The Renaissance flute in mixed ensembles: surviving instruments, pitches and performance practice

Ever since I began making and performing on copies of Renaissance flutes I have been troubled by the problem of the pitch relationship between transverse flutes and other surviving Renaissance woodwinds. Most surviving flutes seem to be at a pitch lower than \( d' = 440 \) Hz, and anywhere from a minor 2nd to a 4th lower than surviving recorders, cornets and dulcians.

This problem is particularly puzzling when one looks at the type of music and ensembles with which the Renaissance flute was combined, particularly in the first half of the 17th century in Germany. Concerted music, or pieces involving both singers and instruments, became popular towards the end of the 16th century. At first the question of instrumentation was mostly left to the judgement of the maestro di capella or Kapellmeister, but towards the end of the 16th century composers began to use specific instrumentation. There are approximately known pieces that call for the flute, predominantly in larger ensembles for mixed voices and instruments.¹

German Baroque Music

Music by Bach and his circle of family and friends, for ensemble/solo singers, gut strings (Baroque bowed, woodwind, plucked and keyboard continuo). Technique classes, talks and a focus on stylistic period performance. This so-called anomaly of Renaissance flutes has been discussed by many authors, and several solutions have been offered.² This general consensus seems to be that flutes were considered to be a tone lower than the other instruments, and were not intended to play at the higher instrumental pitches. However, the situation is more complex. There is evidence that there were higher-pitched flutes, as well as sets of different families of instruments made at the same pitch as the flutes. Furthermore, it is not clear if such flutes were used to perform particular compositions. Let us look at the question of pitch relationships in surviving instruments and Renaissance pitch standards.

Surviving instruments and Renaissance pitch standards

In the article I shall try to answer some of these questions by examining the evidence at hand: surviving instruments, contemporary accounts of wind instruments, and recent research on 16th- and 17th-century pitch. I shall conclude by proposing some hypotheses concerning the performance of original compositions calling for the Renaissance flute.

¹ The Renaissance flute in mixed ensembles: surviving instruments, pitches and performance practice

² Boaz Berney
completed the list, focusing more on concert instruments, but also discussing issues of transpositions and mixed ensembles. In a paper that I presented at the International Renaissance Flutes and Recorder Symposium (Utrecht, 2003) I supplied pitches for almost all the surviving instruments. This list is presented in appendix 2. The pitches of most instruments could be determined simply by playing them, in some cases, however, where access to the instruments was not possible or where they were not in playable condition, the pitch was calculated by making copies of the originals or from the sounding length of the instrument.

Renaissance flutes give a very accurate idea of the pitch at which they were meant to play. There are several reasons for this. They are usually unaltered, as they were rarely used after the 17th century, when they became outdated and fell from use. Wood shrinkage, which occurs in almost all wood and mixed ensembles. In a paper that I presented when the instruments were not possible or where they were not in playable condition, the pitch was calculated by making copies of the originals or from the sounding length of the instrument.6

Wood shrinkage, which occurs in almost all wood-winds, has much less of an impact on cylindrically-bored Renaissance flutes than on the later conical instruments. The sounding length of the cylindrically-bored flute (calculated in this case from the bottom of the instrument to the middle of the embouchure hole) is the most important factor influencing its pitch; although secondary factors such as embouchure and bore size play a part, they are relatively insignificant, and may be disregarded for the degree of accuracy I am aiming for in this paper (5–6 Hz). The data presented in table 1 is based on my own measurements of the instruments at the various collections, as well as measurements presented by Puglisi.8

As others have previously pointed out, surviving flutes can be divided into several groups according to their pitch. Most of these groups (92 per cent of the instruments) are related to one another in a series of semitones. In order to make the data easier to analyze, each pitch has been labeled with the number of semitones from the reference point, \( d' = 408 \). (This pitch was chosen as a reference point simply because it contains the largest group of surviving instruments.) The pitch groups were divided with a tolerance of ±3 Hz (giving a range of 5 Hz in total); so, for example, both instruments at \( d' = 405 \) and 410 have been included in the \( d' = 408 \) group. Only a few of the surviving instruments do not fall into this system of semitones; these I have listed separately.

Table 1 lists these pitch groups. It includes only cylindrically-bored, six-holed flutes; thus an instrument such as the Lisieux flute has been included, but the Halka flute, which is rather similar to it in external appearance but has a tapered bore, was not. Instruments whose pitch or sounding lengths are unknown at the moment (like some of the instruments in St Petersburg) are listed under 'unknown'. Both tenor and bass-size instruments have been included. Incomplete 'basses have been included only when their sounding length could be reconstructed. I have not included any of the instruments marked *", or the Altenklingen flute (R-V: KHM 1028), which are likely to be military instruments and hence irrelevant to the question of instruments used for 17th-century concerted music.9

As table 1 shows, the largest group of instruments is pitched at roughly \( d' = 408 \). There is a smaller group of instruments a semitone higher, at about \( d' = 409 \), two smaller groups a tone higher and a semitone lower, and two very small groups as high as \( d' = 410 \) and as low as \( d' = 360 \). The most surprising fact is that, despite what is commonly believed, some surviving instruments are higher than \( d' = 430 \), although they still comprise only a small portion (12 per cent) of the total number of surviving instruments.

In his recent book about the history of pitch Bruce Haynes produces convincing evidence to support the theory that several pitch standards were employed in 16th-century Europe, particularly in Italy and Germany.10 According to Haynes, there were three pitch standards in Venice and North Italy at the time: mezzo punto, tutto punto (a semitone lower) and chorista (a whole tone or a minor 3rd lower than the first). As Venice was one of the main centres for instrument making, the pitches of the instruments made and bought; there influenced pitch standards in other countries in Europe. Haynes gives nominal pitches for these levels at A-1 (about \( d' = 465 \)) for mezzo punto, A-10 (about \( d' = 440 \)) for tutto punto, and A-1 or A-2 (\( d' = 415 \) or 392) for chorista. The pitches of surviving transverse flutes show these levels to be slightly lower than Haynes indicates, by about a quarter tone, which is likely due to the compensation between the ideal instrumental and vocal pitch, as well as being useful as a whole tone above the lower chorista level.11 Zaccioni wrote in his Pratica di musica (1902) that all instruments, without exception, are higher than the voices, and therefore when playing together the instruments have to transpose down between a 2nd and a 4th.12 Each of these pitch levels had its own function: mezzo punto or CammerThon was used mainly as an instrumental pitch, while chorista or ChorThon was used for vocal music as well as for performances of mixed instrumental/vocal (concerted) music.13

What exactly the function of tutto punto was is not clear: Peter van Huygen suggests that it was a compromise between the ideal instrumental and vocal pitch, as well as being useful as a whole tone above the lower chorista level.14
which is a whole tone lower, is employed only in
church. As we can see, there are surviving flutes at all
these pitch levels, with the largest group of instru-
ments pitched at chorostra or Praetorius's ChorThon.
Was this the norm, or an exception? A possible
explanation for the existence of low-pitch flutes is
presented in chapter 2/II of De organographia.


At the outset it is to be made clear that the pitch of organs and
other musical instruments frequently varies widely. This is
because in earlier times it was not the practice to play all kinds
of instruments together in ensemble [= Concertiren] and thus,
instrument makers built wind instruments quite differently,
tuning some high, others low: for certain instruments, such as the
cornet, shawm and descant violin sound finer and better
when constructed to a higher pitch, while instruments like the
bassoons, bassanelli, bombardes and bass viols sound more grave
and splendid the lower they are pitched.8 This could explain the existence of consorts of flutes
in England and the Netherlands. These were apparently pitched a minor 3rd lower
than his CammerThon:

... wie denn auch die Flötten und andere Instrumenta in solchem
sauber Thon luthlicher als im rechten Thon lauten und saft gar
eine andere art im gehör (sintemalb sie in der tiefe nicht so hart
scheinen) mit sich bringen. ... but also recorders and other instruments [as harpsichords]
are lower at this lower pitch than when sounding at the
usual one, and produce an almost entirely different sound
(since they are not so harsh as this).9

This could explain the existence of consorts of flutes
at low pitches. It is also my experience that, pitched
lower than \(d' = 451\), a Renaissance flute consort
sounds fuller and warmer, and is also surprisingly
easier to play in tune.
The flutes shown in plate IX of De organographia
seem to be a low consort such as this. Their lengths,
and as well as that of the other instruments in the plate,
can be calculated from the scale at the bottom of the
drawing, combined with the Braunschweig Table
that presented on the first page of the series of plates
corresponding to this scale (see illus.1).10 The calculation
is accurate enough, as various factors such as
paper shrinkage and thickness of the engraved lines
would change the results only slightly (within about
2.2–3 per cent).11 The consort of flutes is drawn very
carefully, with the instruments having sounding
length relationship of \(3:2\) between the bass and
tenor, and the tenor and descant. The tenor flute
(calculated at a scale of \(113.4\ mm\)) has a sounding
length of \(629\ mm\), which would place it a whole
tone under the tenor recorder, which has a sounding
length of \(556\ mm\). The pitch can be calculated
to be \(d' = 373\) and \(460\) (in \(C\)) respectively.

This relationship contradicts Praetorius's own
statement at the beginning of the book that all
instruments and voices in his work are referred to
according to CammerThon and that in modern times
all the instruments, both winds and strings, are
tuned to it.12 It is not clear whether lower-pitched
flutes were a norm for Praetorius and hence an inten-
ded example, or whether those were just the instru-
ments his engraver was able to use for the drawings.

Coming back to the complete stock of surviving
Renaissance flutes, we must remember that they
cover a time-span of about 350 years of flute
making, the earliest datable instrument being the
Schnitzer bass in Vienna (GdFM 88), stamped
1501, and the latest instrument being the
Lissieu flute (Vienna, KHM 376; see illus.2),
which can be dated to the 1660s.13 The instruments were
also made in at least four different countries of ori-
gin: Italy and possibly England (Bassano), Germany
(Schnitzer and Rauch), France (Rafi) and the
Netherlands. As we are trying to determine at what
pitch flutes were played in the late 16th and early
17th centuries, looking at this data probably is a whole
problematic. For instance, the large consort of flutes
made by Rauch (Verona, Accademia Filarmonia)
comprises eight instruments, and is 15 per cent of
the total number of surviving instruments. If this
group of instruments had not survived, or, for
example, if the six instruments belonging to the
now empty Augsburg case (see below) had survived,
the picture would have looked different, with nearly

equal numbers of instruments at \(d' = 408\) and \(430\),
and a higher percentage of them at \(450\).

The total number of surviving Renaissance flutes,
about 50 (not including military instruments), is
actually too small to be able to draw solid conclu-
sions. Compared to about 200 surviving Renaissance
recorders and over 300 cornets, it seems very small
indeed.14 I feel that many of us, myself included,
have been misled about the pitches at which
Renaissance flutes were used, because our ideas
were based only on the situation represented by
the surviving instruments. Therefore I shall now look at
other sources that may shed more light on this issue.

Flutes made at the same pitch as other
instruments

Flutes were not always made at a pitch different
from that of other instruments. Towards the second

---

1 The flutes surviving in the collection of the Kunsthistorisches Museum in Vienna represent three of the pitch levels:
the highest, SAM 185, stamped "17" is at \(d' = 480\), the Lissieu flute, SAM 175 at \(d' = 450\), and an anonymous flute SAM
186 at \(d' = 408\).
Once again, the flutes meant for use in concerted music are listed separately from the consort instruments. There is no way of knowing, however, at what pitch these may have been played, and whether these 'big flutes' were bass flutes or just large tenor instruments, perhaps similar to the low-pitched ones made by Rafi.

A later source that mentions flutes as well as other instruments with a common pitch is the catalogue of Manfredo Settala's museum, compiled in 1664. Settala was a true collector in the spirit of the 17th century, interested in science, medicine and mathematics. He was also an able instrument maker and invented several instruments such as the *armonia di flauti*. Among other instruments are:

- **Van concerti corina di flauti opere del Sig. Manfredo, ch'tutto volle di se far suona.**

*Quattro concerti di Trauerse, ovò vogliamo dire Piffari all'Inglese, vno de'quali è di Cortese un'altra di legno Indiano, lucio, e odoroso con me bassi spezzati, e armati in lama d'argento, il terzo con tutte le parti spezzate di voce con tino più basso; l'ultimo è di voce più alta. Tutti manio del Graffi Artefice insign. . . .

Vedere un'altra di mano del Sig. Manfredo, à Contrabass, e contrabassitri in basso.

A recorder consort at corista made by Mr Manfredo, who shows his skill in everything.

*Four consorti di Traverse or Piffari all'Inghilare, one of which is in cosinta, another in smooth and fragrant Indian wood with the bases divided and decorated with silver, the third with all parts divided, pitched a tone lower; the last pitched a little higher. All signed by the hand of the Englishman Graffi, an excellent craftsman. . . .

Another [consort] made by Mr Manfredo with contrabass and contrabassiti in boxwood.*

According to the catalogue Settala had four consorts of flutes, three of which are noted for their pitch: one at 170, one a tone below, and one a little higher, on a tone above. All these instruments were made by the Englishman Graffi (or Grassi in the Latin version). These could have been instruments made by one of the members of the Rafi family. The low-pitched instruments in two parts with silver rings mentioned in the catalogue certainly brings to mind the C. Rafi flute in Bologna (I-Bologna: MC 3388). One of the versions of Claude Rafi's stamp reads: 'CL.Rafi/gyphin'. In this
version the 'Cl' is connected, and could be easily confused for a 'G'. Additionally, 'i' in the old roman font is similar to an 's'. Terzeghi could easily have transcribed 'Cl. Rafi' as 'Grassi'. The only explanation why he identifies this Graffi/Rafi as an Englishman is that by the time the catalogue was compiled, the Rafi family had not made any flutes for over a hundred years. (Claude Rafi died in 1539, leaving no instrument-making descendants after him.) So by the time of the catalogue, the real origin of the instruments was probably no longer known.

Flutes are not the only instruments at corista in the collection. There is also a recorder consort, a trombone and a dulcian. Settala also had an organ. Although most entries in the list have no reference to pitch, some do:

- A Flutes were even made at higher pitches, as mentioned in an order for a large group of instruments approved by the city of Genoa in 1592. These included:
  - chiffon, di legname di busso, parte dritti e parte a sinistra, tutti in una cassa, di tutto punta, made of boxwood, all in a case of boxwood, all in a case of boxwood.

- A possible standard for instrumental music and was at roughly $d' = 460$. It is not a pitch we would readily associate with Renaissance transverse flutes, yet the order states that they should be made exactly at that pitch, the same pitch as the recorders and curved cornets.

- As we have seen, mezzo punto was a common pitch standard for instrumental music and was at roughly $d' = 460$. It is not a pitch we would readily associate with Renaissance transverse flutes, yet the order states that they should be made exactly at that pitch, the same pitch as the recorders and curved cornets.

- Interesting evidence for the existence of high-pitched flutes also comes from an instrument case surviving in the Maximilian museum in Augsburg. The case—which in German inventories of the time would have been called a Futteral—is composed of 28 tubes of various lengths and
meant to house three groups of instruments: a recorder consort of 16 instruments, a flute consort of six instruments (two basses, four tenors), and three pairs of mute cornets in different sizes or pitches, six in total. The pitch of the instruments in the case can be estimated, based on the lengths of existing instruments. For the flutes, the bass slots in the case, with a length of 867 mm, would fit the bass flute at Linz (A.-Linz: Mu), which is at about d' = 460 and only 4 mm longer than the slots in the case (see table 2). The tenor slots have the length of 599 mm, slightly longer than the total length of the Bass flute (A-Vienna: KIM C174, 595 mm, d' = 460).57

Based on the above calculation, we can say that the case was made for a six-part consort of renaissance flutes probably around d' = 460.58 The recorder consort was estimated by Adrian Brown to be at around the same pitch or slightly higher.59

The Augsburg crest—a pine cone—can be found on the front of the case, above the year 1603. The case along with the instruments it contained must have been the property of the city of Augsburg, and was possibly used by the Stadtpfeifer, although no documentation has been found to prove this. In any case, the Augsburg Futteral demonstrates that early in the 17th century transverse flutes were indeed made in high pitch to match the pitches of other woodwinds, and that all of them could have been used in the same musical event, possibly even together.

Original compositions and performance practice

Let us now look at the 17th-century pieces that call for the transverse flute and other wind instruments together, and try to find some possible solutions for the performance of this music. The first question to be asked is at what nominal pitch or pitches these pieces should be performed.

As all the repertory in question is vocal church music, we should, ideally, follow Praetorius's instructions, performing it at his ChorThom, a whole tone lower than CammerThom. We could even consider performing some pieces a minor 3rd lower than CammerThom, as he mentions was common practice in Italy and in Germany during his time. He gives the examples of pieces in F Hypoionian transposed to D, as well as G Hypodorian transposed down to E. Pieces in these modes are often very high for the singers, especially considering that the upper parts would have been sung by boys or male falsettists. The squier would sound much better singing these pieces a 3rd lower, and the text can be more clearly understood at the lower pitch. Praetorius mentions that organists and instrumentalists find such transpositions quite difficult, but that they can be achieved with a little practice. We should be careful with this transposition, however, as in some cases it may result in parts being too low for the voices, especially for the basses. Bass parts in Praetorius's own piece in F Hypoionian sometimes go down to low C', which is in agreement with his conception of the bass range as represented in table 1 of the De organographia. However, as the ranges in the table probably relate to Praetorius's time, especially for larger ensembles, very low pieces, and when dealing with less experienced instrumentalists.

The second question we have to answer is whether we have flutes at the same pitch as the other instruments or lower. According to what we have seen so far, we can approach performing concerted music with flutes in two ways: (1) the flutes used are at the same pitch as the other instruments; or (2) the flutes are lower than the other instruments with which they play, either by a whole tone or a minor 3rd.

The first possibility obviously leaves us with an ideal situation where all the instruments play at the same sounding pitch; none has to transpose its part, and the music can be played as written. This could be Praetorius's CammerThom or Italian mezzo punto at d' = 460 as well as tutti punto at d' = 450. The second possibility, according to the evidence we have examined above, the surviving high-pitch flutes, the Augsburg Futteral and the sets of different families of instruments mentioned in inventories and playing at the same pitch.

The second possibility obviously requires some kind of transposition, either by the flute players or by the rest of the ensemble. Examination of surviving music shows that such transpositions are possible, although each piece has to be dealt with separately to find the best possible solution. When considering such transpositions we must take into account the limitations of the other wind instruments and singers as well as those of a mean-tone organ. I shall now examine some transposition possibilities, presuming that we have flutes which are either a tone or a minor 3rd lower than the other instruments and according to the modes of the pieces.

Pieces in G: There are several pieces by Schein and Schütz in this mode. These cannot be transposed on the flute to A, as it is a very awkward key for the Renaissance flute, involving Fs, which are tuned very low on the instrument. However, it is entirely possible to have the other instruments (pitched a tone higher than the flutes) transpose the piece down to F; this would work well both for the other winds as well as for the organ.

Piaces in F: Many of the polyphonic motets by Praetorius are in this mode, as are all the pieces by Tobias Michael. These are often large-scale works involving many instrumentalists and singers, so the idea of having the entire ensemble transpose the piece down for the sake of two or three flutes is not practical. On the other hand, having the flutes (a tone lower than the other instruments) transpose the piece up a tone (to G) could work quite well. Such transposition would also be necessary in Praetorius's polyphonic motet Wenn wir in höchsten Nöten seinn von his Musae Sionae.51 The piece is scored for five choirs, among which is a Chorus di Flasti that includes a singer (C4 clef), two recorders or transverse flutes (Flauto vel Fiffari in C3 and C4 clefs) and a dulcian. The flute parts are quite low (c>c'), and even include several low cs, which are below the range of a D tenor. The piece could be easily transposed up on the flute, to G, thus solving both pitch and range problems at the same time.

Pieces in C: A similar transposition may be necessary in Sebastian Knüpfer's cantata Ach Herr strafe mich nicht.52 The piece, which is in c (two flats in the key signature), is scored for a pair of transverse flutes, in addition to trumpets, timpani, strings and singers. The part could be played on the flutes as it is, although it is not very comfortable as it includes many Es that have to be half-holed on the Renaissance flute. Here the apparent solution would be to transpose the flute parts from c to d, and thus avoid the Es in the flute parts as well as solving the pitch problem.

Pieces in g: These form the majority of 17th-century pieces calling for transverse flute, and this
Possible transpositions in Flute plays

Table 3

<table>
<thead>
<tr>
<th>Composition in Flute plays other than flute at pitch</th>
<th>Other instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gunter (Shutze, Schein)</td>
<td>G</td>
</tr>
<tr>
<td>F. (Praetorius, Michael)</td>
<td>G</td>
</tr>
<tr>
<td>c (Knupfer)</td>
<td>F</td>
</tr>
<tr>
<td>g (Schutz, Schein, Knupfer)</td>
<td>c (K)</td>
</tr>
<tr>
<td>d (G)</td>
<td>g (K)</td>
</tr>
<tr>
<td>e (G)</td>
<td>c (K)</td>
</tr>
<tr>
<td>f (G)</td>
<td>d (K)</td>
</tr>
</tbody>
</table>

Table 3 summarizes the different keys in which these pieces are found and the possible solution in each case.

Conclusion

To reiterate, it is impossible to find a single solution applicable to all cases. The most important thing to bear in mind is that in the 16th and 17th centuries, pitch was often related to the function of the music, the event and the forces involved, as is demonstrated by Praetorius in his description of the situation in Prague. Inventories show that large musical establishments such as courts, cathedrals, academies or even private collections owned a large number of instruments which often included sets of the same type of instrument in different pitch levels, designed for use on different occasions. Original instruments in large museum collections that survive as a single group, such as the Correr-Contarini collection in Brussels, the Ansbach and Cappel collections in Vienna, and the instruments in the Accademia Filarmonica in Verona, all include sets of recorders, cornetts and transverse flutes at different pitch levels, sometimes with up to a minor 3rd between the lowest and highest sets. I believe that musicians in the 17th century chose the instrument at the right pitch or the right transposition for each occasion and context, and were less attached than we are to a certain pitch level within the semitone system.

Given the choice, I would perform concerted music based on Praetorius's principles, making pitch decisions based on the instrument's available ranges and abilities of the singers. When playing instrumental pieces with other winds, and without singers, I would choose transverse flutes at a higher pitch, a' = 460 or higher, to match the pitch of the other winds. When making a flute consort to be used alone, I would choose a pitch in which the instruments sound best, which is, in my opinion, a' = 408. This is probably the lowest pitch for a bass flute of manageable size, and at this pitch the instruments have a round, warm sound, while retaining their clear speaking quality.

Appendix 1

Recently discovered pieces using the Renaissance flute

<table>
<thead>
<tr>
<th>Composer</th>
<th>Work</th>
<th>Instrumentation</th>
<th>Mode</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antonio Brusoni</td>
<td>Various diminutions and cadences</td>
<td>fl/gamba/rec &amp; other instruments</td>
<td>various</td>
<td>Vaticae Euchistiae (Florence, 1614; 5/1977)</td>
</tr>
<tr>
<td>Sebastian Knüpfer</td>
<td>Ich freue mich in dir</td>
<td>SSATB, 2 fl, 3 trb, 2 vn, 2 va, 2 va, violone, bc</td>
<td>G</td>
<td>MS, Berlin SB</td>
</tr>
<tr>
<td>Tobias Michael</td>
<td>Das ist ein köstlich Dinge</td>
<td>S, fl, bc</td>
<td>F</td>
<td>Musicalischen Seelen-Lust</td>
</tr>
<tr>
<td>Tobias Michael</td>
<td>Kommer Herr zu mir alle</td>
<td>S, T, vn, fl, dulcian, bc</td>
<td>F</td>
<td>Musicalischen Seelen-Lust, no.34</td>
</tr>
<tr>
<td>Tobias Michael</td>
<td>Wer leiblich zir auf dem Bergen</td>
<td>S, T, vn, fl, trb grosso, bc</td>
<td>F</td>
<td>Musicalischen Seelen-Lust, no.35-6</td>
</tr>
<tr>
<td>Tobias Michael</td>
<td>Wo der hoch ist nicht das Haus bei weit</td>
<td>SSATB, rec, vn, fl, 2 trb, dulcian, bc</td>
<td>G</td>
<td>Musicalischen Seelen-Lust, no.41</td>
</tr>
<tr>
<td>Tobias Michael</td>
<td>Gott, schweig doch nicht also</td>
<td>SSATB, 2 fl, 2 dulcians, bc</td>
<td>G</td>
<td>Musicalischen Seelen-Lust, no.50</td>
</tr>
<tr>
<td>J. H. Schein*</td>
<td>Lamentario ecclesiasticum</td>
<td>SSATB, vn, fl, 3 trb, dulcian, bc</td>
<td>G</td>
<td>Occasional composition celebrating 1629 city council election</td>
</tr>
<tr>
<td>J. H. Schein*</td>
<td>Psalms ecclesiasticum</td>
<td>Incomplete, includes SAB, gamba, fl, trb, bc</td>
<td>?</td>
<td>Undated vocal concerto for election of new town council</td>
</tr>
<tr>
<td>J. H. Schein*</td>
<td>Jubilate Deo 24 a 8 / 9</td>
<td>SSATB, 2 cor, fl, trb, vn, ma, 2 vn, 2 va, dulcian, bc</td>
<td>?</td>
<td>Opus novum (Wolfgangt, 1623-4), no.3</td>
</tr>
</tbody>
</table>

* I am grateful to Stephan Rose for supplying me with the list of pieces including transverse flutes found in Schein's occasional work, and for his references to their current locations. These pieces have recently been rediscovered. I have so far been unable to obtain copies.

† Quoted in S. Rose, 'Schein's occasional music and the social order in 1629 Leipzig,' Early music history, xxiii (2001), p.120. The two pieces survive as incomplete copies in the Königlichen und Universitätsehreiben-Kontingentur. According to G. Dünhammer, Personalbibliographien zu den Drucken des Barock (Stuttgart, 1999-2001), these copies are believed to be in the Rossijskaya National'naya Biblioteka, St Petersburg, although recent correspondence with the library has turned up no such work.
### Appendix 2 Surviving Renaissance flutes

<table>
<thead>
<tr>
<th>Maker</th>
<th>Material</th>
<th>Mark</th>
<th>Sounding length (mm)*</th>
<th>Bore (mm)</th>
<th>Pitch (Hz)</th>
<th>Date</th>
<th>Location</th>
<th>Provenance</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anon.</td>
<td>boxwood, brass rings</td>
<td>[gothic] ‘r’</td>
<td>759.0</td>
<td>23.5</td>
<td>456</td>
<td>A-–Linz: Mu 9</td>
<td>Shift</td>
<td>Kremsmünster?</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>yew, bone rings</td>
<td></td>
<td>418.0</td>
<td>13.5</td>
<td>466 in F/445 in G</td>
<td>A–Vienna KHM: SAM 3/229</td>
<td>Schlöfl</td>
<td>Altenklingen (Switzerland)</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>boxwood</td>
<td></td>
<td>534.0</td>
<td>17.2</td>
<td>444</td>
<td>A–Vienna KHM: 175 (c186)</td>
<td></td>
<td>Catoja (Padua)</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>boxwood</td>
<td></td>
<td>7207</td>
<td>12.0</td>
<td>485?</td>
<td>A–Vienna KHM: 218</td>
<td></td>
<td>Catoja (Padua)</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>maple?</td>
<td></td>
<td>735.7</td>
<td>9.0</td>
<td>385?</td>
<td>B–Brussels: 1062 (lost)</td>
<td>Correr–Contarini</td>
<td>(Venice)</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>maple</td>
<td></td>
<td>428.0</td>
<td>14.0</td>
<td>385?</td>
<td>B–Brussels: 1063</td>
<td></td>
<td>small descant in g</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>ivory</td>
<td></td>
<td>578?</td>
<td>17.0</td>
<td>405</td>
<td>O–Prague Narodni</td>
<td></td>
<td>ex–Snoek</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>maple, horn rings</td>
<td></td>
<td>531.0</td>
<td>12.8</td>
<td>454</td>
<td>D–Berlin: 2663</td>
<td></td>
<td>unusually thick walls</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>ivory</td>
<td></td>
<td>566.0</td>
<td>17.2</td>
<td>410</td>
<td>D–Berlin: 5422</td>
<td></td>
<td>shorted?</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>boxwood?</td>
<td></td>
<td>573.0</td>
<td>17.5</td>
<td>405</td>
<td>I–Rome Museo SM: 0715</td>
<td></td>
<td>Alessandro Marcello</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>plum</td>
<td></td>
<td>807.5</td>
<td>25.0</td>
<td>429</td>
<td>I–Verona A/1:3278</td>
<td></td>
<td>single-part bass</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>boxwood, brass ring</td>
<td></td>
<td>8257</td>
<td>27.0</td>
<td>430</td>
<td>I–Verona A/1:3286</td>
<td></td>
<td>body only, double III and VI offset</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>boxwood (crowned eagle)</td>
<td></td>
<td>540.0</td>
<td>17.7</td>
<td>430</td>
<td>I–Verona A/1:1</td>
<td></td>
<td>Nova Zembla expedition</td>
<td></td>
</tr>
<tr>
<td>Anon.</td>
<td>plum?</td>
<td></td>
<td>535.5</td>
<td>17.5</td>
<td>433</td>
<td>pre–1596</td>
<td></td>
<td>thin walls</td>
<td></td>
</tr>
</tbody>
</table>

Anon. | Inscription: Dum vivi tacci mortua voce cano/1601 | | | | | | | R–St Petersburg: 457 | ex–Snoek |

Bassano? | boxwood | !!! | 496.0 | 16.0 | 466 | R–St Petersburg: 438 | ex–Snoek | |

Bassano? | boxwood | !!! | 490.6 | 16.5 | 477 | pre–1596 A–Vienna KHM: 174 (c186) | | Ambras |

Bassano? | boxwood | !!! | 569.0 | 17.1 | 408 | B–Brussels: 1064 | | Correr–Contarini | (Venice) |

Bassano? | boxwood | !!! | 572.0 | 17.2 | 408 | B–Brussels: 1064 | | Correr–Contarini | (Venice) |

Bassano? | boxwood | !!! | 535.5 | 24.5 | 408? | B–Brussels: 1088 | | Correr–Contarini | head only | (Venice) |

Bassano? | boxwood, iron rings | !!! | 558.0 | 13.5–19.5 | 4.28 | CH–Basel: HM 1907.188o | | bought 1907 | reverse conical bore |

Bassano? | boxwood | !!! | 545.5 | 17.2 | 430 | I–Verona A/2: 2 | | donated in 1631 by Alipandi to be used in services in the cathedral |

Bassano? | boxwood | !!! | 544.5 | 17.2 | 430 | I–Verona A/2: 3 | | Alipandi 1631 |

Bassano? | boxwood | !!! | 816.0 | 93.0 | 430 | I–Verona A/2: 7 | | Alipandi 1631 |

F.H. | plum, brass ring | (pine cone/F.H) | 531 | 15.5 | 437 | 17th century D–Nürnberg GNM: MIR 280 | Augsburg? | very thin walls, ornamental turning |

I/S.I | yew, bone rings | | 527.0 | 20.5 | 466 in D pre–1581 A–GrazLandesaeghau: ma | | wide bore, thin walls, ivory rings |

I/S.I | yew, bone rings | | 653.0 | 24.4 | 466 in A? pre–1581 A–GrazLandesaeghau: ma | | wide bore, thin walls, ivory rings |

I/S.I | maple | | 735.0 | 22.5 | 430 | I–Merano A/2: 6857 | | thin walls, no external tapering |
## Appendix 2

Continued

<table>
<thead>
<tr>
<th>Maker</th>
<th>Material</th>
<th>Mark</th>
<th>Sounding length ([\text{mm}]^*)</th>
<th>Bore (mm)</th>
<th>Pitch (Hz)</th>
<th>Date(^1)</th>
<th>Location</th>
<th>Provenance</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lissie</td>
<td>boxwood</td>
<td>LUSIEV</td>
<td>503.6</td>
<td>15.8</td>
<td>461</td>
<td>c.1666</td>
<td>A–Vienna KHM: 176 (Cl87)</td>
<td>Catajo (Padua)</td>
<td>two-part instrument; 17th-century style turning</td>
</tr>
<tr>
<td>Neni, Jacopo</td>
<td>boxwood</td>
<td>L.NENI/(star)</td>
<td>764.0</td>
<td>26.0</td>
<td>453</td>
<td></td>
<td>I–Hamamatsu</td>
<td>ex-Rosenbaum ex-Halfpenny</td>
<td></td>
</tr>
<tr>
<td>Raifi, C.</td>
<td>boxwood</td>
<td>C.RAFI/(gryphon)</td>
<td>612.0</td>
<td>24.0</td>
<td>379</td>
<td>1515–53</td>
<td>B–Brussels: 1066</td>
<td>Correr–Contarini (Venice)</td>
<td>two-part</td>
</tr>
<tr>
<td>Raifi, C.</td>
<td>boxwood, silver rings</td>
<td>C.RAFI/(gryphon)</td>
<td>575.0</td>
<td>38.3</td>
<td>403</td>
<td>1515–53</td>
<td>I–Bologna MC: 3388</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raifi, C.</td>
<td>boxwood</td>
<td>C.RAFI/(gryphon)</td>
<td>577.0</td>
<td>17.5</td>
<td>402</td>
<td>1515–53</td>
<td>I–Rome Museo SME: 0712 (2786)</td>
<td>Alessandro Marcello</td>
<td></td>
</tr>
<tr>
<td>Raifi, C.</td>
<td>boxwood</td>
<td>C.RAFI/(gryphon)</td>
<td>549.0</td>
<td>18.0</td>
<td>423</td>
<td>1515–53</td>
<td>I–Verona BC: 4</td>
<td>Alipandi 1631</td>
<td></td>
</tr>
<tr>
<td>Raifi, Cl.</td>
<td>plum</td>
<td>C.RAFI/(gryphon)</td>
<td>640.5</td>
<td>18.8</td>
<td>362</td>
<td>1515–53</td>
<td>I–Verona AF: 13287</td>
<td>Alessandro Marcello</td>
<td>single piece, very thin walls</td>
</tr>
<tr>
<td>Raifi, M.</td>
<td>maple</td>
<td>M.RAFI/(gryphon)</td>
<td>860.5</td>
<td>24.5</td>
<td>402</td>
<td>1506–23</td>
<td>I–Rome Museo SME: 0713 (2788)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raifi?</td>
<td>plum, brass ring</td>
<td>(gryphon)</td>
<td>964.5</td>
<td>25.5</td>
<td>399</td>
<td></td>
<td>I–Verona AF: 13281</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood, brass ring</td>
<td>(trefoil)</td>
<td>855.0</td>
<td>25.0</td>
<td>405</td>
<td></td>
<td>I–Milan Conservatorio: 6753</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood, brass ring</td>
<td>(trefoil)</td>
<td>856.0</td>
<td>24.8</td>
<td>405</td>
<td></td>
<td>I–Verona AF: 13277</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood, brass ring</td>
<td>(trefoil)</td>
<td>855.5</td>
<td>24.8</td>
<td>405</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood, brass ring</td>
<td>(trefoil)</td>
<td>851.0</td>
<td>24.8</td>
<td>405</td>
<td></td>
<td>I–Verona AF: 13279</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood</td>
<td>(trefoil)</td>
<td>574.5</td>
<td>17.2</td>
<td></td>
<td></td>
<td>I–Verona AF: 13282</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood</td>
<td>(trefoil)</td>
<td>575.0</td>
<td>17.2</td>
<td>403</td>
<td></td>
<td>I–Verona AF: 13283</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood</td>
<td>(trefoil)</td>
<td>575.0</td>
<td>17.2</td>
<td>403</td>
<td></td>
<td>I–Verona AF: 13284</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood</td>
<td>(trefoil)</td>
<td>575.0</td>
<td>17.2</td>
<td>403</td>
<td></td>
<td>I–Verona AF: 13285</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rauch</td>
<td>boxwood</td>
<td>(trefoil)</td>
<td>575.0</td>
<td>17.2</td>
<td>403</td>
<td></td>
<td>I–Verona AF: 13286</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schnitzer</td>
<td>maple, horn rings</td>
<td>AA</td>
<td>795.5</td>
<td>23.0</td>
<td>433</td>
<td>1520–50</td>
<td>I–Verona BC: 8</td>
<td>Alipandi 1631</td>
<td>shortened?</td>
</tr>
<tr>
<td>Schnitzer</td>
<td>maple</td>
<td>AA</td>
<td>538.5</td>
<td>17.3</td>
<td>431</td>
<td>1520–50</td>
<td>I–Verona BC: 5</td>
<td>Alipandi 1631</td>
<td></td>
</tr>
<tr>
<td>Schnitzer</td>
<td>maple</td>
<td>AA</td>
<td>540.0</td>
<td>17.3</td>
<td>430</td>
<td>1520–50</td>
<td>I–Verona BC: 6</td>
<td>Alipandi 1631</td>
<td></td>
</tr>
<tr>
<td>Schnitzer?</td>
<td>pear</td>
<td>A2</td>
<td>573.5</td>
<td>17.5</td>
<td>405</td>
<td></td>
<td>I–Rome Museo SME: 0714</td>
<td>Alessandro Marcello</td>
<td>leather-covered</td>
</tr>
<tr>
<td>Vasel, B.</td>
<td>boxwood, brass ring</td>
<td>B.VASEL</td>
<td>817.0</td>
<td>7</td>
<td>404</td>
<td></td>
<td>I–Bologna MC: 3389</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vits, H.</td>
<td>boxwood, iron rings</td>
<td>HLSYTS/(sun)</td>
<td>849.8</td>
<td>35.5</td>
<td>407</td>
<td></td>
<td>B–Brussels: 2695</td>
<td>ex-Snoeck</td>
<td></td>
</tr>
</tbody>
</table>

\* The sounding length was measured from the centre of the embouchure hole to the end of the instrument.

\(^1\) For a discussion of the dating, see B. Berney, Renaissance transverse flutes’, pp.61–9.
This article is based on a paper first presented at the Renaissance Flute Days Baden-Württemberg, in September 2006. I am grateful to many friends and colleagues for their help and support with this article: to Claudia Sanzio-Bregoli for his help with Latin, Italian and German, to Dr J. R. C. Parry, to Anne Smith and Avital Powell for their support and encouragement, and to Kimberly Rehe for being patient and for the frequent use of her red pencil. Many thanks to museum staff in Vienna, Verona, Antwerp, Brussels, Graz and Berlin for allowing me to measure the instruments and for being ever helpful concerning the history of the instruments and their provenance.


6 The pitches of the instruments in the Accademia Filarmica in Verona and some of the instruments in the Brussels collection were determined by playing the originals. The pitches of the Verona Schnitzers and Brussels Bassano tenors were determined by making copies of the originals. This experience enabled us to calculate the pitches of the remaining surviving originals based mainly on their sounding length, as described above.

7 Both Puglisi (I flauti transversi, p.17) and Allain-Dupré (and early Baroque flutes, p.55) state that for that the Schnitzer instruments in the Verona Biblioteca Capitolare (I-Verona 1c 5, 6 and 8) have had their embouchures and mouthpieces badly altered. The instruments are indeed in poor shape, as they have been damaged by woodworm. The embouchures, however, with their unusual reed or 'chamber' not found on any original flutes, are probably original and are very well executed. This special feature is an integral part of the instruments' design and sound concept, as I have learned by making numerous copies of those flutes.


9 For a more detailed discussion of the three 'S' instruments and the Altenklingen flute, see B. Berry, Renaissance transverse flutes, pp.64-5.

10 Hayes, A history of performing pitch, pp.55-105.

11 Hayes takes the tolerance for his study at a quarter tone, so in fact a flute at d' = 460 would be for him at the pitch level of a, anywhere between d = 453 and 469, with a central pitch at d = 464. While this system is perfectly adequate for a study of Haynes's scale, we can fine tune it using the extant Renaissance flutes. See Hayes, A history of performing pitch, pp.lil-liii.

12 Hayes, A history of performing pitch, pp.36-43.

13 Puglisi, I flauti transversi, p.17.

14 In that case we have the only survivingistant instruments with a whole tone lower than d' = 460 or no more than a whole tone lower than d' = 408. It would make more sense if the instruments mentioned in the inventory were a whole tone to a whole tone lower than d' = 460 or higher than 408.


16 B. Hayes, A history of performing pitch, pp.58-61.

17 B. Hayes, A history of performing pitch, pp.58-61.

18 B. Hayes, A history of performing pitch, pp.58-61.


20 B. Hayes, A history of performing pitch, pp.58-61.


22 B. Hayes, A history of performing pitch, pp.58-61.


26 B. Hayes, A history of performing pitch, pp.58-61.


30 B. Hayes, A history of performing pitch, pp.58-61.

31 B. Hayes, A history of performing pitch, pp.58-61.


33 B. Hayes, A history of performing pitch, pp.58-61.

34 B. Hayes, A history of performing pitch, pp.58-61.

35 B. Hayes, A history of performing pitch, pp.58-61.

36 B. Hayes, A history of performing pitch, pp.58-61.

37 B. Hayes, A history of performing pitch, pp.58-61.
The missing link: the trombone in Italy in the 17th and 18th centuries

The history of the trombone as told in the standard literature lacks significant information from the 17th and 18th centuries. As a result, the proper relationship between some familiar facts is not properly understood. It is well known that Gluck used trombones in five of his operas—two composed for Vienna and all performed in Paris, where he was involved in rivalry with Nicola Piccinini. Piccinini also wrote for the trombone in several operas. There is nothing tentative or timid about his trombone parts; nor, for that matter, those of other Italian composers writing operas in Paris. They used the instrument to excellent effect. Were these Italians familiar with the trombone before they arrived in Paris and heard Gluck?

From 1597 until about 1630 Italian composers published a significant body of works with trombone parts. Then, suddenly, it appears they stopped doing so. Nearly a hundred years later Fux and other composers in Austria began to produce another significant body of works with trombone parts. About the only other familiar trombone repertory in the period in between is German music for Lutheran church services, which no one alleges to be a link between 17th-century Italian music and 18th-century Austrian music. But is there a link between these two repertoires?

The answer to both these questions is yes. It is quite well known that the use of the trombone declined sharply during the 17th century. The instrument disappeared completely from some centres, such as England, France and most courts in German- and Italian-speaking areas. The return of the trombone to prominence began in the late 18th century. Mozart and Gluck have so far received the greatest credit, but they will now have to share it with many hitherto neglected Italians. After a brief examination of the persistence of the trombone in Venice, Naples and Rome, this article will concentrate on three musical institutions in Bologna.

Venice

Given the significance of the music of Giovanni Gabrieli and his contemporaries, Venice is particularly important to the history of the trombone. San Marco was the most important musical institution in the entire city of Gabrieli’s time. It did not remain so for long afterwards; opera soon displaced ceremonial music as Venice’s most innovative kind of music. In fact the trombone did eventually disappear from Venetian musical life for a while, but not until the fourth decade of the 18th century.

Throughout most of the 1680s there were four trombone players at San Marco. There were five from 1689 to 1700 and four again from 1701 to 1706. Although the musical establishment at San Marco was very large, it rarely performed as a single ensemble. Instead it was divided into two groups of identical or nearly identical instrumentation, which were thus available to handle a very full schedule of musical services. (Venice was by no means alone in this practice.) At about this time there was a growing interest in using wind instruments in a solo capacity. Antonio Caldara, who later used the trombone as a solo instrument in so much music composed for the imperial court in Vienna, explored this avenue as much as anyone else. Was the trombone among them? Selfridge-Field notes that in...