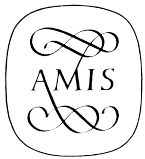
Journal of the American Musical Instrument Society

VOLUME XXII • 1996



The Tromlitz Flute

ARDAL POWELL

THROUGHOUT THE COURSE OF THE EIGHTEENTH CENTURY, changing ideas of tone, intonation, and performance style kept the design and construction of the flute in a state of continuous transformation.[1] Among the flutes of numerous types and models made in different places at various times, the instrument invented by the Leipzig virtuoso, teacher, author, and flute maker Johann George Tromlitz (1725–1805) surpassed others in its technical development and influenced later changes in the flute in some of the most lasting ways.[2] Especially in today's climate of interest in the historically informed performance of German classical music, the construction of the Tromlitz flute, the ideas behind its design, and its musical capabilities, all merit attention.

Tromlitz and his contemporaries recognized certain weaknesses of tone and intonation common to all designs for the flute. Indeed, basic problems in the instrument had been identified from the beginning of the eighteenth century, foremost among them the fact that the notes in the first octave which called for forked fingerings, F, G♯, B♭, and C,

An earlier version of this essay was read at the 1995 National Meeting of the American Musical Instrument Society in Salt Lake City. I should like to acknowledge a 1993–94 fellowship from the National Endowment for the Humanities Program for College Teachers and Independent Scholars for research on the Tromlitz flute. A translation of Tromlitz's 1800 keyed-flute tutor, as well as further detail and documentation on Tromlitz and his instruments, may be found in Ardal Powell, trans. and ed., *The Keyed Flute by Johann George Tromlitz* (Oxford: Clarendon, 1996) (hereinafter, *Keyed Flute*).

1. Some of the factors at work before ca. 1750 are described in Ardal Powell with David Lasocki, "Bach and the Flute: The Players, the Instruments, the Music," *Early Music* 23, no. 1 (1995): 9–29. However, this is not the conventional view as articulated by other modern writers on the flute, including Philip Bate, *The Flute* (London: Ernest Benn, 1969), 95–100; Jane Bowers, "New Light on the Development of the Transverse Flute between about 1650 and about 1770," this JOURNAL 3 (1977): 5–56; and Howard Mayer Brown, "Flute," in *New Grove Dictionary of Musical Instruments* (London and New York: Macmillan, 1984), 1: 769–88, who have maintained that no significant changes took place in the way flutes were made between ca. 1720 and ca. 1760.

2. An excellent study of Tromlitz's life and work may be found in Fritz Demmler, "Johann George Tromlitz (1725–1805): Ein Beitrag zur Entwicklung der Flöte und des Flötenspiels" (Ph.D. diss., Freie Universität, Berlin, 1961; published, Buren: Frits Knuf, 1985).

sounded softer in tone color than the others.[3] Many of the flute designs of the early eighteenth century had by a skillful balance of acoustical elements reduced such flaws to a barely perceptible minimum.[4] Nonetheless, in the continuing search for designs that would satisfy changing conditions, conform to new pitch standards, and accommodate altered ideals of tone, many of the achievements of the early makers had to be left behind.

Tromlitz was concerned principally with the same two factors in flute making as the makers of the baroque period: evenness of tone and security of intonation, but he achieved these qualities in ways that were quite new.[5] Tromlitz eventually developed a flute with a combination of bore, tone-hole location and undercutting, key configuration and springing, and voicing of the embouchure that gave it a large dynamic range and an almost trumpet-like sound in a measure that had never been possible before. However, despite the new flute's excellence, a number of factors prevented it from taking his world by storm.

The Tromlitz flute's advantages came at the cost of a fingering system with some unfamiliar features, particularly a key for c^2 operated by the left thumb, which was normally used to hold the flute.[6] This novelty posed what may have been the most serious obstacle to general acceptance of the Tromlitz-system flute, particularly in a market largely composed of amateur players. Another barrier to the proliferation of Tromlitz's keyed flutes was their high price. In 1796, for example, a keyed flute of the most advanced design cost around four times as much as a one-keyed flute, and three times as much as a four-keyed flute (E♭, F, G♯ and B♭ keys).[7] Thirdly, Tromlitz's one-man shop was competing for the most part with small factory-like operations, whose levels of manning, specialized working style, and division of labor gave them a greater

3. *Principes de la flûte traversière* (Paris, 1707) by Jacques-Martin Hotteterre ("Le Romain") is the first of many flute tutors to observe that the forked fingerings are sharp in pitch if blown in the same way as the other notes (see p. 11). The difference in tone color resulted from the correction of this anomaly, by turning the embouchure inwards and blowing more softly.

4. For a list of surviving conical-bore flutes made before about 1750, see Powell and Lasocki, "Bach and the Flute," 21–3.

5. Johann George Tromlitz, *An das musikalische Publikum* (Leipzig, 1796; reprint, 1982), 1, 3; trans. in *Keyed Flute*, App. II.

6. Names of keys in this article refer to the note produced when the key is opened. These names are not specific as to octave-pitch, except in the case of c^2, so called to avoid confusion with the c^1 key on an extended foot joint.

7. Tromlitz, *An das musikalische Publikum*, 7–8.

volume of production at a more economical cost. As a result of all this, the Tromlitz flute, though it seems to have been well known among connoisseurs in Germany and England, met with far from universal acceptance in Europe as a whole and lost ground to other models which, though less rational, were more easily available and less demanding to learn to play. The recent reawakening of interest in the instruments of the classical period has largely overlooked Tromlitz's revolutionary contributions to the design of the flute, at least partly because specimens of the Tromlitz flute are so scarce: the single surviving instrument with the key configuration that was his most noted contribution languished practically inaccessible in a Russian museum until the recent disintegration of the Soviet Union.[8]

To appreciate Tromlitz's achievements today it is important to see them in a true perspective of his period's musical life and of the flute's place in it. Recent writings have explained the addition of keys in the late eighteenth century by citing increasing chromaticism and use of the high register in orchestral flute parts. In 1979 Catherine P. Smith investigated the flute parts in Haydn's symphonies, while more recently John Solum called the classical flute more "flexible" than the baroque flute and claimed that it "sacrific[ed] power in the lowest notes for more easily produced higher notes."[9]

Such an evaluation of late eighteenth-century flutes says more about modern playing techniques than it does about the instruments themselves: as we shall see, eighteenth-century musicians spoke quite differently about flutes and flute playing. Moreover, such a focus on orchestral flute parts is a mistake: the privileged position of the orchestra in our

8. The six surviving Tromlitz flutes located to date are listed in the table. St. Petersburg, Museum of Musical Instruments, no. 1, is the only example with the c^2 and B♭ thumb keys characteristic of the Tromlitz system. Conditions of access to the St. Petersburg museum in the period before Perestroika are detailed in Grant Moore, "Comments on a Visit to the State Institute of Theatre, Music, and Cinematographie (Leningrad)," *FoMRHI Quarterly* 12 (July 1978): 43–4; and Simon Levin, "Collecting Musical Instruments in Russia and the Soviet Union," this JOURNAL 16 (1990): 118–31.

9. Smith in "Changing Use of the Flute and Its Changing Construction 1774–1795," *American Recorder* 20, no. 1 (1979): 4–8, quoted examples of specific passages from classical music for orchestra. Solum in *The Early Flute* (Oxford: Clarendon, 1993), 50, likewise concentrated on the flute in the orchestra but without giving any examples. Surprisingly, these were the first attempts to identify a musical reason for the technological changes in the flute: Bate, in *Flute*, 95, ascribed it entirely to the emergence of "what we might call a 'mechanical' instead of a purely acoustical approach to the intonation problems of the flute."

musical life, inherited from the nineteenth century, makes it difficult for us to appreciate that most of the music flutists played two centuries ago was of a domestic character: solos, songs, chamber pieces, and concertos performed at amateur concerts—a large body of music almost totally neglected in today's performances and recordings. Whereas orchestral flute parts of the period do tend to avoid the low register because in that range the flute's sound cannot carry through that of the other instruments, in chamber music the whole range of the instrument is equally audible.

Contemporary accounts state that it was at the bottom of the flute's range, not at the top, that a powerful tone was considered most appropriate and the keys made their most valuable contribution. In works published in 1785 and 1786 Tromlitz wrote:

> The evenness of tone produced by these keys in the lowest octave has a splendid and quite unaccustomed effect which is not otherwise expected of a flute, especially on sustained or growing and diminishing notes, which are not possible at all on the dull and dead notes of an ordinary flute.[10]

Other sources confirm Tromlitz's view: the fingering charts of the many anonymous English tutors of the period directed the keys to be used in the first octave but often retained one-keyed flute fingerings in the second and third.[11] The Paris Conservatoire at the end of the century had strong objections to the additional keys, perhaps not least because they were associated with England and the English. However, the benefits the keys conferred on the low register eventually overcame such reservations.[12]

Thus, in the minds of late eighteenth-century flutists and makers, keyed flutes were evidently closely linked with a strong tone in the low register, a new sound which appears to have been associated with the

10. "Die durch diese Klappen hervorgebrachte Gleichheit der Töne in der untersten Oktave machet eine vortrefliche und ganz ungewöhnliche Wirkung, die sonst von einer Flöte nicht erwartet wird, zumal bey haltenden und wachsenden, oder abnehmenden Tönen, welche auf den stumpfen und matten Tönen einer gewöhnlichen Flöte gar nicht möglich sind" (Johann George Tromlitz, "Neuerfundene Vortheile zur bessern Einrichtung der Flöte," in *Miscellaneen artistischen Inhaltes* 26 [1785]: 104–9). Translation by the author. The same material was repeated in Tromlitz's *Kurze Abhandlung vom Flötenspielen* (Leipzig, 1786).

11. A full list of these tutors is in Thomas E. Warner, *An Annotated Bibliography of Woodwind Instruction Books: 1600–1830* (Detroit: Information Coordinators, 1967). A discussion of several of the most important editions is in the Introduction to *Keyed Flute*.

12. François Devienne, *Nouvelle Méthode théorique et pratique pour la flûte* (Paris, 1794), 1.

period's professional players. Tromlitz's own flute playing evidently featured a powerful and even tone, as this aspect of it was emphasized by all who gave accounts of his performances; indeed, he appears to have been a leading figure in the growth in popularity of these qualities in Germany, England, and perhaps elsewhere.[13] Tromlitz's obituary in the *Allgemeine musikalische Zeitung* recalled:

> As a virtuoso he was distinguished by perfection, but still more by complete purity [of intonation] and security of tone, as by precision in performance. He was also one of the first, and in respect of the influence he had, the first, to introduce the now usual bravura- and concerto-style way of playing the flute, and especially the strong, cutting tone best suited to it, and frequent, skillful use of the double tongue. . . .[14]

The same words, "strong and cutting" (stark und scharf), are used to describe Tromlitz's tone in Gerber's *Lexicon*. His concertos were delivered with "as much fire as perfection. His tone was, however, more the ringing tone of a trumpet than the soft sound of a flute."[15] An anonymous reviewer of Tromlitz's book *Über die Flöten mit mehrern Klappen* (The Keyed Flute) gave a still more evocative description of his tone: "Anyone who still remembers the author's public appearances as a flute player knows . . . that he melted the tone of the flute and oboe into each other."[16] Tromlitz was said to have demonstrated "how much power and how much tenderness the flute offered in the hand of him who desires them and knows how [to execute them]."[17] His style of playing stood in

13. On ideals of flute tone in the late eighteenth century, see Jane Bowers, "Mozart and the Flute," *Early Music* 20, no. 1 (1992): 31–42, and *Keyed Flute*, Introd., sec. 2.

14. "Als Virtuos war er durch Fertigkeit, noch mehr aber durch vollkommene Reinheit und Sicherheit des Tons, wie durch Genauigkeit im Spiel ausgezeichnet. Er war auch einer der Ersten, und in Absicht auf Einfluss der Erste, die die jetzt gewöhnliche bravour- und konzertmässige Behandlung der Flöte und vornehmlich den dazu am besten geeigneten starken, scharfen Ton und häufigen, künstlichern Gebrauch der Doppelzunge einfuhrten, ("Nachricht über das Ableben von Tromlitz," *Allgemeine musikalische Zeitung* 7 [1805]: 337–38). Translation by the author.

15. ". . . trug er mit eben so viel Feuer als Fertigkeit vor. Sein Ton war aber mehr der schmetternde Ton einer Trompete, als der sanfte Ton einer Flöte" (Ernst Ludwig Gerber, *Historisch-biographisches Lexicon der Tonkünstler* [Leipzig, 1790–92; reprint, ed. Othmar Wessely, Graz: Akademische Druck-u. Verlagsanstalt, 1977], 2: 686).

16. "Wer sich noch daran erinnert, wie der Verfasser als Flötenspieler öffentlich auftrat, der weiß . . . , daß er den Ton der Flöte und der Oboe ineinander verschmolz" (*Allgemeine musikalische Zeitung* 2 [1800]: 600 ff.; quoted in Demmler, "Tromlitz," 39).

17. "Hierdurch . . . that er dar, über welche Kraft und über welche Zartheit die Flöte in der Hand dessen, der da will und kann, gebietet" (Ibid., 39).

direct opposition to a more relaxed manner popular earlier in the eighteenth century, and still cultivated by amateurs, perhaps especially in England.[18]

It seems that changes of taste in the flute's tone quality, not new demands on its range or its tessitura, were the most significant factors affecting the instrument's construction. Moreover, the alterations in design which produced the more fashionable tone also tended to make the underlying flaws in the flute's design more noticeable and more troublesome. Though pitch standards were far from uniform and though some makers had been producing models with up to seven *corps de rechange* at pitches as high as A440 since the middle of the century, flutes increasingly used higher tunings towards the latter part of the period.[19] Partly because of the resulting shorter sounding length and partly because of changing tone ideals, the forked-fingered notes on these flutes had a less penetrating sound in comparison with the others. At the same time the scales and stepwise melodies of classical music juxtaposed bright and dull notes in a way which baroque music, with its arpeggiated passage work and violinistic themes, had tended to avoid. The added keys, by providing new tone holes for the forked-fingered notes, removed these inherent contrasts altogether.

* * *

Nothing is known of how Tromlitz learned to play the flute or to make instruments. He was famous primarily as a flute virtuoso in Leipzig in the third quarter of the eighteenth century. Of his flute making he wrote:

> To classify me as an instrument maker is not correct, for I am not one; I only make my instrument as a scholarly musician and flute player. I do not know any of the ordinary instrument makers who work from principles; all just imitate, inside and outside Germany.[20]

18. Bowers, "Mozart and the Flute," 31–2.

19. The widespread reputation of August Grenser (1720–1807) as a flute maker was based upon such a model, typified by the instrument in the Dayton C. Miller Collection (no. 140, made 1744–56), Library of Congress, Washington, D.C. For further details see *Keyed Flute*, App. I, the section headed "The Grenser workshop."

20. "Daß man mich unter die Instrumentenmacher setzt, ist nicht recht, denn ich bin Keiner; Ich mache nur mein Instrument als wissenschaftlicher Musiker und Flötenist. Von den gewöhnlichen Instrumentenmachern kenne ich Keinen, der nach Gründen arbeitete, alle machen nur nach, in und außer Deutschland" (*Keyed Flute*, chap. 7, par. 22). English translations of Tromlitz's writings are listed in nn. 21 and 28.

FIGURE 1. Johann George Tromlitz. Engraving by his son Jacob Tromlitz. Photo courtesy of Karl Ventzke.

Tromlitz's career began as a law student at the University of Leipzig; he later held the post of solo flute in the Grosses Konzert from 1754–76. His reputation grew as a result of solo concert tours, which may have continued into his old age. In the last quarter of the century he retired from regular playing and devoted himself to teaching, writing, and the improvement of the flute. All his dated accomplishments in flute design are associated with publications during the last phase of his life, from 1781–1805.

Fortunately, in this late period Tromlitz took to recording his ideas in print.[21] In the first of his didactic writings, *Kurze Abhandlung vom Flötenspielen* (Short Essay on Flute Playing) of 1786, it became clear at the outset that his standards were higher than average. Tromlitz introduced the elements at the core of his beliefs about excellent flute playing, especially clarity of articulation and expression, perfect intonation in a rigorous tuning system having pure intervals and making a distinction between flattened and sharpened degrees of the scale, and the total emotional involvement of the performer.

These themes were developed and expanded in the monumental 1791 *Ausführlicher und gründlicher Unterricht die Flöte zu spielen* (Detailed and Thorough Method for Playing the Flute). The tutor was designed for the two-keyed flute Tromlitz considered the minimum requirement for a good player. However, his writings throughout the 1780s had contained frequent references to flutes with additional keys. There was no question for him of the keyed flute's superiority, yet he was aware that players would resist changing to the unfamiliar instrument out of reluctance to learn new fingerings, and though he insisted that conscientious professionals must use a keyed flute, he understood that this was too much to expect of the amateurs who were the majority of his readership. This notwithstanding, his method for the keyed flute was published in 1800, as a supplement to the 1791 tutor. This book gave a methodical explanation of the use of the keys on a flute of Tromlitz's own design, which by then had reached its ultimate stage of development.

21. Tromlitz's didactic writings are: (1) *Kurze Abhandlung vom Flötenspielen* (Leipzig, 1786); (2) *Ausführlicher und gründlicher Unterricht die Flöte zu spielen* (Leipzig, 1791; trans. and ed., Ardal Powell, as *The Virtuoso Flute-Player by Johann George Tromlitz* [Cambridge and New York: Cambridge University Press, 1991]); (3) *Über die Flöten mit mehrern Klappen* (Leipzig, 1800; trans. as *Keyed Flute*); and (4) "Abhandlung über den schönen Ton auf der Flöte," *Allgemeine musikalische Zeitung* 2 (Jan. 1800): 301–4 and 316–20.

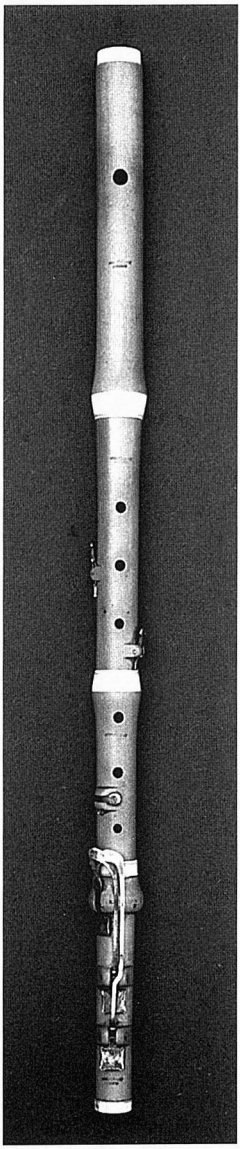


FIGURE 2. Schuchart Senior flute, ca. 1755. Cambridge, Massachusetts, Robert Straus.

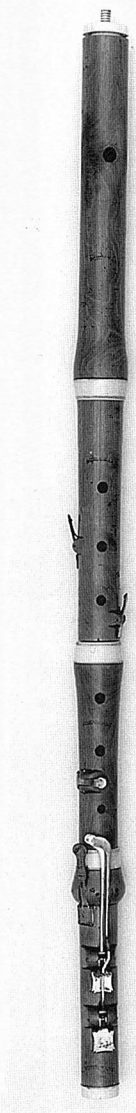


FIGURE 3. Schuchart flute, ca. 1758–65. London, Sotheby's auction, 15 May 1978, lot 13. Photo courtesy of Sotheby's.

* * *

Many of the elements in the flutes Tromlitz built had been introduced by others. I have argued elsewhere that there are compelling reasons for considering a keyed flute stamped *SCHUCHART SENIOR* (fig. 2) the earliest to survive, at ca. 1755, a quarter century before Tromlitz's first announcement.[22] Though keyed flutes at this early date may well have been rare, at least one other flute of very similar design with the stamp *SCHUCHART* (fig. 3) has survived.[23]

These early English keyed flutes had a relatively large bore and, generally speaking, a round and rather thick tone. It is perhaps surprising to find that their forked-fingered notes were comparatively robust and stable in pitch, but this in itself reveals something about the way the instruments were played. If keys had first been added to flutes with very weak forked fingerings, we might deduce merely that more evenness of tone was desired by players, no matter what kind of tone they favored, hard or soft. As it is, we see that players must have been pushing the tone in the first octave as far as these exceptionally well-balanced instruments would tolerate, and thus that they were most likely producing an already extremely incisive sound, a propensity which the keys would have encouraged even further.

The transmission of the English keyed flute to Europe and thus to Tromlitz's environment is very difficult to trace: even in England written sources do not begin to mention the keyed flute until about 1766, and no evidence has come to light that English keyed flutes were known in Germany or Austria until the 1780s, though traveling virtuosi returning from London doubtless introduced a few specimens.[24] From a survey of

22. Ardal Powell, "An English Keyed Flute, circa 1755," *Traverso* 7, no. 3 (July 1995): 1–3; and *Keyed Flute*, Introd. and App. I.

23. London, Sotheby's auctions, 15 May 1978, lot 13; and 21 Mar. 1995, lot 375. The present locations of these flutes are not known: perhaps the same instrument appeared at auction twice. In *Keyed Flute* I have suggested that instruments like this were made in Charles Schuchart's shop between John Just's death in 1758 and Thomas Collier's succession of Charles in (or shortly after) 1765.

24. As far as I have been able to determine, the earliest references to keyed flutes are in the anonymous *The Compleat Tutor for the German Flute . . . Translated from the French* (London, ca. 1770) and *The Compleat Tutor for the German Flute . . . and a Concise Scale & description of a new invented German Flute with additional Keys, made by T. Cahusac, such as play'd on by the two celebrated Masters, Tacet and Florio* (London, ca. 1766): Warner, *Annotated Bibliography*, listings 106 and 111.

the oldest surviving keyed instruments[25] it is clear that the extension to low C was an integral part of the first English keyed flutes, not an optional extra as modern writers have stated.[26] Tromlitz, like most continental writers, did not approve of the C-foot.[27] However transmission occurred, the English keyed flute lost its integral C-foot in the process —as indeed it did in England after a few decades: foot joints to D, C♯, and C were made both in England and in Germany throughout the 1780s and '90s, some makers providing more than one type for a single flute.

Though we can discover little of Tromlitz's early contacts with other makers' keyed flutes, a series of announcements about the instruments he himself was making throughout the 1780s and 1790s gave a commentary on his changing ideas.[28] On all occasions he advocated the use of both D♯ and E♭ keys and an intonation system in which, even for a fully keyed flute, he provided separate fingerings for sharps and flats, differing by one-ninth of a tone. In the first publication of this kind, in 1781, Tromlitz announced that he was making flutes with B♭ and G♯ keys and a C-foot. At this stage he seemed reluctant to advocate the keys too strongly:

25. These include a "Florio" flute by Thomas Collier, dated 1771 (London, Sotheby's auction, 14 July 1990, lot 149); and the well-known Caleb Gedney flute, dated 1769 (Museum of Fine Arts, Boston, no. 1983.330 [ex Shorey, ex Moskowitz, ex Champion]; illus. in Solum, *Early Flute*, 61); as well as those stamped *SCHUCHART* and *SCHUCHART SENIOR* mentioned above; and others listed in *Keyed Flute*'s "Register of Instruments Cited."

26. On uses of the C-foot in England, see Maurice Byrne, "Schuchart and the Extended Foot-Joint," *Galpin Society Journal* 18 (1965): 7–13. On earlier indications of its use, see Ardal Powell, "Science, Technology, and the Art of Flutemaking in the Eighteenth Century," *Flutist Quarterly* 19, no. 3 (1994): 33–42; and Powell and Lasocki, "Bach and the Flute," 13, notes 30–1. The mention in Devienne, *Nouvelle Méthode*, 1, seems to indicate that the C-foot was not at all common in France after the Revolution.

27. Tromlitz criticized an English keyed flute he had seen, with particular scorn for the C-foot, in *An das musikalische Publikum* (1796) 4–5; and in the keyed-flute tutor (*Keyed Flute*, chap. 7, par. 16. and App. II).

28. These are his (1) "Nachricht von Tromlitz Flöten," in *Miscellaneen artistischen Inhaltes* 8 (1781): 115–21; (2) "Nachricht von Tromlitz'schen Flöten," in *Magazin der Muzik* 1, no. 2 (1783): 1013–21; trans. by Ardal Powell as "Information on Tromlitz Flutes," *Traverso* 6, no. 1 (Jan. 1994): 1–2; (3) "Neuerfundene Vortheile zur bessern Einrichtung der Flöte," in *Miscellaneen artistischen Inhaltes* 26 (1785): 104–9; (4) "An das musikalische Publikum," *Musikalische Korrespondenz der teutschen filarmonischen Gesellschaft* 32–4 (10–24 Aug. 1791): 252–69; (5) *An das musikalische Publikum* (1796; trans. in App. II of *Keyed Flute*); and (6) "Replik auf die Anfrage, 'Sollten nicht unsere Flöten durch die vielen Klappen sehr verloren haben; und hat jemand bewiesen, daß diese nöthig waren'," *Kaiserlich-privilegierter Reichsanzeiger* 98 (Gotha, 1800): 1271–2.

> I have tried as far as possible to take away the dull notes by means of the interior construction and by means of the fingering system, so that one can achieve a moderate evenness of the notes in the bottom octave if one is just a bit careful. I have also tried to do it by means of a few added keys, such as: B♭ or A♯ in the first octave, G♯ or A♭, which does produce a strong and bright tone, but it makes playing much more difficult.[29] These keys can only be used to advantage in slow and moderately quick movements. A key for the first-octave E♯, and one for the second octave C can also be added, but these are quite unnecessary. I have also added the first-octave C and C♯ in the low register by means of a long foot joint together with a long key.[30]

In a 1783 article the same material was repeated, but in 1785 Tromlitz waxed enthusiastic for his keyed flutes as he announced what is described here as the "Tromlitz system." This configuration was characterized by an F key for the left-hand fifth finger as well as a short F, and a c^2 key in "a very special arrangement," which doubtless referred to the open-standing c^2 thumb key and closed B♭ (fig. 4a). Tromlitz remarked that he had tried making a key for tone hole 6, which produced e^1 and e^2, but now instead tuned E a little flat so that it could be blown harder and vented with the D♯ key to strengthen its tone.

The long F key announced in 1785 made it possible to play F with a key after D, D♯, or E♭, when the short F could not be used. Credit for its invention has traditionally been ascribed to Tromlitz on the basis of this announcement. However, as I have shown elsewhere, it seems more likely that the key was invented in March 1783 by the father of the blind

29. It should be noted that in naming the keys as B♭ *or* A♯, etc., Tromlitz is not suggesting that the same fingering may be used for both notes, only that the same key is used in both fingerings. Thus $b♭^1$ is fingered 1B♭27, while $a♯^1$ would add 4 to this fingering (1B♭427). A full list of the separate fingerings used in sharp and flat tonalities is in *Keyed Flute*, chaps. 4–6.

30. "Ich habe zwar, so viel möglich, durch den innern Bau und durch die Fingerordnung die stumpfen Töne zu heben gesucht, daß man, wenn man nur einigermaßen vorsichtig ist, eine ziemliche Gleichheit der Töne in der untersten Oktave erhalten kann. Auch habe ich es durch einige hinzugefügte Klappen, als: das eingestrichene b oder ais; gis oder as möglich zu machen gesucht, wodurch man zwar den Ton stark und helle bekommt, aber das Spielen dadurch sehr erschweret, und diese Klappen können nur bey langsamen und mäßig geschwinden Sätzen mit Vortheil angewendet werden. Man kann auch eine Klappe zu dem eingestrichenen eis, und eine zu dem zweygestrichenen c, anbringen, aber diese sind ganz unnöthig. Ich habe auch noch das eingestrichene c und cis in der Tiefe durch ein langes Fußstück nebst einer langen Klappe angebracht" (Tromlitz, "Nachricht" [1781]: 117).

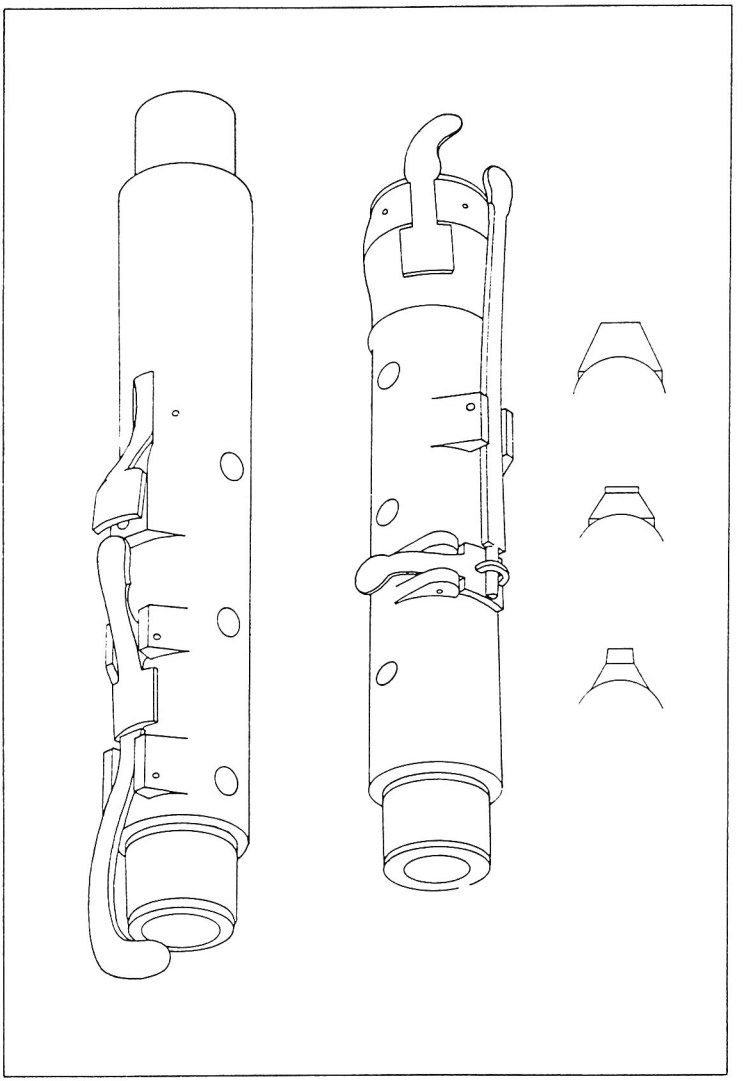


FIGURE 4. Drawings by Stephen Korbet.

a. Left: The left-hand section of a Tromlitz flute shows the "very special arrangement" of thumb keys for c^2 and B♭, first used in the 1785 system, and below them the second B♭ lever, announced in 1796.

b. Center: The right-hand section of a Tromlitz flute shows the long F key, adapted to form a lever acting on the short F.

c. Right: Tone-hole undercutting forms, showing Tromlitz's use of fraises. St. Petersburg, Museum of Musical Instruments, no. 1.

child prodigy Friedrich Ludwig Dülon and communicated to Tromlitz when the three met in 1784.[31]

The "very special arrangement" for c^2 and B♭ is shown in Figure 4a. In the 1785 article Tromlitz went into some detail about his experiments on this account, describing what were probably the first attempts to supply a key for c^2.[32] However, because the left thumb was used to hold the flute, it required players to disrupt the familiar manner of fingering and even to learn a new way of supporting the instrument. Though other types of c^2 key, particularly a long key for the right index finger, emerged in the early nineteenth century, Theobald Boehm in 1832 revived a configuration for c^2 and B♭ based on Tromlitz's in a radical revision of the flute's mechanism. Boehm retained this feature in his 1847 cylindrical flute, which is the basis of the standard modern instrument: thus Tromlitz's concept of using the left thumb for a C/B♭ combination is now familiar, in a different form, to the majority of the world's flutists.

In the 1791 tutor, Tromlitz again mentioned B♭ and c^2 keys for the left thumb. He repeated his recommendation of the 1785 specification for the best flute, with keys for E♭, D♯, F, F, G♯, B♭, and c^2.[33] Another 1791 publication, "An das musikalische Publikum" (To the Musical Public), while advocating the same key configuration, contained significant new information about the transmission of Tromlitz flutes to England.

The eight-keyed Tromlitz flute, a slight advance on the seven-keyed instrument of 1785, was first announced in the 1796 pamphlet *An das musikalische Publikum*. The flute had two F keys; B♭ with a second lever, or a second separate B♭ key; and again a c^2 key of the "quite singular and very useful design" announced in 1785. The newest arrangement was E♭, D♯, F, F, G♯, B♭, B♭, and a c^2 key. A C-foot was

31. *Keyed Flute*, Introd. The account of the long F's invention is in Friedrich Ludwig Dülon, *Dülons des blinden Flötenspielers Leben und Meynungen, von ihm selbst bearbeitet*, 2 vols. (Zurich, 1808), 2: 47. See also Karl Ventzke, "F. L. Dulon [sic], der blinde Flötenspieler (1769–1826): Über 'Leben und Meynungen' eines reisenden Virtuosen," in *Concerning the Flute*, ed. Rien de Reede (Amsterdam: Broekmans & Van Poppel, 1984), 90–106. John A. Rice's article "The Blind Dülon and His Magic Flute," *Music & Letters* 71 (1990): 25–51, contains some new accounts of Dülon's playing while on tour during the period when he reported using keyed flutes by Tromlitz and Grenser.

32. In the Nachwort to J. J. H. R[ibock], *Bemerkungen über die Flöte und Versuch einer Anleitung zur besseren Einrichtung und Behandlung derselben* (Stendal, 1782), Ribock described a c^2 key of his own invention for the left thumb. Although the date of this announcement was earlier than Tromlitz's, Ribock revealed in it that at the time he wrote, Tromlitz was already making the c^2/B♭ arrangement he announced for the first time three years later.

33. Powell, *Virtuoso Flute-Player*, 327.

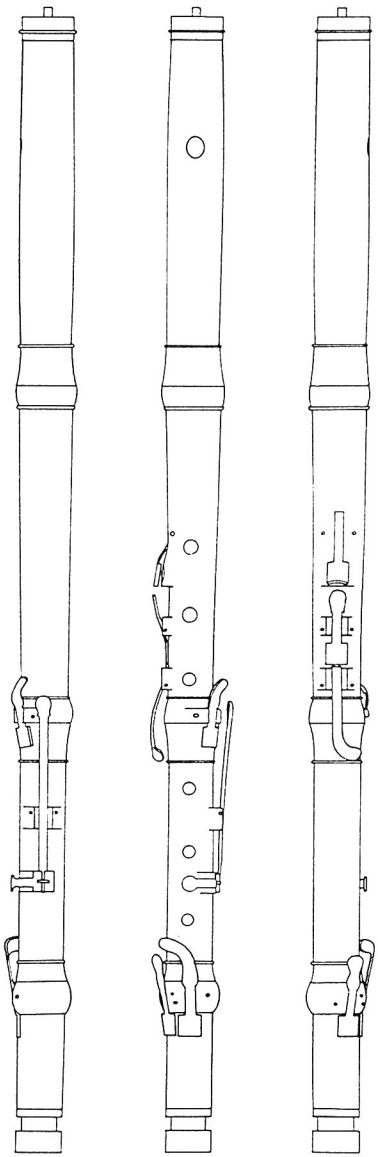


FIGURE 5. Three views of the 1796 Tromlitz flute, as described in his *Über die Flöten mit mehrern Klappen* (Leipzig, 1800). Reconstruction by Folkers & Powell, based on St. Petersburg, Museum of Musical Instruments, no. 1. Drawings by Stephen Korbet.

available but not recommended. Thus the only material difference between the 1796 flute and the one of 1785 was the duplicate key for B♭. In his 1800 keyed-flute tutor, Tromlitz advocated the 1796 system with the slight refinement of double levers instead of two separate keys each for B♭ and F, and with the keyflaps curved to the body of the flute rather than closing on flat key-seats.

Clearly the main points of the Tromlitz key system had evolved rather suddenly. In the 1783 article Tromlitz was apparently not yet ready to announce the thumb c^2 key and found the F key "quite unnecessary," so that his recommendation was for D♯, E♭, G♯, and B♭ keys only. However, by 1785 he had already developed not only one F key but also a second, which was probably not his idea, and a c^2 key for the left thumb, which probably was. The 1785 system had keys for D♯, E♭, F, F, G♯, B♭, C—all those of the 1796 system except the second B♭. In terms of the instrument's development, then, we should view the 1785 flute as the first appearance of the Tromlitz system's characteristic features and the 1796 flute as a refinement of this.

Six instruments by Tromlitz survive and are listed in the accompanying table. From these we can learn in detail about the acoustics of the instruments and Tromlitz's unusual construction techniques.[34] He was one of a small number of makers to undercut tone holes with fraises: these were small metal cutters, most often with a rounded profile, passed up inside the bore and engaged by a threaded rod placed through the tone hole to be undercut. Most of Tromlitz's fraises were unusual in having a straight conical profile. Figure 4c shows the three different cutters identified from the tone holes of St. Petersburg, no. 1, while a fourth (not shown) was used on certain other flutes. The largest has left marks showing it was also used to make the embouchure holes—this is very rare in eighteenth-century flute making.[35] The foremost practical advantage of using fraises was their contribution to accuracy and consistency, while the particular shape of Tromlitz's fraises affected the tone of his flutes. All the keys on the Tromlitz flutes are sprung with tempered steel rather than the brass almost universally used at the time: some keys are fitted with only one thickness of metal, and one has three,

34. A comparison of these instruments on the basis of their bore and tone-hole locations, tone-hole and embouchure undercutting, pitch, key configuration, and manufacturing technique is given in App. I of *Keyed Flute*.

35. The fraises shown are those identified in *Keyed Flute*, App. I, as A, B, and C. Fraise A was used in the embouchure hole.

TABLE. The Six Tromlitz Flutes

LOCATION	KEYS	MATERIAL	PITCHES
Cologne: Günther Höller, loan from Walther Dürr[1]			
	B♭, G♯, F, D♯, C♯, C	ebony	430, 435, 440
St. Petersburg: Museum of Musical Instruments, no. 1			
	c^2, B♭, G♯, F, F, D♯, E♭	ebony	430, 435, 440
Antwerp: Museum Vleeshuis, no. 67.1.239, loan from Koninklijk Vlaams Muziek Conservatorium[2]			
	D♯, E♭	lignum vitae	all 7 missing
St. Petersburg: Museum of Musical Instruments, no. 855			
	D♯	boxwood	423, 430, 435, 442, 448
Würzburg: Rybert Mynter [3]			
	B♭, G♯, F, D♯, E♭	ebony	425 [♯1, ♯♯3–5 missing]
Dieppe: Régnier Family [4]			
	[B♭] G♯, D♯	ebony	[415], 425, 430, [430], 435

[1]Illus. in Tromlitz *Über die Flöten* (reprint, Buren: Frits Knuf, 1991; and Solum, *Early Flute*, 53).
[2]Jeannine Lambrechts-Douillez, *Catalogus van de Muziekinstrumenten uit de versameling van het Museum Vleeshuis* (Antwerp: Ruckers Genootschap, 1981), lists the instrument as anonymous.
[3]Illus. in Tromlitz, *An das Musikalische Publikum* (reprint, Celle: Moeck Verlag, 1992), 4; and Peter Spohr, *Kunsthandwerk im Dienste der Musik* (Frankfurt: The author, 1991), listing A16.
[4]The Régnier flute was originally made with three middle joints and keys for G♯ and D♯. Two further middle joints were added later, each with a key for B♭.

but most are fitted with a double spring, giving a very light and even action without being either too heavy or too spongy.

* * *

Tromlitz's publications and his instruments apparently influenced only the foremost among contemporary makers. The paths his influence took demonstrate that these individuals either failed to understand or did not accept his total concept of the flute's design. A boxwood 1796-system flute with brass keywork for c^2, B♭, B♭, G♯, F, F, D♯, E♭, by Potsdam maker F. G. A. Kirst (ca. 1750–1806), has survived, but in this instrument Kirst has retained his own bore and acoustical proportions, simply superimposing Tromlitz's key system.[36] Though Kirst may have realized the value of this particular configuration of keys and probably copied it directly from a Tromlitz flute, he evidently preferred the tone and intonation of his usual flutes.

The famous Dresden woodwind maker Heinrich Grenser evidently knew of Tromlitz's work, for in 1800 he published a rather sarcastic review of the keyed-flute tutor published in that year.[37] Despite his negative attitude, what he read may have spurred him to experiment with or even adopt some of Tromlitz's ideas. One of Grenser's flutes (Stockholm, Musikmuseet, no. 22649) shows how he took Tromlitz's idea for the c^2 thumb key and double B♭ and simplified it by providing a simple c^2 thumb hole together with a B♭ key operated by the right index finger, corresponding to the second lever for this key that Tromlitz had announced in 1796 and omitting the thumb B♭ entirely. The Stockholm flute is of a type probably made between 1798 and 1806, during which period the first double F keys, the first C♯ foot joints (as opposed to C foot joints made earlier), and the first c^2 thumb holes all appeared on flutes from the Grenser workshop.[38] A somewhat later Grenser instrument (Stockholm, Musikmuseet, no. 237) was originally made with the same key configuration but was later altered by the

36. The Kirst flute, which belongs to the collection of the Toulouse Conservatoire, is illustrated and described in more detail in *Keyed Flute*, figs. 5 and 13 and App. I, as are details of Kirst's various flute patterns and the models he imitated.

37. Heinrich Grenser, untitled review in *Intelligenz-Blatt zur Allgemeinen musikalischen Zeitung* 2, no. 11 (Mar. 1800): 43–6.

38. The Stockholm flute (Musikmuseet, no. 22649) is illustrated in Phillip T. Young, *The Look of Music* (Vancouver: Vancouver Museums and Planetarium Association, 1980), 143. Datings of flutes made by the Grenser workshop are based on discussions in *Keyed Flute* and in Ardal Powell, "The Grenser Flutes," *Traverso* 7, no. 1 (Jan. 1995): 1–3.

addition of a c^2 for the right index finger—before its owner realized that this finger (unlike the left thumb) could not operate both c^2 and B♭ keys at the same time and took it off again. These variations in key configuration had no material effect on the tone, intonation, or response of the subject instruments.

One critical evaluation of the Tromlitz flute by a contemporary was published in 1803, when the doctor and amateur flutist Heinrich Wilhelm Theodor Pottgiesser presented a long anonymous essay full of radical suggestions for redesign of the flute.[39] His ideas were apparently stimulated by a keyless design that Tromlitz had described in his *Über die Flöten* . . . (1800),[40] but he may possibly have developed some of them earlier.[41] The first installment of Pottgiesser's essay remarked on the general problems in flute design, citing Tromlitz's writings as evidence of the effort needed to overcome them. He made his observations particularly with respect to Tromlitz's instruments, since they were the best known to him and, according to the claims of their inventor, the most perfect. Pottgiesser's objections to Tromlitz's flutes were that the left thumb was used for two different keys; that there were altogether too many keys, making fingering difficult; that the keys were not perfectly silent in operation; that intonation was still not perfect; that E was weak, and that many trills remained faulty. The objection as to the left thumb might have been valid but only as a criticism of the 1785 system: the B♭ lever for the right index finger introduced in 1796 resolved the difficulty. By optimal tone-hole placement, sizing, and undercutting, Tromlitz gave the e^1 and e^2 on his flutes a strength of tone few of his contemporaries managed to match, though it is true that the most intense tone was not available on that degree of the scale on any flute.[42]

39. [H. W. T. Pottgiesser], "Über die Fehler der bisherigen Flöten, besonders der Klappenflöten, nebst einem Vorschlage zur besseren Einrichtung derselben," *Allgemeine musikalische Zeitung* 5 (1803): 609–16, 625–38, 644–54, 673–83.

40. See *Keyed Flute*, chap. 7, par. 25.

41. See Powell, *Virtuoso Flute-Player*, 25 and n. 2.

42. With a small number of exceptions in eighteenth-century fingering charts for the one-keyed flute, the key for D♯/E♭ (tone hole 7, counting from the embouchure end) remains closed for all the notes of the first octave except F♯. The closed hole at the lower end of the tube has little effect on the tone of these notes, which are vented by several open tone holes above it. However, the effect of the closed seventh tone hole in muffling the tone of e^1 and e^2 is far greater, since these fingerings are vented only by the open tone hole 6—all the others, including tone hole 7 below it, are closed. Moreover, as Grenser observed in his review of 1800, the sixth tone hole must always be placed higher than its acoustically correct position so that the right-hand third finger can reach it easily; consequently it is

Pottgiesser's criticisms were more convincing when he turned his attention to the trills: some problematic ones did indeed remain; but the majority were far more functional and were provided a larger number of alternative fingerings on Tromlitz's flute than on other keyed flutes of the time—an advantage for which the light and comfortable key action deserved much credit. Pottgiesser's view of the flute's tuning was essentially incompatible with Tromlitz's, calling for equally sized semitones in conformity with the keyboard.

Tromlitz himself realized the limitations of his flute, particularly its dependence on the use of the received basic fingering system. He began the invention of a chromatic flute with only one key, probably with a conical bore, and with an even more unfamiliar fingering. He described the flute in chapter 7, paragraphs 25–7 of his *Über die Flöten mit mehrern Klappen*. However, by the time he had written this description in 1800, he had come to the conclusion that his keyed Tromlitz-system flute was the best practicable solution to the instrument's problems, and he consigned his experimental flute to posterity.[43]

* * *

It is the exceptional good fortune of a modern researcher to find a subject like Tromlitz, whose activities as a performer, an instrument maker, and a teacher all illuminate one another. Even the fact that Tromlitz has remained a somewhat obscure figure over the past two centuries operates in our favor: although his name has long been used in Germany as a generic label for all types of pre-Boehm keyed flutes, it is at least not necessary to penetrate nineteenth-century interpretations of his work to understand his message.[44] Too often in the investigation of early music, performance practice, and instruments, it is difficult to take what we learn from any source at face value, but in the complex interrelationship among music, instruments, technique, and instructions for performance, the body of evidence Tromlitz provided is

made smaller than it might otherwise be. The relative weakness of e^1 and e^2 on conical-bored flutes is thus due to two factors: the forked nature of the fingering and the small size and consequent reduced venting of the sixth tone hole.

43. *Keyed Flute*, chap. 7. pars. 25–7.

44. For a description of the confusion and error that have afflicted the history of another supposedly revolutionary design for the flute, see Ardal Powell, "The Hotteterre Flute: Six Replicas in Search of a Myth," *Journal of the American Musicological Society* 49 (forthcoming, 1996).

refreshingly complete. From the extremely detailed instructions he left in print, from what was written about him, and from the instruments he made, we can form a three-dimensional view of the man and his ideas on music—a view clearer than that we have of any eighteenth-century flutist, including Hotteterre and Quantz. Students of early music and instruments are fortunate to possess in these sources the matrix of the musical experience of a fine eighteenth-century virtuoso for whom the design of his instrument, the music he played, and the special sound and style of his performance were all intimately linked. The remarkable potential of this combination has yet to be explored: with Tromlitz's tutors and the Tromlitz-system flute in hand, the process can begin.