

ANTIQUE TRUMPET MUTES: A RETROSPECTIVE COMMENTARY

Don L. Smithers

The use of trumpet mutes from the 17th and 18th centuries raises a number of questions. Not the least of these is how a mute works and by what interval it raises the pitch of a trumpet when appropriately employed. To solve the problem of how early trumpet mutes work, investigations have been under way for some time at the German Bureau of Standards (PTB) at Braunschweig, Germany, conducted by the German physicist Klaus Wogram and this writer as part of an overall physical-acoustical examination of the Baroque trumpet in order to explain how it behaves, what the dynamic relationships are between a historical mouthpiece, the player and the instrument, and to discover in what ways various ancillary equipment such as mutes, tuning bits (*Setzstücken*), and crooks (*Krummbogen*) affect the response, sound production, tuning and resonance spectra of a given instrument. Some early results of these investigations have been already reported in the pages of *Scientific American*¹ and were published as the fifth chapter of *The physics of musical instruments*.² However, the problems concerned with the dynamics and acoustical phenomena of early trumpet mutes are still being studied; the results of these ongoing investigations will be published when all of the necessary experiments have been conducted and all the relevant data carefully analyzed. But scientific investigations notwithstanding, it is reasonably evident that the transposition effect of early trumpet mutes raises one serious question: by what interval do Baroque trumpet mutes transpose the pitch of an appropriately intended instrument?

Johann Ernst Altenburg, the last writer on 18th-century traditions of trumpet playing who was actually in touch with some of the players and the composers who wrote music for them, said that the mute (*Surdun*) not only made a trumpet sound like an oboe, but, when properly turned and finished on a lathe, caused a trumpet to sound higher — “um einen ganzen Ton” (about a whole step).³ Mersenne noted only that the mute made

1. Don Smithers, Klaus Wogram and John Bowsher: “Playing the Baroque trumpet,” *Scientific American*, April 1986, vol. 254, no. 4, pp. 108-115.

2. Published as *Die Physik der Musikinstrumente* (Heidelberg 1988), the fifth chapter (pp. 56-64), “Das Spiel auf der Barock-Trompete” by Don Smithers, Klaus Wogram and John Bowsher, appeared earlier in *Spektrum der Wissenschaft*, June 1986, pp. 126-137.

3. Johann Ernst Altenburg, *Versuch einer Anleitung zur heroisch= musikalischen Trompeter= und Paukerkunst...* Halle 1795 (facsimile ed. New York 1966), p. 86. Virtually the same description is given in F. J. Fröhlich's *Vollständige theoretisch-practische Musikschule*, Bonn 1811, III^{te} Abtheilung, p. 3: “Bey der Trompete besteht diese Sordine aus einer kleinen hölzernen

a trumpet sound softer;⁴ he said nothing about the transposition effect. And while Praetorius does not mention the trumpet mute in his theoretical writings,⁵ he does recommend its use in the preface to his *Polyhymnia Caduceatrix*, notably as one possible way for performing his setting of *In dulci jubilo*.⁶ Speer said nothing about the mute whatsoever.⁷ Eisel, on the other hand, who cribbed a good deal from Speer, does mention the trumpet mute (*Sordinen*) and noted that it raised a trumpet's pitch by a whole step ("um einen Ton höher"), adding that it put the trumpet in "Cammer-Ton E. dur."⁸ Thus, according to Eisel, the mute succeeded in transposing the trumpet from what one assumes was *Chorton* C, i.e. chamber pitch D, up two semitones to *Chorton* D, or

Röhre, welche in die Stürze der Trompete passt, durch deren Einschieben das Instrument nicht allein einen schwächeren, und einen von dem gewöhnlichen Trompetentone ganz verschiedenen Klang hat, sondern welche auch gewöhnlich verursacht, dass das Instrument also dann um einen ganzen Ton höher stehet."

4. Marin Mersenne, *Harmonie Universelle; the books on instruments*, translated by Roger E. Chapman, The Hague 1957, pp. 329-30.

5. Michael Praetorius, *Syntagma Musicum*, 3 vols., Wolfenbüttel 1615-19 (facsimile ed. Basel, etc. 1959/1974).

6. Michael Praetorius, *Polyhymnia caduceatrix et panegyrica*, Wolfenbüttel, 1618-19: *In dulci jubilo*, à 12. 16. & 20. cum Tubis (collected works, vol. xvii/2, p. 566), which can be played as Praetorius says, either with four or six trumpets — see Don Smithers, *The music and history of the Baroque trumpet before 1721*, 1st edition, London and Syracuse 1973 (2nd edition, Buren, The Netherlands and Carbondale 1989), p. 135ff. In his prefatory remarks to this important collection of Lutheran chorales set in the Venetian polychoral style, Praetorius says that inasmuch as some young trumpeters might have difficulties playing this work in C major, it is possible to perform it a tone lower in B flat, for which the trumpeters should employ whole-step crooks to be borrowed from the trombonists. But, as Praetorius adds, if it is desired to have the trumpets play quietly ("bey einer stillen Music"), then by the employment of whole-step crooks, thereby making the trumpets sound in B flat, mutes can be inserted into the instruments which will consequently transpose them up a tone and back to the correct tonality ("...die Sordunen hienein stecken wil und dadurch die Trommeten vmb einen gantzen Thon höher resoniren, so können sie durch solche darauff gesteckte Krumbügel wiederumb zum rechten Thon gebracht werden.").

7. Daniel Speer, *Grund=richtiger/ Kurtz= Leicht= und Nöthiger/ jetzt Wol= vermehrter Unterricht der Musikalischen Kunst...*, Ulm 1697 (facsimile ed. Leipzig 1974); Michael Praetorius, *Syntagma Musicum*, 3 vols., Wolfenbüttel 1615-19 (facsimile ed. 1959/1974, Basel, etc.).

8. [Johann Philipp Eisel], *Musicus αυτοδιδάκτορ, oder der sich selbst informirende Musicus...* Erfurt 1738 (facsimile ed. Leipzig 1976), p. 92. Eisel may have relied for this information on Joseph Friedrich Bernhardt Caspar Majer, whose *Museum musicum theoretico practicum...*, published at Schwäbisch Hall in 1732, does mention the transposing effect of trumpet mutes. I am grateful to Reine Dahlqvist for reminding me of Majer's observations.

chamber pitch E.⁹ There is nothing ambiguous about this, for despite a possible ambiguity in the usage of “Ton” or “gantz Ton,” what Eisel said can in no way be interpreted as anything but a transposition interval of a whole step, i.e. an interval of two semitones. This is reasonably confirmed by such musical sources as, for example, the *Tocatta* to Claudio Monteverdi's *L'Orfeo / Favola in Musica*, where the score specifically requires “Un clarino con tre trombe sordine” (a clarino with three muted trumpets), both published editions of Monteverdi's remarkable score clearly stating that the music which introduces the opera is a “Tocatta, which is played three times before the curtain goes up with all the instruments; and it is played a tone higher if it is desired to use the trumpets with mutes.”¹⁰ Fantini, too, recommends the use of a mute and, in the preface

9. What Eisel said about a muted trumpet transposing from *Kammerton D* to *Kammerton E* may explain what at first sight appears to be a paradoxical double key signature in the fifth and sixth trumpet sonatas from William Corbett's Opus 3 sonatas published first by John Walsh at London in 1708 and again in c. 1710 by Estienne Roger at Amsterdam. (The title of the complete Estienne Roger print in the possession of the Baron Carl de Geer at Lefusta Bruk, Sweden is *VI Sonates à une Trompette ou Hautbois, Deux Violon & Base...*, while the now incomplete Walsh print in the British Library is *Six Sonatas with an Overture and aires in 4 parts for a trumpet, violins and hautboys, flute de allmain, bassoons or harpsichord... opera terza.*) In the Roger edition the fifth and sixth sonatas each have two separate parts for the first voice, one for “Tromba” and another for “Hautbois o Violino.” What is unusual about this is a difference in the tonalities for each part. The music of the trumpet part, which was printed with only one sharp — f# — is nonetheless written in the key of D throughout, being therefore a tone lower than the other parts for the fifth and sixth sonatas. The part for “Hautbois o Violino,” like all of the lower voices in both sonatas, appears with four sharps, the music being obviously written in the key of E major. The surviving first violin and continuo bass (“Organo”) parts in the Walsh edition for the same two sonatas are printed with two conflicting key signatures before the music, one with three flats (E flat major), the other with four sharps (E major), the violin part having the added instruction, “with the Hautboys Play in the E_b.” This suggests, of course, a practical reason for the double key signature, oboes being better suited to flat keys than violins. But the choice of keys may be further explained by both a possible intention for the use of a muted trumpet as well as an attempt on the part of Corbett for each sonata to have alternative affective connotations, D, E flat and E major having their own and peculiar emotional qualities as defined by the Baroque doctrine of figures and affections.

10. *L'ORFEO/ FAVOLA/ IN MUSICA/ DA CLAUDIO MONTEVERDE...*, first ed. Venice 1609; second ed. Venice 1615 (facsimile ed. Farnborough 1972), facing p. 1: “Tocatta che si suona avanti il levar de la tela tre volte con tutti li stromenti, & si fa un Tuono piu alto volendo sona le trombe con le sordine.” If the C major tonality of the *Tocatta* was intended to be played a tone higher, Monteverdi's prescription for performance logically follows in light of the relationship of tonality of the *Tocatta* to the first and most significant ritornello in d minor/D major (presumably with strings only) that follows, being heard before, during, and at the end of the “Prologo,” at the conclusion of the “Atto secondo” and, similarly, at the end of “Atto quarto.” Moreover, the transposition of tonality is supported by the key of the opening and analogous music that begins Monteverdi's *Vespere* of 1610, where, with the addition of sustained vocal parts, the closely parodied *Tocatta* appears in D major, being performed with a large ensemble that includes

to his *modo* of 1638, says that with a muted trumpet one will play a *D* where a *C* is written.¹¹

Despite these and a number of other contemporary observations and musical requirements, the question of the interval of transposition effected by the use of the Baroque trumpet mute with the kind of instrument for which it was intended would seem to be rendered somewhat academic by the results observed from actual present-day practice when using surviving historical implements. For if the effects noted for virtually every surviving Baroque trumpet mute when played with historical instruments is any evidence, then the interval of transposition caused by its use is not a whole step but, rather, a semitone. This is not only confirmed by the author's own and not inconsiderable experience playing various historic trumpets preserved in such places as Vienna, Prague, Nuremberg and Munich, as well as the many trumpets in the Bernoulli collection when it was kept at Greifensee, Switzerland, but by others, both practitioners as well as scientists performing various acoustical experiments with historical mutes and trumpets. The Prague mutes, for example, which are discussed by Jindřich Keller in his article published here in translation, have been tested by this author and others familiar with the techniques required for playing the Baroque trumpet.¹² They all appear to raise the pitch of a trumpet by a semitone. Moreover, two historic mutes in this writer's own collection also transpose a Baroque trumpet up a semitone. This disparity of actual practice with historic dogma seems irreconcilable, unless, of course, the surviving mutes that raise a

cornetti, trombones, strings and continuo. There is little doubt that Monteverdi's instructions meant that only the lower trumpets were to have been muted, the "Clarino" not. This immediately raises the question as to the pitch of the first trumpet. Was a *clarino* a high-pitch instrument, perhaps made differently than other trumpets?

11. Girolamo Fantini, *Modo per Imparare a sonare l' DITROMBA/ TANTO DI GVERRA/ Quanto Musicalmente in Organo, con Tromba Sordina, col Cimbalo, e ogn' altro istrumento...*, "IN FRANCOFORT" [sic] 1638, p. [6]: "E per la Tromba Sordina si deue sonar per de sol re." The use of mutes for transposing trumpets up a whole step apparently continued as a performing practice well into the 19th century. This is suggested by F.G.A. Dauverné in his *Méthode pour la Trompette...* (Paris 1857, p. xlv) in which he quotes a "Morceau d'Église" for four trumpets from Altenburg (op. cit. p. 120, "Aus meines Herzensgrunde") that is notated throughout in C and requires a trumpet ("Clarino 1^o") in E and two muted trumpets ("Clarino 2^o" and "Clarino 3^o") both pitched in D, with a fourth trumpet part ("Principal") in E scored in soprano clef which, with merely the mental addition of a treble clef and a key signature of four sharps, a player can read as E major in concert pitch. With this example Dauverné writes, "N.B. La sourdine dont on faisait usage alors, à la propriété de hausser d'un ton tout l'étendue du corps sonore l'instrument, ce qui explique le motif pour lequel la 2^e et la 3^e partie (con sordini) sont indiquées en Ré, afin de se trouver à l'unisson des deux autres parties en Mi b." It should be added that Dauverné was no mere theoretician or musical pedant drawing on long-forgotten trumpet tutors. He was a first-rank trumpeter and player of the *cornet à piston*, Hector Berlioz having written many of his formidable soprano brass parts for Dauverné and his disciples.

12. See the editor's note to Jindřich Keller's article.

trumpet's pitch by a semitone were intentionally so designed, mutes transposing a whole step either having yet to be discovered or none having survived. A semitone transposition is, of course, not unuseful, particularly if a trumpet was to play with instruments tuned to a pitch standard (*Stimmton*) of *Tief-Kammerton* (low chamber pitch), which was a semitone lower than *Kammerton* (chamber pitch). By using such a mute, a trumpet tuned to *Kammerton* could therefore be raised a semitone to match the tonality of other instruments in *Tief-Kammerton* playing music in a suitably agreeable key. As pitch standards were readjusted for most 18th-century European ensembles to accommodate the lower-tuned and predominantly French woodwind instruments built to the low chamber pitch, playing with a mute that transposed a trumpet up by a semitone could have been most useful to enable it to play in a mutually agreeable key with other instruments that may have been required to transpose their parts. This would have avoided the greater difficulty of performing at a pitch standard a semitone or a tone and half from the basic tuning of the trumpet, which, without a whole-step tuning crook, was almost always fixed at *Chorton* (the old-fashioned high standard of choir or church pitch).¹³ Therefore and in absolute terms of frequency and tuning, a trumpet crooked

13. It is reasonably certain that historic trumpets were played either at the standing pitch of the instrument (a *Stimmton* of modern D flat), with but small adjustments of pitch made by the addition of short lengths of tubing called tuning bits (*Setzstücken*), or were tuned down by the use of tuning crooks (*Krummbogen*). An instrument was therefore "crooked down" a whole step or more from *Chorton* to *Kammerton* (or to another and lower key), a practice noted as early as the beginning of the 17th century in the second volume of the *Syntagmatis Musici Michaelis Praetorii...* (the *Syntagma Musicum* of Michael Praetorius), Wolfenbüttel 1619 (facsimile ed. Kassel, etc. 1958), p. 33. In my own experience, no original tuning crook has ever been found that lowers the pitch of an instrument by merely a semitone. It is possible, of course, that there were larger crooks that could lower the tuning of a trumpet in D (*Chorton* C) by more than a whole step — down a minor third, for example. This possibility is suggested by Praetorius, who, in the same place wrote, "Etlichen aber gefelts/ daß sie [i.e. some *Chorton* trumpets crooked down to *Kammerton* C] noch vmb ein halben oder gantzen Thon tieffer ins B gebracht werden." This practice is confirmed by a number of musical examples, not the least of which is Johann Kuhnau's cantata *In festum Pentec[ostes]. Feria I. Joh. IV, 13! Daran erkennen wir, daß wir in ihm verbleiben* (B flat major): SSATB, 2 Clarini, Timpani, 2 Violini, 2 Oboi, 2 Viole, Fagotto, and Organo in which he adds the following: "NB: Sind die trompeten ex C ♭ geschrieben. Muß also auff der Trompete ein Aufsatz [*Krummbogen*] bey dem Mundstück gesetz werden, daß die Trompeten einen Ton niedriger biß in den Kammerton klingen. So müßen auch die Paucken einen Ton tieffer gestimmt werden in der Cammertone herunter." Source: Berlin, SPK Mus. Ms. Part. 12260/2. A full score transcription is included in Evangeline L. Rimbach's Ph. D. diss. (Univ. of Rochester, 1966), *The church cantatas of Johann Kuhnau*, vol. 2, pp. 81-145.

into *Kammerton* based on a low pitch *C* (*B* natural) but played with such a mute would have sounded a semitone higher (in *C*), thus agreeing with instruments tuned to low chamber pitch (their *C* sounding *B* flat) when playing music written in or transposed to an appropriately agreeable key, a transposition that would then have involved a shift by one or more whole steps rather than by a semitone or a minor third, the two latter intervals being awkward transpositions for many instruments.¹⁴

There is another possibility for the use of mutes that transpose by a semitone, one that could have been necessitated by the gradual shift to higher tuning standards in the second half of the 18th century. Since the dating of surviving trumpet mutes has yet to be established with any certainty, it is therefore not readily apparent that most of what survives (as is the case for most artifacts) may be of more recent manufacture than otherwise conjectured. Assuming for the sake of argument that the surviving trumpet mutes were made some time in the second half of the 18th century, at a time when the *Stimmton* of places like South Germany, Czechoslovakia, Austria and Northern Italy was approaching the modern standard of $a = 440$ Hz, then trumpets, most of which would have been made several decades earlier, certainly the most beautiful ones, were in all likelihood tuned to the older Baroque standards. Once again the problem of transposition by a semitone (or minor third) as opposed to one or more whole steps would arise. Therefore, when played with its older *Kammerton* tuning crook, thus sounding at a low pitch *C* (*B* natural), a muted trumpet could have been made to agree with a *Kammerton* standard that was approximately a semitone higher than formerly. We know from such documentary evidence as, for example, the letters of Wolfgang Amadeus Mozart, that

14. Johann Kuhnau, for example, inveighed against the old tuning of church organs to the very high pitch of *Cornetton* or *Alt-Chorton* (old choir pitch), which was an additional semitone higher than *Chorton*; in terms of modern, absolute pitch, this meant that an *a* sounded at *c.* 493 Hertz, or the equivalent of a *b* natural at today's standard. Consequently and as Kuhnau said to Mattheson, he had all of the organs at Leipzig tuned down (presumably facilitated by moving the organ pipes down one slot) to the new *Chorton*. One of the reasons he gave for doing this was, as he explained, to alleviate the keyboard continuo players from having to "break their fingers" transposing a keyboard continuo part down a minor third to accommodate the pitch of the new variety of woodwind instruments (oboes, flutes and bassoons) tuned to chamber pitch (where $a = c.$ 415 Hz). By retuning the organs down a semitone, the organ continuo players had only to transpose down a whole step: in a *D* major cantata, i.e. a cantata in *Chorton C* or *Kammerton D* (the key of the voice, string, and woodwind parts), the basso continuo part for the organ was transposed down a whole step, from *D* to *C*, the latter being the key of the trumpet and timpani parts, which in Germany were always notated in *Chorton C*. But the same problem had to be dealt with once again whenever the French pitch of *Tief-Kammerton* (low chamber pitch) had to be reckoned with, many woodwinds at the time having been built to this lowest standard of a minor third below the pitch of the retuned organs.

trumpets (as well as horns) were still played with mutes in the last decades of the 18th century.¹⁵ The use of semitone transposing mutes would therefore have made tuning more efficacious in the likelihood that trumpeters were still playing on instruments made at Nuremberg (or Vienna) in the first half of the century (or earlier), instruments standing (with whole-step crooks) at the old *Kammerton* of the Baroque period, not at the concert pitch standard higher by nearly a semitone that was used by Mozart and his contemporaries.

If, as Altenburg suggested, a trumpet's pitch could be raised by the use of a mute according to how well it was turned ("wenn er gut gedrechselt ist"),¹⁶ then either we must consider that virtually every surviving mute was poorly made or that the transposition interval of a semitone was premeditated, an interval that has reasonable explanations if one takes into account the implications of different time frames and the likelihood of one or the other tuning standards just referred to.¹⁷

Another word about the use of mutes. For anyone inured to the exigencies of playing the natural trumpet *naturally*, i.e. without recourse to fingerholes or any other anachronistic *Hilfsmittel*, then it should be at once apparent that mutes do not allow the playing of any notes below the third harmonic (*G* within the context of a harmonic series built on C_1),¹⁸ the first two harmonics (*sotto basso/Flattergrob* and *basso/Grob*) being unplayable on a muted trumpet.¹⁹ Moreover, it is soon evident to those addicted to the use of anti-node fingerholes in playing a Baroque-type trumpet that a mute renders the

15. See the following letters of Mozart to and from his father, Leopold, in which there is mention of the need to borrow trumpet and horn mutes from the *Stadtpfeifer* of Salzburg for use in performances of Mozart's opera *Idomeneo, rè di Creta* (K. 366) at Munich in the winter of 1780-81 (the page references are to the English translation by Emily Anderson, rev. ed. London 1985): Munich, Nov. 29, 1780 (p. 674); Munich, Dec. 1, 1780 (p. 678); Munich, Dec. 5, 1780 (p. 682); Salzburg, Dec. 7, 1780 (p. 683); Salzburg, Dec. 9, 1780 (p. 685); Munich, Dec. 13, 1780 (p. 686); Salzburg, Dec. 15, 1780 (p. 687), and Munich, Dec. 19, 1780 (p. 692). The fact that Mozart had to borrow mutes on account of the trumpeters at Munich not having any, as Mozart says, has a number of implications, not the least of which is the likelihood that, by 1780, the use of muted trumpets was becoming a thing of the past for most composers and orchestras, at least in Munich.

16. Altenburg, *Versuch einer Anleitung...*, p. 86.

17. But note the whole step transposition still mentioned by the middle of the 19th century that was referred to in note 11.

18. Was this one reason why trumpet writing from after the turn of the 18th century, especially that of Bach, Handel and Telemann, almost never goes below a written *G*?

19. This effect appears to be otherwise in the experience of some modern players. It has been reported by some trumpeters that they can produce the second, *basso/Grob*, harmonic using a Baroque-type trumpet mute. But reports of success in sounding a muted trumpet as low as the second harmonic notwithstanding, there is the distinct possibility that what is produced is a false, so-called pedal tone, what the French physicist Henri Bouasse described as "sons privilégiés, sous-

instrument useless whenever a fingerhole is vented (uncovered), a problem that will be explained after sufficient experiments have been concluded at the German Bureau of Standards.

Taking into account the comments of composers, trumpeters, trumpet pedagogues and music theoreticians from the early 17th to the end of the 18th centuries, it is fairly certain that muted trumpets (as well as muted horns and trombones) were more regularly heard in musical performances than one might suspect from the surviving musical sources alone. As more trumpeters today begin to learn the true art of *clarino* trumpet playing, the more often will we come to expect to hear the classic trumpet played *con sordino*. It is certain that correct historical performance practice as it pertains to the uncompromised, historic trumpet of the 17th and 18th centuries has a considerable way to go before anyone can boast of the kind of achievements readily audible from such instruments as the Baroque violin, oboe, transverse flute, bassoon and recorder. But these instruments, as Speer noted, are fundamentally less problematic than the uncompromised trumpet (why else has the Baroque trumpet been so intractable and so much less susceptible to a modern revival?).²⁰ But with a greater increment of successful revival we must come to expect that the mute will begin to play an integral part in future performances of the classic trumpet's intended repertory.

harmoniques des partiels musicalement corrects." These non-harmonic "privileged tones," with which skilled trombonists are familiar, are produceable in the lowest registers on most long-bore lip-reed instruments, sounding under normal circumstances as a fourth below the first harmonic of a given length of air column and an octave higher, or a fifth above the first harmonic. (The playability of at least the second privileged tone on a Baroque trumpet is evidenced by its occurrence in a number of musical sources, notably from the 17th century, and obviates any use of a trombone, a practice unfelicitously suggested in a recent article published in *Early Music*.) Played with a mute, these false tones may, in fact, be shifted in frequency, thereby giving the impression that it is possible to sound as low as the second harmonic. The evidence provided by measurements with a frequency analyzer, however, does not support the claims of some players, but rather shows that sounds produced by a muted trumpet below the third harmonic are not part of the normal harmonic series of a cylindro-conical tube's resonant spectra.

20. As Speer says in the first section of the "Dritte Klee=Blatt" (p. 189) from his *Grund=richtiger Unterricht* (Ulm 1696; Leipzig 1974) where he begins his discourse on musical instruments: "Jetzt schreite ich zur Sach / und will bey dem leichtesten Instrument den Anfang machen; nemlich von einer DISCANT-VIOLIN." In other words, "I now proceed further and will begin by discussing the easiest of instruments, namely the discant-violin." At the time of its greatest use, the Baroque trumpet was invariably said to have been the most difficult instrument to learn and play in a musical way. It does not require very much by way of observation to conclude that this is as true today as it ever was, particularly if the Baroque trumpet is to be played in a manner both prescribed by treatise writers in the 17th and 18th centuries and demanded by the surviving instruments themselves.