Quarterly No. 64 July 1991

FOMRHI Quarterly

COMMUNICATIONS

FELLOWSHIP OF MAKERS AND RESEARCHERS OF HISTORICAL INSTRUMENTS
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FELLOWSHIP of MAKERS and RESEARCHERS of HISTORICAL INSTRUMENTS

Bulletin 64 **July, 1991**

Well, last time was a bit of a shock. I expected it to be late, as I'd warned you it would be, but not as late as it was. The printer usually takes a fortnight or so, but it must have been six weeks or more. Let's hope it'll be better this time.

As a result, this looks like being a short Bulletin, but there's plenty of meat for the Q.

FURTHER TO: Comm.1027: Poppy Holden has sent me a letter saying how successful her Prague trip was and how grateful she and all the Czechs were for the material which had been contributed. It's an on-going project and I'm sure that David Freeman (address in the List of Members) would be glad of any further offers of help, whether of materials or teaching. If you want a trip to Prague, which is a lovely city with wonderful beer, and a busy time once you get there with a very friendly and enthusiastic gang of people, get in touch with David.

A Comm from Jan Bouterse herewith: I hope Jan will not object, but one of the recorders on his list is in the Collection here, and he had put a ? for the catalogue number, so I've written it in, in ink. It was something that there seemed no point at all in waiting till next time for.

FoMRHI SEMINARS: They went on being successful, though it seemed with fewer and fewer people each time. Clearly another time, we have to choose between catching apparent enthusiasm of the moment ('Do let's have another one; let's pick a date now') and the restrictions of the quarterly deadline. The trouble is that if we'd done it the latter way, we'd still be meeting this time next year, whereas for those who were there we were able to build one upon another while irons were still hot and memories fresh. I'm not sure what the answer is. Any reactions from any of you would be welcome. (I usually say this about something and the response is usually zero). There have been several Comms resulting from the seminars and I suspect and hope that there are more to come, so to that extent, at least, everyone can share the results.

OTHER SOCIETIES: The International Harp Centre (Dorneckstrasse 105, CH-4143 Dornach-Basel, Switzerland) is publishing a new journal about harps, ostensibly with some regard for historic instruments, though the first issue didn't show a lot of evidence of this. They are intending to organise concerts, festivals, exhibitions, seminars. etc etc. Some of our members are involved, Tim Hobrough among them, and perhaps they will keep us in touch and let us know when anything more fully in our line appears or is going to happen.

FESTIVAL: The Swedish Baroque Festival will take place in Malmö 16-22 August 1992 (next year). There will be master classes, concerts, etc. For further information contact The Swedish Baroque Festival, Musikhögskolan i Malmö, Box 135 15, S-200 44 Malmö, Sweden.

EXHIBITION: You all know about **The Early Instrument Exhibition** at the Horticultural Hall, November 8-10. We aren't likely to have produced the October Q by then, though you might be able to pick up a copy at the Exhibition. You'll certainly be able to renew your sub there,

which will help some of you who are otherwise likely to be late, and I will hope to have, as usual, the opportunity of a gossip.

BATE NEWS: New harpsichords, etc, have gone on arriving, including the big Flemish anonymous of about 1650. That one's going out again the day after tomorrow for about three months as it needs a lot of work done on it, but once done it should be quite exciting. Two spinets have also arrived, a Benjamin Slade and a Baker Harris. We have hopes that they may be transformed into an Italian harpsichord, which would be even more interesting, but if that doesn't come off, then we shall still have quite an interesting progression of spinets, from Slade through Hitchcock and Harrison to Harris. We should, too, within the next month, have colour postcards available of the Tisseran, the Goermans, and the William Smith (some of you may have seen the article in *The Independent* suggesting that that instrument had belonged to Handel; there will be more on that in *Early Music* before long). The Friends of the Bate Collection have kindly offered to finance these three postcards, and accumulated profits from Bate Weekends over the years made it possible to have a colour card showing the two Richters oboes side by side. Prices are the usual 25p each (plus something for postage if that's all you're ordering).

We also now have plans of the two **Edward Dodd bows (one is called a viola d'amore bow, if such a thing ever had an independent existence, and the other is for viola da gamba)** in the Retford Memorial Collection. I am assured that they are all that a bow maker requires, but they are not full length drawings; they show about six inches or so of each end, with all the measurements, plus the information that we already have of length, hair length, weight, and balance point. They have been drawn by David Kerr and they cost £5 each for an A4 sheet.

BATE COLLECTION WEEKENDS: There are two in the pipeline:

Nov 23/24 Bow Rehairing with Andrew Bellis. This is our third bow rehairing weekend, but the others have all been over-subscribed and it is quite clear that there is a considerable demand for this, so we are running another. **Places are strictly limited so you must book in advance for this.** Andrew is quite firm and won't take more than 15 people. We've had to turn away some people from the bow-making summer school because Andrew says there isn't room for more than eight to do that, so we'll probably run another one of those next year. I'll let you know in good time.

Nov 30/Dec 1 Recorders for Makers and Players with Alec Loretto and Lewis Jones (Alan Davis wasn't free on those dates), with some playing on our instruments, as usual, as well as on your own, and recorder-making techniques with emphasis on carving the labium.

Fee for each Weekend is £20 as usual (£15 for students and Friends of the Bate Collection), plus, for the Bow-rehairing, £3 to cover the cost of a new hank of hair if you want to bring a bow and rehair it on the spot.

There probably won't be a Weekend in the following term as I'm hoping to get a sabbatical, but more about that in the next Q; by then I should know whether they've found the money to pay someone to do all my work in the Bate. I can't contemplate coming back to a four month

backlog of correspondence, so if they can't pay enough to get anyone who can do the whole job, I shan't go.

CODA: I said that it would be a short Bulletin, and it is. I hope that we'll have more information for you for next time. In particular, surely our other museum members have things that they'd like publicised, new acquisitions, new publications and so on. I feel that I have an unfair advantage, sitting here in the Bate Collection running FoMRHI, but I'll print just as much about any other collection as I do about the Bate if I'm only told about it. Of course I'm happy if you order anything I publicise from here, but the main purpose of publicising them is to tell you what's available in case it'll be useful to you, and surely other museums are producing things that would be just as useful to FoMRHI members, or acquiring things that FoMRHI members should know about.

DEADLINE FOR NEXT Q: October 1st please, and I'll try to get it done before term starts at the beginning of the following week, even though Noughth Week, as we call it, the week before First Week, is pretty busy in the autumn because that's when we are introducing new students to the Faculty and what's in it and available to them.

Jeremy Montagu
Hon.Sec.FoMRHI

BULLETIN SUPPLEMENT

Ephraim Segerman

FoMHRI Seminars: Versions of three of the Comms in this Q (1048, 1050 and 1053) were given in the recent series of FoMRHI seminars at the Bate. Two of mine were in the last Q and I've held over another of mine (on English pitch standards c. 1600) for the next Q in order to give Lewis Jones a chance to submit his paper on this same topic. Many of these Comms would have been written without the seminars, but I know that most of mine wouldn't have been. So this series of FoMHRI seminars has been a success in stimulating Comms as well as providing interesting Sundays for those who could come and knew about them.

Meetings where only invited people can come do occur occasionally, but FoMRHI doesn't indulge in such elitist practices. We believe that every person having experience with historical instruments has something worthwhile to offer others. I fall in this category, and would have been very dissappointed if FoMRHI seminars took place and I didn't know about them in time. I must apologise to those that couldn't come for this reason, and will do my best to avoid this problem in the future. Suggestions for topics of future seminars are always welcome.

John Paul: This well-respected harpsichord maker has just died. Those who knew him will deeply mourn his loss. I've delayed getting this Q to the printer for a few days to be able to include a few words about him written by John Barnes.

FoMRHI Comm. 1044 **Jeremy Montagu**

Review of: **A.C.I.M.V. [Larigot] *Wind Instrument Makers and their Catalogues, No.1: MARTIN FRÈRES & FAMILLE*, Paris, 93 rue de la Chapelle, 61 pp, 1991.**

This is a new departure for Larigot, the reproduction in facsimile of a complete instrument maker's catalogue. It is edited and prepared by William McBride, who some years ago had a scheme for publishing a number of such catalogues himself. The catalogue is preceded by an account, in English, of the history of the firm of Martin, from the 18th century onwards, with reproductions of the drawings of two of their patents.

The catalogue is that of J-B Martin, the successor to Martin frères, and dates from 1905. The woodwind section is fully illustrated, but the brass, percussion and strings are only listed without engravings since, as the introduction suggests, these were probably not made by Martin but were bought in from other makers and stamped with Martin's name. All prices are given, in francs of course, and I'll have to investigate what the exchange rate was at that date.

There are many interesting features. Martin were obviously in the business of pleasing as many customers as possible. Their clarinets, for example, include Boehm system, 'demi-Boehm', the model 'specially adopted by England and its colonies', an Albert system, another slightly different Albert system 'adopted by Belgium', another Albert system with 13 keys 'adopted by Mexico, the United States, and Canada', and an ordinary system 'adopted by France, Spain, Mexico, and all South America'.

The oboes include a Spanish dulzaina, which was available both in olive wood and in copper; I've never seen or heard of a metal example. And the flageolets include ordinary tabor pipes at 30 francs the dozen, as well as Spanish tabor pipes (from the illustration the Basque Txistu, the only fully chromatic tabor pipe, because, with a ring for the ring finger to support it, the little finger can be used to shade the open end) at much the same price each. As well as ordinary flageolets and Boehm system ones, the instrument that was so popular for quadrilles at the early Proms, they produced 'Flageolets à deux corps double système Anglais' at 90 or 75 francs, depending on the material. I had no idea that the double flageolet was still being made and sold as late as 1905.

All accessories are listed, of course, mouthpieces, reeds, pads, cases, mops, etc etc.

At the back of the catalogue there is a list of the instruments that they know of in museums and other collections, and here they have come a rather bad cropper, for if I can spot several errors at a glance, there may well be others. Morley-Pegge's collection hasn't been at Cobham for all of twenty years; what wasn't sold before his death is here, in the Bate Collection. The Galpin Society Collection is in Edinburgh, not in Oxford. So is the Melville-Mason Collection. Both are parts of the Edinburgh University Collection of Historic Instruments. The Bate Collection isn't mentioned at all, even though our Martin flute is ex-Bate, not ex-Morley-Pegge.

These early catalogues are an invaluable aid to the instrument historian, for they fill many gaps in our knowledge of what was used at certain dates, and the illustrations are always useful for identification of instruments. Let us hope that this will be the first of many, and let us wish Larigot all success with this one.

FoMRHI Comm. 1045

JOHN PAUL - An appreciation

Members of FoMRHI will be sad to hear that their colleague John Paul died of a coronary thrombosis on Sunday July 7th. He leaves a wife and two daughters.

He will be most remembered for his book Modern Harpsichord Makers, London 1981, which included contributions from some 18 British harpsichord workshops, explaining their methods, attitudes and aims. Besides being very readable and informative to the non-expert, this will be a useful reference book in future years for those interested in the period following the second world war when the transition from the re-invented to the traditional instrument was being made. He was interested in the work of others, as is obvious from reading his book, but his own work was mostly carried out in a quiet and chosen isolation.

During the 50's and 60's he made a series of large harpsichords with complex specifications for American customers. I was in touch with him regularly before I moved to Edinburgh and examined and played many of these instruments before they were despatched. I was always impressed by the ingenuity of the design and their fine finish and proportions. They achieved a high degree of stability and reliability.

Jack was interested in modern furniture design and made a few instruments with modern decor, though most of his work was veneered in the English 18th-century style.

His later work explored the designs of Ruckers, Kirckman and Taskin and he also restored a number of early English grand pianos.

John Barnes

Dear Jeremy

Comm. 1046 D. Jacques Way

Quarterly No. 60 seems to be much about censorship. Jeremy is told that he should censor members' letters, and that he (and all of us) should not be allowed to make critical comments about instruments.

Anyone who writes a Letter to the Editor should expect (hope?) that it may be published at the editor's discretion. Editors are Special People in that regard.

As for criticism, let's have more of it. As with the general population, there are more horses' arses among critics than there are horses, but criticism serves a most important function, and we don't have enough of it so far as instruments are concerned.

Everyone else in the Early Music business gets criticised (both praise and blame), but the instrument makers for the most part escape scrutiny. That is bad for the general buying public (who get no guidance on what good is), for the exceptionally good makers (who don't get the praise they deserve), and for the poor and inept makers who might profit by knowing where they have missed the mark.

For one maker to criticise adversely the work of another in the public prints is probably difficult. In Germany there are laws against it, and in the rest of the world it is not considered good form, a violation of collegiality. If you cannot praise your competitors, you are supposed to say nothing.

Jeremy is not an instrument maker, is certainly possessed of knowledge about instruments, and so far as I know has no axes to grind. Seems to me an ideal person to break the conspiracy of silence, for a lot of trash is being foisted on the public: instruments that don't work, either mechanically or musically.

The abuse of the antique instruments by dealers (an in some case by museum personnel) is another area that calls for public attention, and again there is a gentleman's conspiracy of silence that ought to be broken.

Critics are human beings, with their faults, biases, prejudices, and areas of ignorance. Any attempt to certify critics leads to no criticism at all worthy of the name. When you publish a book, or sell an instrument, you have given it to the world, and you can no longer protect it from what the world wants to do with it. Justice is not always perfect, critics are no angels. You have to be a big boy, and take criticism as it comes, ignore it, refute it, or learn from it.

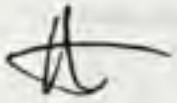
Ardal Powell worries about critics doing justice to his 'authenticity'. Like pregnancy, there are no degrees of authenticity. 'Authentic copy' is an oxymoron. Worse than that, it is a deliberate attempt to mislead and confuse. Unless our purpose is to make fake antiques, and sell them as such, can't we stop using 'authentic' and 'authenticity' to make false claims about our products? I can't make an authentic Taskin, any more than I can paint an authentic Picasso. And who gives a damn? If I make an instrument that works, who cares if I stole some good ideas from Taskin? It would be extremely difficult today to be a painter not influenced in some degree by Picasso.

Let's stop trying to justify our products as 'authentic' (something the Old Ones did not do, and so a dreadfully inauthentic practice), and praise them for their qualities as musical instruments. In other words, let's make authentic instruments of our own, and take the praise and blame for them.

The only honest relationship with the old masters is to steal from them, and make what we steal our own.

'Authenticity, schmoedipus – as long as he's good to his mother.'

Sincerely



DJW

FoMRHI Comm 1047

D. Jacques Way

On Teaching Wood to Sing

John Catch (Comm 1032) seeks to make funny about this. "But no maker, it seems, has tried to put it to practical use."

And I thought the piano makers gave their instruments a pretty thorough thumping about, and even had a machine to do it.

One harpsichord maker I know, finding that the usual 'playing in' of his instruments was a chore, has adapted an old mechanism from a mechanical piano to the narrower harpsichord keyboard, and sets it on automatic pilot for a day or so. He thus *does* "pump in recordings by master players", using the old player-piano rolls. Some instrument makers like to have students from the local conservatory use their instruments for practice; the instrument doesn't care whether they are "master players" or not!

I saw an ad from a harpsichord maker recently which guaranteed that his instruments would not change their sound as they aged. I know it is possible to forbid the development of an instrument, but this is like those old ads for canned salmon, "This product is guaranteed not to turn red in the can." And chalk can masquerade as cheese.

A part of what goes on in the very early stages of making an instrument sound has to do with the wire. New wire has to stretch out and get its kinks smoothed out, and this does make a marked difference in the sound the string can generate. But stretching wire is not all of it. Play a new instrument for five or six hours, and it will start to sing, only to return to its original state after a few hours rest. But it takes less and less time for it to warm up at subsequent sessions, and there comes the day when it knows what it is supposed to do the moment you start to play.

It would take a mighty boom-box in the same room to pump enough energy into a soundboard to affect it. The energy has to come through the keyboard. The belief that instruments do need to be 'warmed up', that they become much more 'musical' after being played for a time, is ridiculed by 'scientists' who use not their own ears (perhaps they haven't any), but electronic [illegible] devices. Which is like using a Welsh cor[illegible]

FoMRHI Comm 1048 Graham Lyndon-Jones & Peter Harris

RECONSTRUCTING MERSENNE'S BASSON AND FAGOT

This is a paper given at the Faculty of Music, Oxford University on the 3rd of February 1991, on the occasion of the symposium of FoMRHI members to discuss 'Musical Instrument Technology in 17th Century England'.

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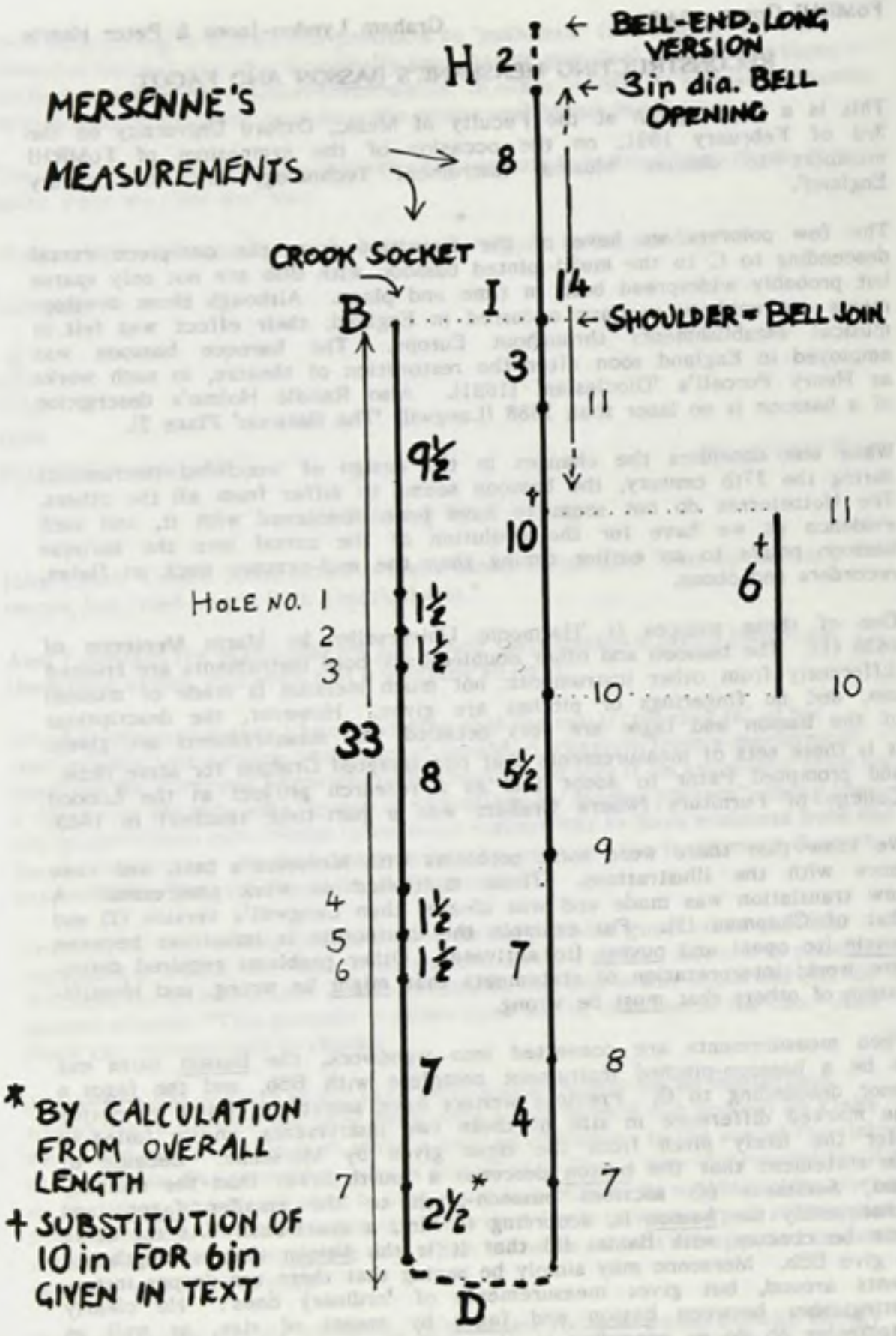
The few pointers we have of the transition from the one-piece curtal descending to C to the multi-jointed bassoon with BBb are not only sparse but probably widespread both in time and place. Although these developments are unlikely to have occurred in England, their effect was felt in musical establishments throughout Europe. The baroque bassoon was employed in England soon after the restoration of theatre, in such works as Henry Purcell's 'Dioclesian' (1691). Also Randle Holme's description of a bassoon is no later than 1688 (Langwill 'The Bassoon' Plate 2).

When one considers the changes in the design of woodwind instruments during the 17th century, the bassoon seems to differ from all the others. The Hotteterres do not seem to have been concerned with it, and such evidence as we have for the evolution of the curtal into the baroque bassoon points to an earlier timing than the mid-century work on flutes, recorders and oboes.

One of these sources is 'Harmonie Universelle' by Marin Mersenne of 1636 (1). The bassoon and other doubled-back bore instruments are treated differently from other instruments: not much mention is made of musical use, and no fingerings or pitches are given. However, the descriptions of the basson and fagot are very detailed, and measurements are given. It is these sets of measurements that had tempted Graham for some time, and prompted Peter to adopt this as a research project at the London College of Furniture (where Graham was a part-time teacher) in 1985.

We knew that there were some problems with Mersenne's text, and even more with the illustrations. These multiplied as work progressed! A new translation was made and was clearer than Langwill's version (2) and that of Chapman (3). For example the distinction is important between ouvrir (to open) and ouvrer (to activate). Other problems required detective work; interpretation of statements that might be wrong, and identification of others that must be wrong.

When measurements are converted into woodwork, the basson turns out to be a bassoon-pitched instrument complete with BBb, and the fagot a tenor descending to G. Previous writers have sometimes failed to notice the marked difference in size of these two instruments, and/or failed to infer the likely pitch from the sizes given by Mersenne. Because of the statement that the basson descends a fourth lower than the ordinary ones, Semmens (4) ascribes bassoon-pitch to the smaller fagot, and consequently the basson is, according to him, a quart-bass. At the same time he concurs with Baines (5) that it is the basson that is lengthened to give BBb. Mersenne may simply be saying that there are deeper instruments around, but gives measurements of 'ordinary ones'. He clearly distinguishes between basson and fagot by means of size, as well as attempting to do so according to the method of construction. It is not our purpose here to discuss the question of the instruments being made by 'fagotting together' which in any case his diagrams do not support.



BASSON Schematic diagram of Mersenne's measurements in 'inches'. (We have taken the inch to be equivalent to 27.33 mm) Scale approx 1:10

Reconstructing the Basson

The diagram shows the measurements in their given positions. H, I etc refer the Mersenne's first drawing, Figure 3. Problems encountered are:
1. 'From hole 11 to the bell is 3 in'. Does this mean to the lower end of the bell-piece, or is 3 in and error for 13 in? If B is the datum, then from hole 11 to the bell end is 11 in viz. 3 in plus the 8 in from B to H.
2. No measurement is given from hole 7 to D, but it can deduced by subtracting the sum of the measurements on the down-bore side from the length BD. This gives 2.5 in.
3. The fingerholes have a different relationship with the up-bore thumb holes compared with all known curtals and bassoons, e.g. the left thumb on a bassoon closes hole 10 and lies between holes 1 and 2. The Mersenne basson has hole 10 nearer the butt, and it requires a key.
4. The up-bore distances 5.5 and 7 in have been reversed in our reconstruction. Otherwise, with 7 in between holes 8 and 9 Eb would be likely to emanate from hole 9, and the action would be uncomfortable for the right thumb. Also this switch apparently more closely agrees with Figure 4.

This feature of the back toneholes being further down implies that the U-bend might be further from the reed than is the case with other instruments. So we tried putting hole 7 into the down-bore (as in curtal Linz 217) (6) but with disastrous results. The octave G to g was narrow and unstable. The conventional drilling of this hole was however satisfactory, the key being longer than usual, thus bringing this tone-hole nearer the reed, while still obtaining the required 2.5 in from hole 7 to the butt.
5. 'There are 6 in from the 10th to the 11th (holes)'. This dimension would be very difficult to retain, particularly when referred to Figure 4. We used 10 in instead. Was this a mistaken six for dix?
6. Both figures 3 and 4 imply a bell flare, and Mersenne says that the bore flares towards the end. We tried a gently expanding bell. This gave low BB♮ . A cylindrical bore with a very short flare at the end gives a sharp BBb, the note being obtainable by lipping down. An extra two inches (as already discussed) would help, there being no evidence to support the use of a contracting bore typical of baroque bassoons.
7. Lastly, Mersenne's two depictions are very dissimilar. Figure 3 belongs to that part of the text containing the measurements, but Figure 4 looks much more like the instrument obtained from them. The accompanying table shows how closely they correspond.

Crooks

Mersenne's second Plate shows believable crooks on all but the basson. The short crook shown would render the instrument unplayable both in respect of the acoustics and the convenience of the player. We used baroque bassoon crook shapes - 240 mm on the instruments by P.H. and 270 mm on that by G. L.-J.

Construction of the Basson

Figure 3 shows a join at B, with a carved-out channel partially separating what would be the wing-joint of a bassoon from the up-bore side. Figure 4 shows a separate turned section here that stops short of the upper group of fingerholes. We have termed this the 'winglet'. No join is shown at the lower end, nor for the bell section. Instrument makers being essentially practical people, we assume that these sections were turned separately and socketed into the main body.

Table. Comparison of measurements from text, Figure 4 and on reconstruction.

		From text		From Fig. 4	Reconstruction by G.L-J.
		in	mm		
B (P)* to	1	9½	260	255	255
	2	11	301	298	299
	3	12½	342	343	339
Text is	4	20½	560	541	562
c.20 mm	5	22	601	581	609
more than	6	23½	642	624	649
on Fig. 4	7	30½	834	817	840
	8**	25½	697	725	735
Fig. 4 is	9	18½	506	563	590
c. 45 mm	10	13	355	394	380
up on text	11	3	82	136	110
B (P) to D (S)		33	902	903	915
B (P) to H		8	219	226	205
11 to H		14	383	360	315
10 to 11		6?	-	249 (= c9 in)	270

*Letters in brackets refer to Figure 4.

**These four dimensions are based on there being 10 in. between holes 10 and 11.

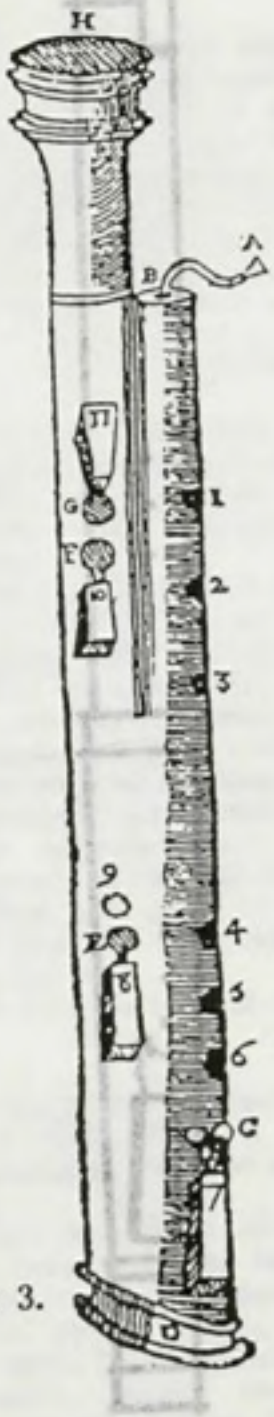


Figure 3.

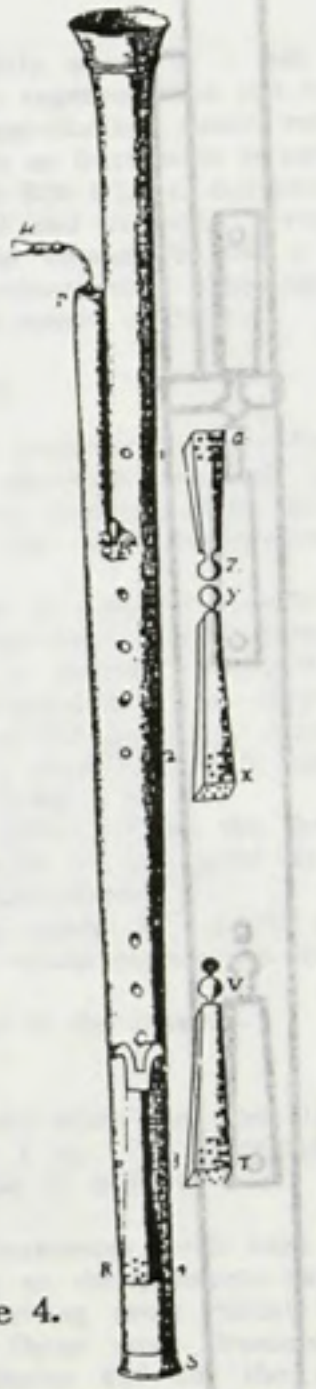
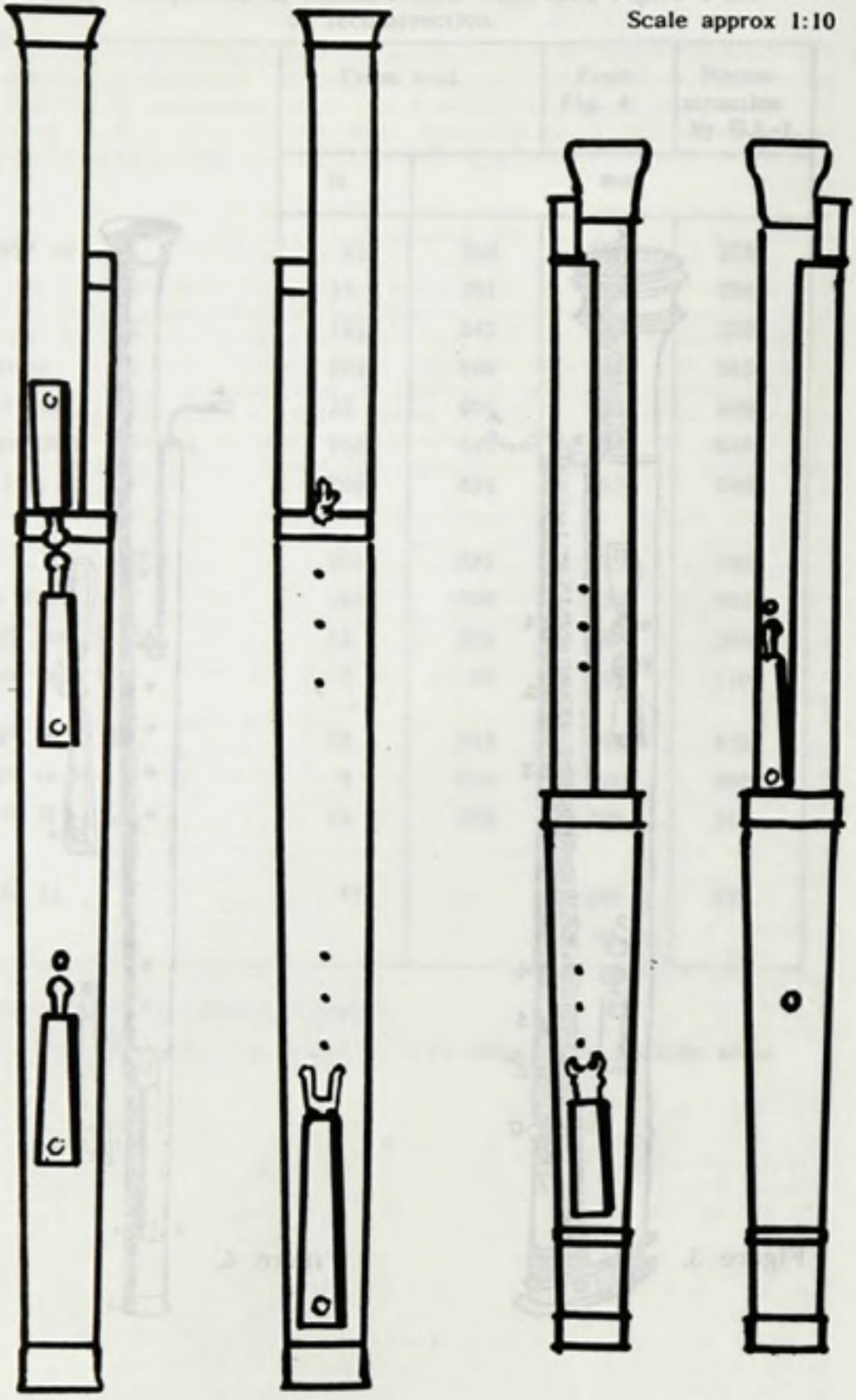


Figure 4.

Scale approx 1:10



Line drawing of the latest reconstruction of the Basson, shown with Vienna 201 (scaled to a' = 440 Hz) for comparison.

Bore

No information is given by Mersenne, so many curtal bores were consulted, and a typical down-bore chosen. The up-bore was made much more like that of a bassoon and the 3-piece curtal in Vienna (no. 201), lacking the increase in conicity starting about 600 mm from the boot. Peter used the same upbore reamer as he used for the boot of a copy of the two-piece curtal, Vienna 200.

Observations

The resulting instruments play well at or slightly above a' = 440 Hz. The two groups of fingerholes are in fact closer together than one would expect for an instrument at this pitch. The curtal-like key covers require large perforations, especially for the low C. Such an instrument is perfect for the performance of compositions requiring low BBb (7). In construction it represents a transitional form between curtal and bassoon. However, using the right thumb for D is curtal-like, while Vienna 201 has a left-thumb D as on a bassoon. More corroborating evidence from other sources would be welcome, and must surely come to light sooner or later.

Reconstructing the Fagot

The text is more ambiguous compared with the treatment of the Basson, and some vital dimensions are omitted. The drawings are both crude, and we lack an equivalent to Figure 4. The diagram shows all the measurements given schematically arranged. The main interpretational problems are:

1. The '16 lignes' from 6 to 7. We took this to mean from hole 6 to the key touch. The use of lignes (twelfth of an inch) here is curious in that 16 lignes equal 1⅓ in, whereas '1½ in' is deemed inadequate for the distances between holes 1, 2, 3 etc. Mersenne says that hole 7 is above the two pegs R, shown on the drawing of the courtaut. Assuming this is correct, and in other respects, namely that hole 9 is opposite hole 4, then we can estimate the distance from holes 6 to 7.

2. The distance given from 10 to 11 is not given. From the drawing, hole 11 is opposite hole 1. Then the distances of any point from A can be derived, as can the overall size of the instrument.

3. A to hole 1 is given as 4 in. This is more typical of a g alto curtal. Compared with the other dimensions given, one would expect this distance to be 6 to 6½ in.

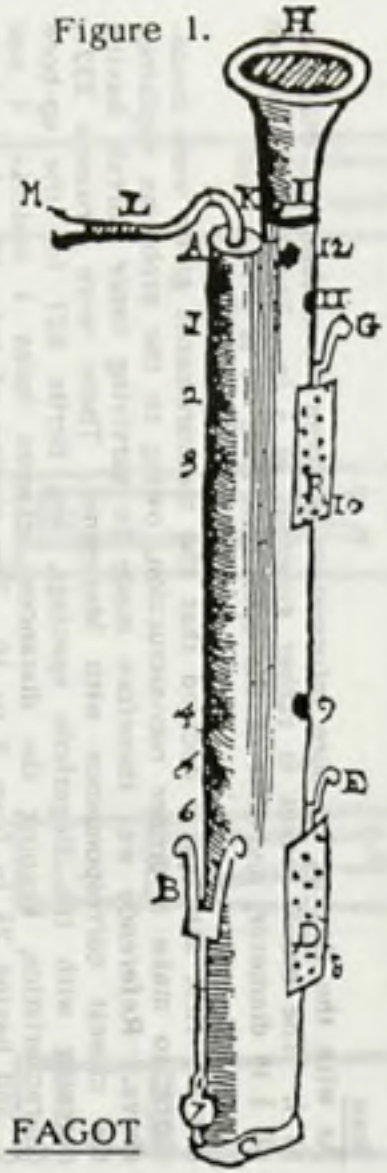
4. Hole 9 to 10 is only 2⅓ in, but looks greater in the drawing.

Bore

As with the Basson, no bore information is given other than the diameter at 1. The crook socket is rather generous at ½ in. The fingerholes are all ¼ in diameter, and that of the open tone hole 12 is ½ in.

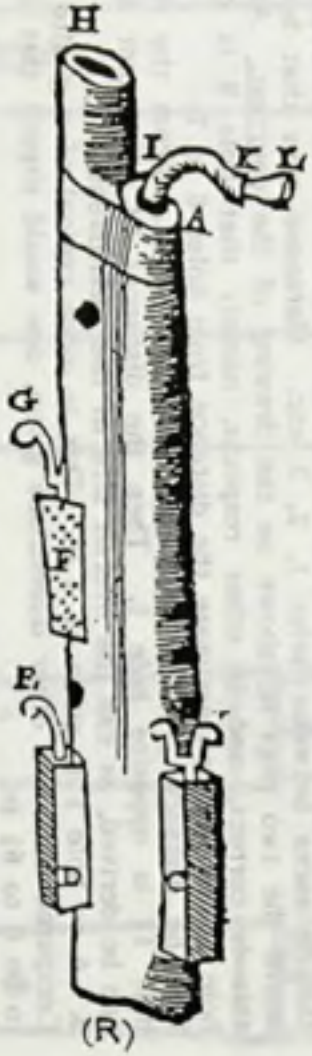
For my first attempt, I decided that the measurements given were inadequate to make a proper reconstruction, owing to the problems explained above. Reference was therefore made to surviving tenor curtals having the closest correspondence with Mersenne. These were Brussels 2327, agreeing with the fingerhole spacings, and Berlin 627 for the up-bore characteristics, keeping the distances between holes 1 and 11, 4 and 9, and having 2⅓ in from 9 to 10. The placing of hole 12 and the bell-joint length were derived from Mersenne, 12 being 7½ in from 11. From 12 to the end of the instrument is 5½ in.

Figure 1.

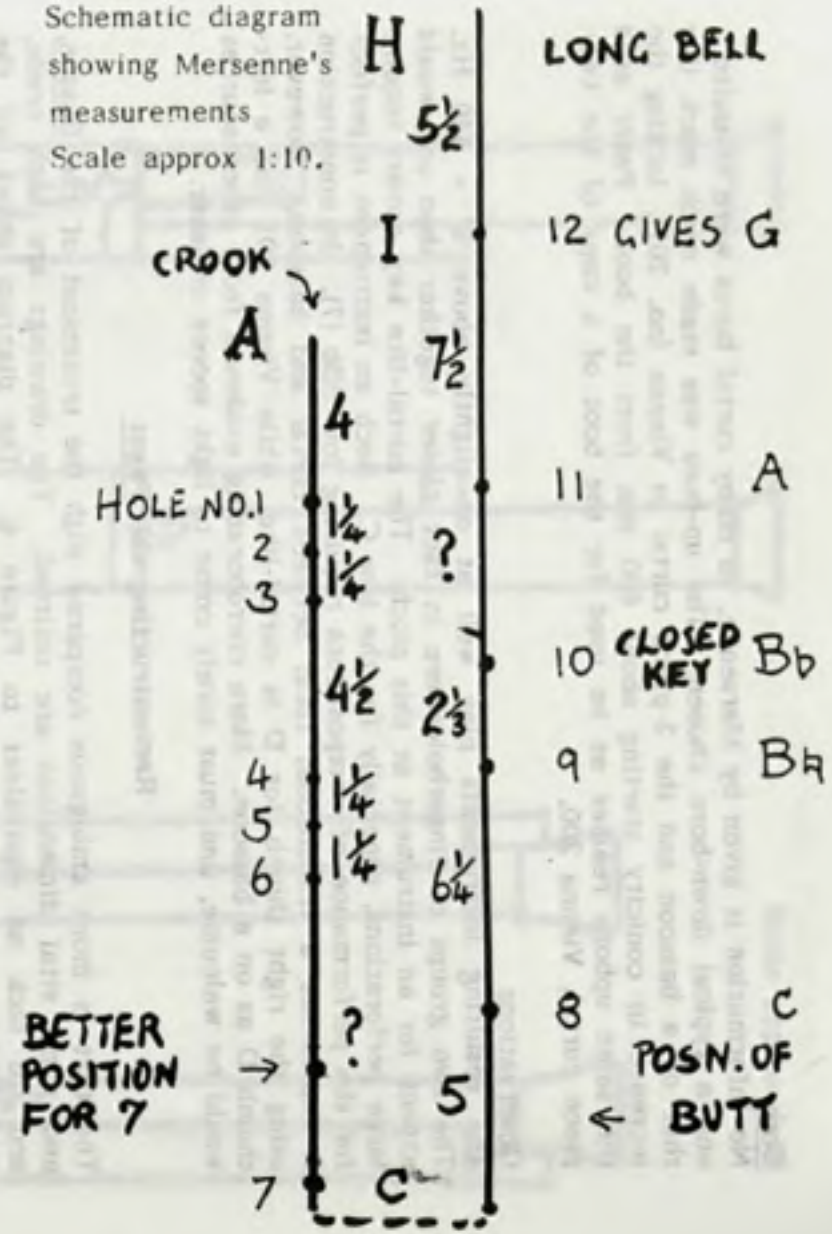


FAGOT

Figure 2.



Schematic diagram showing Mersenne's measurements
Scale approx 1:10.



Stylistically the fagot was made to resemble the basson, with a detachable bell section 9 in long, and a short 'winglet' (see drawing). The instrument works well, though low G and A are flat. Hole 10 was provided with a closed key. This is opened for Bb.

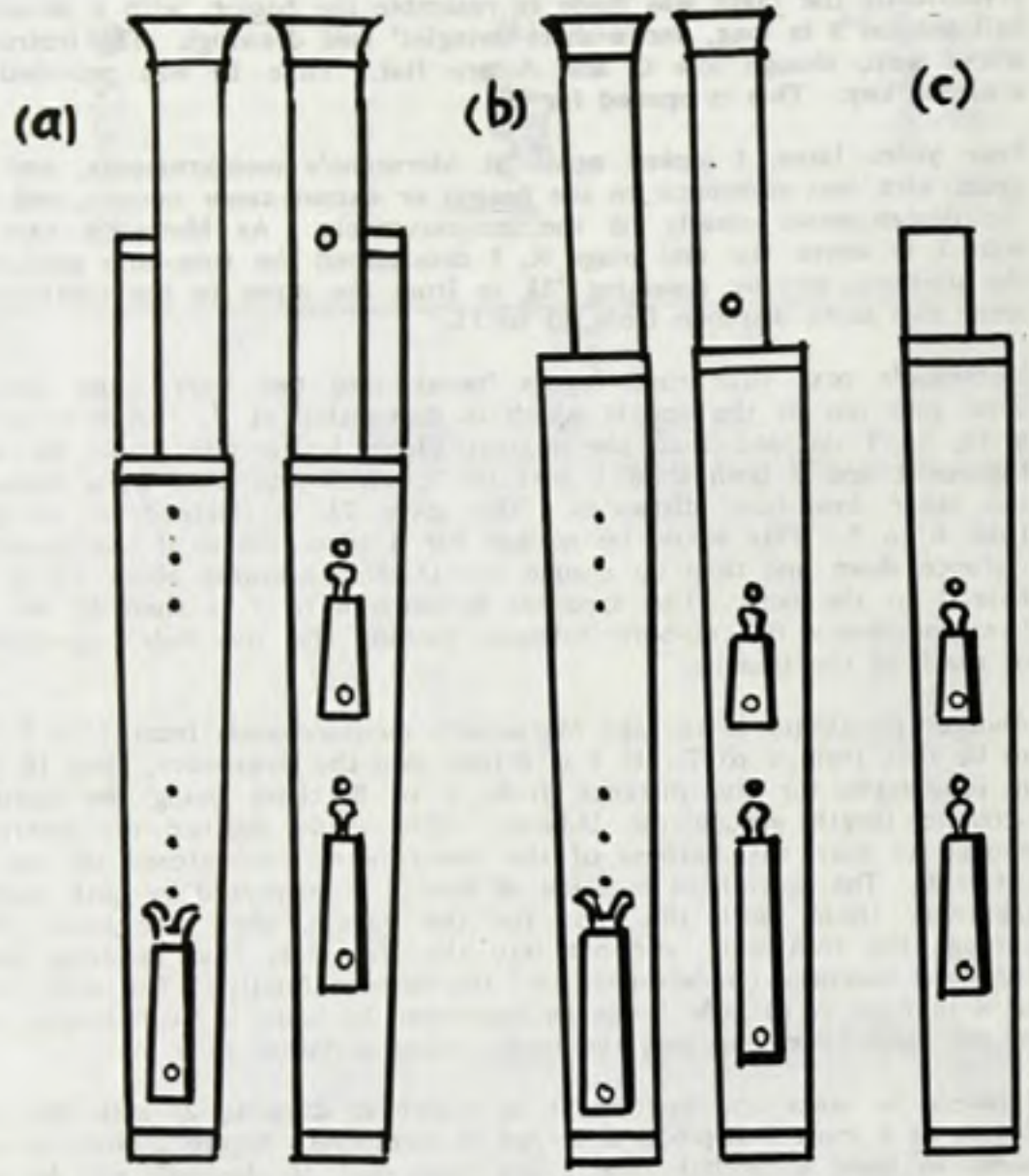
Four years later, I looked again at Mersenne's measurements, and tried again with less reference to the basson or extant tenor curtals, and based the design more closely on the measurements. As Mersenne says that hole 7 is above the end plugs R, I determined the tone-hole positions of the up-bore, and by assuming '2⅛ in from the ninth to the tenth etc' to mean this same distance from 10 to 11.

Mersenne's text says that fagots 'break into two parts' and also 'the wind goes out at the end H which is dismantled at I'. From H to I is 9 in, so I decided that the logical place for a join would be at A. Figures 1 and 2 both show I next to A, which was used as a datum for the other down-bore distances. This gave 7¼ in (instead of 16 lignes) from 6 to 7. This would be normal for a tenor curtal if one counts the distance down and then up around the U-bend, allowing about 1½ in from hole 7 to the butt. The apparent distance 6 to 7 is then 4¼ in. This however upsets the up-bore scheme, pushing the tone-holes upwards out of reach of the thumbs.

Another possibility is to take Mersenne's measurements from 7 to 8 (5 in) to be that from 6 to 7. If 7 is drilled into the down-bore, then 16 lignes is reasonable for the distance from 7 to 8, there being the additional acoustic length around the U-bend. This would shorten the instrument enough to cure the flatness of the lower notes encountered on the first attempt. The down-bore location of hole 7 is supported by both diagrams (However these, with the first for the basson, show the holes drilled through the thin wall, and not into the flat side, thus negating one of the most essential characteristics of the bassoon family.) The short length of 4 in from A to hole 1 can be countered by using a much longer crook, at the same time justifying the large socket diameter of ½ in.

I intend to make the instrument as shown in drawing 2, with the alternative of a short bell-piece as shown in Mersenne's Figure 2 which doesn't seem to have a twelfth hole. The open end of the bell will be about as far from hole 11 as it is from hole 12 on the long bell version. Later baroque tenoroons by I. Kraus survive, some have short and others long bell joints. Most have no provision for obtaining low F, having a vent for G below the bell socket (8). The Mersenne fagot also seems to fill the evolutionary gap between the curtal and the baroque design, but possessing the unique feature of a Bb key.

We feel that we have given Marin Mersenne as much benefit of any doubt as possible, bearing in mind that we do not know the conditions under which copy was sent to his typesetters and engravers. We should not just examine his treatment of these otherwise unknown instruments without studying that of others well known from surviving examples, for example the shawms and the rackett. If this information is reliable, there seems to be little reason to doubt him on the Basson and Fagot.



Line drawings of Fagot reconstructions: Scale approx 1:10
(a) Peter's first attempt
(b) Revised version
(c) Short belled model equivalent to Mersenne's Figure 4 with hole 8 in the same location as for (a).

Footnotes

(1) Marin Mersenne 'Harmonie Universelle contenant la théorie et la pratique de la musique (Paris 1636) Facsimile ed. François Lesure 1965.
(2) Lyndsay G. Langwill 'The Bassoon and Contrabassoon' (Ernest Benn, London 1965) pp. 25-28.
(3) Marin Mersenne 'Harmonie Universelle . . .' trans. Roger E. Chapman (The Hague, Nijhoff 1957)
(4) Richard Semmens 'The Bassoons in Marin Mersenne's Harmonie Universelle (1636), In: Journal of the American Instruments Society, 1985, 22-31.
(5) Anthony Baines 'Woodwind Instruments and their History' (Faber & Faber 1957) p. 286.

(6) This is a quart-bass curtal (lowest note GG). It is illustrated in Brigitte Heinzl 'Die Musikinstrumentensammlung des Oberösterreichischen Landesmuseums (Linz 1981) Plate XVII.
(7) Bartolomeo de Selma y Salaverde (c1580-c1640) was a curtal-player and worked in Innsbruck and Venice. 'Canzoni Fantasie et Corenti' (Venice 1638) no. 10 is marked 'Fagotto solo' and has the range BBb to c'.
(8) Examples are: a 3-key tenoroon in the Rosenbaum collection with G as its lowest note, but having a separate bell-joint; another in the Museum Carolino Augusteum, Salzburg has no bell-joint, as with Mersenne's short fagot; one at Eisenach has 4 keys and a low F.

Appendix

The two paragraphs from 'Harmonie Universelle' containing the measurements:

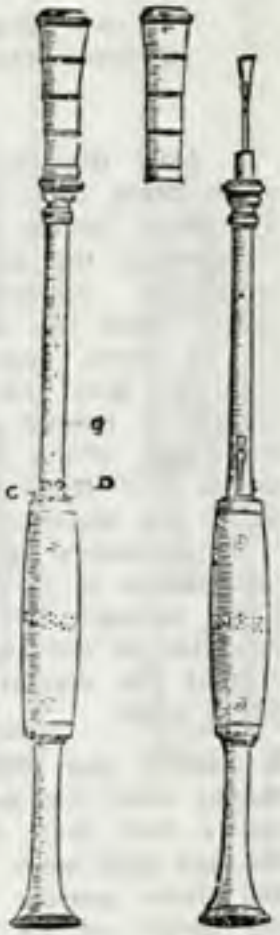
Now the first Fagot on the left begins at A, where we see the small brass tube LK is put on, to carry the wind into the bore ABEI. The wind leaves at the end-piece H, which is removable at I. Concerning the positions of the tone-holes, first, there are four inches from the opening or top A, to the first hole, & four and a half inches from the third hole to the fourth, there are sixteen lignes from six to seven, five inches from seven to eight, six and a quarter from eight to nine, two and a third inches from nine to ten, etc & from eleven to twelve seven and a half inches, & from there to the end of the Fagot which is concealed beneath the open end-piece, there are five and a half inches. This is nearly nine inches from I to H. The other holes are separated from one another by only an inch and a quarter. It is necessary to point out that the crook & therefore the opening A, into which it is placed, is six lignes in diameter; that the end of the Fagot beneath IH has an opening of one and a quarter inches: that the diameter of the twelfth tone-hole, which does not get closed, is six lignes & that the diameters of the first six tone-holes are no more than three lignes each.

To explain the proportions of the preceding Basson which plays a fourth deeper than the normal ones. I say first of all that it would be five and a half feet, if it were stretched out, that is to say if the bores BD and DH were continuous in the same straight line; that it is two and three quarter feet from B to D, & from B to H, which indicates the height of its barrel, it is eight inches. Secondly, that it is nine and a half inches from B to the first hole; from the third to the fourth, eight inches: & that there is only an inch and a half between the other holes as far as the sixth. Thirdly, that it is seven inches from the sixth to the seventh, and from the eventh to the eighth, which is behind, four inches: from the eighth to the ninth there are seven inches, and from the ninth to the tenth there are only five and a half. Lastly, there are ten inches from the tenth to the eleventh, and that from this eleventh up to the open end, in other words as far as B, there are fourteen inches. The diameter at the open end, and thus of the bell, is about three inches: however it must be emphasised that the hole with which the Basson is drilled through its length, that is to say its bore, is narrow at its beginning, and that it expands towards the end: this happens similarly with Haut-bois, & Cornets: & it is this which makes them more forceful than those instruments which are bored the same size from top to bottom.

FoMRHI Comm. 1049 Charles Foster

Praetorius' "Bassett: Nicolo" - "lang Strack basset zu den Krumbhörner", or "Centaur, mythical beast"?

Cornamuses, which survive neither in body nor in iconography, have been produced by modern makers of early wind instruments to an inordinate extent. Other instruments, specimens of which do survive in museums, and several which remain only in contemporary drawings, do not appear to have exercised the same attraction. The Bassett:Nicolo, shown on plate XIII of the Sciagraphia in Michael Praetorius' "Syntagma Musicum II" of 1619 falls into this latter category, since a reconstruction of it has not been offered by any maker to my knowledge.



In note 145, [on pages 93 - 94], of his translation of "De Organographia Parts I and II, by Michael Praetorius, published by Oxford University Press, David Z. Crookes, an eminent member of FoMRHI, refers to the Bassett:Nicolo in peremptory and dogmatic fashion - "There simply was no such instrument; the artist has begotten a centaur. I hope that this mythical beast can now be buried, ere some modern maker starts to produce copies of it." As a relatively modern maker, who, several years ago, before the publication of D.Z. Crookes' translation, did produce such a copy, only two honourable choices are open to me - either to put on a black suit, take a spade and dig a very deep hole, or on the other hand to write a communication to FoMRHI, offering some ontological and possibly logical arguments in this instrument's defence. As I possess neither a black suit nor a spade, only one choice is open to me.

Crookes explains the genesis of the clearly depicted "centaur" in this manner -
"The nicolo of plate 13:i has actually four keys (like the basset of 11:ii), a slender body, windcap, and crumhorn reed. Only this reference and entry 43 on the plates index tell us that the nicolo shawm was meant.
Let me say that I believe the text: that the nicolo shawm is about the same size as the basset, but that it has only one key. In explanation of plate 13:i, I would present the following series of guesses:
(i) The engraver did not have enough space for the nicolo in his frame for plate 11. He made a separate sketch of its body on the basis of the basset shawm, but by mistake kept on all four keys of the basset.
(ii) He transferred this sketch of the body to the frame for plate 13, and then proceeded to draw the crumhorns.
(iii) When he came to draw the reeds and windcaps of the crumhorns, he absent-mindedly endowed the nicolo shawm with a crumhorn reed and windcap as well."

This account of the genesis of this instrument, attributing a veritable catalogue of ineptitude to Praetorius' excellent engraver, contains a multitude of flaws.

The instrument in plate XIII is not termed "nicolo" in the original German edition, but "Bassett:Nicolo", although the section on shawms does state that the Nicolo variety appears on "col. 13", [i.e. plate XIII]. Crookes compounds this confusion, by describing the instrument depicted on the plate in his translation simply as 'Bassett', the inverted commas presumably expressing his sceptical and cynical view of such a designation. The index to the plates, not, however, translated by Crookes, refers to the instrument depicted on plate XIII in somewhat different fashion, as "Basset- Pommer: Nicolo". The spelling of the term "Bassett" with its double "t", (recalling the name of a celebrated manufacturer of Licorice Allsorts and Wine Gums), appears only in the context of the Bassett: Nicolo, elsewhere, it appears to be used exclusively with a single "t". Being a pedant, I shall preserve Praetorius' probable mis-spelling when referring to it. The use of the colon in the term "Bassett: Nicolo" is likewise odd - elsewhere Praetorius employs it to separate the name of an instrument from that of its translation, as on the same page, "Cornetti muti: stille Zincken".

Crookes is right in describing the "mythical beast" as having four keys, but the instrument with which he compares it, illustrated on plate XI, is not described as "Basset Pommer" either there or in the table of instrumental ranges, but rather as "Basset oder Tenor-Pommer". The "Bassett: Nicolo" indeed possesses a slender body, a windcap and a wide reed of the type that appears to function well on large crumhorns.

Crookes' belief in Praetorius' text is most loyal but a trifle misguided - the assertion that the nicolo shawm is about the same size as the basset. but with only one key, is only partly true - the fingerhole sections are necessarily of similar dimensions, because of the identical basic range of both from C_3. The basset shawm, with its range extended down to G_2 by means of its four keys, is illustrated clearly on plate XI, and specimens are found in several continental museums. It is by nature decidedly longer, and with its additional keywork requires a fontanelle markedly longer than that of the unextended nicolo shawm with its single key, the lowest note of which is only C_3. The proportions of the instrument proposed by Crookes would be comparable to those of a greatly enlarged schalmei, which is lowered by about a perfect fourth when its tuning holes are covered, but with the addition of a single key, enclosed within a fontanelle. This would, however, be an instrument of somewhat unbalanced proportions, with an extremely long bell section, making unnecessary and profligate use of timber. Surviving Nicolo shawms which I have seen are constructed in the proportions of alto shawms, although somewhat larger in dimension.

There would have been adequate room for a nicolo shawm on Plate XI; indeed, Praetorius' engraver is not averse to squeezing in additional instruments in somewhat inappropriate places; for example, the largest rackett in Plate X, is crushed between two curtals.

The body in the sketch of the Bassett:Nicolo in Plate XIII, as Crookes rightly states, is slender - indeed, the main part of the stem is similar in diameter to that of the extended bass crumhorn situated nearby. The stem of the basset shawm on Plate XI, however, in agreement with surviving instruments of such a size, is decidedly thicker. The difference, which is visually apparent, is even more significant when one considers that two different scales are used in the two plates - 12 Brunswick inches in Plate XI being slightly less than 10 in Plate XIII.

The proportions of the lower part of the Bassett:Nicolo are decidedly different from those of the basset shawm illustrated, and from those of surviving specimens - on the former the fontanelle is longer, and the bell section shorter. On Praetorius' basset shawm, and on all specimens which I have seen, the lowest key extends below the fontanelle, and is enclosed by a brass cover. On the Bassett:Nicolo, however, there is no indication whatsoever of such a cover, all the keywork is contained within the fontanelle.

A thumbhole is clearly depicted on the Bassett:Nicolo, a feature totally alien to shawms played with an exposed reed, but one found in crumhorns, and other wind-cap instruments.

Crookes quotes two opinions as to the nature of the instrument, (p.94) with a brief and peremptory dismissal of both. -"Weber and Van der Meer ("Some Facts and Guesses concerning Doppioni", GSJ, XXV (July 1972), p.27) take this instrument to be a rauschpfeife or Hautbois de Poitou. Baines (WIH, p251) takes it to be "an instrument sometimes used with crumhorns." Neither suggestion finds a word of support in the text: Praetorius has nothing to say about Rauschpfeifen, or about straight crumhorns with bells for that matter."

While it is extremely unlikely that both of these views are valid, nevertheless, Crookes' vilification of such venerable authorities is totally unjustified, based apparently on the wholly absurd premise, that because an instrument is not mentioned in the text, it is outwith the bounds of possibility that it could appear among the illustrations. Rauschpfeifen, which should more properly be termed schreyerpfeifen, [if we are to believe the very convincing thesis of Barra Boydell, in "The Crumhorn and other Renaissance Windcap Instruments", (1982),] did exist, and survive in continental museums, even if not mentioned by Praetorius. [It is unfortunate that this work, although published four years before Crookes' translation, is not referred to by him - perhaps it falls into the same category as Blumenfeld's translation of Praetorius' "De organographia parts I and II", namely one which he refrained from consulting].

I am inclined to favour Anthony Baines' view of the Bassett:Nicolo, based on the hypothesis that it is similar to the instrument referred to in Kassel inventory of 1613 as "Ein lang Strack basset zu den Krumbhörner", [translated in his "Two Cassel Inventories", GSJ III, (1951)]. The Bassett:Nicolo in Praetorius' plate XIII certainly fits such a description, since it is indeed long, straight, referred to as a basset, and appears in the company of crumhorns. Boydell, agreeing with Baines, suggests that this might be the very instrument depicted in Plate XIII, since that inventory was carried out at the same time as Praetorius was working on the "Syntagma Musicum".

In note 167, [on p 95], referring to the chapter on bassanelli, on the dimly-documented subject of which he apparently considers any additional footnote to be superfluous, Crookes adds his final nail to the coffin of the Basset:Nicolo - "There are no such instruments as "bassets" - if the word here means anything, it means basset shawms - but its occurrence in this context ("played with exposed reed") may be seen as further proof that the bassett: nicolo of plate 13 is a mythical beast."

Crookes, although a linguist, is momentarily oblivious of the fact that the same term can be used to denote totally distinct entities - for

example the English word "baritone", not dissimilar in its usage to "basset" in German, has an entirely different meaning for the members of (a) The Bangor Brass Band, (b) The Belfast Big Band, and (c) The Harlandic Male Voice Choir. In a similar manner, the term "basset" merely designated instruments as possessing a certain range. Crookes in his assertion "if the word means anything", is speaking loosely, he surely could not believe that Praetorius would compare the sound of bassanelli with that of a non-existent instrument, using a meaningless word; Praetorius is, as Crookes grudgingly admits, referring to the basset shawm. The use of the word in the context of an exposed reed in no way, however, disproves the existence of the instrument on Plate XIII, but merely indicates one use of the term "basset".

While I have the greatest respect for Praetorius' scholarship, nevertheless it is apparent that there are many small discrepancies within the "Syntagma Musicum", particularly with regard to the illustrations. In the section on cornamuses, for example, Praetorius clearly states that these are illustrated on Plate VII, whereas in fact only stringed instruments appear there. It is a curious anomaly that Crookes in his notes describes his attempts at constructing cornamuses, illustrations of which do not appear in the Sciagraphia, but expresses total disbelief in an instrument which is quite clearly depicted.

Baines' view is verified by careful comparison of the measurements of the Bassett: Nicolo and the extended-bass crumhorn illustrated on the same page. Indeed, the distances between the fingerholes are remarkably similar on the two instruments, although the distance between the tip of the reed and the thumbhole is fractionally greater on the Bassett: Nicolo. Its upper stem is not, however, similar in dimension to that of the basset shawm as Crookes suggests. The notion that these two instruments might be at the same pitch is at first sight contradicted by the pitches which Praetorius indicates for the former, namely that it produces a D when all finger-holes and the first key are covered, presumably giving it a range, with all four keys in operation, to the A below. The indication of the note G against the uppermost of the three lower fingerholes confirms such a pitch. Curiously, on Plate IX, the same hole on the largest recorder is also indicated as a G; the facts that Praetorius clearly describes the largest recorder as being in F and that the measurements of this instrument compare closely with those of surviving large recorders which are indeed pitched in F, [albeit frequently at a slightly higher pitch], would appear to prove that the pitch indicated for this recorder is erroneous. It is equally plausible that the same error appears in the illustration of the Bassett: Nicolo. An instrument pitched in D would be singularly useless as a bass to a consort of crumhorns, or any other late 16th or early 17th Century wind group, whereas one in F, with a diatonic extension down to C_2 would be exceedingly useful as a substitute for an extended-bass crumhorn.

It was with this premise in mind, without any ontological scepticism such as is propounded by Crookes to perturb me, that I originally built a reconstruction of the Bassett: Nicolo. Using the measurements provided by Praetorius' drawings, taking the Brunswick foot as 11½ inches, with an internal bore of 7mm., and with finger-holes 4.5mm in diameter. [comparable in dimension and angle to those of surviving extended-bass crumhorns by Georg Wier], an instrument was constructed. This played well between A=460 and 466, depending on the adjustment of the reed and position of the gently tapering staple. After this, a slightly larger version was constructed at around A=440, in order to play with my existing

instruments. [It is very convenient that Praetorius' illustrations, if regarded as being in Imperial feet, rather than Brunswick feet, successfully produce instruments at around A=440].

Reeds supplied by most makers fail to produce reliable cross-fingered notes on crumhorns bored with finger-holes of large dimensions such as are found on surviving instruments, [i.e. diameters of approximately 4.5mm, 4.00mm, and 3.5mm on the extended-bass, tenor and alto instruments respectively]. To be more explicit, on an instrument pitched in C, the cross-fingered B flats, employing either the single forked finger stipulated in original fingering-charts, or any additional lower fingers, tend to be only minimally flatter than B natural. Similar problems arise with regard to the notes F natural, E flat and G sharp. It is because of this, that most modern makers have produced crumhorns with finger-holes substantially smaller than those of originals, in order to produce the afore-mentioned notes by cross-fingering, using reeds which only require a low wind pressure. This is a totally indefensible procedure for those who make instruments purported to be historical.

Much experimentation, mainly on crumhorns based on measurements of surviving instruments by Georg Wier, has led to several conclusions. The use of a gently tapering conical staple does not appear to improve the tuning of cross-fingered notes to any perceptible degree, although the tone quality throughout the range is minimally superior to that with the self-same reed on a cylindrical staple. It would appear likely that surviviving crumhorns, because of the inordinately wide aperture before the commencement of the main bore, originally were equipped with staples whose bore at their lower extremity was decidedly wider than that of the actual bore of the instrument. As most original crumhorns appear from their X-rays to possess bores not situated centrally, but more often nearer the thumb-hole than the finger-holes, such a procedure is essential if the reeds are to be situated centrally within the cap, with the enlarged bore for the staple placed in a central position. A cylindrical staple in a similar instrument would not function properly, as the two bores would not necessarily meet precisely. [The staples I use for extended-bass instruments have a taper from 7mm. to 9.5mm. over a total length of 135mm.] The similarly shaped staple associated with the tenor crumhorn of unique construction by "I Milla" in the Kunsthistorisches Museum, Vienna, which along with its reed is believed to be original, reinforces this view.

It is a curious phenomenon that the widening of the aperture of a reed lowers the pitch of the cross-fingered notes on a crumhorn to a much greater degree than that of those produced without cross-fingering. Such a wide opening requires that the reed be scraped very thinly indeed, so that it may vibrate freely without requiring the wind-pressure generated by a "Superman". It is possible with a suitably adjusted and scraped reed to produce a robust sound along with satisfactory cross-fingered notes on a crumhorn where the finger-holes are as large as those found on original specimens. This can be accomplished with a wind-pressure which those accustomed to playing cornetts, sackbuts and shawms do not find at all intolerable. The large finger-holes create considerably more resonance throughout the entire range of the instrument than do their under-sized relations. The twentieth Century crumhorn, furnished with tiny finger-holes and a plastic reed, and sounding like a paper and comb, was apparently invented in order that recorder players who are unwilling to cultivate the production of a relatively strong wind-pressure can nevertheless enjoy playing the instrument. [Authentic racketts, if we are

to believe Praetorius, should sound like a paper and comb, but no-where does he state that crumhorns possess a similar lack of sonority].

The phrase "satisfactory chromatic notes" requires further discussion. Many modern players consider that instruments are "out of tune" if they cannot play in the same temperament as their domestic pianoforte. An anthology of music for crumhorns published in 1977 included the celebrated "Padouana" by Johann Hermann Schein transposed up a minor 3rd, in order to be playable by a "modern crumhorn quartet" of soprano, alto in F, tenor and bass, (both with additional unauthentic keys extending the range upwards). The presence of up to four flats, and of the chords of A flat and D flat major presupposes that the instruments should be capable of playing in equal temperament. If one is unwilling to accept such an approach, but instead considers whether original crumhorns perhaps played in some form of mean-tone temperament, the whole perspective to their cross-fingered notes changes radically. On a tenor instrument in C, for example, with finger-hole positions and dimensions based on a surviving instrument by Georg Wier, blowing without attempting to control the pitch to a great extent, and with a reed not quite so open as is required for attempting to play in equal temperament, the following relationships with their equally-tempered namesakes were noted: the octave C - C is well in tune, the G fractionally flat, both Ds very slightly more so, and the E and A even more so; flattest of all are F sharp, C sharp, and B natural; E flat and B flat are, conversely somewhat sharper. These results are very much in keeping with an instrument capable of playing in some form of mean-tone temperament. The one note on this tenor crumhorn which poses a problem is G sharp, (and C sharp on the bass, and D sharp on the alto in G), which is sharper than would be expected in a mean-tone temperament. These are, however, rarely encountered notes, which can be blown down to pitch fairly readily. Although D sharp is not wholly satisfactory on the alto instrument, E flat, its "enharmonic near- equivalent" is much more so, and is a note that would be more likely to appear in some alto parts. I have ignored mention of the notes D flat, G flat, A sharp and A flat which one would not expect to find frequently in Renaissance music for such instruments, although the A flat is significantly better in tune with a mean-tone temperament than G sharp. [I have deliberately avoided the temptation of giving the exact deviations in cents from their equal-tempered namesakes, since not having access to play original instruments, I must rely on copies based on the measurements of these, with the concomitant possibilities of inaccuracy].

The sizes and angles of the finger-holes of Georg Wier's extended-bass crumhorn, as well as those of the larger holes covered by sliders, were followed in my reconstruction of the Bassett: Nicolo, similar dimensions to the latter were used in the holes for the keys which extend the basic range downwards. As no tuning hole is visible below the fontanelle in Praetorius' drawing, in order to make the lowest note in tune, while preserving the indicated length of the instrument, a fairly deep and wide-mouthed bell is necessary. Such a widening also greatly enhances the resonance of the Bassett: Nicolo through its entire range, in the same way as do the deeply gouged bells of original crumhorns by Georg Wier, so different from their "paper and comb" sounding relations with shallow bells. With a good reed the vibrations can be clearly felt through the fingertips of the player as well as being heard.

The Bassett: Nicolo is admittedly a hybrid, which combines elements of the extended-bass crumhorn with those of the basset shawm. It is, however, an instrument which produces a greater resonance than any extended-bass

[continued on P. 29]

FoMRHI Comm. 1050

Donald S. Gill

Paper Organ Pipes

I first came across the possibility of making organ pipes from paper in a Victorian book 'Organ building for Amateurs' by Mark Wicks. The author described it as a 'new' method of constructing cheap and light organ pipes. Subsequently in discussion with a student at the London College of Furniture Technology it was pointed out to me that there was nothing new about the idea since the V & A museum had a 17th century positive organ (measured and drawn by Martin Goetz and Dominic Gwynn) with all its pipes made from paper. Even later, at a Bate seminar, Lewis Jones mentioned a 15th century Italian organ with the base of the pipes made from wood and their cylindrical tops from paper.

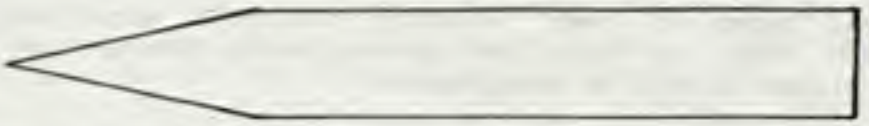
In my spare time for the last few months I have been experimenting with paper pipes. I have now reached the stage where I can make a pipe that satisfies me with a reasonable degree of consistency which seems a good point at which to report on progress.

Materials

The first requirement is for a paper cylinder and a paper cone to form the body and foot of the pipe. I have favoured a rolled and glued paper construction and it is this which has caused the greatest problems. Having tried Sunday colour supplements, brown wrapping paper and cartridge paper I have settled on the last. About 120 gsm seems to be a reasonable weight. Several types of glue have been tried or considered. I wanted a cheap glue which would set hard (to give extra rigidity to the paper) relatively slowly (to allow time to correct defects). The obvious choice was white PVA woodworkers glue but I had a lot of trouble initially because it is water based and when brushed onto the paper the water is absorbed by the paper which expands (and eventually contracts) unevenly producing wrinkles. Pritt Stick works well with all types of paper because it is dry but it is expensive, fairly fast setting and I am not sure how permanent it is. Old fashioned animal glue presumably has the same water problem as PVA and I don't have a glue pot. Likewise I don't have a hot melt glue gun so I haven't tried that and anyway it is expensive if one is more than 'spot welding' the paper. Finally I solved the problem of using the PVA glue without wrinkles developing.

Method

Firstly prepare a mandrel. I use a wooden one shaped like a cricket stump i.e.



This can be used for both the cylinder and the cone. I turned a series of them at 5 mm intervals and intermediate sizes were produced by

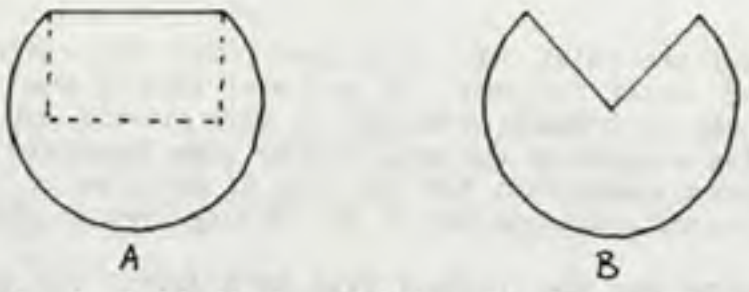
wrapping paper round the next smaller size. Alternatives are any easily available tubing e.g. central heating piping.

Take a piece of cartridge paper width equal to the length of the pipe and length enough to wrap it round the mandrel 3 - 5 times (3 times for small pipes, 5 times for large pipes). Now wet the paper thoroughly on both sides; this is important - my early problems with wrinkles were due to insufficient soaking and cartridge paper is needed because it remains tough enough to handle even when really wet. Wrap one turn of paper round the mandrel then brush slightly diluted PVA glue (say 2/3 glue, 1/3water) on the rest of the paper. Continue wrapping the paper round the mandrel smoothing it out with the palm of the hand. When it is complete slip the cylinder off the mandrel and leave to dry.

Decide on the length of foot and cut out a circle of paper radius about 25 mm more than the foot length. Cut a 90° sector out of the circle and use the rest to form the cone for the foot using the same technique as for the body.

Paint the inside of both pieces (I use Hammerite black). Non pipe smokers may like to know that small, cheap, disposable paint brushes are available from tobacconists; they are called pipe cleaners. When dry trim the end of the cylinder square; and easy way is to wrap a strip of paper round the cylinder to mark a cutting line. Likewise trim the end of the cone square at the point where its diameter is the same as the diameter of the cylinder then trim the pointed end of the cone to produce the correct length of foot.

Now cut 2 circles from thick (approx. 2 mm) card the same diameter as the outside of the cylinder. I use line wash card from the local drawing office shop. Chamfer the edges so that they fit into the end of the cylinder and cone. Decide on the window width, draw a chord this length on one circle and cut along the line. This leaves a roughish surface so glue some paper over the cut surface. Use this circle as a template to draw a chord on the other circle about 1/2 mm further away from the centre. Draw lines from the end of this chord to the centre and cut out the sector so formed. You now have two card circles shaped like this



Take circle A, hold it in position in the squared end of the cylinder, mark the ends of the chord on the outside of the cylinder and then draw the shape of the required mouth. Cut out the mouth and glue circle A into the base of the cylinder.

Repeat with Circle B in the top of the cone, marking and cutting out the top of the windway then glueing B into the top of the cone. The two pieces will now look like this

Now prepare two rectangular pieces of card about 1/2 mm thick to form the mouth and the windway top. Cover them with paper to form a smooth edge.

Tie these rectangles roughly in position with wire, thread or tape. Hold the two parts of the pipe together and blow into it. You may or may not get a note. In any case try modifying the position of everything that is moveable till the best possible note is achieved. It will not be perfect at this stage because everything is leaking like a sieve. It does, however, demonstrate the usefulness of this method of assembly; everything affecting the voicing of the pipe is, at this stage, adjustable. When the best possible note is obtained mark the position of the mouth rectangle and glue it to the cylinder. Check again varying the windway top till the best note is obtained then glue on the windway top rectangle. When the glue has set trim the rectangles with a craft knife to blend in with the cylinder and cone. Check again the best position for the height of the windway and glue the cone to the cylinder.

This joint is the weakest point of the pipe so prepare a paper reinforcing strip to go round it like this

Glue it round the joint, the solid part round the cylinder and the serrated part round the cone. If you want ears either side of the window they can be prepared from card or thin plywood and glued on.

Paint the outside of the pipe (silver grey Hammerite in my case). I use a tapered wooden foot for the base of the pipe of the same type as I use on wooden pipes so that I can exchange wooden and paper pipes easily.

For tuning use the finished pipe as a former for another paper cylinder which will just slide on the pipe and paint it to match the pipe. Cut the pipe to produce a sharp note, slip on the tuning cylinder and adjust it to bring the pipe into tune. I have also produced gedacht pipes by making the tuning cylinder slightly oversize, lining it with leather and glueing a circle of card in the top.

My pipes are currently a mixture of 17th and 19th century technology using 20th century materials. The following table summarises the differences where known.

	17th C (V&A)	19th C (Wicks)	20th C (Gill)
Pipe	Hand made paper made up into pasteboard	Cartridge paper or thick brown paper rolled	Cartridge paper rolled
Glue	Flour paste?	Animal glue	PVA
Labium	Thick pasteboard	Wood	Line wash card
Finish	?	Oil paint	Hammerite

Finally I know why an amateur woodworker like myself chooses paper rather than metal for cylindrical pipes; it is easier to handle and much cheaper. Why did 15th and 17th century professionals choose to use paper? I think the answer is quite simply lightness. I would suspect that many of the portative organs which appear in paintings and sculptures which are obviously highly portable had paper pipes.

Since preparing this Comm. the March 1991 Galpin Society Journal(Vol XLIV) has arrived and I now know that I am not alone. Geoffrey Bridge's article on portative organs mentions his using paper pipes. Judging from the photographs I think he has been making the 15th century type pipes mentioned at the beginning of this Comm. i.e. wood base with a paper pipe, but if I am wrong he may write in with a correction.

[continuation of Comm. 1049 from p. 25]

crumhorn I have heard. At the same time it does not depend on the pre-setting of sliders for its lowest notes, but instead is fully diatonic down to C_2. Although probably extremely rare, and possibly even unique in its time, it nevertheless serves an exceedingly useful function. It performs magnificently as a bass in a consort of crumhorns, particularly in Schein's "Padouana", (untransposed!), in the company of an alto in G and two tenors. It can well be described as "lang Strack basset zu den Krumbhörner". It deserves not to be dismissed as a mere "Centaur, mythical beast".

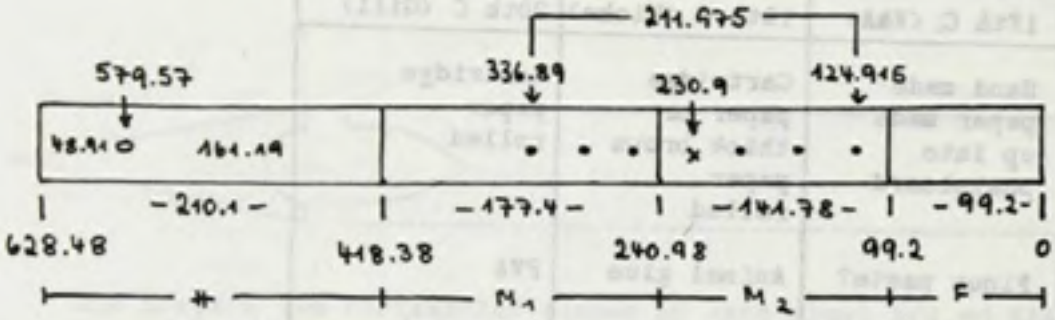
FoMRHI Comm. 1051

Manfred Bracn

The longitudinal structure of the "Bizey Boxwood Flute"

(Bate Collection Nr.106)

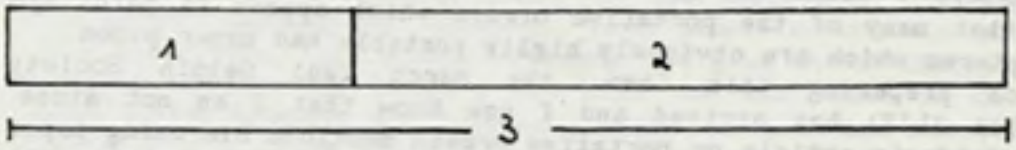
measurements in accordance with
Ken Williams (in mm):



The genesis of the Bizey Flute:

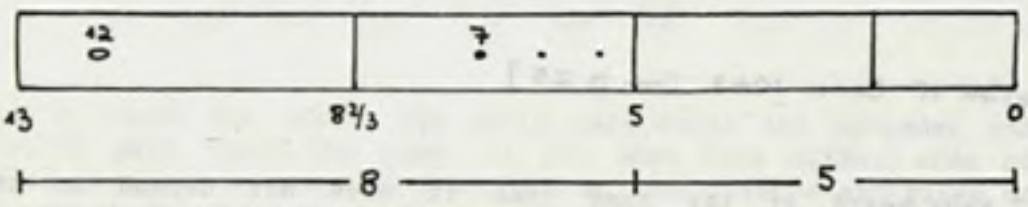
I. primum principium: $\boxed{1-2-3}-5-8-13$

$$\# + (M_1 + M_2 + F) = TL$$
$$1 + 2 = 3$$



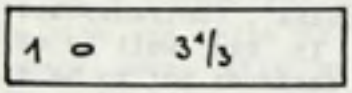
II. principium secundum: $1-2-3-\boxed{5-8-13}$

$$TL = (\# + M_1) + (M_2 + F)$$
$$= \text{MAIOR} + \text{minor}$$
$$13 = 8 + 5$$



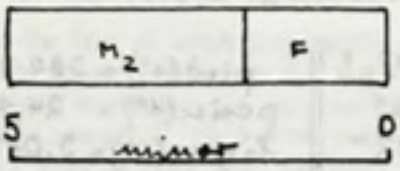
TL = 13 MODULI
MH = 12 "
MA = 8 "
mi = 5 "
#1 = 7 "

HEAD:



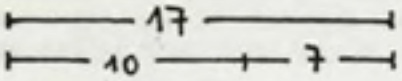
13 - 4 1/3 - 8 2/3

FOOT:



a) minor = $M_2 + F$

17 = 10 + 7

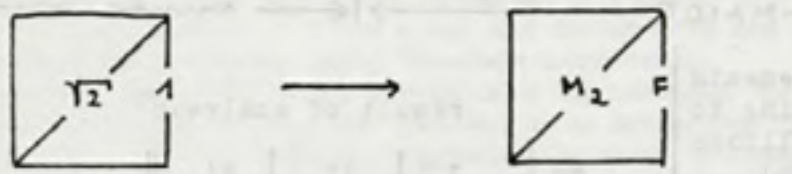


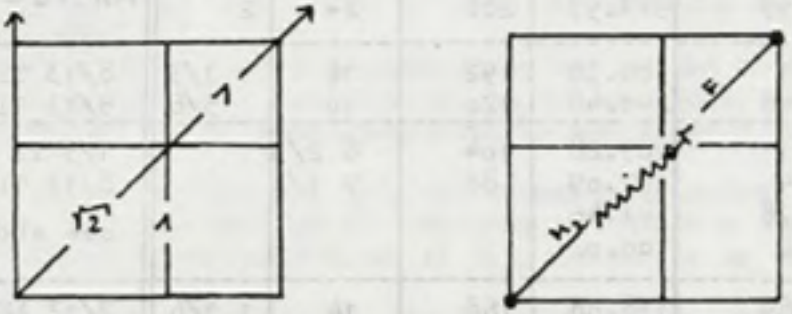
b) $\frac{F}{M_2} = \frac{1}{\sqrt{2}}$

i.e.

minor = $M_2 + F$

$(\sqrt{2} + 1) = \sqrt{2} + 1$

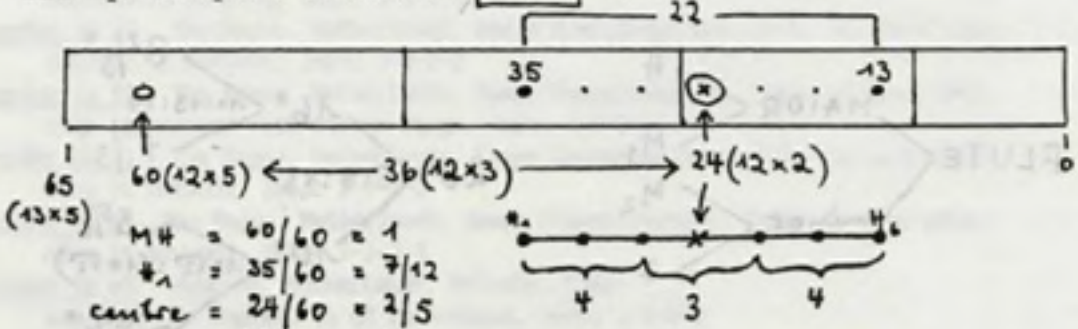




"Unter allen figuren ist das Quadrat
die aller perfectest un volkumenest figur"

(Gualthar Rivius Nürnberg 1547)

III. principium tertium: 1-2-3-5-8-13



MH = 60/60 = 1

$\#_1$ = 35/60 = 7/12

centre = 24/60 = 2/5

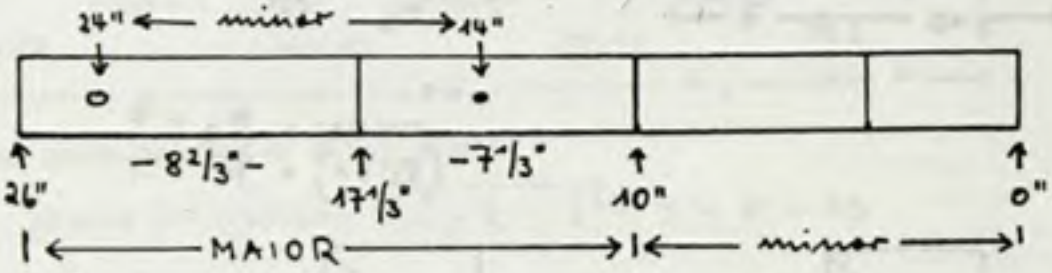
$\#_{1-6}$ = 22/60 = 11/30

$MH - \#_1$ = 25/60 = 5/12

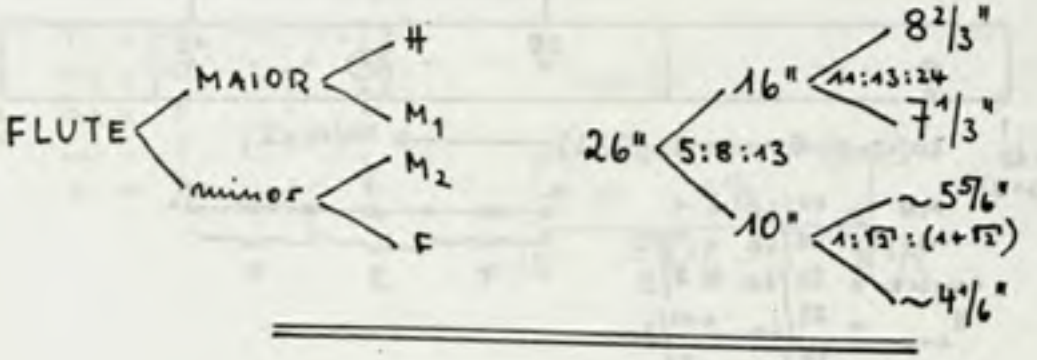
The problem of the linear measure:

MH = 579.57 mm We suppose: 2 pied à 289.785 mm
(Strasbourg: 289.37 mm ?)

MH = 2' = 24" = 288‴ ‖ TL = 13/12 MH = 2 1/6' = 26" = 312‴ ‖ pied(1') = 289.785 ; pouce(1") = 24,14875 ; ligne(1‴) = 2.01239



	measurements according to Ken Williams (in mm)	result of analysis mm	1‴	1"	1'	
TL	628.48	627.86	312	26	2 1/6	MH : TL = 12 : 13
MH	579.57	579.57	288	24	2	
MA	387.5	386.38	192	16	1 1/3	8/13 TL
mi	240.98	241.48	120	10	5/6	5/13 TL
H	210.1	209.28	104	8 2/3		1/3 TL
M_1	177.4	177.09	88	7 1/3		8/13 TL − 1/3 TL
M_2	141.78	141.46				see above $\left(\frac{12}{13}\right)$
F^2	99.2	100.02				
H_1	336.89	338.08	168	14	1 1/6	7/12 MH = 7/13 TL
centre	230.90	231.82			4/5	2/5 MH
H_{1-6}	211.97	212.5			11/15	
H_6	124.9	125.7			13/30	



F.M.R.H.I. Comm. 1052

DUTCH RECORDERS AND TRANSVERSE FLUTES of the 17th and 18th CENTURY

LIST OF INSTRUMENTS (July 1991), by Jan Bouterse

This is the list of dutch instruments I have made in cooperation with Rob van Acht, curator of the Haags Gemeentemuseum in The Hague. Our aim is to collect as many information as possible about dutch woodwinds; all information is (or will be in nest future) free accessible in the documentationroom of the museum in The Hague, Netherlands.
I didn't give in this list information about anonymus instruments; it is often difficult to see if they are dutch. There is indeed a certain amount of instruments found at excavations in the Netherlands, many of them from the 17th century, some of them even much older. I hope to write an article about those (mostly inplayable) recorders and traverso's.

The underlined instruments I have seen personally, but some of them long ago. Recent information is welcome! From some private collections I know the addresses, if I don't know the address I put a questionmark behind "private". All names of public collections are given.
About the "Info": I have given 4 numbers to each instrument:

- The first number deals with the drawing, the second with measurements. 0: I have no information; 1: I have only little information or a sketch; 2: I have full information or a good drawing; 3: I have a very good drawing (with many details) and measurements also of the windway and/or fingerhole-undercuttings.
- The third number deals with a description of the instrument, the fourth with information about sound, pitch of the tones etc. 0: no information; 1: there is some information; 3: there is sufficient information. "x" means: information not relevant.

Also: from instruments with 3-3-2-2 I have most information, it is possible to make a good copy. Instruments with 2-2-1-1 are less documentated, but it is possible to make u useful copy (if you are an experienced woodwindmaker) or to use the information for making comparisons with other instruments.
All dutch recorders in the "Haags Gemeentemuseum" are well recorded in the new catalogue of the museum; some traverso's are measured as well but the measurements and other information are rather incomplete. We hope to make more drawings and descriptions in next years.

What we want to know with this list is if all information is correct; the question-marks indicate that I don't know sure that the information is complete or correct. It is always possible to exchange information with me, it is a pleasure for me to help people with information.
My address: Jan Bouterse, Sandenburg 69, 2402 RJ Alphen a/d Rijn, Netherlands.

Aardenberg, A. van, (1672-1717):
- recorder in f2 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 581-1933; sopranino in boxwood with silver ring; Info: 3-3-2-2
- recorder in c2 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 29-x-1952; soprano in boxwood; Info: 3-3-2-2
- recorder in c2 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 29a-x-1952; soprano in boxwood; Info: 3-3-2-2
- recorder in f1 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 32-x-1952; alto in boxwood with silver rings, Info: 3-3-2-2
- recorder in f1 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 24-x-1952; alto in boxwood, Info: 3-3-2-2
- recorder in f1 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 23-x-1952; alto in boxwood, Info: 3-3-2-2
- recorder in e2 Geldrop, Netherlands, Private, Code: - sopranino or soprano in e2 in boxwood, Info: 2-2-2-2
- recorder in f1 Nieuwegein, Netherlands, Private, Code: - alto in boxwood, foot not original, Info: 2-2-2-2
- recorder in f1, Zwolle, Netherlands, Private, Code:-

alto in boxwood(?), Info: 0-0-0-0
- recorder in f1, Vermillion S.D. USA, Shrine to Music Museum, Code:(?)
alto (ex Von Huenerbein?) in boxwood, Info: 0-0-0-0
Further by Van Aardenberg: perhaps one alto-recorder at Sotheby on 25-11-1988.

Beuker, J.B: (1737-1816):
- bass-traverso in d(?), The Hague, Netherlands, Haags Gemeentemuseum. Code: Ea 32-1936
Info: 0-0-0-0
- bass-traverso in d(?), Paris, France, Musée du Conservatoire National de Musique
Code (?), Info: 0-0-0-0
- traverso in d1(?), Amsterdam, Netherlands, Collection Frans Brüggen, Code -, Info: 0-0-0-0
- traverso in d1(?), Lippenhuizen, Netherlands, Private, Code -, Info: 0-0-0-0
- traverso in d1, Utrecht, Netherlands, Collection Ehrenfeld, Code -, Info: 0-0-0-0

Beukers, W: (sr: 1669-1750 and jr: 1703-1781):
- recorder in c2 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 25-x-1952,
soprano in boxwood, Info: 3-3-2-2
- recorder in c2 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 278-1933,
soprano in boxwood, Info: 3-3-2-2
- recorder in f1 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 26-x-1952.
alto in boxwood, Info: 3-3-2-2
- recorder in d1 Utrecht, Netherlands, Private, Code -,
voice-flute in d1 (a-440) or very low-alto Info: 1-1-1-1
- recorder in f1, Berlin-W, Germany, Instrumenten Museum der Staatlichen Hochschule für Musik,
Code 2792, alto in boxwood, only foot exists. Info: 1-2-1-x
- recorder in d2, Washington D.C. USA, Library of Congres, Code 1257/5
sixth flute in ivory, engine-turned, Info: 0-0-0-0
- recorder in f1, Boston, Mass. USA, Private, Code-,
alto, foot by Boekhout (ex Collection Ferguson) in boxwood (?) Info: 2-2-1-1
- traverso in d1, The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 414-1933,
Info: 0-0-0-0
- traverso in d1, Utrecht, Netherlands, Collection Ehrenfeld, Code -, Info: 0-0-0-0
Perhaps some more transverse flutes by Beukers exist in private collections in Amsterdam, Antwerpen (Belgium and the USA); one more alto-recorder exist in a private colection in The Netherlands.

Boekhout, T: (1666-1715):
- recorder in f1 The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 27-x-1952,
alto in ebony and ivory, Info: 3-3-2-2
- recorder in f Brussel, Belgium, Instrumentenmuseum van het Koninklijk Conservatorium
Code: 1039, bass in maple or fruitwood, Info: 1-2-2-1
- recorder in f Brussel, Belgium, Instrumentenmuseum van het Koninklijk Conservatorium
Code: 1040, bass in maple or fruitwood, Info: 1-2-2-1
- recorder in f(?), München, Germany, Deutsches Museum für Technik und Naturwissenschaft
Code (?) bass in ?, Info: 0-0-0-0
- recorder in f1, Zürich, Switzerland, Museum Bellerive, Code 1963-60,128
alto in boxwood, Info: 2-2-2-2
- recorder in f1, Celle, Germany, Private (Moeck-collection), Code (?)
alto in ?, Info: 0-0-0-0
- recorder in f, Leningrad, USSR, Museum of Musical Instruments, Theatre, Music and Film,
Code(?), bass in ? ,Info: 0-0-0-0
- recorder in f, ex-Luik/Liege Belgium, Private, ex-van Zuylen, Code-
bass in ?, where is this instrument now? Info: 0-0-0-0
- recorder in f, Boston Mass. USA, Private, Code-, bass in?, Info: 0-0-0-0
- recorder in f, Boston Mass. USA, Private, Code -, bass in ? ,(ex Collection Ferguson)
Info: 2-2-1-1

- 2 (?) recorders in f2(?), Tokyo(?), Japan,Museum (?) (Kunitachi?), Code (?)

sopranino in ?, (2 recorders?), Info: 0-0-0-0
- recorder in c2, New York, USA, Metropolitan Museum, Code (?)
sopranino in boxwood (?) with ivory rings, Info: 0-0-0-0
Perhaps an altorecorder made by Boekhout exists in Paris (France)

Borkens, Ph: (1693-1765):
- recorder in c2(?), ex-Liege/Luik, Belgium, Private, ex-van Zuylen, Code(?)
soprano; where is this instrument now? Info: 0-0-0-0
- traverso in d1, The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 39-x-1952
Info: 0-0-0-0
- traverso in d1(?), London, U.K., Horniman Museum,Code (?), Info: 0-0-0-0

Ferens, F:
- stockrecorder, The Hague, Netherlands, Haags Gemeentemuseum, Code 475-1933
canned recorder or stockrecorder, Info: 0-0-0-0
- traverso in d1, New York, USA (?), Metropolitan Museum (?), Code (?)
- ex-Jaap Frank, Amsterdam, Info: 0-0-0-0
- traverso in d1, Delft, Netherlands, Private, Code -, Info: 0-0-0-0
- traverso in d1, Groningen, Netherlands, Private, Code -, Info: 3-2-1-2
further one traverso in ivory at Sotheby on 25-11-1988

Haka, R: (1646-1705):
- stockrecorder in ?, The Hague, Netherlands, Haags Gemeentemuseum, Code: Ea 532-1933
canned recorder or stockrecorder, Info: 0-0-0-0
- recorder in c2, Amsterdam, Netherlands, collection Frans Brüggen, Code -
soprano in ebony with ivory rings, Info: 3-3-1-2
- recorder in c2, Leipzig, Germany, Musikinstrumentenmuseum der Universität Lepzig,
Code 1115, soprano in boxwood with ivory rings, Code: 3-2-2-1
- recorder in c2, Edinburgh, Scotland, Edinburgh University Collection of Historic Musical
Instruments, Code 1037, soprano in ivory in Van Eyck-style, Code: 3-2-1-1
- recorder in c1, ex-Liege/Luik, Belgium, private (ex-Van Zuylen) Code -
tenor (in ebony with ivory rings?), where is this instrument now? Info: 2-2-1-2
I have seen a drawing of a Haka-tenorrecorder in grenadill + ivory, made by S.Hirao Kyoto.
I don't know if drawing and measurements are taken from the ex-Van Zuylen instrument.
- recorder in f2, Nürnberg, Germany, Germanisches National Museum, Code (?)
sopranino (in ivory?), Info: 0-0-0-0
- recorder in f1, Sigmaringen, Germany, Fürstliches Hohenzollerisches Museum, Code -
alto, middle-piece by Rijkel, Info: 0-0-0-0
- recorder in f1, Berlin- W, Germany, Instrumentenmuseum der Staatlichen Hochschule für Musik,
code 2798, alto, only foot in boxwood, (with ivory ring) Info: 1-3-0-x
- recorder in f1, Paris, France, Musée du Conservatoire National de Musique code (?)
alto, info: 0-0-0-0
- recorder in f1, St.Hubert, (Country ?), Private collection, code -
alto, fragment, Info: 0-0-0-0
- traverso in c1 (?), Utrecht, Netherlands, Collection Ehrenfeld, code -
traverso in plain boxwood in low pitch, or in d1 in very low pitch; Info: 3-3-1-1
- recorder in f, Gothenburg, Sweden, Historisk Museet, code -, bass in ?, info: 0-0-0-0
- recorder in c2, Vermillion SD, USA, Shrine to Music Museum, code -,
soprano in ebony (?) with ivory rings (ex-Tony Bingham), Info: 0-0-0-0
Two soprano-recorders in Berlin (2786 and 2738) are lost in the War, one alto-recorder in
Firenze (Florence, Italy) seems to be not existing.

Heerde, J.J. van (1638-1691), A. van (1674-ca. 1720), and J. van (1704-1750):
- recorder in f1 The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 33-x-1952
alto in boxwood, foot by Boekhout, Info: 3-3-2-2
- recorder in f1, Edinburgh, Scotland, Edinburgh University, Code 257
alto in boxwood, Info: 3-2-1-1

- recorder in f1 Leipzig, Germany, Musikinstrumentenmuseum der Universität Leipzig, Code 3244, alto in boxwood, Info: 3-2-2-2
- recorder in f1, Stockholm, Sweden, Musikmuseet, Code (?), alto in ?, Info: 0-0-0-0
- recorder in f1, Lisboa/Lisbon (Portugal), Museo Instrumental, Code (?), alto in ?, Info: 0-0-0-0
- recorder in f, Paris, France, Musée du Conservatoire National de Musique, Code (?), bass in ?, Info: 0-0-0-0
- traverso in (?), The Hague, Netherlands, Haags Gemeentemuseum, Code 292-1933 alto-traverso in boxwood, Info: 0-0-0-0
- traverso in d1, The Hague, Netherlands, Haags Gemeentemuseum, Code 68-1983 traverso in boxwood, Info: 0-0-0-0
- traverso in d1 (?), Alkmaar, Netherlands, Private, Code -, Info: 0-0-0-0

Perhaps one recorder stamped IVH (in the USA, Vermillion) is made by J. or J.J. Van Heerde.

Hensing, B: (17..-1750):
- traverso in ?, The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 38-x-1952 alto-traverso in ?, Info: 0-0-0-0
- traverso in d1(?), Amsterdam, Nederlands Scheepvaartmuseum, Code (?), head only, Info: 0-0-0-0
- traverso in d1, Hastings, U.K., Hastings Museum, Code (?), Info: 0-0-0-0

Jager, J. de (1658-1692) and F. de (1685-after 1707):
- recorder in f1, The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 279-1933 Only middle-piece (and foot?) in boxwood, Info: 3-3-2-x

Parent, M. (1663-1720):
- recorder in f1(?), Leningrad, USSR, Museum of Musical Instruments, Theatre, Music and Film; Code (?), alto, Info: 0-0-0-0
- 2 recorders in ?, The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 82-x-1952 and Ea 1-1985; chord flutes in boxwood(?), Info: 0-0-0-0
- 2 recorders in a1/c2, Berlin-W, Germany, Instrumentenmuseum der Staatlichen Hochschule für Musik; codes 2832 and 2833, 2 chord flutes in maple(?) info: 0-2-1-1

Rijkel, C. (1664-1726):
- recorder in f1(?), Paris, France, Musée de Conservatoire National du Musique Code (?), alto, fragment, Info: 0-0-0-0
- recorder in f1, Stockholm, Sweden, Musikmuseet, Code (?), alto in ?, Info: 0-0-0-0

One recorder in Berlin (2809) is lost in the war. See also the Haka-recroder in Sigmaringen.

Roosen, I. (...-....?):
- recorder in f, The Hague, Netherlands, Haags Gemeentemuseum, code Ea 22-x-1952 bass-recorder in maple or fruitwood, Info: 3-3-2-2

Steenbergen, J. (1676-1730):
- recorder in c2 Amsterdam, Netherlands, Collection Frans Brüggen, Code - soprano in boxwood, Info: 3-3-1-2
- recorder in f1 Amsterdam, Netherlands, Collection Frans Brüggen, Code - altorecorder in boxwood with ivory rings (block by Kanji) Info: 3-3-1-2
- recorder in f1 Uithuizen, Netherlands, Menkemaborg, Groninger Museum, Code ? alto in boxwood, Info: 2-3-2-2
- recorder in f1, Stockholm, Sweden, Musikmuseet, Code (?), alto in ?, Info: 0-0-0-0

- recorder in c2, Ketelhaven (Dronten), Nederland, Scheepsarcheologisch Museum, Code (?) soprano in boxwood, from excavation, foot missing. Info: 2-2-2-x
- recorder in f(?), Darmstadt, Germany, Code (?), bass in ?, Info: 0-0-0-0

Two recorders in Berlin (in g1, 2787 and in c2, 2785) are lost in the War.

Terton, E. (1676-1752):
- recorder in c2 The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 374-1933
  soprano in boxwood with silver ornamentations, Info: 3-3-2-2
- 2 recorders in f1 The Hague, Netherlands, Haags Gemeentemuseum, Codes Ea 31-x-1952 and Ea 978-1933, altos in boxwood, Info: 3-3-2-2
- recorder in f1, Brussel, Belgium, Instrumentenmuseum van het Koninklijk Conservatorium Code 1038, alto in boxwood with ivory rings, Info: 2-1-2-1
- recorder in f1, USA (California), Private, Code -,
  alto in boxwood with ivory rings, Info: 2-2-1-1
- alto in f1 Zaandam, Netherlands, Private, Code -
  alto in ivory, foot shortened, Info: 1-2-3-1
- alto in f1 Hazerswoude-Dorp, Netherlands, Private, Code -
  alto in boxwood with ivory rings, Info: 3-3-2-1
- alto in f1, Washington D.C., Library of Congres, USA, Code 871/24
  alto in boxwood with ivory rings, Info: 0-0-0-0
- traverso in d1 The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 49-x-1952
  traverso in boxwood with ivory rings, Info 2-3-2-2

Wijne, R. (1698-1774):
- recorder in a1 The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 323-1933
  third flute in boxwood, Info: 3-3-2-2
- recorder in f1 Oxford, U.K., Bate-Collection, Code 427, 0111 [JM]
  alto in boxwood, foot missing, Info: 2-2-2-2
- recorder in c2 Amsterdam, Netherlands, Collection Frans Brüggen, Code -
  soprano in boxwood, Info: 3-3-1-2
- traverso in d1 The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 11-1935
  traverso in ebony with ivory rings, Info: 2-2-1-1
- traverso in d1 The Hague, Netherlands, Haags Gemeentemuseum, Code Ea 22-1981
  traverso in ivory, centerpiece shortened, Info: 2-2-2-1
- traverso in d1 Heinkeszand, Netherlands, Private, Code -
  traveso in boxwood with 3 centerpieces, Info: 2-2-2-1
- traverso in d1 Utrecht, Netherlands, Collection Ehrenfeld, Code -
  traverso in plain fruitwood, Info: 1-2-2-1
- traverso in d1 Nijmegen, Netherlands, Museum Commanderie van St. Jan, Code ?
  traverso in boxwood with ivory rings, Info: 1-2-2-x
- traverso in d1 Ede, Netherlands, Museum Oud-Ede, Code (?)
  traverso in boxwood with ivory (or bone) rings, Info: 2-2-1-x
- traverso in d1 Vlaardingen, Netherlands, Collection Ton Stolk, Code -
  traverso from excavation in plain boxwood(?), head missing, Info: 1-2-1-x

Wijne, W. (1730-1816):
- traverso in d1 Albstadt Lautlingen, Germany, Sammlung Jehle, Code (?)
  traverso in boxwood with ivory rings, with 3 centerpieces, Info: 2-2-2-1

FoMRHI Comm 1053

Ephraim Segerman

Some English Viol Belly Shapes

The shape of the outline of a viol belly is the result of the maker's concept of it modified by various factors. These include the mold design (allowing for the thickness of the wood) and execution (see Comm 214), the shape that the ribs are bent to (machine-like precision may be expected from a professional today, but not then), and distortions which can occur when the mold influences the back much more than the belly (as seems to be the case with early 17th century English viols). If the viol is centuries old, there are distortions induced by long-term stress from the string tension, the contractions of each piece of wood (different in different directions), the stresses these distortions produce, and the attempts of repairers to keep the instrument assembled in spite of the distortions and stresses.

An accessible measure of accuracy is the deviation of significant points on the shape from the mirror images of the equivalent points on the other side. The deviations we find are not necessarily the deviations between the instrument itself and its original design because of uncertainties in our own measurements. We find the symmetry line by minimising these deviations, and this could mask real deviations from the maker's symmetry line. We also try to find the centres of arcs from the arcs themselves. Accuracy in the centre position is much better in the direction perpendicular to the radius going to the midpoint of the arc than along that radius itself. Uncertainty in measuring the radius itself gets quite big as the angle subtended by the arc gets smaller. So most statements locating the centres of arcs of the shape tend to appear more accurate than they really are. This is an aspect of a shape analysis where it is very easy to delude oneself that one has found the maker's intention that one sought. Coates excelled in this in his book on the subject.

Consequently, trying to reconstruct the maker's concept of the outline of an early viol from its surviving shape is full of uncertainties. Yet it is worth doing as best one can, either if one claims one is attempting to reproduce such instruments as they originally were, or if one is attempting to reconstruct the maker's methods as an exercise in historical research.

Within the accuracy limitations of our measurements and the indications of accuracy given from departures from symmetry, there can be many different successful analyses because there are quite a few geometrical relationships that work accidentally (I've generated three equally-good ones for the V & A Jaye viol, all quite different from each other and the one published by Coates). In this study I've set myself the task of devising a compass-and-ruler procedure that generates the belly shapes of four viols differing in shape and size, two by Jaye and two by Rose. The object has been to find the maximum number of steps in the procedure which are common to as many of the viols as possible, leaving a minimum number of easy choices that will generate the differences in shape.

I have worked from the drawings of the Jaye and Rose viols in the V & A by Pringle and the drawings by Dumoulin of the Jaye viol in the Paris Conservatoire and the Rose viol belonging to Madame de Chambure (that was on loan to the Conservatoire at the time). The latter two drawings probably suffer from a degree of conceptual restoration but I assume that the belly shapes are accurate enough for my purposes here. For short I shall call these the VJ, VR, PJ and PR viols respectively.

A 17th century writer (Talbot) described viols in terms of belly length, maximum widths of upper and lower bouts and the minimum width at the centre bouts. So we may expect these dimensions, plus where along the length these maxima and minimum occur, to be basic parameters of the design. From the drawings of these four viols, these parameters (to the nearest $1/16$th inch) are:

VIOL	AZ	w_L-2VD	w_U-2YJ	AV	VY	YZ
VJ	$17\frac{1}{16}$	$10\frac{9}{16}$	8	5	$7\frac{1}{16}$	5
PR	$21\frac{1}{8}$	$12\frac{9}{16}$	$10\frac{9}{8}$	$5\frac{3}{4}$	$9\frac{1}{16}$	$6\frac{9}{16}$
PJ	$24\frac{9}{8}$	$14\frac{1}{8}$	$11\frac{9}{16}$	7	$10\frac{9}{8}$	$7\frac{1}{4}$
VR	$27\frac{5}{8}$	$15\frac{7}{8}$	13	$8\frac{1}{8}$	11	$8\frac{1}{2}$

a rose in their bellies, and their centres are at Y. The dimensions associated with the minimum width at the centre bouts are not included here because they are generated by the procedure outlined below. From these figures it is quite clear that variations between these viols fall within fairly narrow limits. The size order of AZ, w_L, $^1/_2$AZ, w_V, VY, minimum width, YZ, AV and $^1/_4$AZ seems to be consistently maintained in these viols.

Figure 1

The figures for the maximum width w_L seem a bit unlikely as lengths to start with and perhaps remember. I found that an arc centred on A going through the midpoint between A and Z always goes through the lower corner of the middle bout. This suggests that starting with the corners might be an alternative worth investigating. Figure 2 adds the corners E and I (and their projections onto the central axis N and X) to the basic parameters. Indeed NE is rather more memorable than w_L, being $4^3/_4$, 6, $6^1/_2$ and $7^1/_2$ inches for the VJ, PR, PJ and VR viols respectively. So, given the total length, one finds its midpoint, draws an arc through it centred on A, and decides on an NE length (somewhere between a quarter and a third of the total length). This fixes points N and E. I then found that Y can then be found directly: On the PJ viol, Y is the midpoint between N and Z. On the other three viols NY is the same length as the NE that was chosen. The length of AV seems to need to be independently chosen (though it may be worth noting that V is a third of the way from $^1/_4$ to $^1/_2$ AZ on the PJ and PR viols and half way on the others). Compared to NE, these are $+^1/_4$, $-^1/_8$, $+^1/_2$ and $+^5/_8$ inch respectively. The position of X on the PJ viol is midway between V and Z. On the other viols X is remarkably close to the point two thirds of the way up from A to Z. I can define its position as the distance up from N that the two-thirds-length point is, to the nearest quarter of an inch. These distances NX are less than NE by the amounts $^1/_2$, $^3/_4$ and $^3/_4$ inch for the VJ, PR, and VR viols respectively. The distance XI of the upper corner to the central axis seems to need to be independently chosen (though on all of the viols except VJ, it is the distance from V to the intersection of an arc through E centred on N and VD). It is less than that for the lower corner NE by $^3/_4$, $^7/_8$, 1 and 1 inch for the VJ, PR, PJ and VR viols respectively.

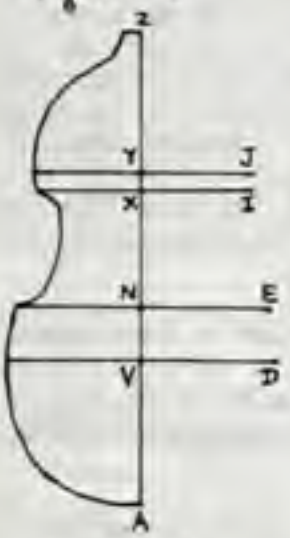


Figure 2

Besides D and J, which will be generated later, we now have all of the points on Figure 2 needed to start finding the arcs of the curve, starting with the total length and picking three other lengths, NE, AV and XI. The process for generating X and Y is different from the others on the PJ viol, but that viol is quite different from the others in another important way, as will be apparent below.

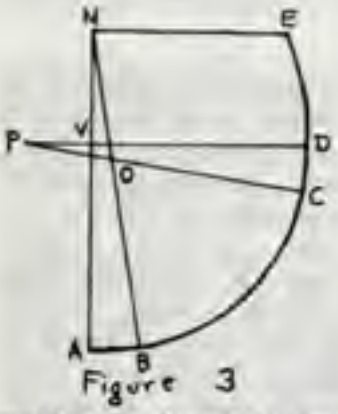


Figure 3

The lower bout shape is assumed to be composed of three circular arcs: AB centred on N, BC centred on O and CDE centred on P. The maximun width is at D and the lower corner is at E.

The layout procedure for the lower bout is as follows: We know N, E, V and A, and that P and D are on the perpendicular to AN at V. On both Rose viols PV - NE and on both Jaye viols PV - $^1/_2$NE. (This is not a consistent difference between these makers since the Ashmolean Rose viol is like the Jaye viols discussed here in this respect). This locates P. Draw the arc centred on P going through E. It intersects PV at D. Next draw an arc in the region of B centred on A, the radius of which is $^1/_2$NE if it is the PR viol and $^1/_4$NE if it is any of the others. Draw the arc centred on N going through A, intersecting the above arc at B. Find the point on NB that is the centre of an arc that goes through B and which just touches the arc centred on P without crossing it. This arc centre point is O and the line PO goes through the point of touching, which we call C.

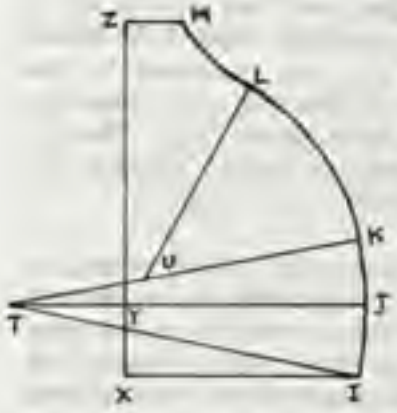


Figure 4

The upper bout shape is assumed to be composed of two convex circular arcs plus a concave curve of varying curvature. The convex arcs are IJK centred on T and KL centred on U. The curvature from L to M gets tighter towards M. One could approximate the LM curve by a straight bit near L and a circular arc at the M end, but I suspect that the LM curve was drawn by eye with the aid of tangents at each end. The tangent at the L end is the tangent to the arc centred on U that goes through Z on all of the viols except PJ, where it goes through a point a third of the way from Z to M on the other side. The tangent at M is the line MI on both Rose viols and one side of the VJ viol. It is the line ME on the PJ viol and the other side of the VJ viol. The length of ZM is $^{13}/_{16}$, $^{13}/_{16}$, $^{15}/_{16}$ and 1 inch for the VJ, PR, PJ and VR viols respectively.

On both Rose viols U is clearly on the centre line YZ. The arc centred on U crosses YZ at the lower edge of the neck block. On the VR viol, I can only locate U by first locating its neck-block point, which is NY up from Y. On the PR viol, U can be found directly, halfway between N and Z. On French viols U is clearly away from YZ, as is shown in Figure 4. The VJ viol has the U's of both halves of the viol about a tenth of YJ (or XI) from YZ, but both on the same side! The intention was either to do the same as French viols (and there was a mistake in picking the centre for drawing one of the arcs), or to be on YZ, as Coates assumed (but Jaye had difficulties in bending the ribs). The former seems to be more likely since the other Jaye viol (PJ) has the same positioning of the U's, but each on its right side in the French style (I may be doing Jaye a misjustice here since it is more likely that the French copied the Jaye style). But the PJ viol has a feature that I've not noticed on any other, namely that U is the same as T, located on YJ, so I to L is one circular arc. This locates the U's on this viol, and to locate the U (or intended U's) on the VJ viol, the average distance above Y is about the same as X is below Y.

Other points that are not used in this study but might be interesting (with no claims about the original design intention) are that the low edge of the neck block on the VJ viol is NE up from X, and it is NE up from Y on the PJ viol. The back fold can be located at a half of NY above Y on the VJ viol, halfway between the neckblock and Y on the PR viol, halfway between X and Z on the PJ viol and halfway between Y and Z on the VR viol.

The layout procedure for the upper bout is as follows: We know X, Y, I, Z and M, and that T and J are on the perpendicular to XZ at Y. Locate T such that TY is a half of XI (except for the PJ viol where T = U and YT is about a tenth of XI on the side of Y being drawn). Draw the arc centred on T going through I. It intersects the TY line at J. For the VR viol, find U such that an arc centred on it just touches the lower edge of the neck block as well as the arc centred on T. On the remaining two viols, locate U as indicated above and find the arc radius that just touches the arc centred on T. Draw the arc centred on U. The point of touching of the arcs centred on T and U is K, and it is on the line TU. Draw the tangent to the arc centred on U that locates L (UL is perpendicular to the tangent) and is the lower tangent guide for the LM curve. Draw the other tangent and then sketch the curve.

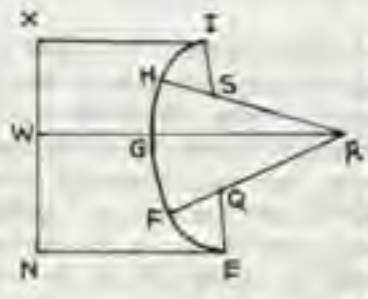


Figure 5

The centre bout shape is assumed to be composed of three circular arcs: arc EF centred on Q, arc FOH centred on R and arc HI centred on S. On all four viols, R is equidistant from E and I, implying that it was generated by the crossing of compass marks of the same radius centred on E and I. That radius is between half and the full distance between E and I. The ratio ER/EI is about $^{5}/_{6}$, $^{7}/_{8}$, $^{3}/_{4}$ and $^{2}/_{3}$ for the VJ, PR, PJ and VR viols respectively. Jaye seems to have preferred a bigger ratio than Rose. He also liked his upper corners sharper. This is the result of having SI perpendicular to XI, while Rose had his S's on the DJ line. If QE is perpendicular to NE, the lower corner is less sharp. This was the choice on the PR viol, but Rose chose Q to be on DJ on the VR viol. Jaye's intentions on his viols here are not clear because on each, one side is one way and the other side the other.

The layout procedure for the centre bout is as follows: We know E, N, X, I, D and J. We generate R as above. Drop a perpendicular from R to NX, with W at the intersection. Find the intersection between RW and DJ, and find G as the point $^2/_3$ of the way from W to that intersection. Draw an arc centred on R through G. Knowing the line it is on, find S so that an arc centred on S goes through I and just touches the arc centred on R. Draw that arc. The point of touching is H, on RS. Similarly find Q and draw the arc centred on Q that goes through E, with F being the point of touching.

I have presented here a procedure (with appropriate variations) for generating the belly outlines of these four viols, resulting in 8 circular arcs (going through points A to L) and a freehand section (LM). For drawing these arcs their centres (N to U) and radii are generated. For the freehand section, the tangents to the curve at each end are given as a guide. The shapes can be drawn reasonably faithfully from the information given here. I suspect that some of this information is more precise than the information used by the original makers.

The motivation for this study was receiving an order to make an English 17th century double bass viol. I don't know of any such instrument that has survived, but some basic dimensions for me to follow are in the Talbot ms. Since I found no shape feature that seemed to depend on size, I expect the above procedure to be relevant. The dimensions given by Talbot in inches are: AZ - $47^1/_8$, YJ - $9^7/_8$, VD - $12^1/_4$ and WG - $6^3/_8$. The fingerboard width at the body-neck join is $3^3/_8$ inch, so I picked $1^1/_2$ inch for my ZM. I wanted to follow the VR viol design as much as possible, so I set V at the midpoint between $^1/_4$ and $^1/_2$ AZ. I found that 11 inches worked for NE. I put X at $^2/_3$AZ. Putting Y such that NY - NE made Y too low (this viol is particularly thin for its length), not allowing an appropriate U to be found on AZ. Finding Y by NY - YZ worked. So did $9^3/_4$ inches for XI. I assumed the neck block thickness ($1^7/_8$ inch), not otherwise being able to generate it (it is needed to get U). I found that to get the given WG and good positions for Q and S, I had to use EI instead of DJ to generate them. There were no more problems, and I'm sure that the resulting shape is a possible one that Rose could have made to these dimensions.

The design procedure given here does not include any golden ratios or other erudite proportions. As I could not find any consistent proportions in the basic dimensions, I decided to stop looking for them. Coates found many in his analysis of the VJ viol, and I am sure he would find them in the others. A good proportion that Coates missed in the VJ viol is that the triangle with corners at the length centre, X and I has sides 3, 4 and 5 inches long. The ratios of perpendicular sides of this triangle on the other viols is smaller than the 3:4 found here, being 2:3, 5:8 (or the golden ratio) and $\sqrt{2}$:2 on the PR, PJ and VR viols respectively. I wonder whether this information is significant.

In this geometrical-analysis business, you rarely find something that you are not looking for, and usually find much more of what you are looking for than you can imagine could just be coincidence and not the maker's intention. Coates looked for and found Jaye the erudite artist-craftsman. I looked for and found Jaye the practical craftsman who wanted to draw out his belly shape in a few minutes (it being quicker to do it individually for each side than to cut and trace a template).

I suspect that no two surviving English viols by the same maker before Barak Norman has the same design, and that few originally had. The fact that the back is more symmetrical than the belly in the examples where both are drawn (by Pringle) implies that only a bottom false plate was used for a mold, which suggests that efficiency in varying sizes and shapes was more important than the efficiency of production of a particular design, which would be enhanced by a fuller mold.

By analysing four viols instead of one, I had hoped to find consistent geometrical relationships that might pertain to all English viols of this period. Actually I found very few candidates for such relationships (AE - $^1/_2$AZ and the method for generating the RG arc), but if we exclude the PJ viol as one on a different design principle, there are a few more (NY - NE, AX - $^2/_3$AZ, TY - $^1/_2$XI and LZ and MI are tangents to LM). Yet I had to violate two of these in designing the double bass viol (perhaps Rose would not have designed such a viol with the dimensions Talbot gave). I very much doubt whether the full procedure I've presented and all of the relationships that I found represent just how these makers designed these viols. Nevertheless, I would be quite surprised if there was no resemblance at all between the above and what they did.

FoMRHI Comm 1054 Bill Napier-Hemy

MERSENNE'S MONOCHORD

The central chart in Mersenne's exhaustive treatment of the monochord, appearing as Table 2 in Proposition IX of the "First Book of String Instruments" in the Harmonie Universelle,[1] can be confusing and frustrating to use as it contains a number of errors, both in the 17th century editions and in Chapman's translation.[2] I have corrected what errors I have found and incorporated these corrections into the chart which follows.

Mersenne's chart compares the interval relationships of a string of 3600 units to a second identical string, tuned in unison with the first and divided into two sections by a moveable bridge, either side of which the string can be sounded. Mersenne thus deals with three lengths of string: the open string of 3600 units, and the two sounding portions of the second string, these varying with the placement of the bridge. If we assign the letter "x" to the variable speaking lengths on one side of the moveable bridge dividing the second string, then the six columns of the chart can be explained as follows:

Column I lists the interval names and the numerical ratios for 3600/x.
Column II assigns note names to x, given that the open string of 3600 units is tuned to "c".
Column III lists the different values for x.
Column IV lists the interval names and numerical ratios for the two sounding portions of the second string. This can be expressed as x/3600-x. Mersenne does not assign names to all of these intervals, giving only the numerical ratios in some cases.
Column V lists the different values for the speaking lengths of the remainder of the second string, or 3600-x.
Column VI gives the interval names and numerical ratios of the remainder of the second string as compared to the open string , or 3600/3600-x. As in Column IV, some of these intervals are expressed by numerical ratio only and have not been assigned an interval name.

Mersenne also includes the names of the intervals between every step of Columns III and V, being mainly semitones and commas; these I have omitted for the sake of visual clarity. Readers interested in these intervals should refer to Mersenne's chart, keeping in mind that there are mistakes in both the original and in Chapman's translation.

The majority of the errors in Mersenne's chart appear in the calculation of the ratios for dissonances, leading one to suspect that this work had been entrusted to an inexperienced or careless assistant and had not been checked before publication. The mistakes in Chapman's translation consist of one typographical error, and the mistranslation of Mersenne's abbreviation "mj." as "major", where the "j" is actually substituting for "i" in an abbreviation of "mineur".

MERSENNE'S MONOCHORD

I	II	III	IV	V	VI
P8 2/1	C	1800	Unison 1/1	1800	P8 2/1
M7 15/8	B	1920	8/7*	1680	15/7
m7 9/5	B♭	2000	M3 5/4	1600	M9 9/4
m7 16/9	B♭	2025	9/7	1575	16/7*
M6 5/3	A	2160	P5 3/2	1440	M10 5/2
m6+ 8/5	A♭	2250	M6 5/3	1350	P11 8/3
25/16	G#	2304	16/9*	1296*	25/9*
P5 3/2	G	2400	P8 2/1	1200	P12 3/1
40/27	G	2430	27/13*	1170*	40/13*
T.T.45/32	g♭	2560	32/13	1040	45/13
25/18	f#	2592	18/7	1008	25/7
P4 4/3	F	2700+	P12 3/1	900	P15 4/1
M3 5/4	E	2880	P15 4/1	720	M17 5/1
m3+ 6/5	e♭	3000	M17 5/1	600	P19 6/1
75/64*	d#	3072	64/11*	528	75/11
M Tone 9/8	D	3200	P22 8/1	400	M23 9/1
m Tone 10/9	D	3240	M23 9/1	360	M24 10/1
M s.t.16/15	d♭	3375	false 29 15/1	225	P29 16/1
m s.t.+25/24	c#	3456	P33 24/1	144	false m 34 25/1
	C	3600			

M = Major, m = Minor, P = Perfect, T.T. = Tritone, s.t. = Semitone.

* Miscalculation in original version of chart.
+ Error in Chapman.

[1] Marin Mersenne, Harmonie Universelle (Paris: 1636, 1637). This chart also appears in Mersenne's Harmonicorum Libri (Paris, 1635).

[2] R. E. Chapman, trans., Harmonie Universelle, The Books on Instruments, by Marin Mersenne (The Hague: Nijhoff, 1957) 36-37.

FuMRHI Comm 1055

F.Raudonikas. Essays of Pythagorean system.
1. Primary concepts. 2. Two-dimensional syntax.

01.1. Institution of theory. The melody (i.e., a succesion of some pitches which are in definite relations and taken in definite rhythm) is recognized as the same until rhythm and pitch-relations remain the same. The absolute frequencies are unessential for recognition of melody - the last one is invariant relatively to frequency shift. Ordering of the pitches of melody is called its scale. Being selfdependent structural whole or modus, this scale takes the certain state in some modal scale. Because of unessentity of absolute frequencies, state of modus has a combinatorical meaning and is estimated from some element of modal scale, accepted as original one. In opposition to arbitrary set of pitches, modal scale institutes by modulatory principle i.e., can contain any its modus in any number of nonidentical combinatorical states.

The same rhythm may be intonated by different pitch-modes. The same pitch-mode may be taken with different rhythms. This peculiarity of musical perception point out independent existance of a) the space of pitch-perception (corresponds to trivial axis of frequencies), b) the space of rhythm-perception (corresponds to trivial axis of time). Both spaces are conjugated - pitch-mode can not be taken out of some rhythm, the taking of the last one always is in some pitches. The space of perception implies the trivial degrees of freedom /1/ of fact which is described under condition that perception acts in description as the subject of measurement.

By experiments with monochord Pythagoras discovered structure and metrics of the space of pitch-perception. These results may be called laws and formulated by such way: 1) arithmetic progression of percepted values is mapped by geometric progression of frequencies /2/, 2) in the space of pitch-perception doubling of frequency acts as recurrent operation /3/.

According to first law psychologically adequate space of interval R looks like L (= $\log_B R$). /4/ Considering B as abstract value we can represent by L and investigate the structure of modes in its one-, two-, three-, and four-dimensional forms. By acception of the unitary element of last one as $\log_2 2$ we obtain description of the contradistinctions of musical modalities, or modal scale itself. Respectively theory contains the relative (i.e., invariant relatively to value of unitary element) and the absolute /5/ (i.e., invariant relatively to frequency shift) syntaxes.

01.2. Harmony elements. The state or thesis of degree L is expressed as $L_U = mU - u$; (1). There are relative frequencies B (ambitus) and M (modul) such that $M < B$ and $m = \log_B M$. Argument U is integer, which takes any values. Determination L_U for some succesion of values U is called the evolution of modus. Set of values of argument defines the number of degrees and if this set contains U values (except 0) then modus has (U + 1) unrepeated (inhomonymous) degrees. This set defines the volume of evolution of scale. $\log_B B = 1$, therefore unit defines the relation of homonymity (repetition) so that homonymous degrees are L and L + a (a - integer). The extent of ambitus is original condition, therefore already under U = 0 modus has L = 0, L = 1 i.e., the bass and the descant boundaries. Others L are defined in homonymity of boundaries (i.e., $0 < L < 1$). The metathesis u is such integer that $0 < (mU - u) < 1$. The meaning or dynamis of degree D is expressed by mantissa of relation u/U (ascended dynamis), or (u + 1)/U (descended one). The characteristics of these relations remain constant under arbitrary volume of evolution and indicate the combinatorical state of modus. /6/

01.3. musical modalities. Term "modal" is opposed to term "tonal" and come into use in connection with crisis of the concept of tonality, caused by appearance of methods by Schönberg, Hindemith etc. /7/ In the system of tones it is equally absurd to say that "nothing" (i.e., not modus) can have definable combinatorical state, and that "something" (i.e., modus, not certainly diatonic one) may be atonal (i.e., have indefinable combinatorical state). Traditional orthography bases on diatonic scale (B = 2, M = 3/2, U = 6). It is small wonder that mentioned authors, which used this orthography for the sake of notation of their works, did not discover possibilities for noncontradictory setting of modulations, which are reasonable in their methods.

Tonality i.e., identity of the state of modus, necessary corresponds to modality i.e., identity of the modus of state, where "identification" can imply only modulations. Thus, in usual musicological meaning term "tonal" cover term "modal". Meanwhile structure of the system of tones yields more relevant using of term.

Adjective "modal" is applying to some forms, which display the certain property in different degrees. For example, logical modality is treated as mean for expression of degree of the reliability of judgement (Hamilton). Let's represent trivial diatonic modes in order of the appearance of its tonics in the "circle of fifths".

0/6	F	G	A	H	C	D	E	f
1/5	C	D	E	F	G	A	H	c
2/4	G	A	H	C	D	E	F	g
3/3	D	E	F	G	A	H	C	d
4/2	A	H	C	D	E	F	G	a
5/1	E	F	G	A	H	C	D	e
6/0	H	C	D	E	F	G	A	h

It is easy to see that in this succesion modes go by degrees of decreasing of majority (= increasing of minority). Here major and minor are questioned properties. Degrees of its display verified by index of mode /8/. By such treatment of modality we obtain concept, homologous to "ethos" of Old Greek harmony. However this concept is formal one and denominations like Dorian, Phrigian, etc. become redundant. Because of index, the musical modality is proved to be the calculable entity.

Musical modalities are similar to "modales de re" of medieval logics i.e., are connected by structure of modes. The same relative mode can connect different modalities. The seme modality may be connected by different absolute modes. If given mode connects given modality, then its inverse connects other modality. However, verifying equivalence of distinguished modalities, the inverses not certainly display extremum of distinction. For example, if into basis of our scale had been taken Zalzalean /9/ diatonic, then whole of traditional theory would be out of minor. Meanwvile the major and minor of traditional theory don't exhaust neither resource of "possible worlds", nor resource of the setting of contradistinctions The absolute four-dimensional continuum fixes universum of the symmetries of musical modalities like periodic system of chemical elements.

02.1. Melodic ciphers. Increasing of argument U not certainly caused increasing of L_U. Last one is oscillating function, therefore connection between L of degree and its number in scale's order is not obvious one. In order to explain sense of this statement, I should like to offer to reader question: if F is origin of the scale, what number has C in its order ?

Reader can object: "Question is not enough definite one. In pentatonic this number will be other than in diatonic, in chromatic - other than in both preceding ones." It is true. Value of the number of degree in scale's order (it is called the melodic cipher) essentially depends from volume of evolution. Traditional names "prime",

" B, C, etc. also are numbers of scale's order. However meaning, which traditional theory gives for these names, do not corresponds to circumstances, mentioned by reader. melodic cipher and L are functions of U. However L_U is invariable one, while melodic cipher keeps itself only under the few values of argument. Then it alters by sophisticated, but no arbitrary way.

Fig.1 represents evolution by B = 2, M = 3/2, $0 \leq U \geq 12$. Every level here corresponds to definite step of evolution (i.e., to definite value of U). Adding the new degree, every step forms selfdependent modus, which includes all degrees, appeared before this step. In other words any evolutional younger mode is the superposition of all modes determined by earlier steps of this evolution. On every step some melodic ciphers change and it is difficult to imagine less reliable basis for designation of tones. Reader can see the assemblage of mentioned scales: pentatonic (4-th level), diatonic (6-th level), chromatic (11-th level).

02.2. Dynamic lines. Letters on the top of fig.1 give chromatic scale in traditional representation. Axis U corresponds to "circle of fifths". Being one-dimensional projections of evolution, traditional scale and circle of fifths conceal from theorist details of structure, expressed on fig.1 by slanting lines. meanwhile these lines describe important peculiarities of modus.

Reader may notice that L_2, L_4, L_6, L_8, L_{10} (fig.1) form the collineation. Let's represent relative frequencies of these positions by powers of relevant ratios of 3 to 2 (i.e., $3^U/2^u$).

$3^2/2^3$	$3^4/2^6$	$3^6/2^9$	$3^8/2^{12}$	$3^{10}/2^{15}$
G	A	H	Cis	Dis

It is clear that all u/U = 1 + 1/2, therefore we can say that all these degrees have identical dynamis (= 1/2) and belong to modus with combinatorical state 1. Hence all other positions lie on other lines, they can not have the same D. Because all these lines ascend from 0, all last positions belong to the same combinatorical state. Because of explanatory possibilities of fig.1 we can write down last statements without supplementary calculations.

L_{12}, L_9, L_6, L_3 also form collineation. However last one descends to (0) - homonym of 0. Let's represent these positions by above described way.

$3^{12}/2^{19}$ $3^{9}/2^{14}$ $3/2$ $3^{-1}/2$

comma Gis H D

To all these positions $(u + 1)/U = 1 + 2/3$, therefore they have dynamis 2/3. For clear reason dynamis of positions is dynamis of line. This and other lines have combinatorical state 1, if they descend to (0). Thus, relations u/U and (u + 1)/U relieve to see deep connection between combining of degrees and combinatorical state of modus. The first continue the last one, being realized in set of symmetries of evoluting modes.

In order to be sure that dynamis has not sense of angular parameter, let's return to fig.1. If M increases, then descended collineations rotate around (0) and approach to descant. Under some M' collineation (0)-10 and descant boundary of modus (i.e., perpendicular to (0)) become join. If M decreases, then ascended collineations rotate around 0 and approach to bass. Let position 12 be neglected. Then under some M" collineation 0-7 and bass boundary of modus (i.e., perpendicular to 0) become join.

From this it follows that under any M (M' > M > M") all positions of modus (except 12-th) remain in limits of its boundaries. Under considerable alterations L of all positions its D remain the same as under M = 3/2. It is easy to show that all audible properties of modus here also remain constant. In consequence of above mentioned superposition this is true for audible properties of all evolutional earlier modes.

Positions 1, 3, 5 form collineation which does not go through 0, but is parallel to line 0-10. Collineation 7, 9, 11 has the same properties. These circumstances suggest that dynamis of line 1-5 (defined from 1) and dynamis of line 7-11 (defined from 7) are equal to dynamis of line 0-10. In consequence of the parallelism of collineations 1, 4, 7 and 5, 8, 11 with line 12-(0) follow analogous statement. In treatment of these lines we used transpositions. However such approach is not the unique possible one. Fifths E-H and F-C in C-Dur, for instance, are never being considered like transpositions of C-G. Discussed collineations show stages of structural identity. However employed means do not require any supplementary statements about its acoustical nature. Without any saying about consonances and dissonances we can represent the structural problem in quite explicable form of dynamic figure.

02.3. Conditions of integrity. Dynamic figure of modus is a complex whole, which in some respects is similar to usual number. In relation to its automorphisms figure is analogous to number and its divisors. In relation to the space of more extensiv set of L_U figure itself may act as divisor. In musicological context divisibility of figure corresponds to cadence, divisibility of the space of L_U - to modulation.

As element of regulare system of points, the point coincides with arbitrary number of lines i.e., is indefinite one. Identification of finite set of points limits the number of possible collineations. Under such condition point is definite, because its coincidences are not arbitrary ones. Increasing number of coincidences, evolution institutes the hierarchy of collineations. The first of them is modus 0/0 - the collineation of "oldest" points (i.e., ambitus, or volume of figure on axis L). If set of L_U does not contains modus 0/0, then it is not the structural whole. Collineation of "youngst" points is diagonal (i.e., volume of figure on axis U, or index). Behavior of various collineations of modus depends from value m ($=\log_B M$) and constitutes the entity of two-dimensional relative syntax.

02.4. Some examples. Fig.2 represents all modes of evolution by B = 2, M = 3/2, U = 6 i.e., trivial diatonic modes of traditional theory. Usual symbols of tones are pointed under positions for the sake of clearness. Reader can notice that positions of all modes lie on contours or on diagonals of figures. Positions C (mode 0/6) and E (mode 6/0) make exception and are called free.

Traditional theory accepts all these modes like equipollent ones. Because of such acception arises absurdity: tritone as dominant (6/0) or subdominant (0/6) of diatonic mode. It is easy to show that presence of free positions make modes 0/6 and 6/0 useless for cadential setting. Thus, any mode forms the modulatory space, however cadential syntax is incompatible with free positions.

Let's notice also that mode 4/2 is minor of traditional theory, while major mode has index 1/5. Thus, fundamental contraposition of doctrine about harmony confronts noncontrary modes. Precedent of phonic system by v.Oettingen (1860-th) serves as evidence that such an approach was not always indisputable one.

Let's turn to unexplainable duality, which traditional theory dysplays relatively to consonance of fourth. In this connection also may be mentioned unreliability of the concepts of hypomodus, authentity-plagality, etc. Theorists usually are not influenced by any

doubts about nature of "circle of fourths". Nevertheless the evolution by B = 2, M = 4/3 forms mirror of evolution by B = 2, M = 3/2.

This fact may be illustrated by example of piano's keyboard. Evolution by 6 fifths does not concern black keys, if it starts from F. Evolution by 6 fourths satisfies this condition, starting from H. White keys form join of both syntaxes, while L_0 of one of them coincides with L_6 of other. In other words combinatorical states of both diatonic syntaxes have tritone as discrepance. From this it readily follows, that white keys (except F and H) of the syntax of fifths act like accidentals in syntax of fourths (and vice versa). Recognizing last one by ear (as "plagal" modalities), we can not explain it because of orthography.

Fig.3 presents all modes of evolution by B = 2, M = 4/3, U = 6. Let's compare fig.3 and fig.2. It is easy to see that if major of the syntax of fourths (5/1, fig.3) may be called hypomodus of usual major (1/5, fig.2), then inverse nomination is equally true. The same relations have any other mutual "definitions" of interreflecting syntaxes. Under reasons, which reader already knows, positions on fig.3 have not signs of tones.

It is great merit of Guido, that he took into basis of our notation heptatonic of the syntax of fifths. By this action was obtained two-dimensional text with essentially musical content. /10/ However two-dimensional text does not verify the two-dimensional structure of pitch-relations, if rhythm of melody is translated. Therefore theorists are too confident, if consider fact of text like fact of selfexplanatory structure of pitches.

References.

/1/ Degrees of freedom is the mathematical concept, expressed number of independent variables in equation. Degrees of freedom define number of coordinates in spatial representations of the solutions of equation. Zero degrees of freedom means that equation contains only fixed parameters. Such equation has one-dimensional spatial representation. By one independent variable equation has two-dimensional representation etc. In order to say that one-dimensional scale has zero degrees of freedom, it is necessary to know equation of its evolution. Arbitrary set of tones has indefinable number of the degrees of freedom.

/2/ From audio and video perceptions of equal rhythm descends linear measures of time and length. The last ones give psychologically adequate description of the space of pitch-perception only in logarithmic form. For example, we obtain succesion of equal musical in-

progression, by division (visible) of the string of monochord in geometric progression.

Of particular importance is fact that harmonics form arithmetic progression of relative frequencies. From this follows substantial asymmetry of the spectrum of musical tone in the space of pitch-perception.

/3/ This phenomenon usually is called the octav-hearing. However adjectiv "octav" is true, if degree with relative frequency 2 has 8-th position in scale's order i.e., in highly limited number of cases.

/4/ The space of musical syntax is accepted as Euclidian one. It may be reminded in this connection about researches of stretched tunings (see. f.ex.: D.W.Martin, W.D.Ward. Subjective evaluation of musical scale temperament in pianos // Journ. of Amer. Acoust. Soc. XXXIII, 1961. P. 582-588.) as about unique case of the careful investigations of perception under condition of sufficiently long ambitus (8 octaves). It was showed that percepted ambitus is on 1,2 % wider than exact one. This result may point out approximate character of assumption about Euclidian properties of the space of pitch-perception.

/5/ Taking antilogarithms under some original conditions, we represent absolute syntax in form of lengths or frequencies. These actions do not belong to theory, but relate to organology, or other empirics. Text has the arbitrary pitch level.

/6/ Let's consider evolution by $m + g$, where g is integer: $L_U = (m + g)U - u' = mU + gU - u'$. Because gU and u' are integers, L_U remain the same as in evolution by m ($= mU - u$). From this it follows that $gU - u' = -u$ and $u' = u + gU$. Dividing of both parts of latest equality by U, we obtain $u'/U = g + u/U$; (2). By analogous way it is shown that $(u' + 1)/U = g + (u + 1)/U$; (3). We proved, that in evolution by $m + g$ dynamis of L_U remains the same as in evolution by m, while g indicates the new combinatorical state of modus.

Let $g = p$ and $0 < p < 1$. It is easy to obtain expressions like (2) and (3) for noninteger characteristic of combinatorical state. Of particular importance is the case, in which $p = L$. This case lies in basis of the trivial indication of tonality. Traditional theory proceeds from fixed volume of evolution ($U = 6$), therefore competency of such indication is highly limited (for instance, under the same key signature exist three different combinatorical states of pentatonic modes, while 5 proper degrees of dodecaphonic mode look like accidentals). It is no difficult to modificate

this indication for arbitrary volume of evolution. However it is obvious that even in modified form such indication has sense only under B = 2, M = 3/2.

/7/ W.Apel, R.T.Daniel. The Harvard brief dictionary of music. New York, 1961. P. 304. Traditional tonality is phenomenon of highly specified kind of orthography. It is obvious that heptatonic scale by B = 2 can not be written without accidentals, if it can not be evoluted by M = 3/2. Scales with "perpetual" accidentals either may be evoluted by other B, M, U, or its evolution does not exist at all. It is equally obvious, that non-evoluted set of tones is non-modulating one and that non-modulating set excludes any systematic setting.

/8/ Index point out parameters of the evolution of modus. Its lower part expresses number of positive values of argument, upper part - number of negative ones. Sum of both parts is equal to volume of evolution. For example, index 1/5 (major mode) means that mode is evoluted by 5 ascended fifths and 1 descended one. Emphasized letters corresponds to inverted tones. It is easy to see that last ones are obtained under negative U.

/9/ About Zalzal see: A.Ellis. On the musical scales of various nations // Journ. of the Soc. of Arts. London, 1885. No.1. 688. Vol. XXXIII. P. 493. Zalzalean scale may be represented by B = 2, m = 5/17, U = 6.

/10/ Modul and ambitus of the scale of traditional theory are fixed parameters. However number of inhomonymous degrees can be freely changed. From this it follows that is possible two-dimensional representation. Any independent connection, which is additionally put into equation, decreases its number of degrees of freedom by unit. Traditional notation bases on heptatonic of scale i.e., fixes number of inhomonymous degrees (= repeals the latest degree of freedom). Tonality with its accidentals is highly witty invented operator of the pitch-space of text. This space become one-dimensional in order to relieve the place for musical rhythm. Besides of the length of modulatory space, in our musics freely changes only its duration.

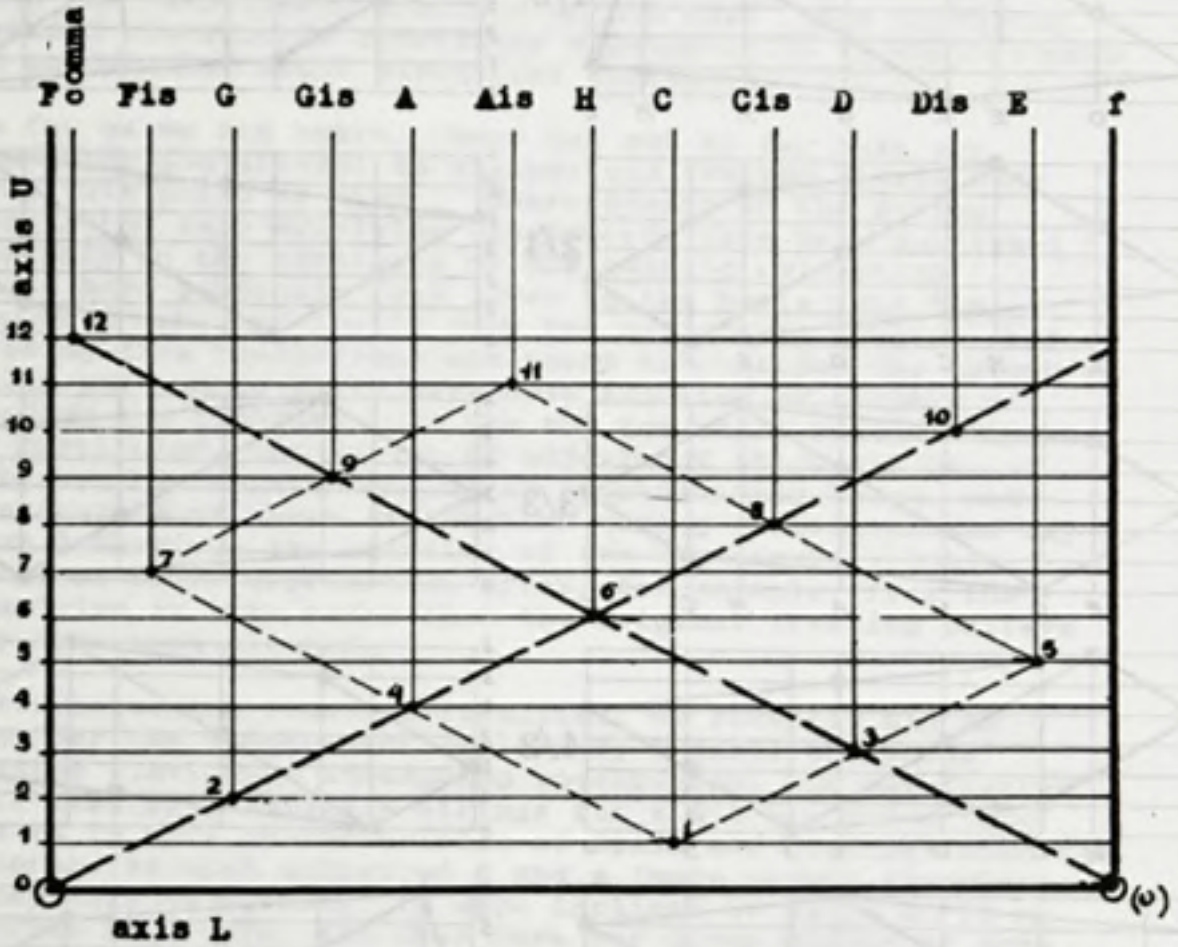

Fo
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Fig.1

M = 3/2, B = 2

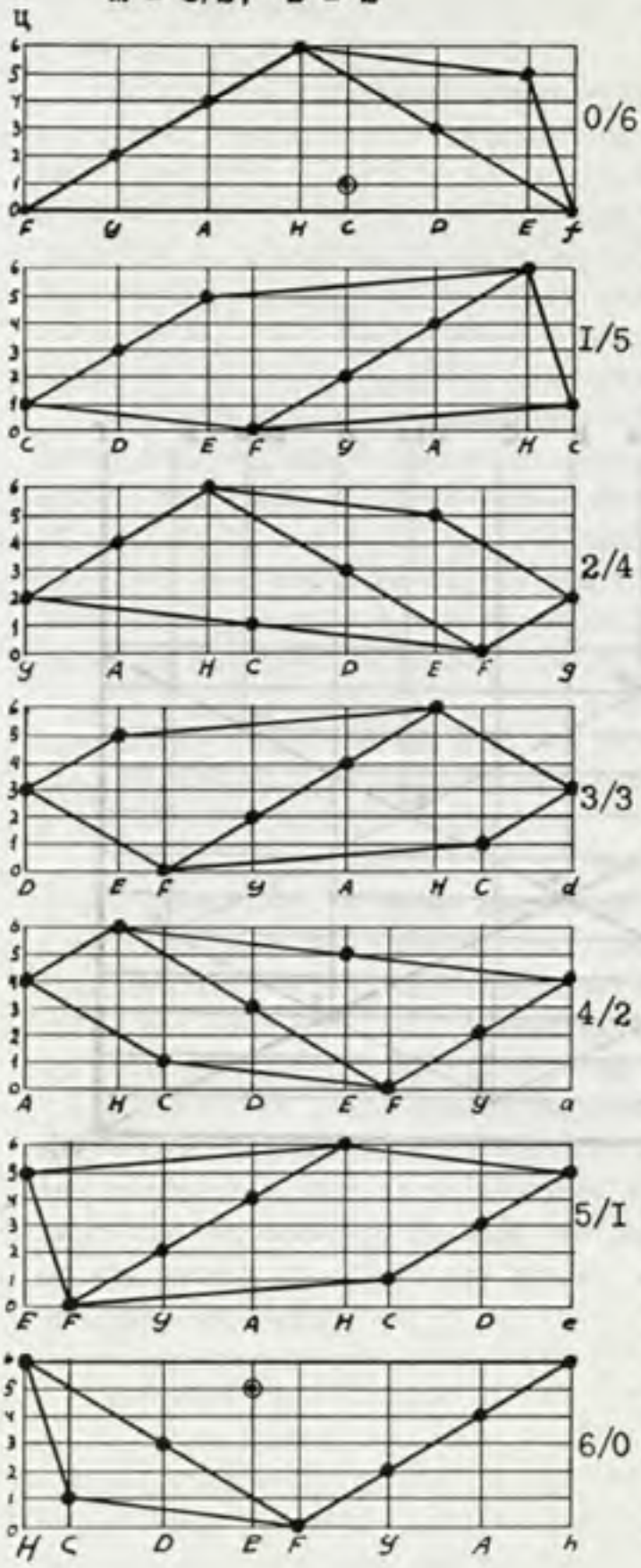

Fig.2

M = 4/3, B = 2

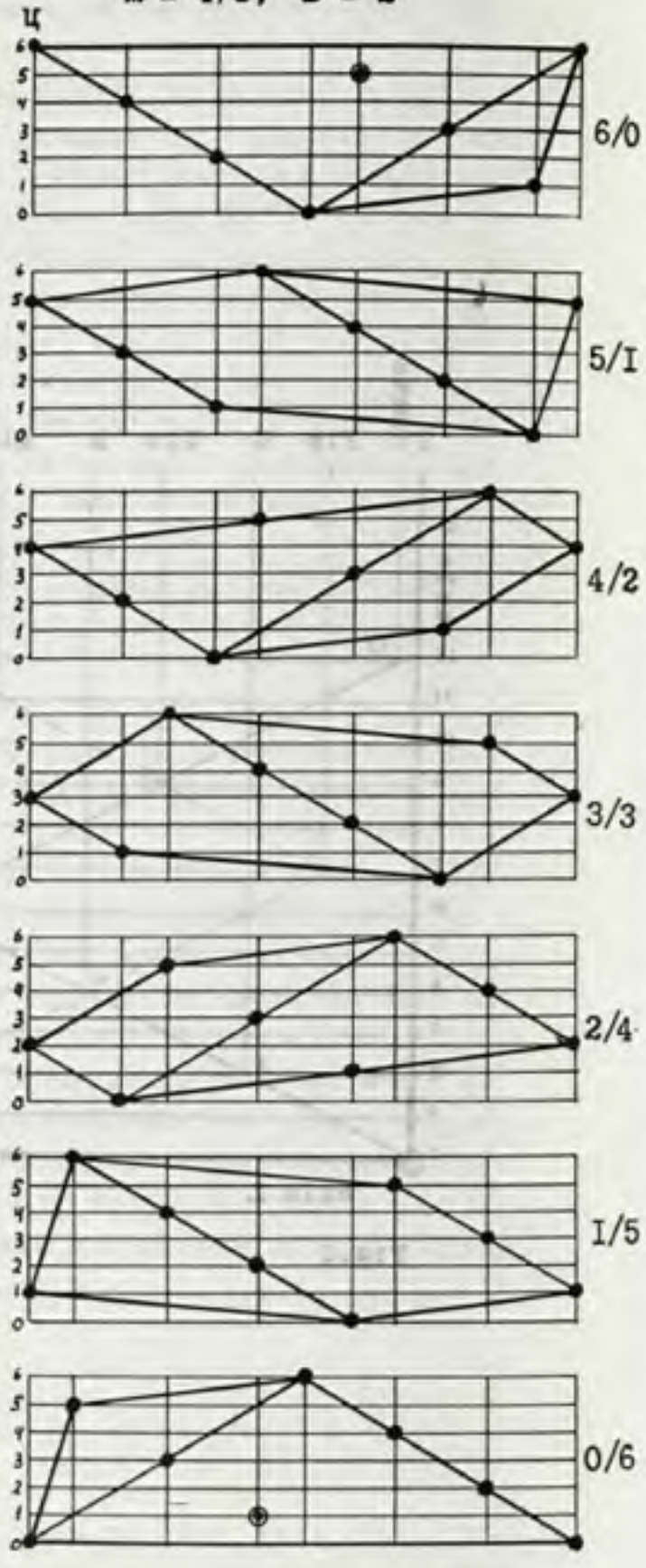

Fig.3

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Peter Bavington and
Miles Hellon

Evidence of Historical Temperament from Fretted Clavichords

The tuning of a fretted clavichord depends only partly on the tuner. Where two or more notes are obtained from the same course of strings, the sizes of the intervening semitones are fixed by the maker, presumably in accordance with the temperament practice of his day. Thus surviving fretted clavichords constitute a potentially valuable source of information about historical tuning.

As far as we are aware, there has not so far been any thoroughgoing attempt to analyse old fretted clavichords from this point of view[1]. Measurements of the string lengths of many surviving clavichords have been published (notably in the catalogue of the Leipzig collection[2]). These have generally been taken on the basis that the tangents rose vertically from the keylevers; however, before drawing firm conclusions one needs to consider the extent to which the tuning would have been adjusted by sloping or bending the tangents. In the top few notes of the compass, in particular, the amount of adjustment which can be achieved by tangent-bending is comparatively large, and constraints of space rather than tuning considerations may have determined the position of the key-levers. Other problems of interpretation arise, for example, from the suspicion in some cases that the original fretting pattern may have been altered.

Notwithstanding these difficulties, we recently had to consider the temperament implied by a small anonymous fretted clavichord undergoing restoration. It was fretted pair-wise with separate strings for e and b. Since this system is more characteristic of Spain and Portugal than the alternative with unfretted d and a (more common elsewhere, especially in Germany) we were inclined to think of it as Iberian in origin, and this idea was given colour by some un-decipherable but plausibly Portuguese writing on the soundboard[3].

Table 1 gives string lengths for each of the fretted pairs on the instrument, taken in the usual way assuming vertical tangents, along with the size of the implied semitones in cents[4]. For comparison, Table 2 gives the size in cents of various possible semitones.

We were aware that Ripin[5] had suggested that the 'e/b' fretting was a means of obtaining a compromise d#/e♭ whilst using a basically mean-tone tuning. However, the size of the semitones seemed too big for mean-tone 'chromatic' (even Silberman ¹/₆-comma mean-tone) yet too small for mean-tone

'diatonic'. The implied semitones are, in fact, roughly equal and average 100 cents.

It began to look as if equal temperament was intended. This surprised us at first, since we had assumed that pair-wise fretting, since it makes some keys easier to play in than others, implied an unequal tuning favouring just those easier keys. However, a little research in the Leipzig catalogue revealed other pair-wise fretted instruments that could plausibly have been intended for equal temperament. One candidate, for example, is no. 3072 by J.C. Speisegger, dated 1725 (see Table 3[6]). Equal temperament also fits very well with the implied semitones found on the 1787 Hubert, no. 22 in the same collection.

With the rediscovery earlier this century of unequal tunings and their reintroduction into musical performance, there has been a tendency to look for them everywhere and to underestimate the role of equal temperament. Recently, however, the tide has begun to run the other way: Rudolph Rasch[7], for example, convincingly argued for equal temperament for Bach's '48', and Thomas McGeary[8] found evidence of the preponderance of equal temperament in eighteenth-century German tuning instructions. It is intriguing to find that the evidence of this little clavichord, subject as it is to the qualifications discussed above, points the same way. If truly Iberian in origin, does it give us an indication of Scarlatti's tuning practice?

Table 2

Size in cents of various possible semitones

Equal-temperament semitone	100
1/4-comma mean-tone:	
'diatonic' semitone (eg b-c)	117
'chromatic' semitone (eg c-c#)	76
1/6-comma mean-tone ('Silbermann'):	
'diatonic' semitone	110
'chromatic' semitone	86
Pythagorean diatonic semitone	90
18:17 pseudo-equal-temperament	98

Table 1

Anonymous ?Iberian clavichord
String lengths and size of semitones on fretted pairs

Notes	Sounding lengths	Size of s/tones	Notes	Sounding lengths	Size of s/tones	Notes	Sounding lengths	Size of s/tones
	mm	¢		mm	¢		mm	¢
c-c#	743/703	96	c^1-$c\#^1$	479/454	92	c^2-$c\#^2$	265/249	108
d-e^b	692/654	97	d^1-e^{b1}	442/416.5	102	d^2-e^{b2}	237/221	121
f-f#	628/592	102	f^1-$f\#^1$	384/363	97	f^2-$f\#^2$	198/188	90
g-g#	582/553	88	g^1-$g\#^1$	347/330	87	g^2-$g\#^2$	177/187	101
a-b^b	542/508	112	a^1-b^{b1}	314/296.5	99	a^2-b^{b2}	156/147.5	96
						c^3-$c\#^3$	132/124	108

Average size of semitone: 100 ¢

Table 3

Clavichord by Johann Conrad Speisegger, 1725
(Leipzig, Karl-Marx Universität, no. 3072)

Size of fretted semitones in cents (to nearest cent)

c-c♯:	85	c^1-$c♯^1$:	92	c^2-$c♯^2$:	93
d-$e^♭$:	103	d^1-$e^{♭1}$:	114	d^2-$e^{♭2}$:	104
f-f♯:	84	f^1-$f♯^1$:	104	f^2-$f♯^2$:	104
g-g♯:	95	g^1-$g♯^1$:	102	g^2-$g♯^2$:	108
				$g♯^2$-a^2:	103
$b^♭$-b:	95	$b^{♭1}$-b^1:	91	$b^{♭2}$-b^2:	119
				b^2-c^3:	98

Average size of semitone: 100 ¢

Notes

[1] The subject is touched upon, in passing, by Edwin M. Ripin in "A Reassessment of the Fretted Clavichord", *Galpin Soc. Jnl. XXIII* (1970).

[2] Hubert Henkel: *Clavichorde*, Leipzig and Frankfurt/Main 1981, ISBN 3 920112 91 1.

[3] The writing was not contemporary with the instrument.

[4] In Table 1 (and Table 3) the calculated size of each semitone in the scale varies from octave to octave. To play in tune these semitones must be the same size, i.e. c-c♯ must be the same as c^1-$c♯^1$, and so forth. This is evidence that tangent-bending must have originally been used, at least to some extent, since there is no other way of achieving this.

[5] *op. cit.*

[6] The information in Table 3 is derived from Henkel, *op. cit.*

[7] Rudolph Rasch: "Does 'Well-tempered' mean 'Equal tempered'?" in *Bach, Handel, Scarlatti: Tercentenary Essays* ed. P. Williams, Cambridge University Press 1985.

[8] Thomas McGeary: "German-Austrian Keyboard Temperaments and Tuning Methods 1770-1840" in JAMIS vol. 15 (1989).

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A Signed Mietke Harpsichord. by Andreas Kilström.

In the Hälsinglands museum in Hudiksvall, Sweden, stands a harpsichord showing characteristic German/Scandinavian features. It has been assumed to be Swedish buildt(1), but in the museum catalogue is a note stating that the instrument "was bought around 1900 - 1925 from a fisherman E J Arboren, Rogsta. (The harpsichord) is supposed to have arrived in Hudiksvall from Germany and belonged to an organist at Rogsta". (Rogsta is a neighbouring parish north-east of Hudiksvall).

Of the known organists at Rogsta before 1850; Jonas Dalin, Jan Odendal, Anders Odendal and Sven Bergström, only the estate inventory of Anders Odendal is to be found. In the inventory of Anders Odendal, 1818, the following entry is to be found: "1 ste Symbal med pedal och stol. 13:16" (One harpsichord with pedals and stool. 13:16). It is not to be found again in the inventory of his widow, Clara. Thus we can establish one owner of the instrument. At the moment of writing there still remains to establish when it was imported and by whom.

A cursory examination of the harpsichord gives no hint as to its maker. However, excellent joinery, delicate mouldings and the beautiful balance and overall appearance of the instrument makes it evident that a master craftsman has been at work.

Master craftsmen of the 18th century normally took some pride in their work and were in the habit of leaving a signature or a stamp, even if not in a visible place. In the case of furniture the removal of the seat from a chair might reveal a stamp. Georg Haupt, cabinet maker to the Swedish court during the reign of Gustav III, has left a signature on the bottom of a drawer of a writing desk destined for the court.

So, where does one look for signatures in harpsichords? In Italian, German and Swedish harpsichords the nameboard normally slides up to accomodate the lifting out of the keyboard. The backside of the nameboard is one place for a signature, albeit in the case of Italians owners signatures seem to be as common. The front edge of the wrestplank might be equipped with a signature or a label, as is the case with the harpsichord in Gotlands fornsal, Visby, Sweden. The Couchet - Taskin in the Nydahl collection, Stockholm, bears Taskin's label on the inside of the bentside as a greeting to future repairmen and researchers. Jacks might bear the maker's or workman's initials and one often finds a date on them as was Taskin's habit, or as in the case of the Ruckers; a production number. But: The most obvious hidden place for a signature is the top or bottom key. On the Hudiksvall harpsichord the top key has written in ink:"Michael Mietke Instrumentmacher in berlin Anno 1710".

General Description of the Harpsichord.

Apart from the addition of a pull down pedal and an accidental glued on - back to front - on the AA-key, the harpsichord seems to be in its original state. The presence of the pedal can be deduced from holes drilled into the underside of corresponding keys and the hole sawn out of the bottom of the case. Neither the pedal board nor the stool mentioned in the inventory have survived. The addition of a pedal would seem a very natural thing for the practise instrument of an organist.

The harpsichord is supported on a stand of 8 turned legs between an upper and a lower frame. The exterior is painted in greenish blue (Prussian blue) in a matte finish. The inside of the lid is laquered in the same hue and has a gilded decoration most aptly described as being 'alla Turca'. The inside rim of the case is veneered in sycamore(?), except for the keywell which is finished in the same blue colour as the outside.

The case rests on a 25 mm thick frame glued on to the bottom. On the ledge which is formed by the protrution of the frame, a moulding is glued. The case top has a moulding, not cut into the wood, but made separately and glued on top of the veneer and extending over the inside case-rim by a few millimeters.

The harpsichord has two 8' registers. There are no strings on the instrument in its present state, but most tuning-pins have remains of wire around them. These are a mix of iron and brass throughout the compass, i e there is no definite point where it changes from one to the other. To me the short scale suggests original brass-wire throughout, which has been replaced by iron as the original strings broke.

The bridge and nut do not taper in height, but in width. The bridge has an average height of 18 mm and is 17.5 wide at GG and 8 at c'''. The corresponding measurements for the nut are 16.5 and 14.5 - 9. The bridge and nut have a moulding cut into them. The hitchpin-rail is made in two sections. the bass end is 15 - 16 mm high and the treble end is 6 mm. The join is in g#. The hitchpin-rail also tapers in width from 16 to 9 mm.

The wrestplank is made of oak and suspended between 'horses' (not on top of). The wrestplank is topped with a 3 mm thick veneer having the same grain direction. The veneer extends over the whole inside width of the harpsichord. The wrestplank is 200 mm wide at the spine and 177 mm at the cheek.

Both register-gap and the two register-slides taper in width. The slides are of the box type and are 22 mm wide in the bass and 20 in the treble, the average height being 37/38 mm.

The keyboard extends from GG, AA to c'''(with the 'blind' sharp described above).The naturals are ebony topped and the accidentals are ivory topped. The keyheads are 35 mm long and have two pairs of scribe lines, the sharps are75/77 mm long and 11 mm high at front, 10 at back. The octave width is 157 mm and the 'stichmass' (width of 3 octaves) is 472 mm. The key levers are made of lime.

The keyboard frame corresponds to the angled register gap and is 390mm in the bass and 363 in the treble. The balance rail follows at an angle to give approximately the same amount of leverage throughout the compass. The keys balance at around 3/8 from the front end. The balance pins are 3 mm in diameter and are placed in two rows 23 mm apart. The keys are guided in a rail at the back by means of wooden fins glued in to the keys. Key fronts are glued on arcaded pieces. The keyboard endblocks are 40 mm wide.

Jacks are made in two sets with damper slots on different sides, so that the dampers will always be on the same side - far or near - of the jacks as

viewed from the keyboard. The jacks seem to taper slightly both in width and thickness.

Comparison and Conclusions.

In Schloss Charlottenburg, Potsdam, Germany are two harpsichords with no makers name to them. They have been attributed to Mietke by way of circumstancial evidence by Sheridan Germann (2). Now, with a definite Mietke harpsichord at our disposal we shall be able to make comparisons and find other ways of proving or disproving the authorship of the Charlottenburg harpsichords.

Not having personally examined the Charlottenburg instruments I do not wish to enter into detailed discussion on the subject. On the other hand I do not have as much information as I would like. However, the similarity of the white Charlottenburg harpsichord and the Hudiksvall harpsichord is so striking that one must assume them to be closely related.

Taking the measurements from Sheridan Germann's article and the corresponding figures for the Hudiksvall harpsichord we arrive at the following table:

		White Charlottenburg harpsichord	Hudiksvall harpsichord
Overall length		2.85	2.69 incl. bottom moulding
Inside width		840	826
Wrestplank width	bass	197	200
	treble	177	177
Registergap	bass	53	48
width	treble	43	44
Soundboard length		1785	1753
Case height		240	245/250
Case top - soundboard		62	69
Octave width		156	157
Scale	c'''	135	136
	c''	268	275
	c'	520	525
	c	987	1050
	C	1603	1691

The Charlottenburg harpsichord is apparently slightly longer and wider but has a more determined taper of the registergap. The comparison of scale is not quite relevant as the Charlottenburg harpsichord has been enlarged. The slightly shorter scale might reflect a raise in pitch and the uneven discrepancy of the lower octaves suggests that the strings have been canted towards the treble and a narrower string band employed. The Hudiksvall harpsichord has an average octave of 157 mm on the bridge, except for the lowest 1 1/2 octaves which is about 10 mm narrower for the octave.

A few visual similarities could be pointed out as well: the proportions of the case, the shape of the bentside, the bottom moulding, the 'latex inner/outer' keyboard end scrolls, the general idea of the stand although one has square legs and the other turned.

To the question of signature on the Charlottenburg harpsichords. As both harpsichords have been extended beyond their presumed original tot

c''',those keys would have to be replaced as they were wide keys with no allowance for a c# and the balance hole in the middle (of its width), if, indeed, the whole keyboards were not replaced. If Mietke was in the habit of signing his top key, as he did in the Hudiksvall harpsichord, this is as probabable an answer as Sheridan Germann's theory of court instruments not being signed (3).

With the Hudiksvall harpsichord we have not only a Mietke harpsichord in original state, but also a means of establishing the identity of the Charlottenburg instruments by comparative methods e.g. mouldings and dove-tails. Mietke's signature could assist in establishing the originality of keyboards and jacks by way of a paleographical examination.

Notes.

(1) Eva Helenius öberg: Svenskt Klavikordbygge 1720 - 1820, Uppsala 1986, p. 235.
(2) Sheridan Germann: The Mietkes, the Margrave and Bach, Bach Handel Scarlatti, Tercenary Essays, Cambridge University Press 1985.
(3) Op. cit. p. 123.

If anyone would like to share information on the white Charlottenburg harpsichord I would be very happy to recieve it at: Aftonro, Merlanna,
645 91 Strängnäs
Sweden

Captions: 1) Front view of the Hudiksvall harpsichord.
2) Mietke's signature on the top key.

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* Geoffrey Bridges, delete M,P, and insert res,W.

* Eric Chapman, correct telephone number to *266042* [apologies jm].

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