cousin Johann Nicolaus (1669–1753), an instrument maker renowned for his tuning abilities, owned a similar instrument called a "monopipe." This was an organ pipe with a sliding cylinder, blown by bellows, and inscribed with the numbers of the monochord. According to J. Murray Barbour, several monopipes are preserved at the Library of Congress.²¹⁹

Most known pitchpipes are dated starting in the mid eighteenth century,²²⁰ and their pitch varies from about A–395 to 440.²²¹ Two specimens preserved at the Paris Conservatory are especially interesting. One, probably late-eighteenth-century French, gives a *Ton de l'opera* as 410.7 Hz and another scale *Plus haut de la chapelle a versaille* as about 430. Given their lateness, these pitches are probably higher than they would have been earlier, but the relationship suggested between chapel and opera pitch is a useful clue. The other is believed to be by the woodwind maker Dupuis (fl. 1682), and is at ca. 395 Hz.²²²

The tuning fork may have existed as early as the beginning of the seventeenth century,²²³ but credit for its invention is traditionally given to John Shore (ca. 1662–1752) in 1711.²²⁴ Of the forks reviewed by Mendel, none has a direct bearing on Bach. Mendel, perhaps over-rigorously, was dubious about the authority of the two most famous historical forks: that of Handel, and the one associated with Stein and Mozart (the pitches of these two forks are 422.5 and 421.6 Hz, respectively). He also questioned the relevance of the fork owned by Pascal Taskin, harpsichord maker and tuner to the French court, which had been tuned to the oboe of Antoine Sallentin (1755–1816), at the time (1783) oboist at the Opéra and Chapelle du Roi (cf. the pitchpipe discussed above) and later the first teacher of oboe at the new Conservatoire. This fork (whose actual authenticity has not been questioned) was at A–409, and it remains unclear which pitch standard it represents; presumably that of the Chapelle (although the pitchpipe mentioned above gives about the same pitch for the Opéra.)²²⁵

219. James Murray Barbour, *Tuning and Temperament: A Historical Survey* (East Lansing, Mich.: Michigan State College Press, 1951), p. 85.

220. Oldham, "Pitchpipe."

221. Ibid. and measurements made by the author at the Paris Conservatory, April, 1984.

222. Measured by the author, April, 1984.

223. Mendel, "Pitch in Western Music since 1500," p. 80.

224. Ll. S. Lloyd, "Tuning-Fork," *The New Grove Dictionary*, 19: 255–56.

225. See Thomas and Rhodes, "Pitch," p. 782, citing measurements made ca. 1860 by Lissajous.

Scientific Reports of Pitch in the Eighteenth Century

In 1712, the English mathematician Brook Taylor (1685–1731) published the first correct derivation of a vibrating string equation, which later became known as Taylor's Formula and served as the basis for further experimentation in acoustics during the eighteenth century. Among the foremost scientists working in this field were Leonhard Euler (1707–83), Daniel Bernoulli (1700–1782), and Johann Heinrich Lambert (1728–77), all of whom recorded measurements of pitch.²²⁶

In 1713, Taylor himself reported experiments indicating pitches for a harpsichord as A–383.6 and 390.2.²²⁷ Euler, working with Taylor's calculations, later measured pitches of A–395.7 for an instrument in *chorali modo* (*sic*) in 1727; in 1731 (data published in 1739), he measured a “keyboard” at A–392.2. Euler worked at various places during his lifetime, including Berlin, Basel, and St. Petersburg.²²⁸ Bernoulli measured choir and organ pitch at Basel in 1762 as A–390. And in 1775 Lambert, working at Berlin, recorded a pitch for a flute about one-half step higher than this, i.e., A–415.3. None of this information is immediately useful to our present study, but it is interesting as background, especially as it confirms the prevalence of a pitch around A–392 (modern G) in various parts of Europe other than France.

The French acoustician Joseph Sauveur (1653–1716) also reported less reliable pitch measurements. Sauveur's writings attracted much attention at the time and influenced Bernoulli's later work. The pitches he mentioned were A–400 for an organ pipe (1701) and about A–405 for a harpsichord (1713).²²⁹

String instruments

Ian Harwood writes:

Wind instruments will only work correctly at their proper pitch, so there is very little doubt what that should be. String instruments, on the other hand, can with the help of modern technology be tuned over a wide range of pitch levels. Nylon strings on a lute, for example, enable it to be tuned considerably higher than

226. This material is dealt with seriously for the first time, in attempting to study historical pitches, by Karp, *The Pitches of 18th Century Strung Keyboard Instruments*.

227. All pitches reported in this paragraph are based on the calculations in Karp, *ibid.*

228. Anonymous, “Leonhard Euler,” *The New Grove Dictionary*, 6: 292.

229. See n. 151, above.

would be possible with gut. . . . Tuning any particular lute too high, or a viol too low, is like condemning a tenor singer forever to alto or bass parts. No one would expect him to do either without strain, but we do it constantly to instruments with never a raised eyebrow. Yet the pitch of a stringed instrument is perhaps the most important single factor in determining the way it sounds, which in turn affects the sonority of the music it plays.²³⁰

According to Segerman, "The highest pitch for the string band was governed by gut first-string breakage."²³¹ There is no unanimity among experts on the strength of original gut strings,²³² but Segerman considers a range from A-440 to a semitone above it as possible for this period.²³³

Appendix C contains material suggesting that the pitch at Cremona in Bach's time was probably around A-460. Many of the finest string instruments of the period were produced there, and they probably provided models for the strings used by Bach.

Walther points out that one of the advantages of using Cammertone instead of Chorton is that the strings will hold their pitch better,²³⁴ and Adlung adds that this is especially true in humid weather.²³⁵

Harpsichords

In a recent study of harpsichord pitch based on calculations of string length, tension, and materials used, Cary Karp questions the historical justification for the use of a pitch as high as A-415 and writes:

With few exceptions, it is unlikely that the strung keyboard instruments of the mid-18th century could reliably have been tuned to a pitch higher than A-405, and there is explicit evidence of their often having been tuned to about A-390.²³⁶

230. Ian Harwood, "A Case of Double Standards? Instrumental Pitch in England c1600," *Early Music* 9, no. 4 (October, 1981): 470.

231. Segerman, "On German, Italian and French Pitch Standards in the 17th and 18th Centuries," p. 28.

232. Cf. Ian Harwood, "Instrumental Pitch in England c1600," *Early Music* 11, no. 1 (January, 1983): 76: "As I understand it, the two main factors are the use of whole, not sliced, guts and the difference in tensile strength between that of rams and that of ewes."

233. Segerman, "On German, Italian and French Pitch Standards in the 17th and 18th Centuries," p. 28.

234. Walther, *Musicalisches Lexicon*, p. 131; trans. Mendel, "On the Pitches in Use in Bach's Time," p. 337.

235. Adlung, *Musica mechanica organoedi* (1768), p. 193.

236. Karp, *The Pitches of 18th Century Strung Keyboard Instruments*, p. 60.

He further states:

A brief examination of non-Swedish keyboard instruments suggests a widespread occurrence of the A=405 maximum pitch. If such an instrument is known to have been used in an ensemble tuned to a higher pitch, there is little alternative to concluding that the harpsichord was tuned to a conveniently lower pitch from which the harpsichordist then transposed.²³⁷

237. *Ibid.*

APPENDIX C

Pitch Standards in Italy in the Early Eighteenth Century

Venice and Lombardy

Lombardic and Venetian pitch were considered together by several early sources.²³⁸ By all accounts, this pitch was surprisingly high. Agricola (as quoted above) said it was “hardly more than a half-tone lower than the ordinary choir- or trumpet-pitch, so that what is *c* on the trumpet is about *c*♯ for them.”²³⁹ Agricola’s Chorton was about modern B, so this would put Venetian pitch a little below modern B♭, or about A–460. Quantz called it “almost equal to our old choir-pitch.”²⁴⁰ Since Quantz’s Chorton was also about modern B, this would make Venetian pitch another semitone higher, unless (as we have speculated earlier) Quantz was referring to a lower Chorton in this instance.

Assuming that Venetian pitch was about A–460, it would be the same organ pitch that Praetorius ascribed to North Germany, and this suggests that Venice and Germany may have had a common standard that was later lost. The lower-pitched woodwinds probably had little general effect at Venice, and French string playing even less.

Of the authors who describe Venetian pitch, Pier Francesco Tosi appears to be alone in putting it only “something more than half a tone” above Roman pitch;²⁴¹ the other sources make it close to a tone and a half. Giovanni Andrea Bontempi (1695) pointed out that the organs at St. Mark’s were pitched a tone higher than those of the other churches of Venice,²⁴² which raises the question to which pitch our sources are referring. Agricola specifically mentions “harpsichords and other instruments” in his description,²⁴³ so he was probably not thinking of St. Mark’s.

238. Pier Francesco Tosi, *Opinioni de’ cantori antichi e moderni* (Bologna, 1723), and Agricola, *Anleitung zur Singkunst*.

239. Agricola, *ibid.*, p. 45; trans. Mendel, “On the Pitches in Use in Bach’s Time,” pp. 469–70.

240. Quantz, *Versuch*, p. 241; trans. Mendel, “On the Pitches in Use in Bach’s Time,” p. 469.

241. Tosi, *Opinioni de’ cantori*; trans. John Ernest Galliard, *Observations on the Florid Song* (London, 1742), p. 26.

242. Cited in Mendel, “On the Pitches in Use in Bach’s Time,” p. 335.

243. Agricola, *Anleitung zur Singkunst*, p. 45; trans. Mendel, “On the Pitches in Use in Bach’s Time,” pp. 469–70.

If the general pitch at Venice was close to modern B \flat , one wonders if woodwind players played at a lower pitch, as in Germany. Instruments at a tone lower (about A–410) would have been relatively easy to obtain, since they were common north of Italy. Playing on instruments a tone lower, they would have transposed up a step, just as at Mühlhausen and (sometimes) Weimar. If this practice were common, players could have transposed at sight, and contemporary scores and parts would give us few if any clues now. This would explain the existence of two original versions of the Marcello oboe concerto in C minor and in D minor,²⁴⁴ and why so many Italian oboe sonatas are written in multiple flat tonalities and include the unplayable low c \sharp .²⁴⁵ Although this possibility is intriguing, it would of course not apply to pieces that would go beyond the upper limit of the oboe's range (d $'''$) when transposed.

There are also surviving woodwinds in northern Italy that are shorter than usual and probably play higher than A–415, notably those by J. C. Denner and S. Schvechbauer.²⁴⁶ These instruments may be examples of another solution to the high prevailing pitch.

This same pitch, about A–460, presumably applied to the violin-making center of Cremona, which is a part of the Veneto. This would explain why string instruments in German churches like Mühlhausen and Weimar could be tuned up to the organ pitch, which must have been a similar one.

Rome

According to Quantz, "Roman pitch twenty-odd years ago was low, and equal to Parisian pitch."²⁴⁷ (Quantz was in Italy in 1724–26, the greater part of the time in Rome. He then moved on to Paris, arriving there in Au-

244. Cf. Bruce Haynes, *Music for Oboe, 1650–1800*.

245. For instance, the sonatas of Besozzi, Platti, Sammartini, and Vivaldi. The most difficult of these pieces are usually in C minor and would be easier up a step in D minor. The low c \sharp ' would then become a d \sharp ', of course.

246. The J. C. Denner oboe at Venice is 53.9 cm. long, according to measurements made by Friedrich von Huene; the average length of J. C. Denner oboes is 56–58 cm. This instrument has four vent-holes in the bell instead of the usual two, and the tone-holes are drilled higher than usual; all of this indicates a higher pitch. The Schvechbauer oboe is even shorter (47.7 cm.). According to Alfredo Bernardini (conversations with the author in January and July, 1984), there are two bass recorders at Venice also probably at A–440 or higher. Instruments by the maker Castel (probably Italian) are also much shorter than normal.

247. Quantz, *Versuch*, p. 241; trans. Mendel, "On the Pitches in Use in Bach's Time," p. 469.

gust, 1726, where he remained for seven months.²⁴⁸) Agricola's report (1757) is similar: "In Rome the pitch is very low, almost like the former French pitch, a major third lower than choir-pitch."²⁴⁹

French pitch, as we have concluded, was apparently about A-392; presumably, then, Roman pitch was about the same. Confirmation of this is provided by Thomas and Rhodes:

There are abundant references in 17th- and 18th-century books and letters to the fact that the pitch level of Roman singing was remarkably lower than that in Italian centres further north and in Germany, and that it was found congenial by singers. Some indication of what the Roman pitch level might have been is provided by Ellis' report of a¹ = 395.2 for "Father" Smith's chapel organ (1708) at Trinity College, Cambridge: in 1759 the college master, Robert Smith, had had the pitch of the instrument lowered to a level matching that of a pitchpipe that he had purchased in Rome in 1720.²⁵⁰

Although the above sources suggest that Roman pitch was about a tone and a half lower than Venetian pitch (see "Venice and Lombardy," above), Pier Francesco Tosi states in his *Opinioni de' cantori* (Bologna, 1723) that "the pitch of Lombardy, or Venice, is something more than half a tone higher than at Rome."²⁵¹ This difference of approximately a whole step between Tosi and other sources can perhaps be explained by the following comment by Quantz:

In Rom wurden einsmals die Blasinstrumente aus der Kirche verbannet. Ob nun vielleicht der unangenehme hohe Ton, oder die Art sie zu spielen, daran Ursache gewesen, lasse ich dahin gestellet seyn. Denn obgleich der römische Ton tief, und für den Hoboe vortheilhaft war: so spielten doch damals die Hoboisten auf solchen Instrumenten, die einen ganzen Ton höher stunden, und mussten folglich transponiren. Allein diese hohen Instrumente thaten, gegen die übrigen tiefgestimmten, eine solche Wirkung, als wenn sie deutsche Schallmeyen wären.²⁵²

(In Rome at one time the wind instruments were banned from the church. Whether the unpleasant high pitch or the manner of playing the instruments was the reason for this I must leave undecided. For although the Roman pitch

248. Reilly, *On Playing the Flute*, pp. xvii-xviii.

249. Agricola, *Anleitung zur Singkunst*, p. 45; trans. Mendel, "On the Pitches in Use in Bach's Time," pp. 469-70.

250. Thomas and Rhodes, "Pitch," p. 783.

251. Galliard, trans., *Observations on the Florid Song*, p. 26. Galliard was himself a well-known oboist, and his translation of this remark without further comment implies his agreement with it.

252. Quantz, *Versuch*, p. 243.

was low, and advantageous for the oboe, the oboists then played on instruments that were a whole tone higher, so that they were obliged to transpose. And these high instruments produced an effect like that of German shawms against the others that were tuned low.)²⁵³

A relatively large number of woodwinds survive by the Milanese maker J. M. Anciuti (ca. 1690–1740). According to Friedrich von Huene, “Anciuti recorders are at A–440 and so is at least one of his oboes.”²⁵⁴ As it happens, among Anciuti’s seven surviving oboes, three are preserved at Rome.²⁵⁵ These instruments fit Quantz’s description if they play at about A–440, which is a tone above A–392. This could explain why Tosi considered Roman pitch higher by a whole step than the other sources we have quoted.

253. *Ibid.*, trans. Reilly, *Essay*, p. 268. See n. 101, above.

254. Friedrich von Huene, letter to the author, April 14, 1984.

255. Museo degli Strumenti Musicali. The oboes are dated 1709, 1718, and 1738 (Young, *Twenty-five Hundred Historical Woodwind Instruments*, p. 2). According to Alfredo Bernardini, another Anciuti instrument was sold in Rome in 1978. The collection at Rome dates from the early twentieth century.

APPENDIX D

Pitch at Three German Musical Centers

Berlin

Indications of pitch at Berlin are conflicting: at least as low as A–415, on occasion it was also lower. From the end of the seventeenth century, French ballet spectacles were popular,²⁵⁶ and several French oboists were active there (cf. the list above). Musical activities in general were minimal during the reign of Friedrich Wilhelm I, but increased dramatically on the accession of Friedrich II (the Great). J. J. Quantz, Friedrich's musical advisor and highest-paid servant of the court, was an advocate of "A-Cammerton," about A–410, for general use, but nevertheless considered French pitch (about A–392) "most advantageous for the transverse flute, the oboe, the bassoon, and some other instruments."²⁵⁷ Most of the flutes made by Quantz for Friedrich play best with the longest middle joint (as the head bore is quite large), with a range in pitch of A–392 to 402.²⁵⁸ The Schnitger organ (1706) in the Eosander Chapel at Berlin-Charlottenburg was reported in 1944 at A–411.3, but in 1974 at about A–392.²⁵⁹ Marpurg in 1776 estimated Berlin pitch to be A–414, and a report in 1859 claimed Marpurg to have given the Berlin opera pitch in 1752 as about A–422.²⁶⁰ J. F. Reichardt, also in 1776, considered the tuning of the Berlin orchestra "low."²⁶¹ As at Cöthen and Dresden, Cammerton may have varied depending on the circumstances and period.

Dresden

As at Berlin and Cöthen, Dresden's musical focus from the end of the seventeenth century was at court, where a Cammerton pitch prevailed. King August II, who favored French art, influenced taste until 1733; dur-

256. Heinz Becker and Richard D. Green, "Berlin," *The New Grove Dictionary*, 2: 565–78.

257. Quantz, *Versuch*, p. 241; trans. Reilly, *Essay*, p. 268.

258. Rod Cameron, conversations with the author, November, 1983, and February, 1984; Friedrich von Huene, letters to the author, May 16, 1983, September 1, 1983, and April 14, 1984.

259. Mendel, "Pitch in Western Music since 1500," p. 34.

260. Cited in Mendel, "On the Pitches in Use in Bach's Time," p. 471.

261. *Ibid.*

ing this time Buffardin and LaRiche were prominent among the woodwind players. With the accession of August III, taste turned toward Italian art, and French musicians were restricted to the Opera and Ballet. From the 1730s, Gottfried Silbermann began building a number of famous organs in the city pitched at about A–410. Probably pitch at Dresden varied, depending on the function and period, between A–415 and 392.

Hamburg

Enough historical pitches are known from Hamburg to indicate that Chorton was standardized there at about modern B and B \flat , and Cammer-ton at about A \flat during the period 1690–1760.²⁶² G. P. Telemann was active in this city from 1721, and many of his chamber works involving woodwinds (including *Der getreue Music-Meister*, the *Musique de table*, and the *Essercizii musici*) were published here. According to Mattheson (1713), who was closely connected to the Hamburg opera for many years, the pitch of opera performances may have been still lower (about A–386), depending on how his ambiguous wording is understood.²⁶³ Mendel has suggested the intriguing idea of comparing the vocal compasses of operas written by Handel for Hamburg and later performed in Venice.²⁶⁴ Handel's only Hamburg opera that survives is *Almira* (1704), which has the most exposed oboe work of any of his operas. The surviving score is in Mattheson's hand, so it is probably the Hamburg version. According to Alan Curtis, some arias were re-used again at Florence and possibly at Venice. Another comparison suggested by Curtis is possible key changes in *Rodrigo* and *Agrippina*, written originally for Florence and Venice, but used later at London.²⁶⁵

262. Mendel, *ibid.*, pp. 467–68; *idem*, "Pitch in Western Music since 1500," p. 78.

263. Mattheson, *Das neu-eröffnete Orchestre*, p. 74.

264. Mendel, "On the Pitches in Use in Bach's Time," p. 475.

265. Alan Curtis, conversation with the author, November, 1983.