Adrian Brown

The Recorders "SAM 130, 140 and 148" – Rediscovery and Reconstruction

The *Sammlung Alter Musikinstrumente* [SAM] holds the world's most important collection of recorders from the Renaissance period. Indeed circa 20% of the surviving examples of these instruments are to be found in Vienna's *Neue Burg*. I started researching these instruments in the mid 1990's, and in the year 2000, I was granted permission to measure all of them, with the objective of making a new museum catalogue. The catalogue was finally published in 2006 and containing detailed measurements of every instrument, I believe at the time, it set a new standard for musical instrument catalogues[1].

One of the first recorders I measured was inv. no. SAM 140, an innocuous looking instrument, of alto size, which just happened to be one of the first recorders in the display case. I had a huge surprise when I started to measure the bore of this instrument. Whereas most Renaissance recorders have a bore profile that starts to contract in an obconical, or companulous profile from around the uppermost tone-holes, this instrument remained stubbornly cylindrical, way past all but the lowest tone-holes, where it finally contracted in a steep obconical section, terminating in another cylindrical of smaller diameter section at the bell (Fig. 1 and 2).

Despite the remarkably good condition of this instrument and the almost perfectly concentric bore, I nevertheless dismissed this instrument as at best, a freak of Renaissance nature, or at worst, one that had suffered from the actions of an over-enthusiastic restorer in the past[2]. However, on my next visit, I measured the soprano size inv. no. SAM 130, and found it had a similar bore profile. Sensing a pattern, I soon moved on to inv. no. SAM 148, a tenor size recorder, and

1 Beatrix Darmstädter: Die Renaissanceblockflöten der Sammlung alter Musikinstrumente des Kunsthistorischen Museums Wien, Sammlungskataloge des Kunsthistorischen Museums, vol. 3, with contributions by Adrian Brown, ed. by Wilfried Seipel, Milan 2006.

2 The fact that the bore of inv. no. SAM 140 is almost perfectly concentric means that it has suffered minimal distortion due to wood shrinkage over the centuries since it was made. This can be observed in the graph of figure 2, where the two measurement traces follow each other to within 0.2 mm of each other over most of the length of the instrument.

having detailed measurements of all three, I realised that these instruments, with the same maker's mark were all built with a very atypical and previously undocumented bore profile (Fig. 3).

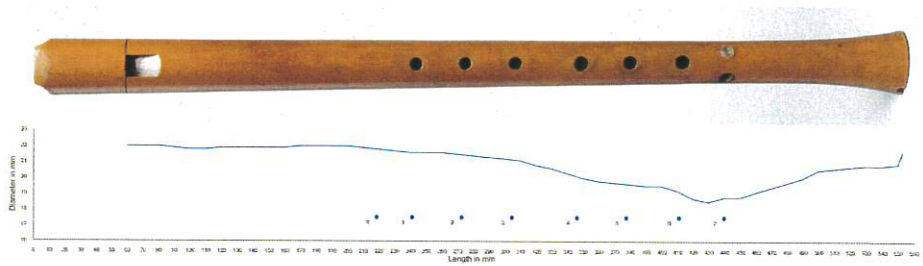


Fig. 1: Inv. no. SAM 143: a typical Renaissance bore profile. © Adrian Brown (graph), SAM/KHM (picture)

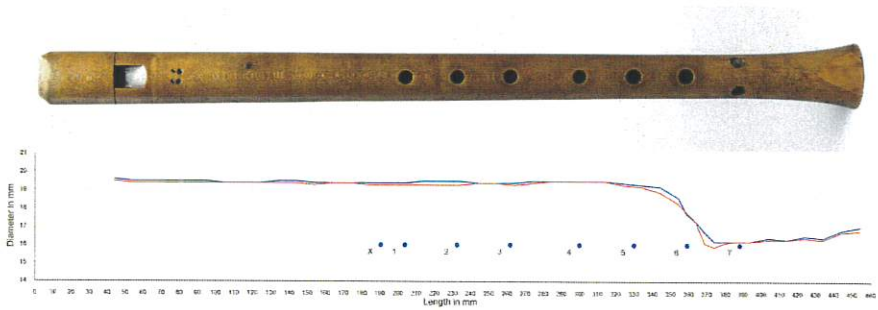


Fig. 2: Graph of inv. no. SAM 140. © Adrian Brown (graph), SAM/KHM (picture)

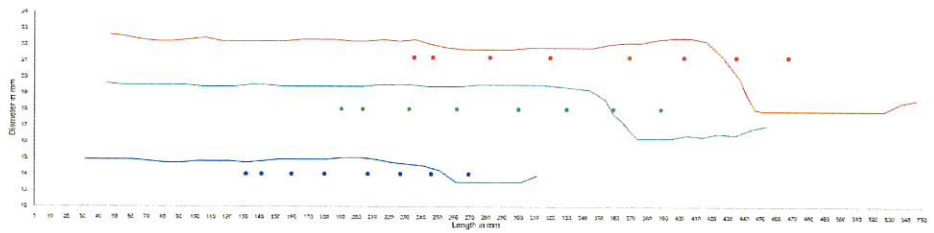


Fig. 3: The bore profiles of inv. nos. SAM 130 (blue), SAM 140 (green) and SAM 148 (red). © Adrian Brown

All three instruments were made in maple, and they bear a maker's mark, unknown on any other surviving instruments, which may well indicate that these are the sole surviving instruments by this maker, or workshop. The mark itself is an abstract symbol, which I first took to represent a pair of apples, but which on reflection, perhaps seems more like a bunches of grapes (Fig. 4). The instru-

ments cannot be dated with any precision, and nothing is known about the maker, or their country of origin. Whereas inv. nos. SAM 130 and 140 have a similar external appearance, inv. no. SAM 148 has suffered what can only be described as a "Baroque re-make" at some time in its past. Its boxwood beak and ornate bell are not original and like several other recorders originating from the Catajo collection, it may have been modified to suit changing tastes, or perhaps even to act as a theatrical prop (Fig. 5).

As shown in figure 1, most Renaissance recorders have a bore profile that forms a gentle taper from the upper, to approximately the lowest tone-hole, from whence it generally expands at a similar angle to form the bell. As such, it mirrors the exterior form of the instrument. The point of the smallest diameter in the bore is normally around 75 % of the largest diameter. A small number of Renaissance recorders have a more slender reduction with the smallest diameter a mere 90 % of the largest, but generally could be said to work in a similar fashion[3]. Renaissance recorders generally have a somewhat smaller range than those from the later Baroque period, but they have a powerful sound, strong in the lowest harmonics, which blends well with other instruments of the same family. Their design is perfect for the main repertoire of the instrument, namely instrumental consort playing of 16th century vocal music, primarily chansons, motets and madrigals and of course instrumental dance settings[4].

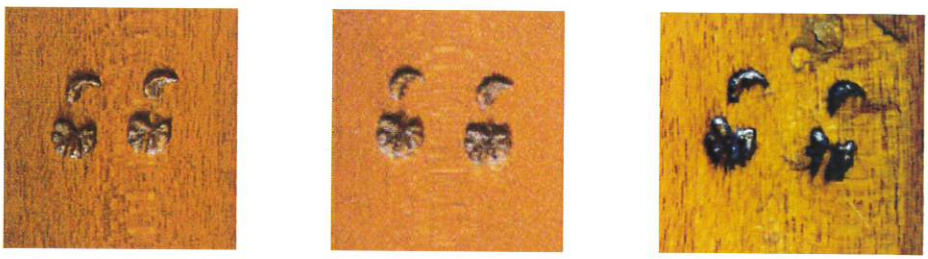


Fig. 4: The maker's marks found on inv. nos. SAM 130, 140 and 148. © Adrian Brown

Comparing the bore profiles and tone-hole positions of inv. no. SAM 143, which is a more typical Renaissance recorder, with those of inv. no. SAM 148, we can see just how different the two designs are (Fig. 6). The three recorders, inv. nos. SAM

3 See Adrian Brown: „Einblick in die Blockflöten des Kunsthistorischen Museums Wien aus der Perspektive des Blockflötenbauers", in: Darmstädter 2006, p. 97–121.

4 Peter Van Heyghen: "The Recorder Consort in the Sixteenth Century: Dealing with the Embarrassment of Riches", in: Musicque de Joye, Proceedings of the International Symposium on the Renaissance Flute and Recorder Consort, Utrecht 2003, ed. by David Lasocki, Utrecht 2005, p. 227–321.

Fig. 5: Inv. no. SAM 148. © SAM/KHM

130, 140 and 148 therefore presented an enigma and I decided to copy them as closely as I could, to discover how they worked and whether my measurements might reveal a different type of Renaissance recorder. The first experiments showed indeed a totally different aesthetic: the recorders were soft in the lowest notes, but had a far more complex tonal spectrum and could play a wider range of just over two octaves, with fingerings for the high notes that we normally associate with Baroque recorders. To give a bit more background, the typical Renaissance recorder has a range of around an octave and a minor seventh and while Silvestro Ganassi in 1535 showed how some instruments could be enticed to play "seven extra notes", it is unclear from both his text and his musical examples, what these extra notes would be used for[5] (Fig. 7). In his 1556 treatise *Epitome Musical*, the French composer and writer on music, Philibert Jambe de Fer, gives a recorder fingering for both the 14th and 15th notes of the diatonic scale, finger-

5 Silvestro Ganassi: Opera intitulata Fontegara, Venice 1535, cap. 4. Source: BnF [Bibliothèque Nationale de France] Gallica, http://catalogue.bnf.fr/ark:/12148/cb37256914b, [6th of March 2017].

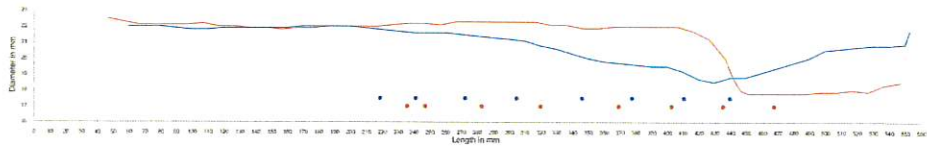
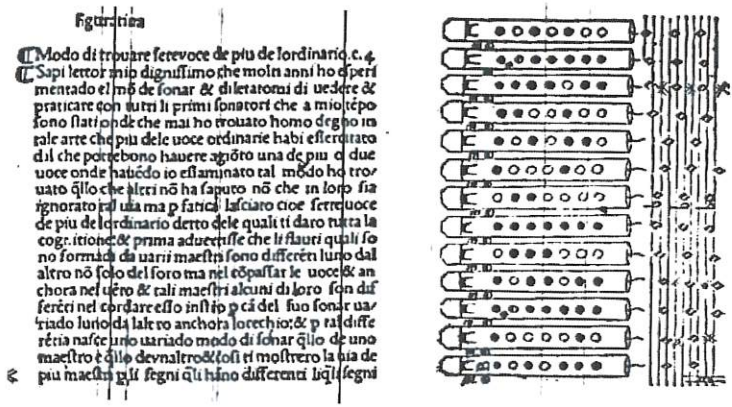


Fig. 6: Bore profiles of inv. nos. SAM 148 (red) and SAM 143 (blue). © Adrian Brown

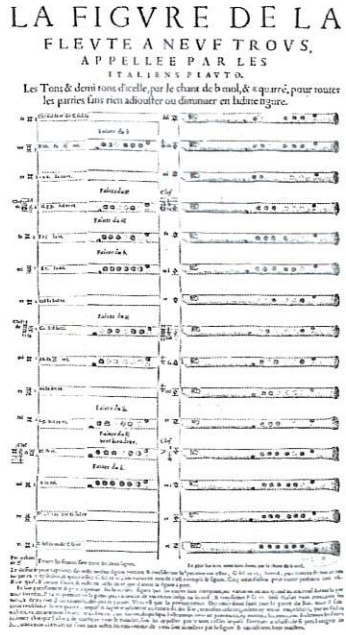


Figuratiua

Modo di trouare sete uoce de piu de lordinario.c.4.

Sapi lettor mio dignissimo che molti anni ho esperimentato el mō de sonar & dilectatomi di uedere & praticare con tutti li primi sonatori che a mio tēpo sono stati onde che mai ho trouato homo degno in tale arte che piu dele uoce ordinarie habi essercitato di che potrebono hauere agiōto una de piu de due uoce onde hauēdo io essaminato tal mōdo ho trouato q̄llo che altri nō ha saputo nō che in loro sia ignorato ral una ma p fatica lasciato cioe sette uoce de piu de lordinario detto dele quali ti daro tutta la cognitione: & prima aduertisse che li flauti quali sono formati da uarii maestri sono differēti luno dal altro nō solo del loro ma nel cōpassar le uoce & anchora nel uētro & tali maestri alcuni di loro son differēti nel cordare esso instrō p cā del suo sonar uariado luno da laltro anchora lorechio: & p tal differētia nasce uno uariado modo di sonar q̄llo de uno maestro è q̄llo de vn altro & cosi ti mostrero la via de piu maestri p li segni q̄li hāno differenti li q̄li segni

Fig. 7: Silvestro Ganassi: La Fontegara (1535) cap. 4: *Modo di trouare sete uoce de piu de lordinario.* © Adrian Brown



LA FIGVRE DE LA
FLEVTE A NEVF TROVS,
APPELLEE PAR LES
ITALIENS PIAVTO.

Les Tons & demi tons d'icelle, par le chant de b mol, & x quarré, pour trouuer les parties sans rien adiouster ou diminuer en ladite figure.

Fig. 8: Philibert Jambe de Fer: Fingering chart for the recorder from *Epitome musical*, Lyon 1556. © Adrian Brown

ings which are very similar to those that are standard practise on Baroque instruments[6] (Fig. 8). Again, there is no hint what sort of repertoire would require these notes, given that the recorder's normal range mirrors perfectly the vocal ranges necessary for its basic repertoire. If we try Ganassi and Jambe de Fer's fingerings on Renaissance recorders, on some sizes and types, these extra notes can indeed be found. However, their quality normally leaves a lot to be desired and while in experienced hands they can be made to "work", they remain more in the realm of the hypothetical, rather than the practical, and leave the distinct impression that both writers were exploring the recorder's range in a theoretical manner. Encouragingly, my reconstructions of inv. nos. SAM 130, 140 and 148 played these high notes with such clarity and ease of articulation, that I felt sure there was something intentional in the design of the instrument to enable this different aesthetic.

The lowest note of inv. no. SAM 130 is modern pitch c^2, SAM 140, is midway between f^1 and $f\#^1$ and SAM 148, midway between c# and d. Before the middle of the 17th century, Renaissance recorders were almost always made in sizes a fifth apart, so given their pitches, it is probably safe to say that these three instruments were never intended to be played together[7]. However, if we compare their bores, and tone-hole positions, we can see a remarkable degree of similarity between their designs.

Their bores all follow the same general profile, namely a long cylindrical section to the lowest two tone-holes, followed by a short obconical section and finally a short narrower cylindrical section to the bell. In my earlier papers including my original article for the museum catalogue, I called this type of bore a "step" bore, due to its abrupt "step" at the lower end. It can be seen from the comparison that the size of this step increases with the general size of instrument, though it remains in proportionally the same position. Likewise, the ratio between speaking length and maximum bore increases with the size, meaning the bore of the larger size, has a proportionally smaller bore diameter than the smallest size. My explanation for this is that a reduction in its overall bore diameter helps the larger sized instrument to speak easier, and to give it a larger harmonic response than if it were proportionally the same.

6 Philibert Jambe de Fer: Epitome musical des tons, sons et accordz, et voix humaines, fleustes d'Alleman, fleustes à neuf trous, violes, & violons, Lyon 1556. Source: BnF Gallica: http://catalogue.bnf.fr/ark:/12148/cb42796043j (6th of March 2017).

7 Adrian Brown: "An Overview of the Surviving Renaissance Recorders", in: Musicque de Joye, Proceedings of the International Symposium on the Renaissance Flute and Recorder Consort, Utrecht 2003, ed. by David Lasocki, Utrecht 2005, p. 77–98; and Van Heyghen 2005 (see fn. 4).

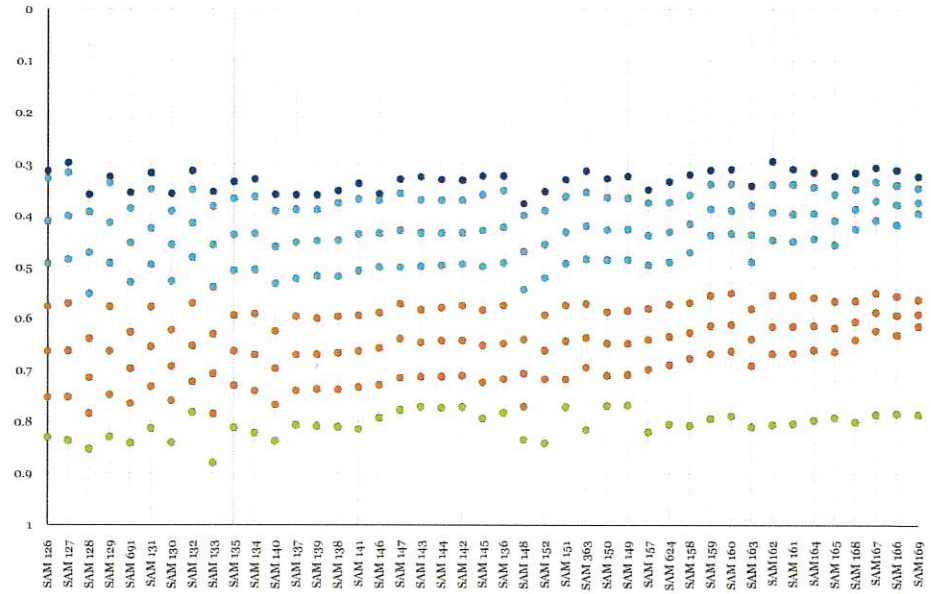


Fig. 9: Tone-hole positions relative to speaking length of the recorders in the SAM, where 0 = block line and 1= the bell. © Adrian Brown

We know from basic acoustic principals that a reverse, or obconical bore allows a shorter speaking length for a given pitch of instrument. It also enables the tuning of the basic octave relationships of the instrument to be made by local bore adjustments, rather than solely by the diameter and position of the tone-holes, which is the only possibility of tuning a cylindrically bored instrument. A happy side effect of a reverse-conical bore is that the complex taper enables tone-holes to be placed in more convenient positions, where they can be more easily reached by the hands[8]. As the size of instrument is increased, the two groups of tone-holes tend to move apart from each other, whilst the stretch within the group must always remain within the span of the player's fingers. Figure 9 shows a comparison chart of the recorders in the SAM collection from the smallest to the largest size and we can see how as the size is increased, the tone-hole positions on the instrument form into two distinct groups of three, with the key covering the lowest hole (Fig. 9).

8 For an overview of the acoustical principals of woodwind instruments see Arthur H. Benade: Fundamentals of Musical Acoustics, New York 1990².

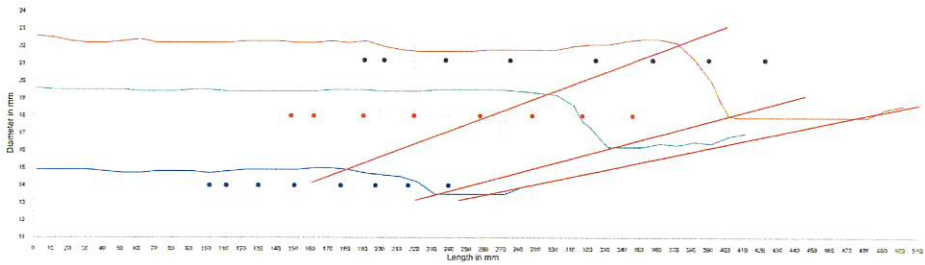


Fig. 10: Principal bore coordinates of inv. nos. SAM 130 (blue), 140 (green) and 148 (red).

A totally cylindrical recorder therefore cannot be made in a larger size than around 45 cm speaking length, since the position and size of the holes necessarily becomes subsequently unwieldy for the average player[9].

A step bore by comparison, has only a small obconical section at the lower end that a maker can adjust to tune the instrument, and given the basic acoustic principals mentioned before, it might seem surprising that this type of bore works at all. The larger diameter in the region of the tone-holes and the contraction to a small, cylindrical section at the lower part of the bore seem to help the production of notes in the 3rd harmonic series, which are necessary to produce the higher notes. A comparison chart of the basic data points of the three bores: the start and end of the obconical section and the end of the instrument shows how similar these three instruments are (Fig. 10).

If we compare the tone-hole positions of the three instruments, relative to their speaking lengths, we can see that the relative hole positions are remarkably similar, and that the three instruments were evidently made to the same proportional template (Fig. 11). Indeed, if we make a comparison which takes account for both the changes in bore diameter and in tone-hole placement, we can better observe the general schema (Fig. 12). In general, these recorders have their tone-holes proportionally lower down the instrument than on the more typical reverse-conically bored instruments. They also show little tendency to re-group into two sets of three holes, as their size is increased. For this reason, I find it inconceivable that recorders larger than a tenor size could be made to this "step bore" design, since the tone-holes would quickly become too far apart to be practical. The proportionally narrower bore on a larger instrument would

9 This speaking length corresponds to a recorder with a pitch of approximately modern f1.

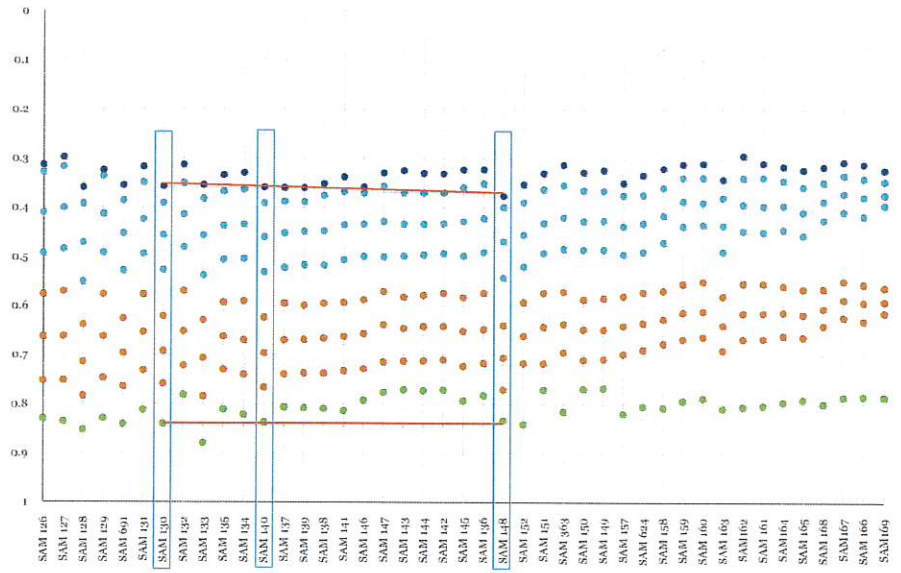


Fig. 11: Tone-hole positions relative to speaking length of inv. nos. SAM 130, 140 and 148. © Adrian Brown

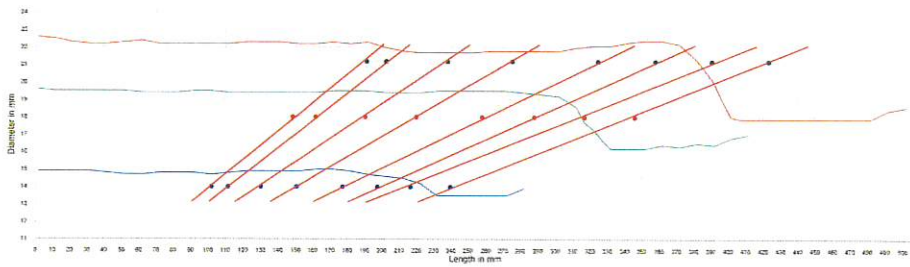


Fig. 12: Tone-hole positions relative to bore graphs of inv. nos. SAM 130 (blue), SAM 140 (green) and SAM 148 (red). © Adrian Brown

only exacerbate the already weak low notes and the tuning, already more delicate on the tenor size, would be compromised.

Another point of comparison concerns the windows and wind canals, which on all three instruments are somewhat narrower than is normal for their sizes of recorder. Again, my own conclusion is that this helps the frequency response of the instrument and makes for a clear and more penetrating sound[10].

10 Consider the windway widths of similar sized recorders from the SAM collection: SAM 134 = 12.5 mm; SAM 135 = 13.4 mm; SAM 140 = 11.2 mm; SAM 138 = 13.6 mm; SAM 137 = 14.3 mm.

The recorders inv. nos. SAM 130, 140 and 148 were made by the same workshop, to the same overall design principals, but are in three unrelated pitches. Furthermore, the aesthetics of their sound and playing characteristics seem at odds with the recorder's main repertoire, namely Renaissance vocal music. Their low notes are not strong, which diminishes the instrument's homogeneity, one of the main requirements of Renaissance polyphony. Additionally, their more lively and immediate articulation, together with their larger harmonic spectrum makes it more difficult for these recorders to blend with each other. Could it be then that these recorders were made for a more solo role, one that we associate more with early Baroque music?

Since 2002, I have made many reconstructions of these three recorders specifically aimed at exploring this repertoire and I feel they have been largely convincing. Similarly, using the original data points and the general scaling these provide, I have made other sizes of recorder based on this design, from a low tenor in c to a tiny flautino in g^2. This has been very simple to achieve, given the clear schema that inv. nos. SAM 130, 140 and 148 gives us.
Since measuring these recorders, I have found several other instruments having similar bore profiles. The bores of some of the recorders made by the Rafi workshop, active in Lyon during the first half of the 16th century also show signs of a step bore, although the proportions of these instruments are very different. The bores of these recorders are very small in proportion to their speaking length and their design seems to follow a general aesthetic more akin to the Renaissance traverse flute, than the recorder[11]. Within the SAM collection, several other recorders also have this step bore, although evidently not made to the same quality of design as inv. nos. SAM 130, 140 and 148.

Step bores are also found in the set of late 17th century recorders made by Hieronymus Franciscus Kynseker (baptised 1636, working period c. 1662–86) in Nuremberg, which are preserved in the *Germanisches Nationalmuseum* [GNM][12]. Although these recorders are in two pieces, with a separate head joint, the bore

11 See Marco Tiella: "The Recorders of the Accademia Filarmonica Di Bologna", in: Musicque de Joye, Proceedings of the International Symposium on the Renaissance Flute and Recorder Consort, Utrecht 2003, ed. by David Lasocki, Utrecht 2005, p. 117–161.

12 The playing of recorders in consort seems to have continued in Germany and England until at least the early 18th century, long after it was deemed an anachronism in most of Italy and, possibly, also of France. See Peter Van Heyghen: "The Recorder in Italian Music, 1600–1670", in: The Recorder in the 17th Century, Proceedings of the International Recorder Symposium Utrecht 1993, ed. by David Lasocki, Utrecht 1995, p. 3–63.

profiles of four of the seven recorders (the alto and tenor sizes) are very similar to our "SAM trio" (Fig. 13). The set is a typical late recorder consort with sizes tuned in alternate fifths and fourths. These instruments do not have quite the same facility in the high register as inv. nos. SAM 130, 140 and 148, and being made as an ensemble for consort playing, they do not need to. The principal reason for this is that the step in their bores are smaller in proportion than those found in our trio, their upper tone-holes are somewhat higher on the instrument and that their wind channels are not as narrow.

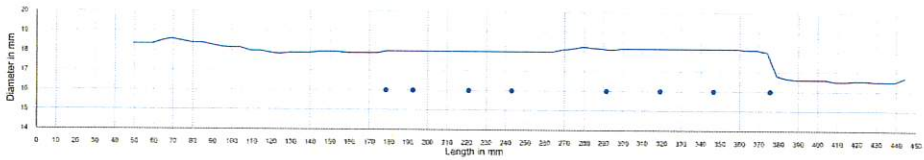


Fig. 13: Bore profile and tone-hole positions of Kynseker tenor recorder GNM, Nuremberg inv. no. MI 101. © Adrian Brown

Although it is impossible to prove any direct connection, the general intention in their design seems to have been very similar to inv. nos. SAM 130, 140 and 148, and may well point towards a common ancestral type, or making tradition of which only fragments have survived.

One of the main problems of establishing any connection is the total lack of biographical information about the maker of inv. nos. SAM 130, 140 and 148. The likelihood is that they were made in either Northern Italy, or Southern Germany, but even this could be wildly inaccurate, since recorders were made in most of the main musical centres of Europe between the early 15th and mid-17th centuries. It is easier however, to find a connection between the Kynseker workshop and the later Nuremberg makers, particular the workshop of Johann Benedict Gahn (baptised 1674, working period c. 1698–1711). Kynseker and Gahn were both members of the master-turners guild, whereas the two other main Nuremberg makers, Johann Christoph Denner, (baptised 1657, working period c. 1678–1707), and Johann Schell (baptised 1660, working period c. 1697–1732) belonged to the rival guild of hunt-lure and bone-turners[13].

The connections between Kynseker and Gahn are both geographically and occupationally, however a comparison of their surviving recorders yields some interesting discoveries.

13 Ekkehard Nickel: Der Holzblasinstrumentenbau in der Freien Reichsstadt Nürnberg, Schriften zur Musik 8, Munich 1971, p. 200.

Gahn's surviving recorders fall into two distinct designs: around half of those documented have what could be described as a 'standard' Baroque bore, with a similar profile to the surviving recorders made by the Denners, Oberlender, and also most of the English and Dutch makers.

The remaining half of his extant recorders have a very different bore design, most noticeably in the foot, which is completely cylindrical in profile. The reverse-conical section of the middle joint also starts very late, and contracts sharply over the last half of the middle joint to meet the foot diameter at its upper end[14] (Fig. 14).

If we compare the bore of this type of recorder with the bore of a Kynseker recorder of similar pitch, then compare both to the bore of inv. no. SAM 140, we can see evidence of a similar design (Fig. 15). The Gahn bore is more nuanced, in that being made from three joints, it is possible to make many more local bore changes to affect tuning issues and problems of note stability, but I feel the general idea of the design is the same and probably stems from the same tradition of making. The question of which of Gahn's two bore designs came first, and whether one superseded the other, is beyond the scope of this paper. However, given the uniformity of most of the Nuremberg Baroque recorders one might speculate that this unusual design of a proportion of Gahn's recorders places them in an earlier phase of his working life, in an inherited tradition we can link to Kynseker. Perhaps later, as a result of the successes of Denner, who together with Johann Schell in 1696, had petitioned the city administrators for the right to make "French woodwind instruments", his design changed and became more like the standard Baroque model[15].

So to conclude, the recorders inv. nos. SAM 130, 140 and 148 show a distinctly separate design of recorder making, quite different from the more standard models used throughout most of the 16th century. The reasons for this would surely lie in a different aesthetic, either due to changing tastes or new musical influences. The design itself seems to show a link to the late 17th century record-

14 Thomas Lerch pointed out this distinction, calling the 'standard' bore type *"Gahn Typ II"* and the more unusual 'step' bore, *"Gahn Typ I"*. Thomas Lerch: Vergleichende Untersuchung von Bohrungsprofilen Historischer Blockflöten des Barock, Berlin 1996, p. 146–158.

15 Nickel 1971 (see fn. 13), p. 204.*"[…] Dahero wir jüngsthin am Löbl. Gedachten Ruegsambt diese Vorschläge gethan, das die Maisterschafft uns entweder zu Mitmaistern an und aufnemen, oder aber wegen Verfertigung der französischen musicalischen Instrumenta, so mainsten in Hautbois und Flaudadois bestehen, vor uns allein leben laßen sollen, hingegen wir uns erboten haben wollen, von anderer Hornarbeit so lang nichts zu verfertigen […]."*

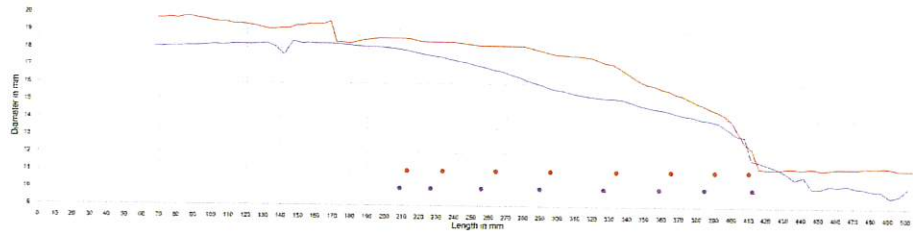


Fig. 14: Bore profiles and tone-hole positions of Baroque recorders attributed to J. B. Gahn: Leipzig 1126 (purple) and Nuremberg inv. no. MI 138 (red). © Adrian Brown

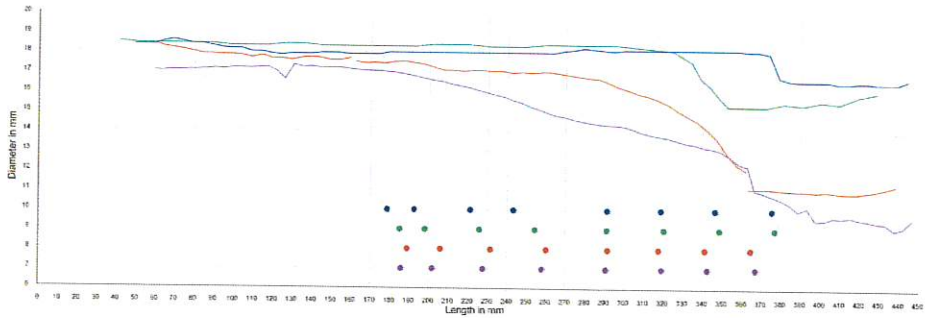


Fig. 15: Comparison of the bore profiles and tone-hole positions of inv. nos. SAM 140 (green); Kynseker alto recorder Nuremberg MI 101 (blue); Gahn Leipzig 1126 (purple) and Gahn Hamburg private collection (red). SAM 140 and Leipzig 1126 have been scaled to approximate the pitch of the others. © Adrian Brown

ers made by members of the turner's guild in Nuremberg. The presence of three sizes of instrument to the same design is a veritable gold mine for modern recorder makers, who can literarily read the measurements for any intermediate sizes by proportional analysis.