## COMMUNICATIONS

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**FELLOWSHIP OF MAKERS AND RESTORERS OF HISTORICAL INSTRUMENTS**

Hon. Sec. J. Montagu, c/o Faculty of Music, St. Aldate's, Oxford OX1 1DB, U. K.
Your SUBSCRIPTION for 1982 is now due. The rates are the same as for the last two years; £4.50 for UK and anywhere by snail or other surface carrier; £6.00 by airmail. And, if you pay in a foreign currency (and this has to include Eurocheques in £ because they charge us on them), do please add £1 to cover the bank conversion charges. We are quite happy with your cheques in your currency; they do work just as well as your bank's cheque.

There is a renewal form enclosed (headed INVOICE for the benefit of those who need a formal invoice). Please send it back with your payment to our new Honorary Treasurer; she'll send any notes on it or with it on to me.

We have in previous years suggested that Canadian and American members could renew through Theo Miller, sending him an extra 50c to cover his bank charges. I've not suggested it this year for three reasons: a) I forgot to ask him if he was still willing to do it; b) only a few of you did it that way, so it seemed a bit of a waste of time; c) too many of you sent it to him too late to get inside the deadline and this led to all sorts of complications, including the loss of one member.

Please remember to send your renewal, as soon as possible and anyway before January 1st; otherwise we waste your money chasing you.

SECRETARY & TREASURER: I was re-elected Hon.Secretary. Margaret Crowe was elected Honorary Treasurer. I, and I hope all of us, am (are) very grateful to her for taking this on. Her address is 6 Ash Walk, Strensall, York Y03 5WY, UK, at least for the time being. She is hoping to move, but it's not likely before the end of the year. This is another reason for sending your renewal in now; if you wait till she's moved, it may get lost. So send it now.

PERSONAL NOTE: May I thank so many of you who so kindly congratulated me on being appointed Curator of the Bate Collection, either in letters or at the Horticultural Hall; it was very heart-warming. And while I'm writing about me, you'll notice that we have a new type face. I'm running FoMRHI from the office and this is the office typewriter; the letters are larger, which make this easier to read, but the lines are closer together (or rather there is less air between them because the type is larger) so that may make it harder. We'll have to see. One problem is going to be the List of Members; fewer letters to the line, and this may waste space. I have tried to keep all entries down to two lines, and this may no longer be possible, which will be awkward.

BACK NUMBERS of FoMRHIQ: We have a photocopier in the Faculty, so I can produce one-off copies of the out-of-print Qs (1-11) at 4p per side of two numbered pages. To calculate, multiply the number of pages given on the lists of contents by 2p and then add for postage: 20p per issue in UK and by surface abroad; 90p per issue by air to USA etc; £1.00 per issue by air to Australia/New Zealand/Japan etc (these are rough estimates because postage rates are about to go up again and by an unspecified amount). Please send the money with the order; if I have to invoice you, I'll charge you £1 for doing so, and I won't do the copying till you've paid. And if you've asked me for copies in the past, please specify them again; half the files are still in London and everything will be chaotic when we move in a month or two.
Bouwrier: The same applies to this. Anything in the last couple of numbers (now that they've switched to FoMRH1Q format) I can supply at 2p per numbered page; from earlier copies at 4p. But remember two things: for extended articles, you're better off ordering from them, and several of their most important articles will be printed here in English (see this issue for one of Toon Moonen's and Q.23 for Geert van der Heide's trumpet article).

Further to: Comm.304; Jonathan Swayne says that he recently measured a Macedonian zurna (forked shawm) and that it was conical from fork to bell. Obviously I'm going to have look at mine again, but at the moment they're still in London. Meanwhile, if any of the rest of you have any such instruments or already have measurement, please check on them.

Bull.23, p.3: Trevor Robinson has sent the following from Fortunes in Formulas; it's small print, but I hope legible:

Marine Glue.—Marine glue is a product consisting of shellac and casuarina, which is mixed differently according to the use for which it is required. The quantity of benzoin used as solvent governs the hardness or softness of the glue.

I.—One part Para caoutchouc is dissolved in 16 parts benzoin; 20 parts powder. After this is done, the mixture is carefully heated.

II.—Stronger glue is obtained by dissolving 18 parts of Para caoutchouc into 120 parts benzoin or naphtha solution, which is poured slowly and in a fine stream into 20 parts asphaltum metal, melted in a kettle, stirring constantly and heating. Pour the finished glue after the solvent has almost evaporated and the mass has become quite uniform, into flat moulds, which solidifies very hard. The pieces are first soaked in boiling water and then heated over a free flame until the marine glue has become thinly liquid. The pieces to be glued are also warmed and a very durable union is obtained.

III.—Cut casuarina into small pieces and dissolve in coal naphtha by heat and agitation. Add to this solution powdered shellac, and heat the whole, constantly stirring until combination takes place.

Water-Proof Glues.—I.—The glue is put in water until it is soft, and subsequently melted in linseed oil at moderate heat. This glue is affected neither by water nor by vapors.

II.—Dissolve a small quantity of sandarac and mastic in a little alcohol, and add a little turpentine. The solution is boiled in a kettle over the fire, and an equal quantity of 4 parts glue and 6 parts of isinglass is added. Then filter through a cloth while hot.

III.—Water-proof glue may also be produced by the simple addition of bichromate of potassium to the liquid glue solution, and subsequent exposure to the air.

IV.—Mix glue as usual, and then add linseed oil in the proportion of 1 part oil to 8 parts glue, and be careful that the mixture remain liquid. 4 ounces of niter acid should be added in every pound of glue. This will also prevent the glue from souring.

V.—In 1,000 parts of rectified alcohol dissolve 60 parts of sandarac and as much mastic whereupon add 60 parts of white oil of turpentine. Next, prepare a rather strong glue solution and add about the like quantity of isinglass, heating the solution until it commences to boil; then slowly add the hot glue solution till a thin paste forms, which can still be filtered through a cloth. Heat the solution before use and employ like ordinary glue.

A connection effected with this glue is not dissolved by cold water and even resists hot water for a long time.

VI.—Seak 1,000 parts of Cologne glue in cold water for 18 hours and in another vessel for the same length of time 150 parts of isinglass in a mixture of lampy spirit and water. Then dissolve both masses together on the water bath in a suitable vessel, thinning, if necessary, with some hot water. Next add 100 parts of linseed oil varnish and filter hot through linen.

VII.—Ordinary glue is kept in water until it swells up without losing its shape. Thus softened it is placed in an iron crucible without adding water: then add linseed oil according to the quantity of the glue and leave this mixture to boil over a slow fire until a glistening mass results. Such glue unites materials in a very durable manner. It adheres firmly and hardens quickly. In chief advantage, however, consists in that it neither absorbs water nor allows it to pass through, whereby the connecting places are often destroyed. A little borax will prevent putrefaction.

VIII.—Bichromate of potassium 40 parts; gum, 30 parts; alum, 5 parts. Dissolve the glue in a little water and add the bichromate of potassium and the alum.

IX.—This preparation permits an absolutely permanent gluing of pieces of cardboard, even when they are moistened by water. Melt together equal parts of good pitch and gutta-preca; of this take 9 parts, and add to it 3 parts of boiled linseed oil and 3 parts of bitarar. Place this over the fire and stir it till all the ingredients are intimately mixed. Then add 100 parts of linseed oil varnish, and filter hot through linen.
Comm.328: Milos Pahor suggests a possible explanation for the Flauti d'Echo, that there were two pairs of recorders, one on and one off stage. He and his daughter often play Jacques Hotteterre's Echos in this way (one recorder on and one off stage). He says that the hall is important; it must have the right natural echo as sufficient space, and suggests that anyone with access to a couple of pairs of baroque recorders and a suitable hall should experiment.

Comm.330; Trevor Robinson writes: "One minor comment on van der Heide's most interesting article on making a baroque trumpet: Copper and brass are annealed by heating red-hot and quenching in water, not cooled slowly. Cooling slowly will work, but it isn't necessary as it is for steel."

Bull.24, p.4: Peter Baldry writes on cheese glue:
Cheese is made by coagulating the protein in milk (casein), and the purification and mixing with lime described by Cennini and Theophilus should lead to essentially the same material as modern (factory-produced) casein glue. This is well known to be strong and water-resistant; it is used, for example, in making plywood. Perhaps this type of glue was used in making cornetto?

Bull.24, p.7: I mentioned the World Bagpipe Convention. Please note that the dates have been changed and this is now to be held from September 13th to 17th 1982, in Louvain. There will be lectures by some 30 ethnomusicologists from twenty different countries where bagpipes are endemic, covering about 40 different types of bagpipes. There will be many recordings available, as well as a display of pipes from the Brussels museum. There will be three concerts, including the use of bagpipes in classical music. Participation fees for individuals are US $100, for which you'll get a good deal of written material as well as admission. Places are restricted, so if interested, book now (and you're more likely to be accepted if you show that you are important in the bagpipe world by listing publications or other qualifications). Write to: H.C.Vuylstekke, Co-ordinator World Bagpipe Convention, Room 2 F 3, A.Reyerslaan 52, B-1040 Brussels, Belgium with your money (cheques made out to WBC - Belgium).

Bull.24, p.10: Bob Marvin writes:
Concerning Paul Gretton's queries:
Friederich v.H. made some recorders from lignum vitae, and it seemed to work, although I don't know about their lasting properties. I made some cornetto mp's from l.v. and they seemed to work and last (although they weren't played day in and out for years). Since the wood is used for marine tackle and bearings one might assume it possesses fair water-resistant properties.
I second his recommendation of the "Droguerie le Lion" a Bruxelles. They even have boxwood. Ignoring his instructions, I'd like to add a native English wood to his list of those suitable for woodwinds, namely (can I say this in print?) Wild Service, Sorbus terminalis, quite a different cookie from the crumbly rowan or mountain ash some have tried. However, availability is questionable these days; the last source I knew of was a certain address in Soho. The Metropolitan Museum of Art in NYC has a solid ivory cornet, with an ivory mouthpiece, unremovable when I tried it. The instrument came from some art gallery. The mouthpiece is rather smallish, very shallow, and very sharp-rimmed. The bore of the cornet (curved) seems to have tangential striations, as from reaming. It also has a somewhat opaque look to the ivory, similar to what I've seen in carvings that had been softened.
And Paul Gretton adds:

**ANOTHER FRENCH RECIPE BOOK** (cf. Bull.24, p.10) I have come across another book similar to Secrets d'Artisans Disparus.... It is in the series of workshop manuals entitled "Les Dossiers de 'Construire!'" and is by Marcel Bourdais: *Secrets d'atelier perdus et retrouvés*, 22e édition entièrement remaniée, Dunod, © Bordas, Paris 1978, ISBN 2-04-010275-2. It's not clear whether Dunod or Bordas (sic) is the publisher. My copy cost 480 Belgian francs.

**Comm.355:** Gordon Wood suggests a book that may have more information on bagpipe fingerings: *Bagpipes & Tunings* by Theodor Podnos (Detroit Monographs in Musicology, 1974). JM adds that he very strongly advises anyone interested to read his review of this book in *Galpin Journal* 28 (1975) before trying to get hold of a copy.

**Comm.357:** Peter Baldry again:

Paul Gretton refers to tuning cornets by pulling out the mouthpiece, but I wonder if this practice is really authentic. The Renaissance recorder and flute generally had no provision for tuning, and enlarging tuning holes on some reed instruments seems rather drastic to cope with the odd "flat organ". It seems more likely that all wind instruments to be used in a particular location would be tuned to a common local standard pitch, making further tuning unnecessary. In any case, I find that with a bit of practice it is easy enough to bring each note in tune with the lips, and I never bother to move my mouthpiece. You can get a much greater change in pitch with the lips than just by moving the mouthpiece (and you can play with sharp organs as well as flat ones).

**Comm.360:** John Downing says that the contact for any researchers who want access to the collection of instruments at Dean Castle, Kilmarnock, is the Curator: Mr. James Hunter, Dick Institute, Kilmarnock, tel: Kilmarnock 26401. John has warned him that he might expect quite considerable interest in the collection from members.

And Graham Wells apologises for the faults in the original list; he did not have as much time as John was able to take to cover it all.

**Comm.362:** Graham also points out that I was out of date: the Aeolian Hall is no longer a BBC light music studio but is now part of Sotheby's empire and houses the new book department and sale room.

**FORTHCOMING EVENTS:** The Leopold-Hoesch Museum in Düren is putting on a saxophone exhibition 'Saxophonisches Seit 1842' from 6th December to 17th January.

The Vereniging voor Huismuziek (who produce the BouwersKontakt Bouwbrief) have an instrument making day on 21st November and, I think 22nd, I think in Utrecht and have asked me to go there to represent FoMRHI. I look forward to meeting all my Dutch friends whom I only know from correspondence.

See the previous page for the World Bagpipe Convention.

**OTHER ASSOCIATIONS:** There are several new Early Music organisations. One is the Border Marches Early Music Forum who have just produced their first Newsletter (September 1981), a duplicated leaflet in the same format as this. If you're in the Welsh border country and in Early music, get in touch with Geoff Warren, their
Secretary, at 2 Berrington Drive, Bodenham, Herefordshire.

Bill Groeneveld writes that he is Vice-President of the Early Music Society of Victoria and that several members are FoMRHI enthusiasts; any FoMRHI members in that part of Australia who are not already involved should be in touch with him.

We hope that there will be a new overall organisation in this country by the time this reaches you. Just over a year ago there was a conference at the Art Workers' Guild at which the informal and ad hoc Standing Committee of the Early Music Conference asked those who were there just what sort of organisation they wanted. It was decided, after a good deal of discussion and suggestions, that they should sort out something and come back in a year's time. I'm only sorry that they didn't announce the date of the next meeting earlier so that you would all have known about it; it's on October 31st, before this will reach you. We only had the notices at the Horticultural Hall.

It's nothing near our field, but Don Barney writes that in his professional connexion with adoption social work, he suggested a bulletin on FoMRHIT lines, which has been adopted and proved successful. So even outside the area of Early Music we have our influence!

MATERIALS: Mark Ellis writes:

Pegs: here is a new source of pegs made to order at reasonable prices; woods available include rosewood, ebony, box, pear etc. For a quotation send drawing with details, specifying wood required, to Mr Ellis, "Purnell", Dowland, Winkleigh, Devon EX19 8PG.

And Jonathan Swayne says:

Para 5.2 of Bourvbrief XIX, Nov. 1980 (bull.24, p.12) refers to Black Horn. This may already be known to many members, but black buffalo horn is available from the Halesowen Horn Company Ltd., PO Box 5, Halesowen B63 3UW, W. Midlands. The last time I bought some (last January), the price per kilo of horn tips having a minimum diameter at the cut of 25mm, was £1.80. The price of a complete horn is about £5.50, but of course most of this is hollow.

PLANS: Mark Ellis again:

Plans: I still have some copies of my viola d'amore plans (drawn from V&A no 722-1878) at £7 plus postage (for two A1 sheets plus notes).

And Alan Mills, who will be over here in June next year, is looking for plans of 2-4 key bassoons and 2-5 key clarinets. Can anyone suggest any sources?

If anyone were interested, I would very much like to have plans available of instruments in the Bate Collection (I'm not capable of drawing them). There is growing interest in the later woodwind, through the classical period into the early 19th century. We tend to say 'why bother - they come up at auction all the time' but that is really only true of London and New York; there are plenty of aspiring players, like Alan, a few thousand miles away from the auction houses who want to play these instruments and who would be happy to make them if plans and/or detailed measurements were available. So, would anyone like to come to Oxford and measure and draw some of our instruments? We should be able to work out some mutually satisfactory sale arrangement.
MUSEUMS: The Bate Collection here is open (usually - there are odd
dates when I’m away or have to be elsewhere) from 2-5 every week
day afternoon (I’m not yet sure what happens in the vacations) for
general purposes. Unless I'm lecturing, or otherwise engaged here
or elsewhere, specialist access which involves opening cases is
usually better by appointment in the mornings, but can be arranged
at other times if necessary. However, at the moment we've not yet
got our new showcases so that a lot of instruments are still packed
up and I don't always know which crate they're in. The cases are
due by the end of November (builder's estimate) and thereafter
things will gradually appear. If there's something you need to get
at, I'll find it if I can, but no promises; I may have found it
already of course; several people have been measuring things here
since I arrived. At the moment there are about 100 instruments
out on display.

I am very interested in extending our range of instruments back in
time, even if only for display purposes. John Cousen and Tim Hob-
rough have already been very generous and have given me what John
calls 'cosmetic instruments' -- instruments that have gone wrong
in the making and therefore are not saleable but which do at least
show the shape of their type. I would be very grateful for more
of these, and even more grateful of course for examples that work
(I am waiting eagerly for a Hotteterre flute which Felix has pro-
mised me from Leningrad and which I've heard is on the way -- this
will be greatly valued here and I'm sure will be used by students
and others exploring the repertoire of the period. One of the most
important features of this Collection is that most of the instru-
ments are intended to be used).

Leningrad: And mentioning Felix Raudonikas reminds me that he wrote
the other day to say that people have written to him at the Museum
in Leningrad. Please don't do this. He doesn't work there and it
causes embarrassment. However, if you want help with anything
there, he will always do what he can, but only if you write to him
at his home address in the List of Members.

Brussels: The same applies here, as you'll see from the following
note from Nicolas Meeus:

CONTACTS WITH THE BRUSSELS MUSEUM: I have proposed to help FoMHI members
in their contacts with the Brussels Museum and I remain prepared to do so.
One should realize, however, that the normal procedure is to first contact
the Museum itself; my proposition applies only in case of difficulties. To
contact me instead of the Museum can only result in problems, as it hurts
susceptibilities. Write to Mr de Maeyer, curator, rue aux Laines 14,
B-1000 Brussels; if that proves unsuccessful, send a copy of your letter
to my personal address (rue de l'Escrime 31, B-1190 Brussels) and I'll do
my best.

And I should have said above that the Bate Collection is not con-
fined to woodwind, as some believe. Philip's own collection was,
of course, confined to orchestral woodwind, but we have an impor-
tant selection of brass instruments (the Morley Pegge Gift), a
few string instruments, some keyboards (the Taphouse and the Roger
Warner Loans), a good display of a bow-maker's workshop (the Ret-
ford Gift) and, also from Retford and some of his colleagues, a
collection of English bows (which we're very interested in expand-
ing), and will have, once I've properly moved from London, a good
selection of percussion. We are a teaching institution and we
want to show the students how instruments differed, and ideally
what they sounded like, through all the periods which they are
studying.
A BRASS PROBLEM: Many of us have brass instruments, or woodwind instruments such as basset horns with brass bells, which are cracked and crazed. So far nobody has found a cure for this. I was in correspondence recently with ICCROM and asked if they had any ideas and they suggested that the cause, rather than corrosion from ammonia or gas-light (as Eric Halfpenny had suggested in GSJ), was season-cracking, something that had first been observed in cartridge cases in India in the monsoon season; materials that suffered from internal stresses would suddenly crack with the change of atmospheric conditions. A suggested cure is annealing for 20 minutes at 300°C (or 96 hours at 200°C), but neither of these seems suitable for brass instruments because all the soldered joints will fall apart. Still, if I can find something of my own of no value, it will be worth trying (assuming that I can find a suitable oven — I've not asked my wife yet what her oven goes up to, and even if does go to 200°C, our diet may get restricted if there's an instrument in it for 4 days!). I'd be grateful for any other ideas, and for any offers of experiment.

NOTES & NEWS: Bill Kibby has sent me a note of his Piano Archives Monthly Newsletter. Odd pages are available at 25p each, and:
- p.81 has a summary of some early London directories, starting at 1765 and running up to 1775 & 1782;
- p.92 has some general comments on old directories;
- p.82 has a 1797 list of piano and music firms in London,
- p.83 ditto for 1805;
- p.84 has locations of some old directories in Essex and East London.

Subscription to his Newsletter costs £2.20 a year (plus 25p for foreign currency -- ie notes -- or £1.50 for foreign cheques) and his address is: 6 Fairview Crescent, Benfleet, Essex SS7 4JP, UK.

Ken Williams has sent us the following two short notes, and he makes the point, in connexion with the bow timber but much more widely applicable, that too many of us don't realise that trade names and 'common' names are quite meaningless to people who live in other places and that "Gordon's Goo" might be a simply marvellous adhesive, but if nobody in the country has heard of it a chemical description might be more useful, and Density, Mod of E, and Mod of R will give at least some indication of timber in terms of performance even if the quality actually sought is more elusive."

TAILPIECES for VENETIAN VIOLS.

Martin Edmunds has described the construction of early Italian viols in G.S.J. V.33, and the method of forging tailpiece hooks proves simple and effective.

However, the angle of the hook as illustrated results in less than 90° to the line of string tension, and the tailpiece can (and does) leave the hook very precipitately when the instrument is handled.

I suggest that the hook be overformed as shown in the sketch.
In seeking obtainable alternative timbers for viol bows there is an astonishing lack of information as to the requirements for the timber.

Articles and books abound with illustrations and discussions about the various shapes of bow heads etc., and universally attribute almost magical qualities to pernambuco wood as a suitable material, but there is no published material that I can find that list the qualities of this timber that make it so eminently appropriate.

Even the normal timber specifications are not stated, but the following details were obtained from the Australian Commonwealth Scientific and Industrial Research Organisation, and may be of use.

Pernambuco: Density 63.5 - 71 lbs/ft³; Modulus of Elasticity 2.72 x 10⁶ lbs/in²; Modulus of Rupture 20,500 - 23,000 lbs/in².

CODA: That's it, unless anything else comes in while I'm typing up the Book News and List of Members Supplement. Do please remember to send Margaret your renewal in good time for Jan 1st. That's the deadline for next issue, too, so if you're saving postage by sending everything to her, remember to allow time (through the Christmas posts, too) for her to get it on to me. Let's have your Comms — one reason that we've been able to hold the subscription the same is that we've had some thin issues this year. It has the advantage of saving you money, but that's not what you join FoMRHI for; you want the information, too, and unless you give information to others, you may not get any back.

Jeremy Montagu
Hon. Sec. FoMRHI
c/o Faculty of Music
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Oxford, OX1 1DB, UK.

Boxwood: J.E. Garfitt, Consultant Forester of Aythens Cottage, Cradley, Malvern, WR13 5LQ, has written to say that he is expecting a consignment of "very fine fresh-felled home-grown box timber, some up to 8 inches diameter later this year"; if you want any, get in touch with him.

Mediaeval Technology: I find Tim Hobrough's suggestion (see a separate Comm in this issue) a very exciting idea. After all, we know that different treatment affects the sound produced by metal; why not of wood also? As it is, he has been adzing out the bodies of his harps, and finds that this does make a difference. I hope that he may find some like-minded colleagues who would be interested to try this.

Further to: Comm. 328: I miss-filed a comment (in manuscript) from Cary Karp (apologies to him) on the Flauto d'Echo. He reminded me of the Dolmetsch chin key which opens a small hole opposite the mouth of a recorder, increases the area of open hole, raising the pitch and thus demanding softer blowing to get back in tune. There is a flute d'accord in the Stockholm collection by Veyrat (18th century) with a key for the lower thumb which could be just such a device (the holes it covers are roughly opposite the mouth), though it may be an octave key; the instrument doesn't work well enough to be sure. So, just possibly, something like the Dolmetsch key was known in Brandenburg? Certainly it seems a likelier suggestion than Miloš's to me.

PS: Analogies for running out of carbon ribbon; I hope this works!
INSTRUMENT CASES

We have always been unhappy with the design of modern cases for lutes and viols. The whole lid comes up, hinged on the side at points near the widest part of the body and at the pegbox bulge. When the weight is kept down for portability, the case will often topple over when the lid is raised with no instrument inside. Also, an unduly large number of catches needs to be done and undone each time it is used. These catches are needed to ensure the rigidity of the edge, so that if a knock occurred around the sides, the body of the case would not distort and damage the instrument. The most vulnerable area is around the widest lower end of the case.

As is so often the case (oops, sorry about the pun) the historical way has decided advantages. In all early cases we know of, the lid is hinged across the top near its widest point. The whole region below this widest point is permanently rigid, providing full catchless protection where it is needed most. Catches on the sides of the neck are unnecessary since the internal neck supports prevent a knock from bending the case. So the only catches necessary are one (or two) at the pegbox end and perhaps one at each side at the upper end of the body. New habits for safe easy insertion and extraction of the instrument are easily acquired.

We would like to congratulate John Gorrett for using this early principle for the fibreglass case he provides with his student lutes. It is very light, compact and safe, and has only one (locking) catch! There is only one model available, but he will pad it out specially to fit any small seven-course lute of the Venere or Hieber types if templates are sent. If there is enough demand, he might be persuaded to make other sizes. The price is £45 (£37.50 to lute makers). His address is Woodlark Instruments, Darenthdale, Shoreham, Sevenoaks, Kent TN14 7TT.

Soft cases provide very little protection against knocks but they protect against scuffs and the weather. Careful musicians often prefer them because they are lighter, take up less space and can be safer in air travel since in them instruments can usually be taken in the passenger cabin.

An adventurous wife with a sturdy sewing machine can often be persuaded. If not, Diana Brennand can. Soft case making to order is one of the fields she displays real virtuosity in (other areas are as oboe soloist and NRI string maker). Her address is 33 Forest Range, Levenshulme, Manchester M19 2ES.
FoMRHI Book News

John Paul's Modern Harpsichord Makers has just appeared from Gollancz at £15.50. I shan't have time to read and review it till the next Q, but you may like to know about it. At a quick glance it's a series of interviews with a number of makers (most of them FoMRHI members, so I'll have to be careful!).

Catalogues: Several new ones that I've bought recently. The Vleeshuis in Antwerp Catalogus Muziekinstrumenten; the Deutsches Museum, München, Katalog der Blasinstrumente; the Germanisches Nationalmuseum, Nürnberg, Checklist of Non-European Instruments; Conservatorio di musica Luigi Cherubini, Firenze, Antichi Strumenti. None have been sent for review, so no comments, but at least you know they exist.

A book I didn't know existed till I bought a copy is the Minkoff reprint of Art du faiseurs d'instruments De Musique et Lutherie. This is a much reduced-size reprint of text as well as plates of part of the Encyclopédie Méthodique. We all have reprints of the plates, but it's the first time I've got hold of a copy of the text.

The Guild of Master Craftsmen have sent me a copy of The First Guidebook of Specialists in Repair, Restoration & Conservation. FoMRHI is in it and a few musical instrument R/R/C'ers. It's quite useful because it lists people who repair, restore or fake anything, so if you need a source of any bits and pieces that you can't make yourself, it would be worth looking here. If you want a copy, say you belong to FoMRHI because it will then cost you £4.95 instead of £6.95. And if you want to be listed in a future edition, write to them. The address is 170 High Street, Lewes, East Sussex.

NRI have produced a new booklet, Baroque Violins, Violas and Cellos with 10 pages of history and a couple of pages of description of the models they make. If you want a copy, write to Eph or Djilda at 18 Moorfield Road, West Didsbury, Manchester M20.

Rudolf and Uta Henning have just issued their 13th calendar, Zeugnisse alter Musik, with, as usual, an engraving or woodcut or other black and white picture for every month. A good selection this year, especially November, which shows a group of four French army clarinetists, all playing with the reed uppermost and dated 1846, well after that practice was thought to be extinct in France. Copies cost DM 19.80 (Uta's address is in the List of Members). They are now offering looseleaf sheets from past calendars at 24 sheets (I think – the form isn't very clear) for DM 18.50. They are also about to publish a book of sketches by Ruth Tuck of modern musicians at DM 29.80, and, in the summer next year, a documentation on the musical pictures in the various Maximilian the Great series (Triumph, Prayerbook, etc) which will cost about DM 90; Uta would welcome indications of interest in this. Please add DM 1 for postage of any of the above (apart from Maximilian) and send a cheque (in DM) with your order.

Tony Bingham (also in List of Members) has produced some very pleasant writing paper. 48 sheets in a pad with eight different musical borders (ie it repeats six times), costing £2.50. He let me have some to sell at the Horticultural Hall and they went like hot cakes. The ideal Christmas present for any of your friends who write letters. Orders to him, I suppose plus 25-50p for postage, though he didn't say anything about that. They're A4 size, by the way.
Book News continued

Mark Ellis

Book: Métiers d'Art (vols 10-11). FoMRHI members may like to
know about this double issue of a French periodical devoted to crafts,
which includes 140 pages on instrument making, with short articles
on jewellery and embroidery. Under the title "La facture instrumentale"
there are essays on many aspects of making and restoring string, wind,
keyboard and percussion instruments. "Early" instruments include
lutes, viols and harpsichords. The quality varies from rather simplistic
comment to detailed consideration of repair work. It is extensively
illustrated, with some colour plates. I think it is very good value at
36 francs (about £4). Copies can probably still be obtained from the
Conservatoire Nationale, 14 Rue de Madrid, 75008 Paris; allowance
should be made for postage.

Contents of Bouwbrief XXII (Sept.1981)

Paul Gretton

3.1.: List of instrument drawings available from the
Paris Conservatoire, 14,rue de Madrid, F-75008 Paris.
6.1.: Bouwerskontakt members are combining to buy a large
quantity of Vigoplas artificial ivory. Minimum quantity
in Holland is 20kg.
5.2.: List of sources (all in the Netherlands) for Stahlecker
ethnic paints. (SeeFoMRHI Bull.24,p.10)
8.2.: Informative short article by Jeroen Nieuwint on the
 tuning of harmoniums. (Relevant to all free-reeds.)
8.3.: Exponential progression of harpsichord string-lengths
with computer print-out.
9.1.: Final installment (stringing) of the series of articles
by Wouter Dekker on building a hurdy-gurdy.
9.3.: Corrections to the article by Harry Zwetsloot on
"Mathematics of a Lute Profile" in Bouwbrief XIX.
9.5.: Commentary by H.Zwetsloot on "Glueing lute-bellies
without clamps" (Bouwbr.XVIII)
11.2.: Advance information about the "Super Instrument-Building
Day". This will be an exhibition, with demonstrations by
makers in action, at "De Lantaern", Utrechtseweg 4,
Nieuwegein Noord (Near Utrecht) on 21 Nov.1981 from 10am
to 5pm. Further information from: Vereniging voor Huismuziek,
Catharijnesingel 85, Utrecht, tel.030-316474.
Restoration Reports for Two Broadwood Pianos

The following reports may be of interest to members, and I would welcome comments from others, including suggestions for better methods. I tried to use methods which were reversible whenever possible and identified my new parts with the date.

Restoration of Grand Piano no 4900 by Broadwood 1810

The following original parts are missing: 2 tuning pins, 8 iron strings, 25 brass strings, the bolt attaching the lyre stay to the bottom of the piano, one of two decorative screws retaining the nameboard, the lid stick, the balance cloth strip, the cloth strips of the front and back touch. Part of a lid-retaining hook and one small piece of veneer was also missing. The state of preservation is remarkable, due to its having had little use, having been kept closed and not being subjected to extremes of humidity.

The listing tape was removed from the tails of the strings and each iron string in turn was unhitched from the nut and bridge pins, but not from the hitch pins, and the rust removed with P 600 silicon carbide paper between the tuning pin and the loop. This was done without turning the tuning pin. The soundboard and wrestplank, bridge and nut were cleaned while the strings were off the nut and bridge pins. The 8 iron strings and 25 brass strings were replaced, and all the iron strings rubbed with a slightly oily cloth. The wire used was from Ormiston Ltd., London. The gap spacers were also cleaned of rust and lightly oiled. The listing tape was then replaced in its original position.

The modern round balance and front washers were left in place, but the modern back-touch strip was removed as it was harder than the original two layers of woollen cloth. Two strips of suitable green woollen cloth were cut and tacked in place with new tacks in the original tack holes. The tails of the keys were raised by paper strips under the back-touch cloth until the action had the right amount of lost key-motion before the hammers began to be raised by the key. Paper washers were added under the balance washers to level the keys. Some lead key weights had corroded, and these were lightly hammered to prevent the keys from touching.

Most of the hammers were too tight to fall under their own weight, so they were removed from their pivot wires, and the wires were polished with Brasso cleaner. The cloth bushings of the hammers which run on these wires were slightly compressed by inserting a tapered needle of a suitable diameter until the friction was reduced to the correct amount.

The outer layer of the hammer coverings had become compacted onto the under layers, so a steel wire of .48 mm diameter was bent into a tight U and held in a pin vice. This was inserted as a trial on one hammer between the top and second layers to separate them, and resulted in a softening of the tone. The same action was taken with all the other hammers. 3 broken hammer shanks were repaired. 7 hammers were displaced to one side by 1 mm and 2 hammers by 2 mm compared with the strings. The shanks of these hammers were bent by wrapping a short length near the butt in cloth. Application of
boiling water with a paint brush then heated the shanks for long enough to enable the shank to be bent by finger pressure.

The gap braces had sunk a little into the wood of the bellyrail, distorting the register in which the dampers are guided and causing about a dozen dampers to bind. The register was removed, and the notches for the gap braces slightly deepened to allow for the present position of the gap braces. The register was then straightened and a few splits glued together, to enable all the dampers to move freely.

The efficiency of the dampers was much reduced in the middle and bass owing to the cloth having become bent under the weight of the dampers. The cloth of each damper was wetted, except for the part which is glued on to the wooden part. The cloth would then stay put when placed into the required shape and remained the same shape after being allowed to dry. The water was prevented from contacting the wood of the damper by making a pair of shields of aluminium foil to place under the cloth. Pieces of leather were glued to the notched part of some of the dampers, where they are raised by the sustaining pedals. This was necessary to adjust the raising of some dampers to match the rest. The two damper pedals (treble and bass) were adjusted and made silent, lost motion being eliminated. A metal screw was made for the lyre stay, so that it would attach firmly to the original metal plate recessed into the bottom.

The original string diameters are as follows:-

| 1 - 4 | CC  | EE  | .948 mm brass |
| 5 - 8 | EE* | GG  | .896 " |
| 9 - 12 | GG* | BB  | .808 " |
| 13 - 16 | C  | E*  | .735 " |
| 17 - 21 | E  | G*  | .695 " |
| 22 - 32 | A* | g*  | .657 " iron |
| 33 - 55 | G* | c*  | .565 " |
| 56 - 73 | g* | c*  | .492 " |

Some broken original strings are returned with the instrument, and a number of spare new strings are also included in case of future breakages.

A piece of veneer was replaced at the top of the spine at the extreme front. A new lid stick was made and identified with the date 1981.

The set-off for the hammers was adjusted for each note and readjusted after a period of playing. The pitch was repeatedly raised to a' = 415 (a semitone below modern pitch a' = 440) until it became stable. It should not be raised above 415. If a ruler is placed on top of the cheek and tilted by inserting a wedge above the junction of the cheek with the bentside until the ruler is seen to be parallel to the top of the spine the effective thickness of the wedge is a measure of the twist. This was measured as 11 mm after the tuning had stabilized at 415. There is a split in the bass hitchrail but it shows no sign of spreading, the tension of the strings being held by the screws between the hitchrail and the case. At present the split extends from the 1st string of note 9 to the first string of note 21.
The brass retaining hook for the lid flap was broken, and was built up by adding new brass which was then filed to shape. A brass casting was made over a steel wood screw, using the original knob as a pattern for the sand mould. This was then cleaned with files and polished on a buffing wheel.

**Restoration of Square Piano no 26420 by Broadwood, London 1821.**

D M Y

The date 11 - 10 - 21 (October 11th 1821) is written in ink on the side of key no 39 which has the initials RP stamped on top. The letters D, M and Y presumably stand for day, month, year.

The piano was remarkably clean before restoration and the soundboard did not need cleaning. The original iron strings had hardly any trace of rust and there is virtually no damage from moths. The action has had little use and is completely original including all its cloth and leather parts except for the hinge of hammer 59 and the support wire of damper 56.

**Strings**

<table>
<thead>
<tr>
<th>Strings</th>
<th>Description</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-13</td>
<td>close covered copper on iron, probably original</td>
<td>0.98</td>
</tr>
<tr>
<td>14-15</td>
<td>copper</td>
<td>0.98</td>
</tr>
<tr>
<td>16-21</td>
<td>not original</td>
<td>0.74</td>
</tr>
<tr>
<td>22-27</td>
<td>iron</td>
<td>0.69</td>
</tr>
<tr>
<td>28-37</td>
<td></td>
<td>0.52</td>
</tr>
<tr>
<td>38-63</td>
<td></td>
<td>0.59</td>
</tr>
<tr>
<td>64-73</td>
<td></td>
<td>0.54</td>
</tr>
</tbody>
</table>

The plain iron and copper strings have every appearance of being original, except for 10 iron strings which had previously been replaced. These were removed and replaced with Ormiston iron wire. Brass strings were fitted as follows:-

<table>
<thead>
<tr>
<th>Strings</th>
<th>Description</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-18</td>
<td></td>
<td>0.90</td>
</tr>
<tr>
<td>19-21</td>
<td></td>
<td>0.80</td>
</tr>
</tbody>
</table>

The lowest covered string was missing and was replaced.

Before restoration the pitch was about 3 semitones below a' = 440 except for a few top notes which were 4 semitones below a' = 440. The pitch was raised to 1 semitone below a' = 440, i.e. a' = 435. Sir George Smart's pitch of 1828 for London concerts was 435, but the lower pitch is a little safer.

The tuning pins for notes 1 - 30 have holes for the wire, but those for notes 31 - 73 are without holes. All tuning pins are original.

**Action**

The hinge of hammer 59 and the wire of damper 56 were replaced. 3 layers of paper with a combined thickness of 0.3 mm were interposed between the two layers of original cloth comprising the back touch, to reduce the initial lost motion of the keys before the hammers begin to move. The set-off was adjusted for each note.

The damper cloth was in good condition but had bent into a
curved shape, reducing the damping efficiency. The dampers were fixed in the up position and each piece of cloth wetted with water containing a trace of soap (without which it is not easily absorbed), applying the water from a hypodermic syringe to the surface of the cloth. The wet cloth was set to lie straight at about 30° to the vertical and allowed to dry, after which the cloth regained its springy quality and the damping was again efficient.

A new lid stick was made and attached at the right hand end of the case by the original screw. The back right-hand support block for the dust cover was repaired. The front of the pedal leg had been broken at the point where the pedal lever pivots. This front portion was replaced with matching mahogany and the pedal lever refitted using the existing brass pedal rod. Two thick leather washers were glued to the underside of the wooden button which transfers the pedal motion through the baseboard, inorder to produce the right damper motion. A new leather tag complete with a small wooden triangular piece was fitted to the toolbox lid.

The music desk for use when only the keyboard flap is raised had lost the original lower strip which supports the three movable uprights, a broken non-original piece of mahogany being glued at the back of the supporting strip for music books. A new strip was made from mahogany and the three movable uprights fastened to it by the original rivets. The new strip was identified with the date 1981.

The strings were repeatedly tuned up to a pitch of $a' = 415$ until the tuning became stable. The case twist was then 5 mm.

John Barnes, May 1981.

FoMRHI Comm. 367

D. Way

BROWNING HARPSICHORD PINS

The brown or black color of old iron work comes, of course, from rust. Nowadays iron is purified and then elements are added back to give the desired qualities. Old iron was brought to the needed state of purity, but with traces of the impurities from the ore or the smelting process still present; these traces more or less inhibited rust. Wrought iron lasted on ships for the life of the ship, while the steel plates on ships today require constant chipping and repainting. The guns buried after the battle of Colloden were unearthed in relatively good shape, but a modern gun buried that long would be rusted to dust.
After the pins are tumbled to polish them (with sawdust or bran, which also removes all the lubricated oil that remains from the working), bright pins will rust and discolor quickly. Commercial blacking (bluing, browning) quickly wears off where the tuning wrench abrades the pin (less true of square-headed zither pins and piano pins than of the flat-headed harpsichord pins). Where the blacking is worn off, the pin quickly rusts. Dipping the pins in a drying oil (vegetable, or animal—fish oil is the basis of one modern rust-controlling preparation), and allowing them to dry on an absorbent surface to take up the excess (the modern and ubiquitous urethane varnish works very well, thinned half-and-half with turps or mineral spirits) does not forbid the oxidation of the surface (just as varnishing copper or brass will not indefinitely preserve the polish), but slows it. This 'varnish' does not wear off the pin from tuning, and does no harm to the seat in the wrestplank. Pins so treated appear to have nothing on them. They color down to a blackish brown with time, but this is a matter of years.

I suspect that the brownish-blackish color of old harpsichord pins are the result of such gradual oxidation after some such oil treatment. But the artificial rusting of iron to produce various shades of blue, black, or brown in a controlled and relatively rapid way was practiced at least as long ago as the fifteenth century, so it is quite possible that in a few instances harpsichord pins were treated in this way.

Frank Hubbard once recommended heating the pins to a cherry-red, then dropping them in linseed oil. This produces a beautiful black color—but alas the coating (for that is all it is) soon wears through. The patented 'instant' bluing or browning solutions also make a very fragile coating, and are useless for harpsichord tuning pins.

The book Firearms Blueing and Browning by R. H. Angier (Harrisburg, 1936) covers its subject completely. He thinks that common salt was perhaps the earliest medium to induce controlled rusting, and describes his experiments with it. The most common early method was with 'butter of antimony' (equal parts of antimony trichloride and olive oil, or common butter with a few drops of olive oil) described in the Hanover Magazine in 1781, and 'russetting of gun barrels' is mentioned in a 1637 report in the London Record Office under the heading of 'Repairs to the Arms of Trainbands'. Armourers of the sixteenth century were able to impart brilliant colors (violet, blue, gold, silver, etc.) to their products (Sir Guy Laking, A Record of European Armour and Arms, London, 1920).

Merrill Lindsay (author of several books on arms and director of the Eli Whitney Museum, North Branford, CT), who has lent me these books, reports that Sam Colt browned his guns in a smoke-box fired with fish bones (although that cannot be the entire process).

However, all the methods of colouring iron reported take days, and sometimes weeks, with repetition of the process until the desired color is reached. This would not be practical for something like harpsichord tuning pins, and it seems unlikely that such a process would be used on so much of the old iron we find with a rich brown or brownish-black patina (I have a Spanish credenza from the fifteenth or sixteenth century with iron lock, hinges, key—points of wear where any kind of surface treatment would wear away). In general the color of old iron is the daughter of slow time.

I'll Xerox the pages of Angier with his recipes and instructions for those who really want to try it. Meanwhile, in the salty air of this seaside village, my tuning pins darken slowly to a grayish blackish brown, with the oil or varnish lubricating between the tuning wrench and the pin so no rust spots appear. In any case, even with artificially controlled 'rusting', the application of oil or varnish is required.
Jeremy Montagu described in Comm. 323 a terminology where the various types of plucked keyboard instruments are distinguished by the angle between the strings and the nameboard: close to 90° for the harpsichord, about 45° for the spinet and close to 0° for the virginal. This terminology is but a by-way of referring to the shape of the instruments; the reason why it is preferred to a mere qualification of the shape probably is that the shapes are at times difficult to define. The virginals normally are either rectangular or polygonal. The harpsichord and spinet, on the other hand, could both be defined as 'wing-shaped' or as having a bentside, and there seems to be no simple way of defining their shape more accurately (the harpsichord shape, as everybody knows, is the grand piano shape; and inversely. This is how dictionaries solve the problem ...).

One drawback of this terminology is that it takes little account of the historical meaning of the terms utilized. The polygonal virginal, for instance, is almost exclusively Italian and would therefore in most cases more properly be called a spinet. The bentside spinet, on the other hand, is quite typically English and as such would as often has been called a virginal in its own time. Another, more important drawback is that the terminology is not entirely safe because it is not generally accepted. The term 'spinet' is not entirely unequivocal to denote what we may provisionally call a cembalo traverso. The expressions 'wing-shaped spinet' or 'bentside spinet' are more accurate.

Now, if the shape must be qualified in any case, one does not quite see why the terms 'spinet' and 'virginal' should correspond to given shapes, why one could not speak of an Italian polygonal spinet or of an English wing-shaped virginal. These expressions seem as accurate as can be desired and would meet some of Eph Segerman's objections in Comm. 338. I would not follow him up to the point of calling 'virginal' a harpsichord, however, as this would make the problem really hopeless.

Donald Gill refers in Bull. 24 (p. 4) to a terminology in which the virginal is defined as having both bridges on vibrating soundboard, while the spinet has only one. This assumes that the rectangular and polygonal instruments normally have both bridges on free soundboard, which is definitely wrong. I have shown in the Brussels Museum Bulletin IV (1974) that several rectangular virginals with the keyboard at the left have a heavy soundboard bar under the left-hand bridge, the vibration of which is so impeded. Some virginals with the keyboard at the right (museletas) have the bass end of the right-hand bridge that extends above the wrestplank, and several Italian instruments have soundboard bars crossing one or both bridges: are these instruments virginals or spinets? Also, some harpsichords have the near bridge(s) on a strip of soundboard between the wrestplank and the gap; a wing-shaped spinet with the same disposition is not inconceivable.

At any rate, Donald Gill's definition would be in conflict with Jeremy's. Jeremy writes that in this case the criteria of bridge position should prevail 'since what matters is the sound'(Bull. 24, p. 5). But it is not at
all certain that whether one or both bridges are on free soundboard makes any important difference in the sound (comments on this are invited!). There are other reasons why the criterion of bridge position must be rejected. It would at times be impossible to ascertain whether an instrument is a 'virginal' or a 'spinet' without examining the barring, which is rather unpractical and may make the terminology impracticable to non-specialists. As mentioned above, whether an instrument is a 'virginal' or a 'spinet' may in some cases remain open to dispute, when a bridge is only partially on free soundboard. Also, a 'spinet' could have been transformed into a 'virginal', or inversely, if its barring had been altered: the name of such instruments would become dependent of their ups and downs, which does not seem desirable.

There is another important criterion to consider: the position of the plucking point. Instruments plucking near the end of the strings seem intended to sound more or less like harpsichords (the deadening of one of the bridges may be intended to enhance the likeness), while instruments plucking nearer the middle of the strings have a sound of their own. The difference in sound between the two types is unescapable. Klaas Douwes reports that the instruments plucking near the middle are known as muselars, those plucking near the end as spinetten. It may seem tempting to equate the Flemish spinett with 'spinet' and, by analogy, muselar with 'virginal'. This would however unduly restrict the usage of 'virginal', which after all was a generic term originally.

Therefore, following a suggestion of Ed Ripin, I would advocate a terminology retaining the Flemish words to denote the position of the plucking point: a virginal could be 'muselar type' or 'spinett type' depending on whether it plucks in the middle or near the end. Or else, such instruments could be called shortly 'muselar' or 'spinett' (with two t's!). Ed had told me that he intended to propose this in his articles for the New Grove. Now that the Grove is at last available, the proposition does not appear formally; it is implicit in the inclusion of 'muselar' and 'spinett' articles. Ed had noted the analogy between the doublet spinet/spinett and the one cornet/cornett.

To sum up, the full nomenclature could read as follows:

1. HARPSICHORD. This is the type with the strings at 90° with the nameboard. The plucking point is always near the end of the strings. The bridge position determines the following subcategories:
   a) near bridge (nut) on the wrestplank
   b) near bridge on free soundboard

2. WING-SHAPED SPINET or WING-SHAPED VIRGINAL. Same remarks as for the harpsichord. 'Virginal' should probably be preferred for instruments of Northern origin.

3. RECTANGULAR VIRGINAL or RECTANGULAR SPINET, the latter to be preferred if the instrument is of Southern origin. Subcategories concern the position of the plucking point:
   a) near the middle: MUSELAR TYPE (or, shortly, MUSELAR)
   b) near the end: SPINETT TYPE (or SPINETT)
   and the position of the bridges:
   a) one bridge deadened
   b) one bridge partly deadened
   c) both bridges on free soundboard
4. POLYGONAL SPINET or POLYGONAL VIRGINAL, the latter to be preferred if the instrument is of Northern origin. The same subcategories as for the rectangular instruments could apply, although the distinctions would often be less clear. More particularly, many Italian polygonal spinets are midway between the muselar and the spinett types. An instrument like the 1548 Karest virginal in Brussels could be defined as a POLYGONAL VIRGINAL OF SPINETT TYPE or, shortly, as a POLYGONAL SPINETT; the left-hand bridge is deadened on all its length. The 1550 Karest virginal in Rome, a most interesting case for what concerns the terminology, could be a BENTSIDE POLYGONAL SPINETT; I have no information on its soundboard barring.

5. TRIANGULAR SPINET or VIRGINAL, etc. These are exceptional cases which cannot be fully defined by a mere denomination and deserve a full description.

References

1) M. Castellani GSJ XXV pp73 - 79
2) P. Puglisi GSJ XXXII pp24 - 37
Mixed clavichord/spinette (with vibrato)

I have - being a very amateurish hobbyist - built a clavichord reversible to a spinnette. For a start I have more or less followed the ordinary design of a small clavi-chord. It is fretted, that is there are nearly 3 tangents per string, 2 per string and 1 per string. In a 20 strings for 45 keys, 'C to c'.

When reversed to chlavichord playing the tangent is resting 3-4 mm under its string and the tangent attacks the string in the ordinary way.

To reverse to spinnette playing, I start doing this: First I switch, by means of a specific handle, all the tangents from their low resting position to a "spinnette"-resting-position, immediately underneath each string. Second: I move a row of jacks to come within reach of the strings by moving a thin "register box" (situated in the space between the keys and the string level). Above each string there is a quill in its jack. The jack is upside down and cannot move, as it is fixed in the register box. The jack is not quite vertical. The quill is at zero-distance above its string. Operation: When the key is pressed down, the tangent lifts the string - and the string meets the quill. A tone with vibrato.

Like perhaps Albert Einstein would say: Whether it is the jack that moves towards the string or the string that moves towards the jack, it is a relative movement. If I am not mistaken the idea is used earlier in an instrument called "Geigenwerk" (tangents lifting strings towards a rotating wheel to cause violin tones).

The result is not yet pleasing. My homemade quills are too stiff (could be changed). Single strings are too weak, gives a vibrato too difficult to handle (could be better by introducing pairs of strings for each tone or by some arrangement that limits the key movement). For further details, please write, dear Ben friends.
Even if the length and the width of organ pipe and other similar details defined, nevertheless it is impossible, all the same, to indicate single-valued the tone frequency which it will produce. There are a number of factors pertaining to, f.e., the mechanism of excitation, which could influence considerably the value of frequency. "Constant value K" used by Dominic Gwynn is rough approximation of influence of all similar factors. The builders of organ utilize it for determination of pipe draft dimensions when there is confidence that the pipes would further receive a final adjustment by frequency. In more important cases constant K is useless.

It is useful to explain on example how constant is the value K in reality. With this purpose I have taken the pipe from organ made by me, its length is 323cm, while diameter is 23.6cm. On the probeary wall with different blow pressures it produced the frequencies cited below. In the next experiment the width of its mouth by means of Scotch-tape was reduced so that the mouth area decreased by 1/3. (The mouth height was the former). The frequencies received under these conditions are given below. According to these results and on the basis of formula cited by Dominic (p.74) the values of K have been calculated.

<table>
<thead>
<tr>
<th>Wind pressure in mm of water</th>
<th>16</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequenc. in HZ for wide mouth</td>
<td>425</td>
<td>446</td>
<td>454</td>
<td>459</td>
<td>462</td>
<td>467</td>
</tr>
<tr>
<td>Frequenc. in HZ for narrow mouth</td>
<td>425</td>
<td>436</td>
<td>444</td>
<td>450</td>
<td>455</td>
<td>459</td>
</tr>
<tr>
<td>K for wide mouth</td>
<td>3.30</td>
<td>2.50</td>
<td>2.21</td>
<td>2.04</td>
<td>1.94</td>
<td>1.77</td>
</tr>
<tr>
<td>K for narrow mouth</td>
<td>3.30</td>
<td>2.37</td>
<td>2.57</td>
<td>2.35</td>
<td>2.18</td>
<td>2.04</td>
</tr>
</tbody>
</table>

It could be seen as obediently K value was changed due to pressure alterations and as the result of mouth area decrease. I am sure that Dominic should be able to accomplish more successful investigations, if he would pay attention to such circumstances.

Resultant data on 3 frequencies of the third octave cited by Dominic on p.75 differ between themselves, however these differences not so important as it appears to Dominic. Judging by the data on p.74 (which I consider as initial data for determination of "average pitch values") standard deviations for the averages obtained by Thomas-Rhodes, Evans and Gwynn accounted for accordingly 10.75 ; 7.92 ; 10.54 cps. It follows from this that the results of all three authors are not reliably different. (For ex. T-criterion of Student calculated for the data of Gwynn and Thomas-Rhodes equals to 0.798 , p>0.1.) In other words, the results of all three investigations are too uncertain to attach an importance to the differences between them. All frequency values cited on p.75 (including the result of Ellis) lie in limits of one confidential interval. Using the statistical concepts Dominic should apprehend well their absoluteness. It would certainly help him to consider the works of his predecessors more indulgently.
The item L is one of those luggage buckles that are easily obtainable; as the sketch shows, the block is slightly open, and when the lever is brought to the horizontal (dotted line) the clamp exerts its maximum. If it is taken fully down, the pressure slackens and so, in use, I held it in the dotted position with my right hand (finger actually) while I turned the cross slide in with my left hand. This operation takes seconds. To put in a pin the link of the buckle is lifted out of the U strap and the top block is hinged up sufficiently to take out the one pin and put in the new one. For a short run I used a brush for the coolant; for a long run a drip-can is best. The wood stop blocks E & G are positioned so that the rod that is inserted into the pin hole makes sure that the resulting square comes out dead, i.e. the pin is turned through 90°.

The first job to be done is to drill the holes in the pins and chamfer them to take off the burr, then the positioning rod is made a push fit in the hole. I made the top gripping blocks from hard wood with the two faces a clean fit. Then a hole of the correct size was drilled when they were clamped together after the hinge was fitted. The taper reamer was then used and in order to make sure that there would be a grip on the pin I lined the lower half of the tapered hole with fine emery paper, rough side up. A block of wood of the correct thickness was used as a gauge for the amount of projection of the pin before clamping.

JM adds: Harold sent us this note because he thought it might be useful to others. He wrote it after he ran out of tuning pins for the harps he makes and, when he found out what new supplies cost, decided to make his own from engineering standard taper pins. He says that once the fixture has been made, it can be quickly assembled onto the cross-slide of the lathe and that the actual squaring of the end takes seconds.
Jeremy's remarks on soft shawms in Bull. 21 prompt me to write a bit more on this issue.

Placing one's lips on the reed, while it does suggest a desire to be able to play softly, does not necessarily produce a soft tone. Somehow it doesn't sound quite right to call instruments such as the Spanish tiple and tenora "oboes": they produce such a typically loud shawm sound (as well as a soft sound). In "Styll Shalmes" I argued that renaissance shawms were often, if not always, played as the tiple and tenora are, both loudly and softly, with a lipped reed. The Burgkmair drawing of shawms with crumhorns (pl.60,p.85, in Jeremy's Medieval and Renaissance Instruments) is probably further evidence for this. But if this is the case, to start calling all or even some renaissance shawms "oboes" would surely be disastrously confusing. Whether or not the position of the lips would be a useful diagnostic for ethnic instruments, I don't believe it is a practicable one for historical instruments.

Tinctoris said that the doucaine was "imperfect" because it could not play all pieces. The only feasible explanation of this, apart from the cylindrical bore theory, would seem to be that the doucaine's use was restricted by its limited dynamic range, i.e. that it was, like the later bassanello, a kind of shawm designed to be played quietly. It certainly seems that it was a distinct variety of instrument, not just a shawm played differently: the shawm itself was, after all, "perfect" - because it, on the other hand, could play both loudly and softly and therefore deal with all kinds of music. Had Tinctoris been writing later he would presumably have classed the mute cornett and bassanello as "imperfect" for the same reason, because they had restricted dynamic ranges, and therefore usefulness, as compared with the cornett and shawm respectively.

It's worth bearing in mind, of course, that the doucaine may not have been considered "imperfect" by anyone outside of Tinctoris' immediate circle, geographical region or time. We know that soft shawms ("the styll shalymes" - mentioned in a way which implies that they were instruments designed to be soft, i.e. English doucaines) existed at least by 1509. And there are pictures of what must be earlier soft shawms, and of shawms with shapes or features which suggest they might be doucaines. But I have not yet seen a mediaeval picture of a likely cylindrical bore reed instrument, nor any other evidence for their existence at that time.

And the name "doucaine" very likely derives from words meaning "soft shawm". So the name of the instrument, the iconographical evidence, a perfectly logical explanation of Tinctoris' statement on "imperfection", and the internal logic of his complete statement, all suggest that the doucaine was a soft shawm. There is only really the other explanation of "imperfect" to suggest that it may have been anything else.

Interestingly, the only recording* I've heard of a "doucaine" reconstruction, Körber's cylindrical bore capped reed instrument, negates the very assumption upon which this alternative explanation of "imperfect" and the reconstruction are based, by playing the instrument effectively in both normal and overblown registers and thus giving it quite a reasonable pitch range.

*Chansons der Trouvères, Early Music Quartet, Telefunken Das
There are also a few things I would like to add to the original Comm.:-

Two more possible doucaines: (1) in "The Assumption of the Virgin", Matteo di Giovanni, late 15th cent., National Portrait Gallery, London (see Blades, Percussion Instr's & their History, pl.78). This appears to meet criteria iii, iv, v and vi (see Comm.272, p.54); (2) in a tapestry in what appears to be early 15th century style, but which I have seen identified elsewhere as "Concert in the Open Air - tapestry from Brussels, c.1500", reproduced on the cover of The Baroque Harp (!)(Elena Polonska), a Turnabout L.P., TV34069S. This instrument appears to be a tenor, has only a slight flare to the bell and has a visible triangular reed and no disc or pirouette. It is in company with a harp, rebec and lute. Thus it meets criteria i?, iii, (iv, v and vi not applicable - it's not in the player's mouth) and vii.

Further evidence for soft shawm playing before the oboe: Monteverdi's scoring for "piffari" (descant shawms) in the Vespera of 1610 - they play as an integral part of a polyphonic texture with recorders, cornetti etc. (Also of interest is a painting by Jan Steen (1626-79), "The Cat's Dancing Lesson", Rijksmuseum, Amsterdam (see Arnason, A History of Modern Art, p.352), which shows a "piffaro", apparently without pirouette, being played very much like an oboe. But this may not pre-date the oboe.)

Some information needed which might throw further light on the whole question:-

(1) a complete list of references to the doucaine or to soft shawms, with approximate dates and locations;
(2) any references to soft reed instruments in Arabic/Moorish musical history, or pictures of same, e.g. in Farmer's Musikgeschichte in Bildern, Islam (to which I don't have access);
(3) a list of pictures of shawms with bulbous bells or others of the features mentioned in Comm.272. (What are the pictures of "pear-shaped" bells which Sachs refers to? His source book was apparently Die Musikalischen Instrumente in den Miniaturen des fruhen Mittelalters, vol.1, Edward Buhle, Leipzig, 1903 (pp.44-45). Does anyone have access to this?);
(4) any pictures, recordings etc. of the French folk shawm with pear-shaped bell called "musette".

Also, according to Early Music (July '77, p.435), Christopher Page and Lewis Jones once gave a lecture/demonstration of "imaginative" reconstructions of instruments from the Cantigas. Did these include the doucaines? If so, can anyone offer any information on them?
Further to the comments by Thomas Rein on Comm. 307.

The subject of the materials used in gesso is more complex than is sometimes supposed. Although the word *Gesso* is indeed the Italian for the naturally occurring mineral gypsum, the meaning is normally extended to apply to the grounds made with glue and chalk which have been used for centuries by easel painters in northern Europe. Martin de Wild, in *The Scientific Examination of Pictures* (1929), records the presence of whiting in the grounds of a large number of Dutch and Flemish paintings from as early as 1437, and notes that gypsum was not present in any instance, so the use of chalk can hardly be described as recent. The results of the examination of the decoration of only a few harpsichords has been published; however, we found natural chalk in what appeared to be the ground for the original case painting on the 1769 Taskin in Edinburgh, as well as beneath the lid painting of the 1671 Philip Jones virginals. A natural chalk ground also occurred beneath the soundboard paintings of an anonymous French instrument of c. 1700 which we recently restored.

In Italy and Spain calcium sulphate, in one form or another, was the preferred bulking material for grounds. When natural gypsum (the dihydrate $CaSO_4 \cdot 2H_2O$) is heated, it is converted from a soft rock-like material to one which crumbles readily to a powder, but its reaction with water depends on the temperature to which it has been heated. When gypsum is heated to between 120$^\circ$ and 130$^\circ$C, plaster of Paris (the hemihydrate $2CaSO_4 \cdot H_2O$) is formed. This material combines readily with water and sets rapidly, reverting to the dihydrate. At temperatures between 200$^\circ$ and 400$^\circ$C normal builder’s plaster is formed. All the combined water is driven off, forming the anhydride ($CaSO_4$). This, too, reverts to the dihydrate when water is added, setting more or less slowly depending on the temperature at which it has been burnt. When gypsum is heated above 400$^\circ$C the anhydride is still formed, but the material will not set with water and is described as dead burnt. If dead burnt plaster is steeped in excess water for some weeks, it eventually reverts to the dihydrate, but as a powder, not as a solid lump. This appears to be Cennini’s gesso sottile and according to Gettens and Mrose (Studies in Conservation Vol 1 no 45 1954), it is still used in Italy as a gilding gesso though it is now called ‘gesso a oro’.

If almost dead burnt gypsum is mixed with glue size instead of water, the reversion to the dihydrate is virtually stopped. Gesso made in this way is composed of a mixture of anhydrite and the dihydrate and Gettens and Mrose have shown that the gesso grosso on a number of early Italian and Spanish paintings was prepared in this way. This gesso grosso contains many coarse particles and is microscopically distinct from gesso sottile made by slaking almost dead burnt gypsum in water. Though we have identified gesso sottile in the grounds of the decoration on Italian harpsichords, we have not found gesso grosso. In view of Gettens and Mrose’s work, it is unfortunate that D.V. Thompson, in his otherwise excellent translation of Cennini, referred to the use of plaster of Paris rather than plaster in the section on making gesso, and that he has been followed in this by most other writers on the subject, including Gettens and Stout in their *Painting Materials* (1942).

Mr Rein rightly suggests that when fresh plaster of Paris reacts with the water in the glue size it produces a gesso which sets harder than chalk gesso (in fact about as hard as gesso made with dead burnt gypsum). This plaster of Paris gesso is composed entirely of the dihydrate, which forms after a few days as quite large particles. Italian gypsum kilns were fairly crude affairs but plaster of Paris was a special product, made in small quantities and requiring considerable care if it was not to be burnt to the dihydrate.
unlikely that it would have been used in the past if a more easily obtainable product could have been used instead. In our experience, plaster-of-Paris gesso sets inconveniently slowly compared with chalk but as most builder's plaster contains additives to accelerate or retard the set today, if you want a particularly hard gesso for some reason, or cannot obtain natural chalk (precipitated chalk is not satisfactory), then plaster of Paris may be the best material to use. It should be borne in mind that it is not quite the correct material and that if one is concerned with authenticity, gypsum-based gesso would only be appropriate on an Italian instrument.

Perhaps it is worth mentioning that on the three Ruckers instruments bearing traces of original marbling which we have examined, the marbling was painted directly onto the wood without an underlayer of gesso. No gesso occurred beneath the marbling on the anonymous French instrument referred to above, and on one of the two decorated Italian virginals we have examined it was also absent.

It is not clear what Mr Rein means by the word 'tempera', which can refer to any medium used to temper (ie. bind) colours. If he is thinking of egg tempera, we have found no evidence that it was used on harpsichords before the end of the nineteenth century. We have discussed this point in 'Tempera and Decorated Keyboard Instruments' Galpin Society Journal Vol XXXII (1979).

Cheese glue - usually known as casein - was sold until a few years ago as Casco (not Cascamite which is a urea-formaldehyde glue). However, Casein is still available if one is prepared to make it up. Essentially, casein is insoluble in water, but will dissolve in strong solutions of alkali. Casein powder (ammonia casein) can be obtained from L. Cornelissen & Son, 22 Great Queen Street, London WC2B 5RH. Although the glue can be made up using quicklime, we use the ammonium carbonate method which we find works well.

Solution A. Mix 40gm of casein powder with a little water to a smooth paste. Thin this with about 250cc of warm water.

Solution B. Mix 10gm of ammonium carbonate in about a dessertspoonful of water and press out any lumps. Pour B into A while stirring and continue to stir for a minute or so. Carbon dioxide will be given off causing a 'head' to form on the glue, so use an amply large container or you will have glue all over the bench. When no more gas is given off - 5 to 10 minutes - the glue will have thickened and be ready for use.

Note: unless the ammonium carbonate is kept in a very well stoppered container it deteriorates rapidly.

There is another form of casein available called soluble casein which only needs to be added to water, but on the one occasion we tried using it we could not make it work properly.

Casein glue will certainly resist damp. In very damp conditions it becomes weaker but it regains its strength on drying. Like other organic glues it is subject to attack by micro-organisms when wet, and woodworms find it palatable even when dry. The strong alkali present can cause noticeable staining of some timbers. Nevertheless, it is an extremely strong glue, comparable with urea formaldehyde on most timbers. It gives plenty of time for assembly and from the point of view of restoration, casein has the useful property that it can be digested by the enzyme Tripsin.
The basic justification for building early instruments is that unless musicians play early music on appropriate instruments they will not be able to achieve the correct sound: not just in the matter of timbre or tone, for the way the notes are played and the structure of the music itself can be affected. In short, the tools affect the product.

This applies even more to instrument building itself. In my own work on harps I have found that many apparent structural peculiarities start to seem quite reasonable after I've built a few instruments using tools similar to those of the original builders. Some things (like carving out a 5" deep soundbox) make absolutely no sense at all until original-type tools are used. Again, the tools affect the product.

What I would like to do now is set up a workshop to build Medieval instruments using, as much as possible, historically appropriate technology to explore the possibilities and limitations of the tools and methods.

As well as being valuable for research purposes, the workshop could be a good "tourist attraction". And, provided that the builders were permitted to sell their products, it should be almost self-supporting. What is needed is a rent-free or low-rent location at a "living" folk museum, private estate, or some such place that could benefit from the tourist aspect of the project and be able to provide some degree of practical support. It might be best if other activities of similar nature were taking place nearby. If anyone knows of a location which might be suitable, please get in touch with me and I'll send off a more detailed description of what I've got in mind. Any European location considered, at present.

I suppose the best set-up would involve two stringed and two wind instrument makers, starting with just one or two, and eventually making the facilities available for work by other builders. Whether or not the workshop was in operation year-round would depend on the location and the people involved.

If any members are interested in participating in or assisting the project, I would like to hear from them.
More on Organological Terminology - A Response to Comm 351
by E. Segerman

I'm both happy and sad about Jeremy's Rejoinder Comm 351. The happiness is that Jeremy has finally got the message on theorboes, chitarrones and archlutes. The sadness is that the strong language I used in Comm 338 for arguing my points must have hurt for him to make such an angry reply. I expected to engage him in the kind of intense debate on philosophical and practical issues that is a traditional method of recreation and mutual education amongst Jews who are the best of friends in New York and Jerusalem. In this tradition, while scornful language is used against the opponent's ideas being debated and the opponent's willingness to hold them, the underlying respect for him is never in question. I am sorry that this style offended Jeremy's sensitive Englishness. This leads me to conclude that he should join the rest of us in being happier that he has taken the Oxford job.

There is little in Jeremy's Comm 351 to argue with. I will repeat my apology for apparent intemperateness in Comm 338 (I actually was in particularly good humour when I wrote it). And my paper was unscientific in the meaning of the term as I use it. To me, being scientific means creating hypotheses which would potentially increase our knowledge, and then engaging in investigations designed objectively to test the truth of these hypotheses. The issues here are terminology and not knowledge, so scientific method is not involved. Jeremy is using some other meaning of the term since he states that guessing "is hardly a scientific procedure". The hypothesis in the scientific method is nothing more than a guess. But Jeremy seems to be saying that the terminology of the systematic organologist is 'scientific'. This is technically true since one of the accepted meanings of the term 'scientific' is 'systematic, precise'. I'm finding it hard to imagine how Jeremy could have thought that I violated this meaning of the term. Perhaps he is saying that since I seemed to be against an established 'scientific' system of nomenclature, I must be 'unscientific'. This is illogical.

I do not see how putting a category name to a strange corpse of an instrument does in itself increase our understanding of it in any meaningful way. Possible relationship with other instruments which would be implied by the category name depends on knowledge of those other instruments in the category. But if one already has this knowledge, the possible relationships can be explored directly without the need for the category name. The value of the name here is to help in the library search for related instruments when they are not yet known by the researcher.
Of much greater importance, universally-accepted category names facilitate communication when various different instruments are compared. Here I completely agree with Jeremy. I was only objecting to one of the inadequacies of the Hornbostel-Sachs system that doesn't seem to bother Jeremy (both of us are certainly aware of many others). This inadequacy is that, to borrow a term from Jeremy, the nomenclature is too Europacentric, while the intended application is too non-Europacentric. Of course, the terminology is in European languages which are internationally accepted for the expression of scholarship. The trouble is that the names of specific European instruments are often used to name general categories. This creates little or no confusion with non-European instruments but at times it does create confusion with European instruments (the area of my specialist concern, which I make no apologies for).

When such terms have traditionally been used as categories in European languages (e.g. drums or harps), they create no problem. But when a name is given a much broader category meaning than it ever had in Europe and when that category is applied to a European instrument that never had this name, people not trained in the special terminology are bound either to be confused or misled.

I suggested Latin terminology as an easy way out. It also makes translation of the terminology from one internationally used European language to another unnecessary. If alternatively the systematic organologists were willing and able to invent attractive easily-translatable category names that create no confusion, the other groups of name users would be glad to adopt them. But, if Jeremy's attitude is typical, the systematic organologists seem not to be concerned enough about the problems they create with respect to European instruments to care about changing their names. So it is up to the others to ignore them and invent their own category names whenever necessary.

It is my impression that there are many more musical-instrument scholars involved with European instruments than with non-European instruments. The former group rarely uses the terminology of systematic organology which is accepted by the latter group. This is probably because the members of the former group doesn't find the terminology attractive and they can get along without it. An important aspect of the attractiveness of the terminology is whether it can confuse or mislead the non-organologists that this group more frequently communicates with. It is a pity that these two groups are separated by using different languages. There is no basic reason why systematic and functional organologists should use different languages. The differences between them is not that great.
FELLOWSHIP of MAKERS and RESTORERS of HISTORICAL INSTRUMENTS

1981 LIST of MEMBERS — 2nd Supplement, as at 19th October 1981

* in left-hand margin denotes a change of address etc from the Main List or 1st Supplement.

AMIS — see Peggy Downie.

Donald L. Barney jr, 602 S 126th St, Tacoma, WA 98444, USA; tel: 344 9780 (ww, M; musicologist).

Jonathan Bosworth, 29 Main St, Acton, MA 01720, USA; tel: (617) 263-0493 (oboe, shawm, chalumeau, tabor pipe; M).

G. Brian Bourne, Tregantle, Kiln Way, Grayshott, Hindhead, Surrey, UK (keyboards, violins).

Virginia Bridge, 108 Cotman Fields, Norwich NR1 4EP, UK; tel: 0603-661798 (research).

Hendrik K. ten Bruggencate, Blossom Cottage, Abthorpe, Towcester, Northants NN12 8QN, UK; tel: 0327-857166 (organs; M, R).

Ralph Bryant, Saurenbachstr.36, CH-8708 Männedorf, Switzerland (trumpet, cornett; P).

Pål Bue, AMK, Østre Strandgt.17A, 4600 Kristiansand, Norway (ww, P, res; clarinet, P).

Lutz Bungart, The Instrument Workshop, 318 North 36th Street, Seattle, WA 98103, USA; tel: (206) 632-7918 (keybds, parts for keybds; M).

R. A. Chiverton, 97 Montpelier Terrace, Cheltenham, Glos; tel: 517378 (flute, recorder; M).

Arthur Churchill, 57 Wallace Crescent, Carshalton, Surrey SM5 3SU.

Steven E. Clark, 4953 Barat Circle, Anchorage, AK 99504, USA; tel: (907) 333-0474 (virginals, plucked str. instrs, flute; M).

Graham Cochrane, 24 Prospect, Corsham, Wilts SN13 9AF, UK; tel: Corsham 712529 (bagpipes; M).

Graham Cooper, 14 Gomer Lane, Gosport, Hants (until November) then: 92 St. Johns Road, Locks Heath, Hants, UK.

David A. Darbyshire, 57 Clayton Grange, Leeds LS16 5EQ, UK (all str. instrs & ww; M).

K. Bartley Ellis, 30 Kingsway East, Newcastle-under-Lyme, Staffs ST5 3PZ, UK; tel: 0782-617915 (violin, viol, rebecc).

Andrew Fairfax, Huygenslaan 2, Amersfoort, Netherlands (violins, recorders; M).

John Downing has moved to Canada; temporary forwarding address: c/o Disney, 25 Slade Close, Headington, Oxford OX3 7DY, UK.

Gavan & Lesley Duffy, 33 Hamilton Road, Thornton Heath, Surrey, UK (lute, recorder; P).

Richard B. Earle, 13A Clapham Manor St, London SW4 6DU, UK; tel: 01-622 3395 (bar & class oboes; M, P).

Early Music Centre, 137 Goswell Road, London EC1V 7ET, UK; tel: 01-278 6783.

Hugh & Betty George, 'Five Oaks', 13 Wellington Road, Enfield, Middx EN1 2PD, UK; tel: 01-363 1511 (hpschd, MRP (Hugh) dec (Betty) etc.

F. Donald Gill, tel: Stokesley 700976.

Ole Halén, Kuluavuorenkatu 7, SF-00500 Helsinki 50, Finland; tel: 90-763736.
Nikolaus Harders, Landwehr, 2875 Ganderkesee, West Germany; tel: 04222/1872 (viols).
Dick Hensoldt, 20421 Kedzie, Olympia Fields, IL 60461, USA; tel: (312) 748-0155 (recrdrs, shawms, oboes; M,P).
David G. Jones, Morland Pianos, Morland, Penrith, Cumbria CA10 3BA, UK; tel: 09314-338 (pianos; R,P,teach).
* Martin Jones, 8 Lambert Street, London N1 1JE, UK; tel: 01-607 6137.
P. Malcolm Jones, 73 Oxford Road, Moseley, Birmingham B13 9SG, UK; tel: 021-449 7139 (keybds, reed ww, MCP res; mus.libr.help).
Jane Julier, Lewdon Farm, Cheriton Bishop, Exeter, Devon, UK; tel: 064724-283 (viols; M,P).
* F. Cary Karp, code: S-11657
Robert Kerr, 46 Barony Terrace, Edinburgh EH12 8RD, UK; tel: 031-334 4444 (lutes, viols; M, teach).
Kilström -- see Grahn & Kilström.
* James Kimbel, 1205 8th Ave #3R, Brooklyn, NY 11215, USA.
* F. Cajsa Lund, Gildegaard, S-27100 Ystad, Sweden; tel: 0411-71327.
Mark McDougal, 160 Station Street, Carlton, Victoria 3053, Australia. Laurence Marshall, 282 Wilbraham Road, Manchester M16 8WP, UK; tel: 061-881 8774 (keybds; M).
* Bryan Maynard, Hawthorn Cottage, West Lutton, Malton, N.Yorks Y017 8PA; tel: West Lutton 372.
* F. Jeremy Montagu, 171 Ifley Road, Oxford OX4 1EL, UK.
Rod Nelson, Beaupré Cottage, Hay Lane, Horsley, Glos, UK; tel: Nails worth 3061 (ren.recorders; M,P).
A. D. Nicholson, 101 Bishops Road, Bristol BS7 8LX, UK; tel: 426233 (class & bar guitars; M).
* Chinnyere Nwachukwu, National Department of Antiquities, Nigerian Museum, PMB 12556, Lagos, Nigeria.
Peter Nyman, 131 Moorland Road, Woodsmoor, Stockport, Cheshire, UK; tel: 483 5577 (fl, clar, gtr, keybds, M,P; Finnish trad.insts).
Willis Overholt, 366 N. Erie, Wichita, KS 67214, USA; tel: (316) 688-5011 (vl, hpschd, lute, gtr; M,R).
Adolf Ferdinand Packeiser, Linien Str. 14, 28 Bremen 1, West Germany; tel: 0421/700334 (french chamber pipes, cornemuse; M,R,C,P,W).
Delia Pye, 200 Broomwood Road, London SW11 6JY, UK; tel: 01-223 5878 (clavichord).
Dirk Rademaker, Huxfelderstr.33, 2801 Grasberg, West Germany; tel: 04208/1042.
* F. Mary Remnant, 15 Fernshaw Road, Chelsea, London SW10, UK; tel: 01-352 5181 (pfte, vl, rbc, fidl, pos.orgn, gtr, rcdr, bells, etc).
Richard Repham, Director, Yale University Collection of Musical Instruments, 15 Hillhouse Avenue, New Haven, CT 06520, USA.
* Trevor Robinson, Institut fur Pharmakognosie, Universitatsplatz 4/1, A-8010 Graz, Austria (till June, 1982).
David Royal, 35 Carden Road, London SE15, UK; tel: 01-732 8595 (lute, bar.oboe; M,P).
James Russell, c/o Mournecraft Ltd, WIN Industrial Estate, Newry, Co.Down, Northern Ireland BT35 6PH, UK; tel: 61305 (str.instrs).
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Peter J. Smart, 11 Church Lane, Tarleston, Middx TW11 8PA, UK; tel: 01-977 2731 (viol, lute, M; most str.instrs, R).
* Richard E. Smith, Farthings, 25 Leith Rd, Beare Green, Dorking, Surrey RH5 4RG, UK; tel: Dorking 6407.
* F. Bernard Thomas, 21 North Side, Clapham Common, London SW4 3RF, UK (fl, rcdr, capped reeds, P,I,W; music publisher).
Reid Library, University of Western Australia, Nedlands, WA 6009, Australia.
Roland Wilson, Am Rapohl 20, D-5000 Köln 40, West Germany; tel: 02234/72914 (cornett; M,P).
Stevie Wishart, 5 Gladstone Street, Norwich, Norfolk, UK; tel: 0603-23214 (rebec, fiddle; P, res).
Richard Wright, 65 Lambton Road, London SW20 OLW, UK; tel: 01-947 7798 (cittern; M).

General Facilities

Library Facilities & References: Malcolm Jones


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String Instruments - general: David Darbyshire James Russell Andrew Haddow Peter Smart

Psaltery: Mary Remnant

Parts for Keyboards: Lutz Bungart

Keyboards general: Brian Bourne Malcolm Jones Peter Nyman Andrew Haddow Laurence Marshall

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Steven Clark, v Richard Rephann, h
H & B George, h J & L Shortridge, hvs
Grahn & Kilström, h

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Fiddle: Bartley Ellis Mary Remnant Stevie Wishart

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       Nikolaus Harders Peter Smart

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Richard Earle  David Royal

Shawm: Jonathan Bosworth  Dick Hensold

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Philip Gruar (s,m)

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Cornett: Ralph Bryant  Roland Wilson

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Richard Rephann, CT  J & L Shortridge ME  Don Barney, WA
Jonathan Bosworth,MA  Dick Hensold, IL  Lutz Bungart, --
LUTE OUTLINES - A PRAGMATIC APPROACH TO GEOMETRICAL DESCRIPTION.

William Samson

David van Edwards (Lute Soc. J. 15 (1973) 48) and Djilda and Eph Segerman (PoMRHI Comm. no. 5 (1976)) have discussed the geometrical construction of lute outlines. Both of these articles take a pure approach which makes minimal use of measuring instruments. This approach, although excellent for several instrument outlines, is very difficult to apply to many other outlines encountered in practice.

The method described below makes full use of a ruler and polar coordinate tracing paper for the measurement of distances and radii.

A basic construction in which the outline can be drawn with three different radii is described first:

1. Draw a centre line and mark the positions of the bridge (B), the bottom (C), the neck-body join (D) and the widest point (E).
2. Mark the position where the edge of the fingerboard meets the edge of the soundboard (F).
3. Draw the line of maximum width through E, perpendicular to the centre line and mark on this the position of the edge of the soundboard, (X).
4. Draw the perpendicular bisector of the line FX, to cut XE (produced) at G.
5. Centre G, radius GF, describe an arc from F to X and a little beyond. This curve forms the upper part of the outline.
6. Estimate the radius of the outline at the bottom of the instrument (using polar coordinate tracing paper for accuracy) and plot the centre, H, on the centre line. Describe an arc, centre H, radius HC, through C.
7. Measure the radius, \( r_1 \), of the lower 'corner' of the lute outline.
8. Set compasses to radius \( r_1 \).
9. Centre C, radius \( r_1 \), mark point I on centre line. Centre X, radius \( r_1 \), mark point J on EX.
10. Draw an arc, centre G, radius GJ to intersect another arc, centre H, radius HI, at point K.
11. Draw an arc, centre K, radius \( r_1 \), touching the side and bottom arc segments.
12. The above process gives half the outline. Repeat the process for the other half.

The above construction is shown in figure 1.

Two lutes which fit the above construction method well are detailed below. All measurements are in centimeters.

<table>
<thead>
<tr>
<th>Maker</th>
<th>date</th>
<th>CD</th>
<th>CH</th>
<th>CR</th>
<th>CE</th>
<th>CB</th>
<th>DF</th>
<th>EX</th>
<th>( r_1 )</th>
<th>rose</th>
<th>diam</th>
</tr>
</thead>
<tbody>
<tr>
<td>JC Hoffman</td>
<td>1776</td>
<td>49.9</td>
<td>80</td>
<td>32.1</td>
<td>15.0</td>
<td>10.0</td>
<td>4.7</td>
<td>15.1</td>
<td>7.4</td>
<td>8.0</td>
<td>10.5</td>
</tr>
<tr>
<td>Unverdorben</td>
<td>C16</td>
<td>54.7</td>
<td>40</td>
<td>31.9</td>
<td>16.8</td>
<td>9.3</td>
<td>5.6</td>
<td>16.9</td>
<td>11</td>
<td>10.5</td>
<td></td>
</tr>
</tbody>
</table>
Most lutes, however, have a different radius of curvature immediately below the line of maximum width from that immediately above it. In this case we must note the radius, $r_k$, of the section immediately below X:

1. The previous construction method is followed for the upper part of the outline.

2. Plot point $L$ on $GX$, distant $r_x$ from X.

3. Describe an arc, centre $L$, radius $r_x$, downwards from X.

4. Describe an arc, centre $H$ (located as before), radius $HC$, through C.

5. Plot point $J^1$, distant $r_x$ from X, on $GX$, and $I^1$, distant $r_x$ from C, on $HC$.

6. Describe an arc centre $L$, radius $LJ^1$, to intersect another arc centre $H$, radius $HI^1$, at point $K^1$.

7. Describe an arc, centre $K^1$, radius $r_x$, to form the 'corner' of the lute outline.

This process is shown in figure 2.

The table below lists a number of lutes for which the upper part of the outline is formed by the first construction method and the lower part by the method described above:

<table>
<thead>
<tr>
<th>Maker</th>
<th>date CD</th>
<th>CH</th>
<th>CR</th>
<th>CE</th>
<th>CB</th>
<th>DP</th>
<th>EX</th>
<th>$r_x$</th>
<th>$r_z$</th>
<th>$r_y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>J Tielke</td>
<td>1696</td>
<td>15.95</td>
<td>30</td>
<td>30.5</td>
<td>14.5</td>
<td>9.9</td>
<td>5.0</td>
<td>15.3</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>Frei (Warwick)</td>
<td>C16</td>
<td>48.2</td>
<td>52</td>
<td>29.0</td>
<td>14.0</td>
<td>9.3</td>
<td>5.1</td>
<td>15.4</td>
<td>10</td>
<td>9.3</td>
</tr>
<tr>
<td>Frei (Vienna,1)</td>
<td>C16</td>
<td>46.3</td>
<td>60</td>
<td>26.0</td>
<td>13.5</td>
<td>8.6</td>
<td>5.0</td>
<td>15.0</td>
<td>10</td>
<td>7.8</td>
</tr>
<tr>
<td>Frei (Vienna,2)</td>
<td>C16</td>
<td>47.5</td>
<td>30</td>
<td>29.2</td>
<td>13.5</td>
<td>8.8</td>
<td>5.1</td>
<td>15.0</td>
<td>11</td>
<td>7.1</td>
</tr>
<tr>
<td>G Gerle</td>
<td>1580</td>
<td>45.9</td>
<td>80</td>
<td>26.3</td>
<td>13.5</td>
<td>8.5</td>
<td>2.7</td>
<td>15.3</td>
<td>9</td>
<td>9.5</td>
</tr>
<tr>
<td>G Heiber</td>
<td>C16</td>
<td>43.2</td>
<td>80</td>
<td>25.5</td>
<td>14.0</td>
<td>7.6</td>
<td>3.2</td>
<td>15.4</td>
<td>10</td>
<td>8.5</td>
</tr>
<tr>
<td>Maler (Prague)</td>
<td>C16</td>
<td>47.4</td>
<td>28</td>
<td>30.5</td>
<td>13.5</td>
<td>8.6</td>
<td>5.5</td>
<td>14.6</td>
<td>10</td>
<td>9.2</td>
</tr>
<tr>
<td>M Hoffman</td>
<td>1697</td>
<td>48.5</td>
<td>40</td>
<td>28.9</td>
<td>16.1</td>
<td>9.0</td>
<td>4.8</td>
<td>15.6</td>
<td>11</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Some lutes have an additional complication in that the upper part of the outline is made up from two radii. Suppose Z is the point on the outline where this radius changes. The following construction is used for the upper part of the outline in this case:

1. Estimate the radius of curvature $r_z$ of sector $XZ$ and radius $r_y$ of sector $ZF$.

2. Plot $G^1$ on $XE$ (produced) distant $r_x$ from X.

3. Describe an arc centre $G^1$, radius $r_z$, through X in an upward direction.

4. Describe an arc, centre $G^1$, radius $r_z-r_y$ to intersect another arc centre $F$, radius $r_y$, at point $Y$.

5. Describe an arc, centre $Y$, radius $r_y$, from F in a downward direction to complete the upper part of the outline.

6. The lower part of the outline is drawn by one or other of the first two constructions.

This construction is shown in figure 3.
The table below lists four lutes which require this modification:

<table>
<thead>
<tr>
<th>Maker</th>
<th>date</th>
<th>CD</th>
<th>CH</th>
<th>CR</th>
<th>CE</th>
<th>CB</th>
<th>DF</th>
<th>EX</th>
<th>$r_1$</th>
<th>$r_2$</th>
<th>$r_3$</th>
<th>$r_4$</th>
<th>Rose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tieffenbrucker</td>
<td>1609</td>
<td>49.9</td>
<td>80</td>
<td>29.7</td>
<td>16.0</td>
<td>8.8</td>
<td>4.0</td>
<td>17.0</td>
<td>11</td>
<td>54</td>
<td>28</td>
<td>10.7</td>
<td>27</td>
</tr>
<tr>
<td>Venere</td>
<td>1592</td>
<td>43.3</td>
<td>60</td>
<td>24.2</td>
<td>15.1</td>
<td>7.95</td>
<td>3.1</td>
<td>15.0</td>
<td>9</td>
<td>40</td>
<td>20</td>
<td>8.9</td>
<td>23</td>
</tr>
<tr>
<td>Sellas</td>
<td>1630</td>
<td>41.8</td>
<td>60</td>
<td>25.3</td>
<td>15.7</td>
<td>8.3</td>
<td>5.4</td>
<td>16.0</td>
<td>10</td>
<td>40</td>
<td>36</td>
<td>9.3</td>
<td>21</td>
</tr>
<tr>
<td>Schelle</td>
<td>1727</td>
<td>47.5</td>
<td>70</td>
<td>29.4</td>
<td>13.0</td>
<td>9.8</td>
<td>5.0</td>
<td>15.5</td>
<td>10.5</td>
<td>64</td>
<td>52</td>
<td>8.0</td>
<td>20</td>
</tr>
</tbody>
</table>

The advantage of this method of describing lute outlines is that shapes can easily be scaled up or down simply by scaling the appropriate parameters. The first method of construction has the additional advantage of allowing a maker to decide on a string length, bridge position, body width and neck width, and from these basic measurements construct an elegant outline to suit, in the way the old makers must have done.

End of the following Comm. 378

This was the fate of many who worked with a high arched model which, by a quirk of fate, and not as some would have us believe, a lack of foresight, did not respond to the modern requirements. A similar logic would perhaps claim that Bach foresaw the symphony orchestra as the final solution for realising his music.

A drawing of the instrument is available, and I would be interested to hear from anyone who knows of other instruments or has information on this maker.

Ian Watchorn.
REPORT ON THE RESTORATION OF A VIOLIN.

Original manuscript label reads: B. Jacovis
Cromona 1649

??

The 6 has been altered to read 5; the 4 could be a 7.

The violin is the property of Pamela Munks of Sydney, Australia, and was brought for restoration to a specification suitable for general baroque playing.

On receipt, the violin was in playing condition with a standard modern specification. It was structurally sound but displaying signs of much repair work to both top and back.

In all there were 8 repairer's labels and inscriptions.

The tone of the violin was sweet and mellow, but small and lacking any attack whatsoever.

VARNISH: A rich golden orange on a yellow base. The back and sides largely unretouched, the soundboard heavily reworked. Ultra-violet light caused those areas not worn or rosin-affected to fluoresce a "salmon pink" colour. Subjectively, one of the most attractive and vivid Cremonese varnishes I have seen; a high transparency and lustre.

SCROLL: The scroll is old (C18th) but not original and is spliced in the usual manner to the modern neck. Both timber and varnish on the scroll differ from the body, and the lesser degree of wear and unrelated workmanship indicate a later date.

The scroll is beautifully carved and resembles, in style and symmetry, the best work of the Amati school.

TABLE: Made in three parts, with a join near the centre line and a second join passing through the bass F hole. The pine, of a red colour, is of a medium grain, cut off the quarter so that on the bass side, near the join, the wood appears slab cut, due to the steep arching. At some point, the soundpost has pierced the top, and the repair executed using a triangular patch reinforced inside with an oval soundpost patch of irregular grained pine. Numerous other cracks, two in need of attention. Purfling: single B/W/B set in 4mm from edge, 1.5mm wide.

RIBS: Lightly figured maple, except lower treble bout which is plain and darker in colour. Purfling insert at join on tailblock. Some repaired worm runs on bass side.

BACK: Of medium figured maple, descending from centre join. Centre join repaired. 2 repaired cracks on treble side. Button lined and pinned with ebony.

AT THIS POINT THE FINGERBOARD AND SOUNDBOARD WERE REMOVED.

FINGERBOARD: Once removed, revealed a heavy rosin buildup which suggested the position of a previous fingerboard, terminating 65-75mm from neck end.
SOUNDBOARD. All repairs studded and secure except section of centre join and small edge crack. Edges thin and uneven, esp. at neckblock, due to repeated removal.

NECKBLOCK: Old, possibly original. Single plugged nailhole. The pine of the neckblock is similar to that of the tail and bass side corner blocks, all of which seem original. The treble corner blocks are larger, newer, and neater than the others, and may date from the time of replacement of the odd rib.

RIBS: Heavily marked by toothed scraper, except the replacement which is smooth. Signs of heat scorching and some cracking during bending. Ribs 1.0-1.2mm thick. Liners are of pine, 2-3 mm X 4.5mm, except upper treble at back, which is maple 2X6mm. All in good order.

BACK: 2 cracks studded as is centre join. Irregular burn mark follows line of ribs inside lower treble bout.

LABELS: The makers label has been altered to read 1549. Should read 1649 or 1679. Repairers label also altered to read 1646, more likely 1696. English inscription next to makers label: partly illegible, reads: Repair’d By .......... ?69? very unclear. Several 19th inscriptions.

In determining a suitable specification for the violins restoration, historical factors as well as the owner’s personal requirements had to be considered. The violin dates from the 3rd quarter of the 17th, and is Cremonese of the Amati school. Thus, a neck of about 125mm length-nut to edge of top, level with and parallel to the edges of the soundboard would be suitable. As, to my knowledge, there are no unaltered examples by Jacovis (I have yet to find mention of him in the standard texts, some experts deny his existence, but other sightings are reported in New York and Switzerland—nonetheless Jacovis is a rare bird.), it seems reasonable to assume that he followed the stylistic dictates of the period.

However, to reconstruct the fingerboard as indicated by the rosin deposits mentioned above, leaves some late baroque high position playing in mid air. So the fingerboard was measured musically.

NECK: New neck, 124mmX24(at nut)X32(at body), was spliced into old housing in pegbox. Old block retained, the mortise from the modern neck filled with pine flush with ribs and squared to accept butt join with neck. Neck secured with one 1/4” rosehead nail through dowel in original hole. This left the dowel visible around the nailhead. It was decided not to replace the rib section at the neckblock for reasons of strength, which may have been impeded by the extra glue joints required.

BASSBAR: Before altering: 297X13X4.5. Longer and deeper than usual for modern bars for structural reasons. The bar was in good order so it was cut down to 245X7X4.5mm, being 1mm at ends.

SOUNDBOARD: Was pieced at the neck to replace the cutout from
modern neck and to increase the thickness at that point. Also pieced at the corner blocks and tailblock to provide a more even gluing surface. Two cracks glued and lined inside with parchment.

**FINGERBOARD:** and tailpiece were made of maple, veneered on top with ebony and inlaid with 1.0mm boxwood stringing. Fingerboard was designed to give a 5mm action at the bridge end with a centre height at the bridge of 29mm. Dimensions: 228mm x 25mm x 41mm with a 45mm radius curve.

**BRIDGE:** Made after the Stradivari pattern to rise 29mm at centre Thickness at feet: 4.8mm. 1 sawn maple.

**SOUNDPOST:** Of fine grained pine 4.5mm diameter.

**PEGS:** A set of boxwood pegs and button were turned to an appropriate design and fitted. No bushing of pegholes was necessary.

**VARNISH:** A coloured varnish was applied to areas of new wood, the heel of the neck, and the volute of the scroll to match as closely as possible the original. The neck, fingerboard sides, and tailpiece were varnished to give a golden tint.

**STRINGS:** From N.R.I., French medium gauge series. E&A, plain gut; D, high twist gut; G, copper wound on gut. Pitch: a415.

After restoration the violin was in full playing order and, allowing for post-operative shock, produced the same sweetness of tone, clearer, no longer tight, and with much improved attack.

**LIST OF PARTS REMOVED:** Modern neck, fingerboard, nut, bridge soundpost, tailpiece, pegs, and button, part of bassbar, top of tailgut saddle to level of table.

**LIST OF NEW PARTS MADE:** Neck, fingerboard, tailpiece, pegs, button, bridge, soundpost, part of neckblock and table, bone nut.

**PRINCIPAL DIMENSIONS:** Length back: 358mm, table:359mm Width upper bout: 163mm, centre bout: 106mm, lower bout: 202mm, Height ribs: 28mm, Table, Max rise: 14.5mm, back: 14mm. String length (restored) 320mm

**REMARKS:** A number of features relating to the model and the general condition of this violin were working against its producing an acceptable modern tone. Indeed, the tension of modern strings threatened to shorten it’s life considerably. These problems were rectified by the restoration, both producing a better instrument; with the possibility of longer active service and providing information on an early maker who may have remained ignored, wrongly labelled a second class worker.

Continued on p. 38
Various books on violins starting with the one by Fétis in 1856 relate Vuillaume's analysis of the gradation of bow stick thickness used by Tourte. Vuillaume described how to generate a set of points along the stick such that the diameter changes by 0.3 mm along the length from one point to the next. He prescribed a construction with a horizontal line 700 mm long which represents the stick length without the head. Let us call this line the x axis with x = 0 at the left or thick end and x_f = 700, f standing for 'final'. Perpendicular to this line on the left end is a vertical line 110 mm long (the length of the thick uniform-diameter part of the stick where the frog rides), and on the right is a vertical line 22 mm long. The upper ends of these vertical lines are joined by a slanting straight line. The equation of this line is \( y = y_0 - mx \) with \( y_0 = 110 \) and \( m = (110-22)/700 \). A compass centred at the left end (x = 0) opened to the height of the perpendicular (110 mm), rotated down to the line marks a point \( x_1 = 110 \) mm. Thus \( x_1 = y_0 \). A perpendicular is then drawn at this point up to the slanting line. The compass centred at the bottom and opened to the top of this new perpendicular is rotated down to the line to mark \( x_2 \). A new perpendicular is drawn at \( x_2 \) and the process continued.

This process can be expressed algebraically as \( x_n = x_{n-1} + y_{n-1} \), which when combined with the equation of the slanting line leads to the recursion formula \( y_n = (1-m)y_{n-1} \). Solving for \( x_n \) we get \( x_n = \frac{1-(1-m)^n}{m}x_1 \).

The full length \( x_n = x_f = 700 \) results when \( n = 12 \). This value for \( n \) is confirmed by the drawing often accompanying the discussion, which shows 12 arcs. Yet the discussion mentions only 10 points. This is because the length between \( x_0 \) and \( x_1 \) is cylindrical with no drop in diameter, and the diameter at \( x_1 \) is given, the first point to find is \( x_2 \). Also the final point \( x_{12} \) is the thinnest point of the stick just before the head and is already known. This leaves \( x_2 \) to \( x_{11} \) or ten points to be found. There are eleven steps of .30 mm leading to a total decrease in diameter of 3.3 mm. The diameter of the cylindrical portion of the stick (or the measurement between flats if it is octagonal) was given by Vuillaume as 8.6 mm, and he gave the minimum thickness as 5.3 mm.

There is no evidence that Tourte, who was illiterate, generated his gradation of violin-bow stick thickness this way. Even if Tourte thinned purely by eye, he seems to have been consistent in his products and Vuillaume's geometrical analysis is valuable as an objective description of the results of Tourte's craft intuition.
At the end of his description of the method, Vuillaume indicated that an analogous procedure established the proportions of viola and violoncello bows. The specifics of the adaptation are not stated but it is likely that the same geometric construction to find the points $x_n$ was expected to be used, with all dimensions keeping the same proportion with the stick length as in the violin. The size of each step of diameter reduction remained the same. Measurements I've made on a couple of high-quality modern cello bows supports this, with the same 3.3 mm total change in diameter that Vuillaume measured on the violin bow.

Let us get Vuillaume's method into an explicit relationship between diameter $d$ and length $x$. The method states that: $$d = d_0 - (n-1)s$$ with $n \geq 1$, where $s$ is the size of steps for each point (0.3 mm in the Tourte case) and $d_0$ is the maximum diameter. Solving for $n$ in the expression given above for $x_n$ gives $$n = \log(1-mx/x_1)/\log(1-m).$$ Combining these two equations, we get: $$d = d_0 - s - s \log(1-mx/x_1)/\log(1-m)$$ for $x \geq x_1$. Substituting Vuillaume's values for the violin bow: $$d = 8.9 - 5.142 \log_{10}(1-x/875)$$ for $x > 110$, and $$d = 8.6$$ when $110 > x > 0$.

If we generalize for bows of different length (i.e. cello), with the curve linearly scaled along the stick length (i.e. the same reduction occurs at the same fraction of the stick length), we have $$d = d_0 + 3.5142 \log_{10}(1-0.8x/x_1)$$ for $x > 1571x_f$. In Vuillaume's construction this is equivalent to giving right and left vertical lines the same proportion to the stick length as in the violin bow.

If we now generalize further and allow a scaling of the reduction in diameter we get $$d = d_0 - (d_0-d_f)(\log(1-px/x_f)-\log(1-px_1/x_f))/[\log(1-p)-\log(1-px_1/x_f)]$$ where $p$ is the shape factor that is .8 in Vuillaume's analysis of Tourte's bows and $x_1$ is the length of the cylindrical portion of the stick. In Vuillaume's construction, this is equivalent to arbitrarily choosing $x$, which is the height of the vertical line on the left. The height of the vertical on the right is $x_1$ minus $p$ times $x_1$. The number of diameter steps $n = \log(1-p)/\log(1-px_1/x_f)$ and the diameter change per step is the total diameter divided by $n-1$, or $$s = (d_0-d_f)\log(1-px_1/x_f)/[\log(1-p)-\log(1-px_1/x_f)].$$

There is nothing sacred about the logarithm function. The curve $z = -\log_{10}(1-0.8x/x_f)$ can be fitted at the end points ($x/x_f = .1571$ and $x/x_f = 1$) and at the point of halfway reduction in diameter ($x/x_f = .7273$) by a parabola which would then have the equation...
The use of these other functions would make a difference of no more than about 0.1 mm in diameter anywhere along the stick when compared to the use of the logarithm function.

An interesting version of the elliptical function is

\[ d = d_0 - \frac{x_f}{50}(2 - \frac{\sqrt{4.0625 - (x/x_f)^2}}{x_f}) \].

It makes the stick less than \( \frac{1}{4} \) mm thinner than Vuillaume's function for the violin bow stick at the tip end \( (x = x_f) \) and less than \( \frac{7}{4} \) mm thicker at the point \( \frac{1}{4} \) of the way up the stick \( (x = \frac{3}{4}x_f) \) where the cylindrical part of the stick in this function ends.

The two functions are within about 0.1 mm of one another between \( x = \frac{1}{2}x_f \) and \( x = \frac{3}{4}x_f \). This new function is therefore reasonably close to Vuillaume's. I do not know how well this new function fits Tourte's bows, but for that matter, neither do we know how well Vuillaume's construction actually fitted them. The new function has the great virtue that it can be generated by a particularly simple geometrical construction involving the arc of a circle.

Draw a horizontal line of length a fifth the length of the stick (head excluded) along the bottom of a sheet of paper. At the left end of the line draw a vertical line perpendicular to it, extending upwards twice its length. At the right end of the line draw another vertical line upwards, but this time it is a quarter of the length of the original line. Place the centre-point of a large compass at the top of the long vertical line of the left, and open it to meet the top of the short vertical line on the right. Then draw an arc from the top of the right vertical line down to where it meets the original line, which should be at a point a quarter of its length from the left. Multiply the maximum thickness of the stick by 10 and mark a point on the left vertical line this distance up from the horizontal line. From this point draw another horizontal line, parallel to the first. The space between this new horizontal line and the arc below (as well as the left quarter of the original horizontal line) represents the stick shape contracted by a factor of 5 along its length and expanded by a factor of 10 along its thickness. Measurements can easily be taken from this construction and used for making the stick (each mm of thickness in the geometrical construction is 1/10 mm on the stick).

The better fit to Vuillaume's logarithm function that the first-stated elliptical function offered can be geometrically constructed in the same way, with the left vertical line being 2.020 times the length of the original horizontal line instead of twice, and the length of the right vertical line .258 times that length instead of \( \frac{3}{4} \). It is clear that a wide variety of thickness curves can be generated by varying the lengths of these two vertical lines.

I hope that in this paper I have presented a theoretical
framework based on Vuillaume's construction for the diameter variation on the Tourte bow which is perhaps extendable to describe that variation in other bows. In addition I have presented an alternative simple geometrical construction for that variation based on an ellipse which is similarly extendable and perhaps useful to describe other bows.

An Oxford lectureship that is also a curatorship of an extensive instrument collection is a plum job, even if the bulk of the collection is 19th century wind instruments. It was always obvious that Jeremy is the best man for the job, but since he was going to Israel, the job seemed wide open. So many organologists applied, including me.

Because of lack of specialism in wind instruments my chances were negligible. Yet I felt it worthwhile to apply, if only to make the selectors (who I assumed would be able to influence the person chosen) aware of the reasoning behind my view that there is serious conflict between the Bate Collection's philosophy of a lending and playing collection and the responsibilities of conservation. To this end I appended the following essay to my application.

Since I expect that Jeremy and many other museum curators do not fully agree with these views (for which, incidentally, I claim no originality), I feel it is worthwhile to publish that appendix to stimulate discussion on this topic.
CONSERVATION OF RESEARCH INFORMATION VS. A LENDING
PLAYING COLLECTION

Historical research concerning surviving instruments can be discussed under the headings of 'software', 'ephemeral hardware' and 'durable hardware'.

The software includes the name or names that were associated with the instrument, the type of player and environment it was made for, the music that was played on it (including non-notated components) and the playing technique used in it. Signs of wear by early players are valuable evidence concerning the last two points. This evidence can be obscured by extensive modern playing.

The ephemeral hardware includes the readily replaced components between the player and the instrument's primary resonator. Examples are reeds, mouthpieces, strings, moveable bridges, and harpsichord quills. The sound produced by instruments are profoundly influenced by the characteristics of these components, and these characteristics were often tailored to match the characteristics of each instrument. But early specimens continually associated with particular instruments have rarely survived. Evidence concerning the original materials and shapes of these components may remain where they were fixed to the instrument. Experimenting with modern replacements to make these instruments play optimally can easily obscure or destroy this evidence.

The surviving instrument itself is the durable hardware. Research interest here includes determining its material and acoustic properties and the details of how it was made, as well as identifying the maker or makers and dating the manufacture and modifications.

For acoustic research the early condition of the instrument needs to be preserved. Accidental damage during handling or transport, no matter how apparently well repaired, may seriously affect acoustic response. So also would distortion and cracking which can result from subjecting the instrument to the stresses of performance conditions after a long period of relaxation (or relaxation of these stresses after a long period of being performed on). The stresses of changing temperature or humidity when moved from one environment to another can lead to the same results. The probabilities of these problems occurring are obviously much greater in a lending and playing collection than one kept undisturbed in a well regulated museum.

Valuable information concerning an instrument's manufacture is embodied on the maker's scribe marks, tool marks,
surface treatment and adhesives. This information can readily be lost or obscured during restoration to playing condition, routine repair and maintenance or extensive handling.

It has been argued that if a few examples of each different type of instrument are preserved undisturbed, future research will have the material it needs. This approach assumes a limitation on the type of research studies to be made which has already proved false. Nowadays one often studies all of the surviving instruments from the same period and place to discern changes in methods of manufacture which will give date information on individual instruments. Such studies may also identify differences between tools and methods used by the various makers and so can help in identification.

It can also be argued that the way the Bate Collection had been used, it is already ruined for the kind of research I have been outlining. It therefore might as well continue to be used as it has in the past. I would expect that some information is already lost, much will withstand another 50 years of maltreatment (from a conservation point of view) without serious effect, and a fraction, perhaps a small fraction, is at risk on the short term if current practices are continued. I insist that no one has the knowledge needed to evaluate the importance of the research information now at risk. It is impossible to predict what questions future researchers will seek answers to from the instruments.

RESEARCH PROGRAMME

I agree with the basic premise of the Bate Collection that a musical instrument locked in a museum case is only a faint shadow of what a musical instrument essentially is. The sound of the music written for it and for which it was made is necessary to demonstrate its significance. But putting historical accuracy into these factors is one of the primary purposes of the research mentioned above. Without this research we have only guesses and approximations. With current research methodology we will be able to make better guesses and approximations. We must preserve the data that future researchers need to be able to improve on these.

In the long term the best way to reconcile the unknown needs of future research with our desire to experience the sounds of the instruments, is to make accurate copies (dimensions adjusted to compensate for the effects of age) and play on them instead. Such instruments should give closer approximations to the original sounds than the surviving instruments. Copies of instruments in other collections plus reconstructions of historically important instruments with no surviving examples could more comprehensively perform the function of a teaching collection.
In the medium term, we should be doing the research to produce the best copies we can. Towards this end I suggest a programme of 1) careful measurement of the dimensions and of the acoustical and material properties of each instrument, 2) research into the details of how the instruments were made, 3) setting up a workshop that could make copies in the ways the originals were made, and 4) systematically developing the craft skills and methodology to reproduce the observed instrument quality. The combination of modern measurement technology (to define the end product and to monitor the steps in production) with traditional craft methods has proved, in my experience, to be a remarkably efficient route to making high quality instrument copies.

In the short term, the conditions for use of the instruments in the Collection should be interpreted so to get the maximum benefit for the risks taken. So the handling and playing of the instruments should be restricted to those projects which have a high probability of adding to our research knowledge or of adding to our appreciation of the musical capabilities of the instrument. Every effort should be made for each research project to be fully documented, with the Collection retaining a copy of the data produced and subsequent writeups. Similarly, every performance using the instruments should result in a high quality tape recording deposited with the Collection. I see no justification for students handling the instruments in a teaching context. Slides, diagrams and recordings should be sufficient for conveying the necessary information.

For the instruments regularly played on, a crash programme needs to be carried out attempting to record data at risk. All surfaces that players normally have contact with and where we suspect information might reside should be examined microscopically and recorded photographically and descriptively. All repairs and maintenance procedures need to be fully supervised and recorded with complete replacement of damaged parts (while storing the original) preferred to extensive repair.

I would like to conclude this proposal with a plea to treat surviving 19th and early 20th century instruments with the same care and respect that we give 16th and 17th century instruments. Researchers of the 21st and 22nd centuries will thank us for it.
This article is part of a publication in 'Bouwerskontakt' by Toon on his experiences while making a bass viol based on a Barak Norman instrument.

A parabolic design was chosen for the belly, the details of which follow. The reasons for this choice were:

a) The mechanical characteristics which give as light a construction as possible.

b) The old gambas in the Brussels Museum have this shape.

c) The rejection of influences from violin making which many modern builders apply to gamba building. An example of this is the so-called "Hohlkehle", a "channel" along the edge resulting in a concave-convex-concave profile, and the use of linings. I have used the last, but will definitely not use them again.

d) The nicer shape which results, especially from a mechanical point of view, which pleases me as an engineer.

The calculation of the parabolic shape

A parabola is easy to compute, but also easy to represent graphically. This latter technique would have been used in earlier times. The formula for a parabola is $Y = px^2$ or $x^2 = \frac{Y}{p}$.

One starts with the longitudinal profile. This is the profile along the glue seam of the belly. The greatest height above the bottom plane is taken as 20 mm, resulting in a curvature of the parabola of 17 mm. (fig.1)

The parabola is drawn from the apex, which lies at the centre of the longitudinal axis (centreline). Given are $X = 630$ mm, $Z = 315$ mm and $Y = 17$ mm., so we can calculate the parameter $P$.

The formula $Y = \frac{x^2}{p}$ gives: $P = \frac{x^2}{y} = \frac{315^2}{17} = 5836.76$.

$P$ is kept in the memory of our calculator. The intention is to draw the 1 mm. contour lines, i.e. the $X$ distances on the parabola have to be calculated for $Y$ values of 16, 15, 14, 13, ...., 2, 1. The formula is transformed to give $X$:

$y = \frac{x^2}{p} \Rightarrow YP = x^2 \Rightarrow X = \sqrt{YF}$.

We enter $Y$, multiply by $P$ from the memory and take the square root. The results are shown in tabular form in fig. 2. The resulting $X$ values are measured on both sides of the centreline on the drawing of the belly. Lines are drawn through these points perpendicular to the centreline. These are the transverse profiles. The width of the transverse profiles is measured on the drawing. The height of the apex of each transverse profile is taken from the longitudinal profile (fig.1). Fig. 3 shows the resulting transverse and longitudinal profiles.

The parameter $P$ is calculated for each transverse profile as well as the $X$ values for each $Y$, again at 1 mm. intervals. All this is shown in tabular form in fig. 4.

To achieve a smooth variation in the contours, and thus in the belly, the
sharp corners near the corner blocks have to be rounded off (fig. 5); there the transverse profile would theoretically look as shown in fig. 6 as the dotted line. The width of this flat section (a) is set out on the curved part, giving a flat plane in the top view. This serves as a transition between the curve and the edge and must not be removed. All the calculated points are now transferred to the drawing. The contours are obtained by joining all points with the same heights. Where necessary, extra transverse profiles may be computed. One must also experiment with the corner transitions to obtain a smooth profile. The result is shown in fig. 7. The drawing gives a vertical projection. However it has to be used on the triangular profile of the belly itself. This has a slope of 1:11, giving an angle of 5.1944°. The error at the greatest width is 0.75 mm. This can be ignored as it has no significant influence on the total height. This means that the drawing can be transferred directly to the sloping side of the belly. However, before this can be done, the two sections have to be glued together, the underside must be planed flat, the top cleaned up and the shape cut out 5 mm. wider than required. The drawing (in my case on tracing paper) was stuck to the timber with sticky tape and the computed points transferred to the wood with a compass needle. After removing the paper the contours were drawn on the wood. As the drawing shows half the belly it has to be turned over to give the other half and the same holes marked on the wood with the compass needle. The contours on the wood indicate which holes belong together and prevent mistakes when removing the wood. The wood is removed by a process of drilling holes. To prevent the wood from tipping and thus causing a deeper hole than required, the table of the drill press was enlarged using a thick piece of chipboard, held down with countersunk bolts and nuts. The final height of the drill point above the table was set for each contour. This is easiest done using drills or bars having the same diameter as the required depth. It is important to do
this very accurately. The holes were drilled on each compass mark (fig. 8). Because of the precision required and the amount of holes, 800, this is a tiring process. Having done this, a block of wood was glued against the underside of the belly, using drops of glue here and there. This block was placed in a vice in such a way that the belly stuck a couple of centimeters above the top of the workbench. This makes it possible to plane on the sloping side. Firstly the wood is remove using a gouge, a chisel and a mallet until the bottom of the holes is reached. Then, using a small plane and a convex 'violin makers plane' (for the concave surfaces), wood is removed until only the last points from the drilled holes remain. A scraper is used to finish. Sanding is done only when the belly is glued to the instrument and the edge inlay is finished.

Another method, also based on the parabola and most probably used by the old builders, is as follows: a parabola has the characteristic that the length of the tangent is equal to that of the "subtangent" (fig. 9). One determines the height of the curve and the thickness of the edge. Initially the surface is planed parallel to the bottom to the greatest thickness required (at the apex of the parabola), e.g. if the greatest thickness is 20 mm., this is marked along the sides of the timber. The intersection of this plane with the sloping sides of the triangular profile is marked. Wood is removed to within a few millimeters of the final thickness by planing in one direction for one half and in the opposite direction for the other half of the surface. The remainder is removed across the grain with a very sharp plane. The wood is now cut to size. The length is 1 cm. longer than the case. This 1 cm. is required to give an overlap of 5 mm. on both sides. The thickness of 3 mm. is marked off along the edge. The parabolic shaping is first done along the longitudinal axis. The actual length (5 mm. in from each edge) is divided into four equal parts along the centre line (fig. 10).

The shaded triangles in fig. 10 are removed over the entire width. Using this method we continue until a smooth curve is achieved longitudinally (fig. 11). A number of lines are drawn perpendicular to the centre line. After the wood has been cut to shape, but 5 mm. longer overall, points along these lines halfway between the centre lines and the true edge are joined with a smooth curve. As with the previous method the corners have been rounded off to give a truly smooth curve. Also, the more lines are drawn at right angles to the centre line, the easier it becomes to get a smooth line. The same method as used along the longitudinal axis is used to give a parabolic shape in the transverse direction. Again a violin makers plane is used on the concave sections. Only after the top surface is completely finished do we start working on the thickness. The block glued to the underside is carefully removed. Initially wood is removed to give an overall thickness of 4.2 mm. Finally the greatest thickness will be 4 mm. A small vice is bolted to the drill press. A large roundheaded bolt is
clamped in the vice and the distance between the lowest setting of the point of the drill and the top of the bolt is accurately set at 4/2 mm. (using a 4.2 mm. diameter rod). The initial holes are drilled at random about 1.5 cm. apart. Using the gouge, without the hammer, the wood is removed until only small points are visible where the holes were. Now it is time to prepare for the second drilling. The thickness is kept to that of the old gambas, 4 mm. in the middle and 2.5 mm. at the edge.

Before we continue with constructional details, I will say something about the membrane function of the belly. A membrane must be flexible, elastic and have a particular mass. These three factors are related to the vibrations which are to be absorbed and transmitted. The following analogy explains this. A brick is suspended in a frame with springs (fig. 12).

A heavy brick and slack springs cause hardly any vibrations when disturbed. With a light brick and tight springs only fast, short vibrations result. Only with the correct ratio of brick weight and spring tension are prolonged vibrations obtained. Thus we can conclude that the belly must be thick enough to give it the required mass, yet the edges must remain flexible and springy enough. To make the board as thin as 'mechanically' possible is incorrect. The criterion is the membrane function. The old gamba builders have determined this experimentally and I therefore accept their figures without reservation.

A remarkable coincidence is that the thicknesses of a violin and a bass gamba are identical to within a few tenths of millimeters. The forces in the bass gamba are twice those in a violin. This means that the gamba is 4 x weaker. A cello is 8 mm. thick in the middle and is thus equally strong as a violin and 4 x as strong as a bass gamba. The violin family has a much higher string tension and longer string angle, resulting in a higher downward pressure on the bridge. A violin is made loud and sharp by a high curve and thicker edges. The higher curve must be compensated by thinner edge and soundboard. A good gamba has a low curve and a thin soundboard and can thus never be sharp. There is a traditional saying about the sound of the gamba: "The string instrument that approximates the human voice most closely is the gamba".

The variation of thickness from the centre line to the edge is a parabola. Mechanically this is the nicest solution because the entire thickness is used to spread the stresses. The membrane function is also best fulfilled this way. A parabolic variation also gives more material at core than would be the case with a triangular profile (fig. 13). The execution and calculation of the parabolic variation of thickness is simple. One once again draws a series of lines at right angles to the centre line on the inside of the soundboard. The width of the concave section is measured (fig. 14), this is less than the width of the instrument as the glue edges must remain flat. This width is halved as everything will be calculated relative to the apex of the parabola.
The parameter $P$ is calculated from $P = \frac{x^2}{y}$ where $X = \frac{1}{2}B$ and $Y = 4 - 2.3 = 1.7$ mm. With $P$ known, the various $X$ distances can be computed for the desired $Y$ values. For example: if we wish to know at what distance from the centre line the thickness is 3 mm., then the 3 mm. is subtracted from the 4 mm. total height. Thus $Y = 1$ mm., then $1 = \frac{x^2}{y}$ \[ X = \sqrt{1 \cdot P} \]

The computed thickness are based on a flat plane. In practice this is not so, but the thickness has to be measured from the top surface profile. The distances are calculated for each transverse profile for $Y$ values of 2.3, 2.5, 3.0, 3.5 and 3.75 mm. Once again, as with the upper surface, it is necessary to round off the corners to obtain a smooth curve when joining the points of equal thickness. The soundboard can now be drilled for the second time. The remaining material is removed with a violin plane and finally a curved scraper to finish off. A curved scraper can be made out of a straight one and it is advisable to make a set of scrapers with a range of curvatures.

The thickness variation of the soundboard can be checked by holding the wood in front of a light. One has to remember, however, that wood is not homogenous and there may be dark spots which have nothing to do with the thickness.
Talbot's measurements on viols as reported by Donington (GSJ III (1948) pp. 27-45, reprinted Chelys VI (1975-6) pp. 43-60) are placed in comparative juxtaposition in Tables 1 and 2, with Simpson's information from "The Division Viol" (1665) included for comparison.

The precision with which the measurements were made obviously varied amongst the items measured and could have varied from instrument to instrument for the same item. The statements indicating comparison with the Division viol as shown in Table 2 are so inconsistent with the detailed measurements that it is likely that this information came from one of his informants and referred to different examples of these instruments. This can give us some indication of the variations that could be expected amongst instruments of the same type. It is ambiguous as to whether the stated differences of 1 inch in "Neck and Body" meant each individually or in total. In all cases there is better agreement between stated differences between instruments and differences in the detailed measurements when the sum of neck and body lengths is considered.

Donington's discussion of Talbot's measurements of viols was full of doubt because the instruments were rather larger than allowed by his (and everybody else's) preconceived ideas of English viol sizes. When it comes to overall interpretation of information he has tended to be a believer - more of a musician than a scholar. But when it comes to detailed information his scholarship has always been impeccable.

Donington questioned the depth of the Division viol under the bridge. At 7 inches it is higher than that measurement on the Consort bass and it leads to a very excessive height of arching of 2 inches, while the arching height was slightly over 7/8 inch for the Lyra viol and 1 1/4 inch for the Single or Consort Bass. Donington rightfully suggested that the depth measurement should have been about six inches, leading to the reasonable arching height of 1 inch. Talbot's measurement would have been correct if the back of the Division was arched as well as the belly, and by the same amount. Simpson stated that he preferred Division viols constructed in the manner of violins.

To continue along this line of speculation, it is quite possible that Talbot's Division viol was a converted bass viol. Comparing the body measurement with those he provided for the bass violin, the Division viol belly length is 3/8 inch shorter, upper-bout width is the same, lower-bout width is 1 1/2 inches smaller, body depth under the bridge is the same and body depth at the edges is 1/8 inch greater. The length of the pegbox and scroll is also the same. These differences are well within expected variations in design of instruments of the same type, and so this speculation is clearly possible.
Donington offered no suggested corrections to the two measurements of the Division viol questioned by Talbot himself. These were the distances from the bridge to the end of the fingerboard (8\(\frac{3}{4}\) inches while that for the Lyra was 11\(\frac{1}{4}\) inches and for the Single Bass 10\(\frac{1}{2}\) inches) and from the bridge to the end of the tailpiece (3\(\frac{1}{4}\) inches, while that for the others was respectfully 31/8 inches and 4 inches). Why Talbot questioned the second of these is not immediately apparent (though a possible reason will emerge below), but the first measurement seems anomalously low.

On closer reflection there is good reason to believe the figure for the first distance. The fingerboard of the Lyra viol (17 inches) is only .60 times the string stop (28\(\frac{1}{8}\) inches) because playing in very high positions is not part of the Lyra style, while the fingerboard of the Division Viol (18\(\frac{1}{3}\) inches) is .69 times the string stop (27 inches), properly over the \(\frac{5}{3}\) mark specified by Simpson as needed for the music. The measurement in question is just that which remains when these differences in musical requirements are accounted for.

Talbot copied bits of Simpson's book in his ms. and so could well have been aware of this. But he probably questioned the first measurement, as he did the second, because if one adds up all the measurements along the length of the instrument, there is a much greater discrepancy with the Division viol than any of the others. He was probably guessing where the error might be. The distances from the nut to the bridge, plus from the bridge to the lower end of the tailpiece, minus the tailpiece excess (overhang past the body) should add up to a figure close to the sum of the lengths of the neck and the belly.

We want to consider these sums in detail. All of these distances are given for all the viols except those for the tailpiece excess (the overhang past the lower end of the body) which only were given (as 1\(\frac{1}{2}\) inch in each case) for the Lyra and Single Bass viols. It seems reasonable to assume that the Division viol should also have this tailpiece excess, and a reasonable assumption for the tenor viol tailpiece excess can be 1 inch. The Double Bass measurements do not include a tailpiece excess and it is likely that the tailpiece was fixed by tailgut or wire rather than slipping over a post (called 'term' by Talbot).

The measurements from nut to bridge and from bridge to the lower end of the tailpiece are along lines that go at angles to the soundboard and should be forshortened by the cosines of these angles for proper comparison. The angles can be estimated and corrections made by assuming that the nut and the end of the tailpiece are close to the soundboard plane, and that the rise from this plane is the arching height plus bridge height.

The arching height of the Double Bass is not given in the direct measurements, but can be estimated from Talbot's comparison of Double Bass and Division viols.
The resulting sums are shown in Table 3. An error of one inch or so is to expected because of the roughness of our assumptions and of Talbot's measurements. A comparison of the differences between the two sums in line 2, e shows that they are consistent to this level of accuracy except for the Division viol measurements which indicate an error of 3 or more inches, and the task now is to locate it. We assume that there is only one error involved since they seem to be so infrequent in the manuscript.

There is the possibility that the tailpiece of the measured Division viol was fixed like a violin or the Double Bass so that there was no tailpiece excess. This would only account for little more than half the differences we are looking for. This assumption would also place the bridge more than halfway up the belly (.52 - compare with Table 3, line 3) and this makes it exceedingly unlikely. Also rejected as unlikely for the same reason are: assuming that the tailpiece length or the bridge-to-tailpiece distance were longer or the belly length was shorter to account for the difference. If the distance between the bridge and fingerboard were increased by the required amount, the string stop would be about 30 inches, conforming with Simpson's and T. B.'s (see Donington's discussion) figures, but the ratio of fingerboard length to string stop then falls below the specified by Simpson.

Adding three inches to the fingerboard length conforms to all of Simpson's statements and is a satisfactory solution. The credence of the solution is added to by looking at the details of the possible error. Talbot wrote the distance from the nut to the end of the fingerboard as 1ft 6in and 4 lignes (a ligne is an eighth of an inch). We presume he intended to write 9 in instead of 6 in. Recent studies in errors in recording numbers (associated with typing numbers into computers) indicate that the most frequent error is interchanging 6's and 9's.

The only other possibility, that the neck length should be shorter by the required amount, also provides a satisfactory solution. It has the attraction, when compared to the longer-fingerboard solution, that the proportions of the neck with respect to other parameters is more like that of the other viols, as shown in Table 3 section 4), 5) and 6).

The longer fingerboard solution is more attractive from the point of view of matching the string stop specified by Simpson and T. B., of having a high-probability mechanism for Talbot's error, and conforming more with Playford's statement ("An Introduction to the Skill of Musick" 7th ed (1674) p101): "a Bass-Viol for Divisions must be of less size [than "a Bass-Viol for Consort"] and the strings accordingly[...] a Bass-Viol to play Lyra-way... must be somewhat less than the two former and strung proportionally." "Size" here is closely associate with strings and so would likely include string stop as an important determinant. The sequence of string stops for Consort, Division and Lyra viols is 32, 30 and 281/8 inches in the longer-fingerboard possibly, and 32, 27 and 281/8 inches in the shorter-neck
The changes in the Tables for each choice is as follows:
The longer-fingerboard solution changes the fingerboard length of the Division viol in Table 1 to \(21\frac{1}{2}\) inches and its string stop to 30 inches. The shorter-neck solution makes the neck length in Table 1 into \(12\frac{1}{2}\) inches and the neck-length differences of the measurements as given in Table 2 into \(-1\frac{1}{2}, +2\) and \(+2\frac{1}{2}\) inches for the Lyra, Single and Double Basses respectively.

In conclusion, when the measurements of viols made by Talbot are compared, they seem to be reasonably consistent. The only apparent errors are one (or perhaps two) with respect to the Division viol. As to the primary error, which is about 3 inches, there are two acceptable solutions as to its location. The longer-fingerboard solution is more consistent with information provided by Playford and Simpson and has a clear mechanism by which it could have occurred. The shorter-neck solution leads to instrument proportions more consistent with the other viols.

Talbot also gave added measurements comparing the Division viol with the Lyra Consort and Double bass viols, apparently involving different examples of these instruments. The two sets of instruments are so diverse that the measurements of differences in one does not help to make a choice between the two solutions in the other.

My preference is for the longer-fingerboard solution. I am attracted to the demonstrated possibility that the Division viol was a converted bass violin because it halves the number of errors we have to assume Talbot made. (Such a minimizing prejudice is essential for objective history.) And with such a conversion assumption, the power of the argument of consistent proportions for the shorter-neck solution is greatly weakened.
<table>
<thead>
<tr>
<th></th>
<th>Tenor</th>
<th>Lyra</th>
<th>Division Simpson</th>
<th>Single Bass</th>
<th>Double Bass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of Belly</strong></td>
<td>23</td>
<td>28</td>
<td>27 1/4</td>
<td>30</td>
<td>47 1/8</td>
</tr>
<tr>
<td><strong>Width</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>upper bouts</td>
<td>11</td>
<td>12 3/4</td>
<td>14</td>
<td>-</td>
<td>14 3/4</td>
</tr>
<tr>
<td>middle</td>
<td>8</td>
<td>9 1/2</td>
<td>10</td>
<td>-</td>
<td>11 1/8</td>
</tr>
<tr>
<td>lower bouts</td>
<td>13</td>
<td>15 1/2</td>
<td>16</td>
<td>-</td>
<td>17 1/2</td>
</tr>
<tr>
<td>at neck</td>
<td>-</td>
<td>2 1/2</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td><strong>Depth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at neck</td>
<td>2 3/4</td>
<td>3 1/2</td>
<td>3 8/8</td>
<td>-</td>
<td>3 11/16</td>
</tr>
<tr>
<td>middle and bottom</td>
<td>4 3/4</td>
<td>5 1/8</td>
<td>5</td>
<td>-</td>
<td>5 1/2</td>
</tr>
<tr>
<td>under bridge</td>
<td>5 1/4</td>
<td>6+</td>
<td>7</td>
<td>-</td>
<td>6 3/4</td>
</tr>
<tr>
<td><strong>Fingerboard</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>length</td>
<td>16</td>
<td>17</td>
<td>18 1/2</td>
<td>20+</td>
<td>21 1/2</td>
</tr>
<tr>
<td>width at nut</td>
<td>1 3/4</td>
<td>2</td>
<td>2 1/4</td>
<td>2 3/16</td>
<td>2 1/8</td>
</tr>
<tr>
<td>width at other end</td>
<td>2 3/4</td>
<td>3</td>
<td>3 1/2</td>
<td>3 16/16</td>
<td>3 1/2</td>
</tr>
<tr>
<td><strong>Tailpiece</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>length</td>
<td>9</td>
<td>11</td>
<td>11</td>
<td>-</td>
<td>12 3/8</td>
</tr>
<tr>
<td>width at top</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>3 1/2</td>
<td>4</td>
</tr>
<tr>
<td>width at bottom</td>
<td>-</td>
<td>1 1/2</td>
<td>-</td>
<td>1 3/4</td>
<td></td>
</tr>
<tr>
<td><strong>Soundholes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>length</td>
<td>4</td>
<td>4 1/4</td>
<td>5</td>
<td>-</td>
<td>5 1/4</td>
</tr>
<tr>
<td>distance</td>
<td>-</td>
<td>6 1/2</td>
<td>6 1/4</td>
<td>-</td>
<td>7 1/4</td>
</tr>
<tr>
<td><strong>Bridge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>height</td>
<td>2 1/2</td>
<td>3</td>
<td>3 1/4</td>
<td>-</td>
<td>3 1/2</td>
</tr>
<tr>
<td>breadth at top</td>
<td>3 1/4</td>
<td>3 1/2</td>
<td>3 5/8</td>
<td>3 15/16 4</td>
<td>4 13/16</td>
</tr>
<tr>
<td>breadth at bottom</td>
<td>3 1/2</td>
<td>3 1/4</td>
<td>3 1/2</td>
<td>-</td>
<td>4 1/2</td>
</tr>
<tr>
<td><strong>Neck Length</strong></td>
<td>11</td>
<td>11 1/4</td>
<td>15 1/2</td>
<td>-</td>
<td>14 1/2</td>
</tr>
<tr>
<td>End of Fingerboard to Bridge</td>
<td>8</td>
<td>11 1/8</td>
<td>8 1/2</td>
<td>-</td>
<td>10 1/2</td>
</tr>
<tr>
<td>String Stop</td>
<td>(24)</td>
<td>(28 1/8)</td>
<td>(27)</td>
<td>30</td>
<td>(32)</td>
</tr>
<tr>
<td>Bridge to Tailpiece</td>
<td>2</td>
<td>3 1/8</td>
<td>3 1/4</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Length of Pegbox and Scroll</td>
<td>8 1/4</td>
<td>7 1/2</td>
<td>8 1/2</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>Tailpiece excess past whole length</td>
<td>-</td>
<td>1 3/4</td>
<td>-</td>
<td>1 3/4</td>
<td></td>
</tr>
<tr>
<td><strong>Number of Frets</strong></td>
<td>7</td>
<td>(7)</td>
<td>7</td>
<td>7</td>
<td>(7)</td>
</tr>
<tr>
<td><strong>Length of Bow</strong></td>
<td>28</td>
<td>30</td>
<td>30 Hair 27</td>
<td>31</td>
<td>31 1/2</td>
</tr>
</tbody>
</table>

( ) not explicitly stated but deduced from other statements.
### TABLE 2.

**COMPARISONS WITH DIVISION VIOL (inches)**

*(other viol minus Division)*

<table>
<thead>
<tr>
<th></th>
<th>Body</th>
<th>Neck</th>
<th>Upper Bouts</th>
<th>Lower Bouts</th>
<th>Depth Sides</th>
<th>Bow Length</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lyra Viol</strong></td>
<td>Statement</td>
<td>-1</td>
<td>-1/2</td>
<td>-1</td>
<td>-1/2</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Measurements</td>
<td>+3/4</td>
<td>-4 1/4</td>
<td>-1 1/4</td>
<td>-1/2</td>
<td>-1/8</td>
</tr>
<tr>
<td><strong>Single Bass</strong> (Consort)</td>
<td>Statement</td>
<td>+1</td>
<td>?</td>
<td>+1</td>
<td>+1/2</td>
<td>+3 or 2 1/2</td>
</tr>
<tr>
<td></td>
<td>Measurements</td>
<td>+2 3/4</td>
<td>-1</td>
<td>+5/8</td>
<td>+1 1/2</td>
<td>+1/2</td>
</tr>
<tr>
<td><strong>Double Bass</strong></td>
<td>Statement</td>
<td>+12</td>
<td>+6</td>
<td>+6</td>
<td>+10</td>
<td>+3</td>
</tr>
<tr>
<td></td>
<td>Measurements</td>
<td>+19 7/8</td>
<td>-1/2</td>
<td>+5 3/4</td>
<td>+8 1/2</td>
<td>+5 1/8</td>
</tr>
</tbody>
</table>

**Addition Information on Double Bass (inches)**

- Height fingerboard from belly: 11/2
- Body depth under bridge: greater than Division viol: 4
- Maximum width of soundhole: 7/8
- Thickness of belly: 1/8+
- Thickness of back: 3/16
- Total length: 7 3/4
- Bridge to breech (belly bottom): 22 5/8
- Number of strings: Generally 5, sometimes 6
### TABLE 3.
COMPARISON OF MEASUREMENTS OF DIFFERENT VIOLS FOR LOCATING THE DIVISIONAL-VIOL ERROR

<table>
<thead>
<tr>
<th></th>
<th>Tenor</th>
<th>Lyra</th>
<th>Division Bass</th>
<th>Single Bass</th>
<th>Double Bass</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Sum of belly and neck lengths</td>
<td>34</td>
<td>39(\frac{1}{4})</td>
<td>42(\frac{3}{4})</td>
<td>44(\frac{1}{2})</td>
<td>62(\frac{3}{8})</td>
</tr>
<tr>
<td>2) Nut-bridge-tailpiece lengths</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) sum, original (with tailpiece excess)</td>
<td>35</td>
<td>42(\frac{1}{4})</td>
<td>41(\frac{1}{4})</td>
<td>48(\frac{3}{8})</td>
<td>62(\frac{3}{4})</td>
</tr>
<tr>
<td>b) same, correcting for angles</td>
<td>34.4</td>
<td>41.4</td>
<td>39.7</td>
<td>47.3</td>
<td>60.4</td>
</tr>
<tr>
<td>c) after subtracting tailpiece excess</td>
<td>33.4</td>
<td>39.7</td>
<td>38.0</td>
<td>45.6</td>
<td>60.4</td>
</tr>
<tr>
<td>d) difference 1) minus 2)c</td>
<td>+.6</td>
<td>-.5</td>
<td>+4.7</td>
<td>-1.1</td>
<td>+1.7</td>
</tr>
<tr>
<td>e) same difference if correct for Division arching height</td>
<td>+.6</td>
<td>-.5</td>
<td>+4.1</td>
<td>-1.1</td>
<td>+1.2</td>
</tr>
<tr>
<td>3) Proportion of bridge position from belly bottom to total belly length (with assumed tailpiece excesses)</td>
<td>.42</td>
<td>.44</td>
<td>.46</td>
<td>.49</td>
<td>.48</td>
</tr>
<tr>
<td>4) Ratio of neck length to body length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) original Talbot data</td>
<td>.46</td>
<td>.40</td>
<td>.57</td>
<td>.48</td>
<td>.32</td>
</tr>
<tr>
<td>b) 3 inch longer fingerboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) 3 inch shorter neck</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Ratio of neck length to string stop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) original Talbot data</td>
<td>.46</td>
<td>.40</td>
<td>.57</td>
<td>.45</td>
<td>.37</td>
</tr>
<tr>
<td>b) 3 inch longer fingerboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) 3 inch shorter neck</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) Ratio of neck length to fingerboard length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) original Talbot data</td>
<td>.69</td>
<td>.66</td>
<td>.84</td>
<td>.67</td>
<td>.63</td>
</tr>
<tr>
<td>b) 3 inch longer fingerboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) 3 inch shorter neck</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FoMRHI Comm.383
(see Comm 350 & others)
Jeremy Montagu
Review of: Will Jansen, The Bassoon, part XI
We begin part way through the biographies of present-day bassoonists and the proceed to the beginning of the section on records (we end part way through a discography). The Introduction to this section, recounting some of the early problems of recording and so on, is full of interest, and Mr. Jansen has a number of interesting, and by no means always complimentary, things to say about recording technique, including an important polemic on the habits of record producers in not advertising their wares and then deleting them before anybody can hear about them through the grape-vine from one player to another. It's a bit worth reading and is the beginning of Chapter 43, from pp 1857 to 1873. The rest of this fascicle is simply a list of recordings (the numbers of which may or may not be accurate, remembering the general standard of proof-reading of this work) of everything he has ever heard of that includes a bassoon. You may remember, by the way, that a few Qs ago I commented on his dislike of early instruments; well, in the biography of Brian Pollard and in his descriptions of the DGG Archive Fireworks and some of the Collegium Aureum recordings, he gets quite complimentary about the difference in the sound and so on. Perhaps he has learnt to appreciate the Early Music world in the course of a few hundred pages. Or perhaps he is just inconsistent and forgot what he'd written earlier.

FoMRHI Comm.384
Jeremy Montagu
Review of: Conservation, Archaeology & Museums, Occasional paper no.1 of the UK Institute for Conservation, 1980 (available from the Institute, c/o Tate Gallery, Millbank, London, SW1P 4RG for £1.50, post free).
I asked for this for review because it includes a short (2pp plus 5pp of drawings) Data Sheet on musical instruments likely to be found by archaeologists by Graeme Lawson. It's restricted to String Instruments (perhaps there are others to follow) and, since it is addressed to British archaeologists, it covers lyres, harps, fiddles and psalteries only. It is, of course, very summary, but it does illustrate all the small parts which may so easily be overlooked, and Mr. Lawson also illustrates what the very faint traces of an instrument may appear like, in patches of faintly discoloured earth or sand in the ground, with just the hard parts (nails, tuning pegs perhaps) surviving. It's a very useful paper and let us hope that it will lead to the discovery and recognition of many more instruments, or parts of instruments in the future.

FoMRHI Comm.385
Jeremy Montagu
Review of: Technical Bulletin no.4, December 1978, of the Canadian Conservation Institute, Care of Musical Instruments in Canadian Collections by R.L. Barclay, available free of charge from the Institute, National Museums of Canada, 1030 Innes Road, Ottawa, Ontario, K1A 0M8.
This is quite a brief booklet (29pp in English and then the same, opening from the other end, in French), but it covers very nearly everything one needs to know, if only in summary. Anybody who is unfamiliar with the major books on care of instruments and their proper environment (eg Gary Thomson, Museum Environment, Butterworth) should read this. And after all, there aren't any major books on
the care of instruments anyway (some time ago I pointed out one that should be avoided: Berner et alii). As minor (in size) books on the subject go, this is really excellent and I recommend it very highly.

FoMRHI Comm. 386

Jeremy Montagu


Some general papers on folk musicians, especially in urban and industrial surroundings; a number of papers on bagpipes (Romanian, Bohemian) shawms (Yugoslavia, Greece, Italy) and fiddles (Bohemia, Slovakia, Norway, Bulgaria) and flutes (Norway, Serbia, Bolivia), as well as more general papers on instruments in many areas of Europe which cover these and other instruments. This series is of major importance (and my debt to Ernst Emsheimer, the general editor of the series, who has sent me a copy of every one of them free, even including his own Festschrift, is incalculable) to any of us who are aware that instruments and techniques used by folk musicians at the present day embody many features of the early instruments which we try to recreate (especially in their construction). If you cannot afford to buy these books (and they are worth every penny, or should I say kronor, that they cost) can and should consult them in libraries, or, if you are in Oxford, can come and read, but not borrow, my copies.

FoMRHI Comm. 387

Jeremy Montagu


A bit off, you may think, the man's reviewing his own book. Well, the reason is that it isn't my own book. I made sure (particularly with the Germans in mind, for they have a reputation for this sort of thing -- see what they did to the Pelican Musical Instruments through the Ages, ed. A.C. Baines) that my original contract gave me the right to vert any translations, despite which the first I saw of this one was when a bound copy plopped through the door. While some of it is my book, a fair amount of it is the translator's own theories -- why she couldn't write her own book instead of publishing them under my name, I can't think. Anyway, the purpose of this review is really to warn you (and to ask you to warn any German friends) that there are fair number of inaccuracies (as well as any that Eph has already pointed out of my own) which were not in the original and that the proof-reading (and even names of authors -- all Baines's books are credited to Bachmann! -) of the Bibliography is a disgrace. I won't waste your time by going into details. Just regard it as an unauthorised translation and stick to the English text. If there is any demand from German-speakers I could prepare a correction-sheet, but as an alternative, I sent Uta Henning a xerox of all the errors, and she is welcome to re-xerox that for anyone who wants it.