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FELLOWSHIP of MAKERS and RESTORERS of HISTORICAL INSTRUMENTS

Bulletin no.14 January, 1979

A happy new year to rather less than half of our members - to those of you who have remembered to renew your subscriptions so far. I hope that the rest of you will come along in due course, after we have had to print a note reminding you that you haven't paid (which wastes a little of your subscription), put it in an envelope (which wastes a little more) and put a stamp on it (which wastes quite a lot more). We keep the subscription as cheap as possible, but obviously we are going to have to allow, in future when we work it out, that something like 15p from each subscription may have to go on reminders.

FINANCES: We did make a profit last year, chiefly because we did less reprinting than in previous years of back issues (see below). I have not got the full figures yet because I haven't had the results of the last batch of cheques from the bank, but it is somewhere around £300. We'll have to see how we go in the first part of this year and what the post-office threatens, but it may help us to keep the rate the same again for 1980 - no promises, though.

This reminds me that I should have put a note in the last issue that the books had been checked for 1977 and passed as OK. There was a profit of £137, of which £30 was profit on the Seminar and was earmarked to pay for people and institutions who could not send money abroad. One cannot say how much of that £30 was used for that (or perhaps how much more) since no figure goes down as hypothetical subscriptions for them; we keep a rough idea that we don't get too many (we can afford more if anyone has any nominations) and then they are simply sent a copy of each issue, the cost and the postage of which is part of the total bill for each issue. The £300 profit for 1978 includes whatever is left of that £137 - ie it is an accumulated profit. It comes mainly from the sale of back issues, and because we have now run out of complete sets for the first two years, and are running low on odd copies, it will probably be less in the coming year.

BACK ISSUES: We have in the past reprinted back issues as they ran out. Unfortunately a whole lot are running out, or have run out, together, more than we can afford to reprint as prices rise (I'm chary of using this year's subscription money to reprint back issues on the theory that we shall sell enough to get the money back before we need it to print the October issue - we might not and then where would we be?). In addition we are reaching the point where it costs quite a lot of money for a new member to buy a complete run, and therefore we are less likely to sell them. I asked the Fellows what they thought: should we let them run out, should we reprint, or should we produce an anthology of what seemed worth reprinting and forget the rest (bearing in mind that anyone could ask for a one-off xerox of anything that wasn't in the anthology)? The majority voted for the anthology, but their suggestions for what should be included covered almost every Communication; out of 93 Comms (plus some supplementaries) only 19 were omitted. This is very flattering since it shows how the Comms are valued, but it does mean that the anthology idea is a wash-out. We shall have to discuss further what we do next, but for the moment we shall have to let the first nine issues of FoMRHIQ go out of print as they run out, while we make up our minds.

NEW FELLOW: Carleen Hutchins was elected a Fellow.

CONGRATULATIONS: to Noel Mander, the organ builder and restorer, who was made M.B.E. in the New Year's Honours List (for the information of the non-natives, the Honours List is a twice-yearly event in which people get knighthoods and such; only top conductors and soloists get knighthed, and for an instrument maker to get an M.B.E. is quite exciting).
OBITUARY: I regret to tell you that Josef Marx has died. Some of us knew him as an oboe player, and many more as half of McGinnis & Marx, the publishers of a great deal of interesting music. Josef was enormously knowledgeable on the history of instruments and ever-ready to help his friends and colleagues with information. He will be remembered as a friend by all who knew him; many of us have known him best by correspondence, of course, and it was a great honour for me that he stayed with us here several times when he was in London. His first visit here was a memorable occasion because we got all the old oboe gang (if I may refer to them so disrespectfully) down to meet him and we had more three-key oboes lying all over the floor than I've ever seen together in one room; a memorable occasion indeed.

I also regret to report the death of L. R. Millard, who made harpsichords and various string instruments.

HORNIMAN MUSEUM: Further to what I said in the last Bulletin, I can say from personal experience that Frances Cooper is very helpful indeed. She allowed Axel Poignant and me to photograph a good many instruments for my next book (due out in April) and allowed us to shift furniture around to get a big enough area and so on. Things are now very different indeed from what they were (cf. Madeau Stewart's note in the January Early Music Gazette; let us hope that the British Museum does not become as inaccessible as the Horniman was).

FURTHER TO LEGIBILITY: Edmund Bowles writes:

I would like to put forth the suggestion that perhaps there are a sufficient number of members/fellows who have, or have access to, IBM (or similar) typewriters to solicit volunteers for typing some of the more significant, or major, contributions when received far enough in advance, especially if there is the possibility of there being reprinted on an anthology later on. Given sufficient lead-time, I myself would be glad to undertake part of this task, provided that I was working from clean, legible copy, not a handwritten draft full of tiny addenda, changes, inserts, etc.

FURTHER TO: Bull.12, p.11; Cary Karp writes:

John Morley's query about ivory in Bull.12: I don't think we should be asked to discuss the moral tenability of using ivory substitutes. What about the moral justification in using real ivory?? All the trade restrictions on ivory have not been designed to make life difficult for the instrument maker — they are intended to make continued existence a reasonable future prospect for the elephants. If anyone can suggest an argument for endangering the survival of the elephants to allow us to decorate our instruments I would be most eager to hear it. I should think that the problem would remain acute for as long as human beings regard ivory as a desirable and expensive material. Purveyors of ivory in any form can help matters simply by terminating that aspect of their trade. Discussing substitutes only skirts the issue. The "I'm not going to buy any more ivory after I've used up what I've already got" approach seems to me also to be highly undefensible. Surely this question is more worthy of discussion than many which have been treated in F.M.Q.

I think Cary is right; we ought to discuss this more. We can make reconstructions of instruments, but if we once allow the elephants to be wiped out just so that we can put ferrules round woodwind instruments and facings on keys, they've gone forever — and what a cheap and shoddy reason for wiping out a species.
Bull.15 p.3: Cary also says:

To Jeremy's list of musically relevant "intangibles" in Bull.13 (p.3):

Using molten lead for bending metal tubing gives the metal a stress-relaxing heat treatment which it will not get from Cerrobend. The lead is often melted out of the tubing by immersing the entire piece in a bath of molten lead. This "bath" is, according to many brassmakers, quite important for the ultimate quality of the instrument. The same people usually deplore the use of Cerrobend.

In as much as the reaming of woodwind bores is not usually a high-speed operation, it is unlikely that high-speed machinery causes us problems therewith. The drilling of long cylindrical holes of small diameter is, however, a problem which is easily solved using super high-speed machines. (Of the type virtually never encountered in the small-scale workshop.)

Casual perusal of Plumier should make it obvious to anyone that 20th century mechanized turning is almost primitive when compared to the intricacy of tooling in use (commonly ?) in the 18th century. (No implication here that we are incapable of making good instruments in 18th century fashion using 20th century tools.)

Comm.84: Bob Marvin wonders whether either Cary Karp or Paul Hailperin would disagree with the statement that some bores were made with multiple reamers and some weren't. My impression of this whole correspondence is that both they and the rest of us would agree with Bob on that. It is a pity that no woodwind-making tools seem to survive. Has anyone tried asking in such firms as Rudall Carte (who go back anyway into the middle of the last century) and any others who may have taken over even older firms whether there is any old junk stashed away? I suppose that even when firms survive, they move and it was never worth carting junk like that from one workshop to another. But it might be worth thinking about.

Comm.119: Harry Shorto writes:

Offset maker's marks on flute head joints (FoMSHIC 13, p. 8, ed Comm. 119). Yes, on my Potter (sc. Senior; date c. 1780 if the dealer's stamp "Simpson/Royal Exchange" is James and John S. active at the Bass-Viol and Flute in Sweetings Alley 1780-1795).

Lining up the marks gives a good 15° inturn as far as one can judge by eye. Incidentally it brings the B flat key a little nearer the line of the fingerholes than I find wholly comfortable (but about where Quantz's fingering-chart illustration shows it!). I had never dared turn the head in this far before. First impression is that the cross-fingerings that need flattening, G sharps, B flats, Cs especially, need much less flattening; also the bottom D, which is a little shaky on this flare-foot instrument, is improved. But the results are better in sharp keys than in flat ones; with the embouchure in line with the fingerholes it is the other way round.

There must be some more of these about. Look at the illustrations in Meylan of the Quantz two-key from the Encyclopédie (but not so in Quantz!) and of the four-key from Hugot & Wunderlich's tutor; embouchure well in in both. One would expect old habits to survive some time into the simple-system era.

Can anyone else add to this?
Felix Raudonikas tells me that they have an ivory Stanesby junior in the Leningrad Museum which has also been chopped, rather less drastically than mine I presume since he gives the pitch as A-434; he doesn't say anything about lining up the marks, though. It has had 5 keys added, one of them the duplicate F.

Comm.132: Ian Harwood writes:

Like Frederick Rubin, I too have experimented with varnishes, including some of those described in Joseph Michelman's Violin Varnish. I agree with Mr Rubin in finding it unsatisfactory to add colour tincture to the Mastic-Turpentine-Linseed Oil varnish. The colour saturation becomes very low, first because the tincture has to be diluted with the turpentine 'essence' and then because of the tendency of linseed oil to kill colour. Mr Rubin's idea of laying down the colour in a thin spirit varnish, then applying the oil varnish over it sounds good, though I have not tried this myself for two reasons. (a) I find the idea of having the colour distributed throughout the varnish more aesthetically satisfying (though I can't really justify this feeling); (b) I have had trouble with oil varnish peeling off when applied over priming coats of shellac-based spirit varnish. There seems to be very poor adhesion between shellac and linseed-oil varnishes. I know other people who have had similar experiences, and I wonder if Mr Rubin has had any trouble in this respect.

It occurs to me that, if oil varnish is to be used over spirit, a better adhesion ought to be achieved if the same resin is used in both. Since spirit varnish dries almost entirely by evaporation of the alcohol, the resulting coat will be the unchanged resin or mixture of resins used. If this coat is insoluble in turpentine and linseed oil there will be poor adhesion, but if it will dissolve, even to a slight extent, all should be well. Shellac alone is not soluble in turpentine or linseed oil; I wonder whether the shellac-mastic-benzoin mixture is?

Another point that I do not understand is how Mr Rubin, who says earlier that he found it very difficult to spread coloured spirit varnish evenly (and I certainly second that!), later reports success in 'laying down the colour coat with a thin spirit varnish'. The bare wood needs sealing with a clear coat or two to prevent the coloured varnish acting as a stain and going on unevenly where it soaks in more or less, and I've always had problems with the colour coat biting into the previous clear ones.

I'm afraid I have now taken the coward's way out by using a commercial oil varnish available as 'Extra Pale' and as 'Varnish Stain' in a number of shades, but I still feel attracted to the idea of preparing the varnish myself in a nice simple way without recourse to somewhat hazardous 'cooking' processes. I too would be glad to hear of the experiences of others in this respect.

Comm.145: Felix Raudonikas writes:

I am very much obliged to Jacques Leguy for useful and fair remarks. Now I know that I and the Université de Paris invented exactly the same method. I am afraid that there is too much honour to my person in that confrontation. Taking into account the importance and complexity of the invention, I respectfully gave the priority to Paris.

Apparently I have not all possible information concerning the question. Nevertheless wishing to continue the work, I make up a deficient information on methods with the fruits of my imagination. I will be obliged and thankful to everybody who will point out that the methods described by me are known already. I will be obliged still more to anybody who will send me the information of such kinds.

I have read Jacques' interesting work about the cornett acoustics (Comm.
In spite of this, the cornett-like instruments are unknown to me. As for double-reed woodwinds, the situation here is not so hopeless as it seems to Jacques. The nature of the sound-producing agent requires here more "hard energy of excitation", therefore the reed instruments generally have a narrower band than the labial ones. This diminishes the number of possible problem decisions in every specific case. When several different reeds with unsimilar behaviour have been mentioned in summary, we have a plurality of unsimilar conditions with quite definite limits. I assume readily that changing the reeds Jacques would be able to obtain the parallel transfer of the whole oboe range at a sufficiently wide interval. However, earlier or later the moment will come when some part of the range will go beyond the limits of any pitch axis possible for it. The upper and lower limits of such a kind will give the boundaries of the interval where the absolute pitch height of the specific instrument may acquire the different values. Exactly such a meaning I put into the concept of "absolute pitch height widebandness".

The instrument maker imagines the absolute height of its pitch as an absolutely definite value, but due to the nature of things, the woodwinds have a wide band. While studying the original instruments, two questions always arise: 1) in what pitch was it used? and 2) in what pitches may it be used? From the point of view of instrument utilization in actual music playing, it is useful to know about any pitch possible. Besides, one can be sure that some one of the values relevant to the plurality obtained by investigation will represent the the absolute pitch height implied by the instrument maker. In the latter case it is meaningful to obtain a more definite answer. It seems to me that some mathematical methods are applicable here (for instance discriminant analysis). Here also the pure logical circumstances can help, but they are not investigated in full detail by me yet. If some day I will understand them properly, I will certainly write an article which, I hope, will satisfy Jacques better.

As for the reeds breaking the integrity of frequency ratios between modes, it seems to me that this problem concerns the sphere of correct reed making, rather than the investigation of instrument pitch. I admit that this sphere gives quite a number of troubles to me, and I will take any advices on these questions, both from Jacques and any other author. Maybe Jacques can point out to me the literature also on the methods of experimental selection of staples for the instruments with double reeds?

Comm.149 (review of O.Szende's Intervallic Hearing):

Neil Buckland writes: "I notice every now and then comments in communications which suggest that the writers are not very clear about the physics/psychology of music and the area in which the two fields mix and mingle he may be being tactful, but my review referred to above is an obvious example. jm/j Could I recommend a book which I found extremely informative in this respect? Music, Sound and Sensation by Fritz Winckel (translated by Thomas Binkley), published 1967 as a Dover paperback. The contents of this bear interestingly on questions of precision of pitch, vibrato, etc, etc, and it is quite inexpensive."

Comm.150:

Bob Marvin writes: "I've not read Hutchins' introduction to the Scientific American music articles, but I've read most of those articles, and I'm not bursting with confidence that she supplied the sort of critical commentary those articles deserve. It's mostly a matter of subtlety. There are those to whom music is just a grand, undifferentiated noise, and there are those for whom it's a soul-stretching exploration of aural sensation. And all between. These articles largely ignore the aesthetically developed side of musical instruments, and concentrate on the grosser
aspects of their performance. My complaint with the authors is that they don't point out at first the limitations of their researches. By doing so, they discourage others from considering the finer points of human perceptions and experiences. The simplicity of the problems they choose to investigate reflects more their own interests rather than the intrinsic difficulty of investigation of aesthetics. What they are doing can be interesting, but it has not yet ventured in the direction of sensitive, aesthetic music."

Jeremy Montagu comments: I have included the above because I do not believe that it is the Secretary's job to censor one member's comments on another member's work. However, as a member myself, I think that I am entitled to say that I think that Bob is talking cod's-wallop. For one thing, these are articles on acoustics (I remind you that the title is The Physics of Music) and however important the aesthetics may be (and I'd agree with him that they are important), they do not form a part of the acoustics or the physics of instruments, and for another of course everybody is entitled to write about "the problems that reflect their own interests" - that's just what Bob did above and what we all do every time we write anything. What is more, whenever we write we reflect those interests which are relevant to what we are writing about; I suspect that the authors of these articles may be just as interested in aesthetics as Bob is, but that they leave that interest to one side when writing about the physics of instruments for the Scientific American.

Since Bob has brought the subject up, I would like to add that I'm a lot more interested in the acoustical aspects which the acousticians do not seem able to measure. This comes up very strongly in Will Jansen's new book on the bassoon (reviewed elsewhere in this issue), where he cites repeatedly examples of acousticians being unable to measure or account for tonal differences very perceptible to the bassoonist's ear which are caused by the use of different bells on the same instrument, the differences in the bells being external shaping and profiling (not differences of bore shape) and thus different thicknesses of wood at various points on the bell. This links, of course, with the perennial debate on the effect of different materials on the sound of the instrument and (eg Bull.13 p.3) how the materials are treated.

Comm. 161 & 162: Cary Karp writes:

Comm. 161: Converters of intervals into cents very often convert cents into string lengths, fret placement, etc. I would therefore like to suggest the following conceptual modification of Comm. 161 (and Comm. 21). The number of cents (\( \mathcal{G} \)) in an interval (I) is,

\[ \mathcal{G} = \frac{1200 \log_2 I}{1200} \]

Rewriting this for I gives,

\[ I = \text{antilog}_2 \frac{\mathcal{G}}{1200} \]

or

\[ I = 2^{\frac{\mathcal{G}}{1200}} \]

Inasmuch as pocket calculators don't have \( \log_2 \) functions, \( \log_2 I \) must be calculated as either \( \log I / \log 2 \) or \( \ln I / \ln 2 \). The \( y^x \) function (which is to be found on virtually all calculators with \( \log \) functions) does, however permit direct computation of antilogs to all bases. The above formulas can easily be remembered and can be used for systems dividing the octave into other than 1200 parts simply by substituting the desired number of divisions for 1200 in the formulas.
Comm. 162: A slide rule for string calculations using the "string formula" has been available for close to 15 years from:

Verlag Das Musikinstrument
D-6000 Frankfurt am Main
Klöberstasse 9.

It is sold under the name "Duplex Slide Rule TF65" and is supplied with instructions in several languages at a cost of DM 50,-. It lacks the range guide that Eph and Djilda provide, but has an equally useful set of scales for use with overspun strings. As far as I know home-brew slide rules and nomographs for use with the "string formula" had been in widespread use prior to the appearance of the commercial device.

Comm.170: Felix Raudonikas sends his apologies for three errors in that communication.
1) The title should have read: Pitch Axis and Band Width.
2) Formula (2) at the bottom of p.62 should be: $\sigma = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2}$
3) The reference in the middle of that page to the previous description of the methods of measurement and data treatment should have been to Comm.145 in FoMRHIQ 12.

COURSES: Walter Sallagar has sent me details of all the courses at Schloss Breiteneich this summer:
July 15-29: Interpretation of mediaeval & renaissance music
July 15-29 & July 29-Aug.12: Instrument making with the following instructors and instruments: John Hanchet - alto shawm
Graham Lyndon-Jones - tenor curtal
Barbara Stanley - ren. tenor traverse & cornamuse
Alec Loretto - soprano & alto recorders (ren.)
July 15-29: Reed and staple making for double reeds
July 29-Aug.12: Classical & Modern wind chamber music
Aug.12-19: Music of the 16th century
July 22-Aug.12: Clavichord making

Anyone interested write to Walter at A-1030 Wien, Neulingasse 42/10, Austria.

Yvonne Hamilton recommends a 9 day course (10th-19th April) at West Dean College, West Dean, Chichester, Sussex, which covers lute, guitar, celtic harp, spinet. She says that she learned a lot from previous courses there. Write to the College, not to her.

FoMRHI Seminar on technology seems to be attracting interest; I've had a certain amount of response, including an invitation to hold it at Trent Park where workshops could be available to us. Watch the Bulletin for further information.

FoMRHI Research Conference (announced in the Supplement to Bull.13 on p.13). I've heard nothing and as it's David, Chris and Eph who are organising it, I'll leave them to put further details in the Supplement again. Unfortunately I shall be away in early February.

REQUESTS FOR COMMS: L.A.Kirk asks for two: one on the subject of, or a review of, the available harpsichord workshop plans (I'm not clear what he means by that; if it is plans for a workshop, surely one fits the workshop into the available space?); the other a communication on the making of bent sides for harpsichords. Can anyone help?

Martin Haycock says "How about a Communication on the fundamentals of lute and cittern building?" We've had requests for that before; I know it's a tall order, but a lot of people would be grateful if anyone would provide such a Comm. or even the first part or parts.
Daniel Morgenstern would like drawings, articles and comments about Virginals/Muselaars, and specifically about doublé soundboards (such as are found in the Yale Leversidge), soundboard ribbing, scaling and the arpichordium stop. Any volunteers?

REQUESTS FOR PLANS: Jerry Womack is looking for plans and drawings for rebecs and vielles. If anyone has any or knows of sources of any, please let him know.

Jean Claude Compagnon is looking for plans, photos etc of musettes du cour. He would also like to know of examples in museums and private collections (I've told him of the Pitt Rivers, Oxford) and names of makers who are making them today. He asked what reeds Nicholas MacGegan was using in the Princesse de Navarre performances and I had to tell him I didn't think to ask him; I had assumed that they were as in the Mersenne picture. Can anyone help?

Francis Woodahl hasn't any original woodwinds available in his area and asks if anyone can put him on to plans for any renaissance and baroque woodwinds, apart from those which have been listed in various issues of FoMRHTQ. Addresses for all three are in the List of Members - please help.

Charlie Barker asks whether it would be possible to compile a list of instrument plans that are available. He has written to various museums that have been mentioned in the Bulletins and got quite a lot of information. He would be willing to make a start on this if others would help. It seems to me to be a useful idea, especially as our earlier issues are going out of print. Would anyone who would help in this project write to him (address in List of Members) with a list of museums from which they have plans or up-to-date lists, so as to avoid duplication?

REQUESTS FOR INFORMATION: John Hodgkinson asks for the names and addresses of suppliers of good quality hinges, clasps, coverings and linings for instrument cases.

Doug Eaton would appreciate information on bow-making wood, such as the density of the types most commonly used. I suspect that he has trouble getting imported wood (I've heard this from other Australian members) and may be thinking of trying local woods, so all the information on the desirable characteristics of bow-wood could be useful to him.

Dick Abel (address in 1st Suppl, FoMRHTQ 12) asks whether anyone has devised a simple, uncomplicated method of making stuffed pads for 19th century woodwind keys of the "saltspoon" type and whether these are still commercially available. I've sent him quotes from Bate's Flute and Baines's Woodwind Instruments; can anyone help further?

Paul Gretton (address also in 1st Suppl.) asks if anyone can tell him the correct scale and local fingering for the gaita gallega? Has anyone a fingering chart they can xerox for him? He also asks what does one use for the lace on lutes? and where can one get strips of whatever the material is?

Geoffrey Lee asks for a source of supply of both real and imitation ivory in small quantities for woodwind joints. I hope that he will read Cary's note on p.3 of this Bulletin, and if anyone can suggest sources of artificial ivory other than those listed in previous FoMRHTQs that they'll write to him at the address in the 2nd Suppl. in the last issue.

Grant Moore says that he will be making several oboi da caccia in the near future and would be interested if anyone in his neck of the woods (mid west to the east coast) might know of anyone willing to make some bells for him, either spun or beaten or both.

Dave Skulski (address in 3rd Suppl, herewith) says that he has been struggling with a set of crumhorns that won't cross-finger. They were made
by John Hanchet as replicas of the Brussels set. Dave has tried big reeds, small reeds, thin reeds, thick reeds, long staples, short staples, conical staples and cylindrical staples, and still they won't cross-finger. He says that the originals in Brussels don't cross-finger, either, so I'm not really clear why he expects John's copies to be any different, but still, if anyone can help him with some further suggestions, would they please do so? I wonder whether he has tried plastic reeds? If real reeds with real crumhorns won't cross-finger, perhaps a bit of faking will persuade them to fake. Of course one further question occurs to me: are crumhorns meant to cross-finger?

Stephen Taggart has a run of questions, basically about Northumbrian small-pipes but relating also to other reed instruments.

1) What difference does increasing/decreasing bore diameter make for a given length?
2) What is the effect of boring a drone 9/64" instead of 1/8"?
3) He has seen small-pipe chanters made with quite rough bores; what tonal difference does reaming (I think he means polishing) acylindrical bore make? One of Rudall-Carte's staff told him that the upper portion of oboe bores were best left slightly rough.
4) Why does undercutting a fingerhole downwards "decrease whistling and improve tone" (Cocks & Bryan, Northumbrian Bagpipes)?
5) What difference does fraising (undercutting all round) make?
6) Does rounding the top (ie outer) edge of a fingerhole make any difference?
7) Is a large fingerhole necessarily louder than a smaller one?
8) What happens when one has to bore a fingerhole that is of greater diameter than the bore of the instrument? How should it be finished inside?
9) Why is it that the note E, in particular, on the small-pipes is so critical, so sensitive to bore length and wind pressure?
10) Has anyone done any work comparing the tonal qualities of different timbers using dimensionally identical instruments? Is it possible to make dimensionally identical instruments that play in unison?
11) Is it true that whatever you do to follow plans accurately, you will always have to alter the sizes of finger holes when tuning?

He would be grateful for any help or advice. Anyone who can answer all the questions might as well do it in the form of a Comm on basic woodwind technology, in which case please send it to me; otherwise to him.

The addresses of all the enquirers are in the List of Members, except for those otherwise noted. Please send replies to them, rather than to me for forwarding, which wastes my stamps and time as well as yours!

TOOLS AND MATERIALS: Tim Hobrough has seen in the Dulcimer Player News an advertisement for a Pitch Box by Sterling Music Co., 505 South Harrison Road, Sterling, Virginia 22170, USA. It costs $60 plus shipping and gives 8 octaves of equal-tempered tone from a quartz crystal generator, which seems about half the price of other devices; there is also an optional "precise zero beat display". He asks whether anyone has tried one or could evaluate it.

Geoff Mather (address in 3rd Suppl, herewith) offers to make planes (see next page for his note and sketches). He sent me a photograph of a couple and they all have handles as in the sketch NS 35°, something like a file or chisel handle but well-shaped in a good quality dark wood (rosewood?). The blade is held by a shaped block of brass, retained by a knurled knob. They look a beautiful job, and of course a handle makes work a lot easier than pushing with just finger and thumb.

He also sent a note on a peg-cutting device, which you will find elsewhere here as a separate Comm. There must be many more of you who make such devices - please spare the time to write them up for your colleagues.
Geoff Mather says he will make these carving planes as sketches when the odd hour permits. They have curved soles to their bodies, which make the Viol and Violin soundboards easy jobs.

The reversible cutting iron is plain at one end and toothed the other. A stout handle allows more force at the iron than the usual thumb and fingerplanes (your all about to make) and a lever lock assists fine adjustment to the depth of cut. The cutting iron sizes are .250" and .562" and the bodies are machined and hand formed from hard brass. Handles are made in various woods, as available. No optically correct surfaces here but nice to look at and efficient too.

He says no more aching fingers with these tools, and so if you don't mind the protracted delivery contact him for prices.

OFFERS: George Sandberg (new address in 3rd Suppl.) is thinking of translating BouwersKontakt into English if there is any demand for it or for any particular articles, etc. I have listed the contents as they have come in, so look through our issues and if you have any requests, send them to him.

BIBLIOGRAPHIES: Tim Bobrough says that he would be willing to compile a bibliography such as Ricardo Brné suggested on p.11 of Bull.13 if other members would help him. He suggests that people should write up, preferably on index cards, books that they've found useful, giving: author, title, subject, publisher & date, price if known, and comments. The comments should include why they think it useful, what areas of interest are covered, whether it's good for beginners or not for beginners, etc, whether it is accurate or not, and in what areas, and so on. He would then cross-reference, alphabeticate (sic) and so on and type it up, and we can either include it in FoMHQ or produce it as a separate booklet. As he says, if everyone would spend half an hour or so, a pretty good start could be made. Everyone has come across such books, many of them from small publishers with limited distribution. Please write them up and send the cards to Tim at his new address in the Supplement herewith.

LIST OF MEMBERS, SUPPLEMENT: This will be found herewith as usual. Many of you have sent us your zip codes, and so on. Don't be offended that I have not included them; they will be in the next main list in April. Also
I have not listed all the changes of instrument, etc., in the main list, but you will find them all in the organological index. Both to save a bit of time, and I hope you don’t mind. They’re all noted on the cards and on my master copy, so the next proper list will have them all in.

Postal Delays: If you write, or if you have, by the time you read this, renewed your subscription in late January or early February, don’t be surprised if the answer is delayed. I didn’t get a summer holiday last year because I was finishing a book, and I’m taking it now instead.

Personal Advertisement: (don’t read this if you don’t approve of me advertising my doings). I’m giving a big public lecture at St. John’s Smith Square on April 22nd on Musical Instruments Through the Ages. Anybody who wants to see 150 or so of my instruments, and hear a good many of them (as many as possible in an hour and a half) is welcome to come along. No discounts on prices for FoMRHI members, I’m afraid, as I’m doing it to raise money for a charity I’m interested in (and I’m personally responsible for any losses). Tickets at £3.50 & £2.50 available from The Leo Baeck College, 33 Seymour Place, London W1H 5AP, and £1.00 at the door. Starts at 7.30.

Our Thanks, as always, for the nice things that so many of you have said about how useful you find FoMRHI while you were renewing. Both Djilda and I find it takes a lot of work on top of everything else, but it obviously is worth doing when so many of you show your appreciation.

At the moment that’s the lot, but I’ll keep this open while I do the Members’ List Supplement on Sunday in case anything more comes in.

Paul Kemner would like to see a short review of the Vaudry harpsichord plans, or any of the plans from the V&A as they’re so expensive. Can anyone oblige? He would also like to know where he can get authentic type harpsichord supplies, such as tuning wrenches for flat-head harpsichord pins, wire for strings, etc.

Guitar Course: William Cumpiano is planning two courses, both running for six weeks, on guitar making. One for beginners in early June and one for advanced in late July. Write to him for details and precise dates.

Ricardo Brané asks if anyone can provide a good set of drawings and photos of the Ebert viol in the Brussels Museum; he has had no reply from Martin Edmunds whom he thought might have them. He also wants the address of the Viola da Gamba Society.

Micro-Electronics: I forgot to say earlier that Noordin Ghani (new address in 3rd Suppl, herewith) offers help to anyone on micro-electronics, micro-processors and digital electronics. He is not sure how useful this may be in our field, but he would be happy to help anyone who can use such techniques and equipment.

Finally: That seems to be the lot. I’ll be in Jerusalem by the time you get this and will look forward to hearing from any of you when I get back. This probably means that, like last summer, I shall be in town again next summer and may have the pleasure of meeting any of you who are in London on your holidays. Do look up your colleagues when you travel; I find it a pleasure to meet fellow enthusiasts and I imagine that most of us do. Unlike another Society that I could name, we have a List of Members - use it to meet your friends.

Jeremy Montagu
7 Pickwick Road
Dulwich Village
London SE21 7JL
FOMRHI BULLETIN 14 SUPPLEMENT. Compiled by Djilda Abbott.


The announcement of this conference was in the last issue of FoMRHI Quarterly (Oct. '78 page 13). In addition to the papers listed we have one by June Yakeley on "The Guitar". There is no closing date for contributors, so if you show up with a worthy paper we'll be glad to hear it.

We have heard from two people interested in coming, one voting for holding the Conference in Oxford. Adding in the votes of contributors results in a win for Manchester. Since it will be all about incomprehensible boring scholarship which is of interest only to boring scholars, the Conference will be able to be held in the cosy premises of NRI.

Venue: NRI, 18 Moorfield Road, West Didsbury, Manchester M20 8UY, phone 061-445 0525. From 11:00 a.m, Saturday 10th February till whenever we finish. Anyone wanting instructions on how to get to the Conference, contact NRI, and anyone requiring a bed or sleeping-bag space contact either Eph Segerman (at NRI) or David Fallows (061-881 5071) and we'll do our best.

COURIER SERVICE FOR MUSICAL INSTRUMENTS

Anne Frazer Simpson and her colleagues of Mareschal Music Associates are now offering transport for musical instruments from anywhere to anywhere, with back-up tuning service for keyboards. Deliveries or there-and-back concert service. Enquiries welcomed, even if your needs are not immediate - this will help Veronica Sharpe to cost out the idea. It is hoped to have this service fully operative in time for September's Early Music Exhibition. Contact: Mareschal Music Associates, Waldon Cottage, Sturminster Marshall, Wimborne, Dorset. BH21 4BP. Tel: Sturminster Marshall (025 885) 493.

DOREEN & MICHAEL MUSKETT will be giving a HURDY-GURDY COURSE at their home in Hertfordshire. 6th - 8th April, 1979. Tuition will be given in 18th century style and playing techniques, English & French folk traditions of the present day and the use of the hurdy-gurdy in medieval and renaissance music. Particular attention will be given to the correct use of the "coup de poignet". There will be lectures and discussions on history and construction techniques. Applications: Doreen Muskett, "Piper's Croft", Chipperfield Road, Bovingdon, HEMEL HEMPSTEAD, Herts. HP3 0JW.

The CORRECT STRINGS TO USE ON A HURDY-GURDY. M. Muskett

String length: 320 - 340mm. Nut to bridge.
Open chanterelle sound: g. Wheel viewed from handle.

Chanterelle
violin D

Mouche
violin D

Trompette
violin D or 'cello A

Tune to c or d
Tune to G

Petit bourdon
'cello G

Gros bourdon
'cello C

Tune to G
Tune to C

e is middle c

MORE ON PAGE 21.
FELLOWSHIP of MAKERS and RESTORERS of HISTORICAL INSTRUMENTS

1979 List of Members - 3rd Supplement, as at 7th January 1979

* in left-hand margin denotes a change of address from a previous list
# in left-hand margin means joined in last quarter of 1978 but not yet renewed for 1979 and thus perhaps not wishing to remain a member.

Rowan Armour-Brown, Leomansley House, Lichfield, Staffordshire; tel: 05432-23575 (violin; M,R).

Josep Tubau Bartomeus, Numancia 35-1-1, Manresa, (Barcelona), Spain; tel: 8743554 (ww, C,P; flute, recorder, M).

# Karl E. Baumann, 4 Sussex Place, London W2 2TR; tel: 01-723 9853 (lute, orpharion; C,P).

Ricardo Branel - add tel: (055) 855 181

# Christian Brosse, D-2 Hamburg 11, Deichstrasse 32, West Germany (violin, viol; M,R).

Brian Carlick - add tel: Charlton on Otmoor 493

Steven E. Clark, 4953 Barat Circle, Anchorage, Alaska 99504, USA; tel: (907) 333-0474 (virginals, plucked strings; M).

Olive Cole, 41 St John's Hill Grove, London SW11 2RF; tel: 01-223 9250 (lute, viol; M,P).

# Timothy Constable, 74 Wickenden Road, Sevenoaks, Kent TN13 3PW (harpsichord; M).

# Robert Cooper, 105 West Perry St., Savannah, Georgia 31401, USA; tel: (912) 234-6498 (lute; M).

* P. H. Cowdery, 2374 Robin Drive, Mississauga, Ontario, Canada L5K 1S9 (flageolet, transv. flute; R,C).

* Sand Dalton, Rt.2, Box 3196, Lopez, Washington 98261, USA; tel: (206) 468-2662.

* Claire Darbois, 13 quai des Bateliers, 67000 Strasbourg, France.

John Downing - correct tel: Middlesborough 317346

# Julian Drake, Highcliffe, near Eyan, via Sheffield S30 1QT (bar. flute, cornett; F, cornett; M).

Nicholas Driver, Church Terrace Cottage, Laxfield Woodbridge, Suffolk; tel: Ubeaton 464 (early & trad. perc, bones, bodhran; M,E,P).

# Richard J. Fletcher, RD 1 Box 83, Roaring Branch, Pennsylvania 17765, USA; tel: (717) 324-6447 (lute, guitar; M,R).

* Sender Fontwit, Mill Creek, Big Sur, California 93920, USA.

* Charles Ford (from the end of February) Brick Barns Farm, Dowland's Lane, Copthorne, West Sussex.

# Stuart G. Forbes, 2506 Huntington Lane, Apt. #1, Redondo Beach, California 90278, USA (recorder; M,P).

* Eric Franklin, o/c Pitroy House, Ash Lane, Wells, Somerset BA5 2LR.

# John Gamble, 8 Kneeton Vale, Sherwood, Nottingham NG5 3DR; tel: Nottingham 604911 (lute, guitar; M).

* Noordin Ghani, 187 Osborne Road, Newcastle-upon-Tyne NE2 3JT; tel: 0632-815872.

* Charles Groppetti, via Martinengro Cesaresco 20, 25100 Brescia, Italy (string instrs; R).

# Roger Hargrave, 4 Eward Avenue, Newark-on-Trent, Nottinghamshire.

Martin J. Haycock, 27 Harcourt Road, Westbury Park, Bristol, Avon BS6 7RQ (psaltery, harp, citern; M).

* Steve Heavens, 2760 Falcons View, Southgate, Runcorn, Cheshire WA7 2XN.

John D. Hill - change tel: (312) 383-7915

* Tim Hobrough, The Old Schoolhouse, Bochrubin, Torness, Invernesshire; tel: Dornie 266.

Peter Hoogerheide, Lawickse Allee 64, 6707 AK Wageningen, Holland; tel: 08370-1117 (organs, viol, ren. ww; M).

* Akira Ishii, 354 Saitama-ken, Fujimi-shi, Mixutami higashi 2-46-11, Japan.

Peter Andreas Kjeldsberg, Ringve Museum, N-7000 Trondheim, Norway; tel: (075) 20 135 (museum curator).

Evert Kluter, Stanisangel 9, Oenkerk, Netherlands; tel: 05103 1718 (Moorise balk; M,P).

Edward L. Kottick, School of Music, University of Iowa, Iowa City, Iowa 52242, USA; tel: 337-9345 (keyboard, plucked string; M).

Arthur Lewis, Nyth Wennol, Tregaron, Dyfed.

* Philip Lord, Jan Berststraat 25, Diemen, Holland.

# Lawrence Lundy, 505 Elmside Blvd, Madison, Wisconsin 53704, USA.

Thomas McGeeary, 1206 W. Main #7, Urbana, Illinois 61801, USA (harpichord, virginals, clavicord; M,R,hist.).

* John Marriage, The Manor, 103 Main Street, Little Downham, Ely, Cambridgeshire CB6 2SX; tel: Fymore 655.

C.R.F. Maunder - add tel: Cambridge 832112

* Geoff A. Mather, 24 Fernlea Grove, Downall Green, Ashton-in-Makerfield, Wigan, Lancashire; tel: 0942 714469.

Peter Mirans, 19 Chelmsford Street, Ngaio, Wellington 4, New Zealand; tel: 791 274 (keyboards; M).

William Nolan, 3 Church Villas, Lexfield Woodbridge, Suffolk; tel: 491 (violin, viola, cello, harp; M).

Musikhistoriska Museet, S-114 51 Stockholm, Sibyllegatan 2, Sweden.

Robert J. Peckham, c/o Euratom C.C.R., Ispra, 21020 Varese, Italy.

* John Pringle, 26 Dervent Grove, London SE22 6EA; tel: 01-299 0801.

* Sean Rawnsley, 9a Scott Avenue, Mangere Bridge, Auckland, New Zealand (cello, cello-picc, cemb.; viola; C,F,P,Res.icon).

Robert Spencer, 11 Barelay Oval, Woodford Green, Essex IG8 OPP; tel: 01-504 5639 (lute, guitar).

Peter Spohr, Baldunstr. 76, D-6000 Frankfurt 70, West Germany; tel: Frankfurt 622860 & 655976 (flute, keybd, dulcian; P,0,R).

Melanie Spriggs - add tel: 01-249 5383

Len S. Stanners, 9a Scott Avenue, Mangere Bridge, Auckland, New Zealand (viola; M).

Minoru Takahashi, 921-4 Ikocho Hazama, Adachi-ku, Tokyo, Japan 121; tel: 03-899-9721 (woodwind; P).

M. van Vaerenbergh, Vander Vekenstr. 115, 1810 Wemmel, Belgium.

William Waterhouse, 86 Cromwell Avenue, London N6 5HQ; tel: 01-340 8362 (curtall, racket, bassoon, flageolet; C,P).


General Facilities:

Microelectronics: Noordin Ghani

Museums: Trondheim: Ringve (Peter Andreas Kjeldsberg)

Planes: Geoff Mather
Organological Index:

All instruments: Peter Kjeldsberg

Percussion: Nicholas Driver Tom Savage (jews harp)

String Instruments General: Djilda Abbott Roberto Groppetti Tom Savage

Dulcimers: Aidan Edwards William Nolan

Psalteries: Aidan Edwards Martin Haycock Peter Forrester William Nolan

Misc. Zithers: Evert Kluter (Noordse Balk)

Keyboards general: Ed Kottick Peter Mirams Peter Spohr

Harpichord etc: Steven Clark, v Thomas McGeary, hv Timothy Constable, h William Nolan, hvs Daniel Morgenstern, hvs

Clavichord: Thomas McGeary

Plucked strings general: Gerald Adams Ed Kottick Steven Clark Enzo Puzzovio Peter Forrester

Lute: Karl Baumann Richard Fletcher Robert Longstaff

Olive Cole John Gamble Robert Spencer

Robert Cooper Bob Hadaway

Guitar: Aidan Edwards John Gamble Robert Spencer

Richard Fletcher William Nolan Maish Weisman

Peter Forrester

Vihuela: John Downing Peter Forrester Bob Hadaway, co

Cittern, etc: Karl Baumann, o Martin Haycock, c Harold Snyder, b o John Downing, o b Robert Longstaff, c Maish Weisman, c o b

Mandolin: Peter Forrester Mandore: Peter Forrester

Rebec: Peter Forrester

Fiddle: Peter Forrester Henk Schellekens

Violin fam.: Rowan Armour-Brown Charles Johnston Christian Brosse Mark Smith (vcl, cb)

Viole da gamba: Christian Brosse William Nolan Len Stanners

Olive Cole Henk Schellekens Mark Smith

Peter Hoogerheide

Hurdy-gurdy: Gerald Adams William Nolan Maish Weisman

Robert Longstaff Henk Schellekens

Harp: Martin Haycock Robert Longstaff

George Higgs Maish Weisman

Wind instruments general: David Ross David Skulski

Woodwind general: Josep Bartomeus Theodorus Miller

Peter Hoogerheide Minoru Takahashi

Transverse flute: Josep Bartomeus Daniel Morgenstern

Brian Carlick Peter Spohr

P.H. Cowdery

Julian Drake

Recorder: Josep Bartomeus Brian Carlick Peter Forrester

Neil Buckland Stuart Forbes
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**Geographical Index:**

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<td>Edvard Kottick, Iowa</td>
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<td>Graham Cooper, Virg.</td>
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**Appendix, 8th January:**

* Graham Cooper, 524 Longleaf Rd., Virginia Beach, Virginia 23454, USA. Robert Hadaway, Coedinaf Isaf, Llanic Road, Tregaron, Ceredigion, Dyfed, Wales (lute, cittern, opiharion, etc; M,R,W).

* Stratton and Caryl McAllister, IBM PSIC, via IV Novembre 103, I-00187, Roma Italy.
All forthcoming material in this one.

Charles Ford (ed): Making Musical Instruments: Strings & Keyboard, Faber & Faber, £15.00, due in February. Faber asked if they could circulate a leaflet about this to you all; I gave them numbers and deadline, but nothing has arrived. In case it doesn't, the various authors are: Dietrich Kessler, The Viol; Ian Harwood, The Lute; Adam Paul, The Violin; José Romanillos, The Guitar; Michael Johnson, The Harpsichord; Friedemann Hellwig, Restoration & Conservation. They sent me a dust-wrapper, judging from which it's a large format and, I assume, well-illustrated. If they send us review copies, it will be reviewed in the next issue by as many people as they send copies — it should be a team-review if they will cooperate.

Crafts Advisory Committee: Conservation Sourcebook, 352pp, £4.25 paperback, £5.95 hardback, due 17th January. Lists, they say, the many organisations which can help craftsmen, etc on conservation with publications, technical advice and so on. Musical instruments are only one of the subjects covered, of course. Copies are available at £2.95 (paperback) until 31st Jan. if you're interested and this gets to you in time; order from CAC, 8 Waterloo Place, London SW1Y 4AU, saying you are a FoMRHI member.

LL.S.Lloyd & Hugh Boyle, Intervals, Scales & Temperament, Macdonald, London. A reprint of the 1963 collection of essays of Lloyd's, all interesting on the study of intonation, with the very useful table of cents, savarts, decimal ratios and monochord-string lengths in the back. I've always thought that my monochords (see Comm.21) were more accurate than Hugh's (I don't trust his method of stopping the string not to cause extra tension), but his list is extremely useful. He rang up and told me about the reprint, so all I know is that it's coming, probably in February, but no details about price, etc.

Archivum Musicum of 50125 Firenze, Lungarno Guicciardini 9r, Italy, have sent me a massive list of facsimiles they intend to produce of original musical texts from Capirola onwards. A good many are lute tablatures, but some are keyboard, a few guitar and some general instrumental. Only six have been published so far: Molinaro, Intavolatura di Liuto, 1599, lire 15,000; Frescobaldi 1st & 2nd books of Toccate e partite, lire 10,000 each, and so on. The prices seem quite reasonable for Italian facsimiles; if you're interested, write to them for a list.

Jeremy Montagu (ed), Choose Your Instrument, Gollancz, due March 8th. Don't be misled by anything you hear of this; there's only about a page and a half on early music. The book is designed to help young school children decide what instrument they want to play, and so few schools give the opportunity to play anything except conventional instruments, we couldn't put much in on early instruments.

There is the next book from David & Charles (and Overlook in USA) due in April, The World of Baroque & Classical Musical Instruments, but that can be left till next time.

Paul Gretton asks me to say that Sackbut & Cornett has not been abandoned; the first issue will appear in a few months.

MICAT: Cary Karp asks me to say that because the museum has been moving (new address in Suppl. herewith) it has been delayed. All 1976 subscriptions will carry on through 1979. He apologises for not answering any letters, but he fears that some may not have reached him because of the move; if you can bear to repeat them, in case of this, please do so. He will answer as quickly as he can.
At last the first section of this long-awaited work, described by the publishers as "the ultimate book on the bassoon", has appeared. It is the first 190 pages, about one tenth of the whole work, and it is presumably this enormous size which has dictated the extraordinary scheme of producing it in ten or twelve parts as a serial. From the part that has arrived so far, it is very difficult to work out what the whole book is going to be like. There are, for example, continuous references to illustrations, but nowhere in the publisher's blurb, which includes a complete list of contents, is there any indication of where the plates will appear. There are a few random illustrations in this section, the first of which, after a frontispiece and a portrait of the dedicatee, is numbered fig.15. Where, I wonder, are figs.1-14? Other aspects of the production are equally odd. The text is not justified; i.e. the right hand margin of the page is not a straight line vertically but looks like typewriting. This may be acceptable (I hope it is) in a production like FoMRHIQ, which is obviously typewritten, but it looks odd on a printed page. More seriously, much more seriously, the book has not been proof-read. There are myriads of literals, of misspellings of all sorts such as printers inevitably produce and which are normally corrected in galley by the author or the publisher. In addition, there of all sorts such as printers inevitably produce and which are normally corrected in galley by the author or the publisher. In addition, there are cases where two lines have been repeated, just as I have repeated them here. Did any of you read this far without noticing that two lines were repeated? Of course not, and this shows that nobody read through the text in proof. One can miss a literal (though even in a foreign language I find it difficult to believe that anyone could miss all of the enormous number of literals there are here) but I don't see how anybody could miss repeated lines. As a result, despite the extravagant terms in which Frits Knuf boost the book, it would appear that there is no great interest in it; surely otherwise somebody would have had the job of proof-reading even if the author was unwilling to do it.

The author's attitude is very much a puzzle. Clearly he was not willing to proof-read, but almost equally clearly he was not willing to write the book in any proper sense of the word write. As FoMRHI members will know (only too well) I write books myself, and it looks as though Will Jansen and I work in much the same way initially. What I do is write in bits. Either instrument by instrument, or odd bit of information by odd bit goes down on paper as I think of it. The resulting pile of paper, some in manuscript and some typed, is then shuffled into some sort of order, and it is at that point that our methods diverge. I sort it and prune it, rearranging it and shifting it around till it is in some sort of coherent order before I start writing the book properly, but Will Jansen has simply sent it off to Frits Knuf in that state, and they, I can only think without reading it unless they are very different from any publisher I've met, print it and call it a book. It isn't a book, of course, but the first rough draft for a book. There are all sorts of snippets of information here repeated three, four or even five times, often in exactly the same words, just as they occurred to him in the context he was writing at that moment. Even the most cursory of revisions would have shown that some of the repetitions were unnecessary and undesirable. The result, of course, is that one feels that if the author cannot take any trouble with writing it, should we take any trouble with reading it? And if he is careless in his writing, is he equally careless in his research and in his facts?
Some of his facts he is certainly wrong about; even I, and I know much more about brass than I do about woodwind and, like almost all of us, least about the bassoon which is why this book could have been, should have been, so important to the history of instruments, even I can pick up a good many errors. One example, frequently repeated, is that the early bassoons (context suggests 4 and 6 key) only went down to C because there was no key on the bell to give the low B flat; this just isn't true, as a moment blowing an old bassoon (or a glance at the appropriate fingering chart in Baines's Woodwind Instruments or any old instruction book (the oldest I've got is Majer's Museum Musicum of 1732 and that goes to B flat) will reveal.

It is apparent that Mr. Jansen doesn't think much of early instruments; the first that he has any real approval of is the Savary model of the early 19th century, and bassoons really only become proper instruments with Almenraeder and Heckel (this is a slightly unfair summary). One gathers that most 18th century bassoons sounded rather unpleasant and unmusical (I wonder what sort of reed he used when, and if, he ever tried one?) and as for things like dulcians (curtals), they were primitive, limited, imperfect (p.15 and frequently thereafter), coarse and dull in sound (passim), and so on. Also "a short, coarse and hoarse sound is the main feature of all instruments with widely conical bores - the serpent, the bass horn, the ophicleides" - again one wonders has he ever heard any of them properly played? (I was doing a film recording yesterday and Alan Lumaden was playing the serpent; the only problem was that for the purposes of that film, his sound was too beautiful so that he had to coarsen it). He actually produces the statement that in the 18th century "much was written that could not be performed with a reasonable degree of success on the contemporary bassoon; it can be said that many composers in reality wrote for the future", and there are many other equally nonsensical statements. There are a number of other instruments that he writes about equally ignorantly, among them and again repetetively the basse de musette, which he persists (about four times) in describing as a form of bassoon rather than as an improbably late tenor shawm (there are a lot of mysteries about the basse de musette, an instrument that seems to be Swiss, 18th century and usually marked I.IR, but one is clear at a glance and that is that it isn't a bassoon or anything to do with one).

On the other hand, once he gets to 1800 or so there is a vast amount of information, much of which appears to be accurate and much of which is not available elsewhere. How useful the rest of the book is going to be, we don't yet know, and as much of it is bibliographical and biographical on makers and players and composers of the bassoon and its music, it may even be that the great length of the book is justified. Certainly so far as this first part is concerned, a normal author's revision would have resulted in length reduction of 50% or more.

A couple of final points: if you are thinking of buying the book, the whole thing will cost Hfl.490, well over £100, though this includes free binding cases. And don't be put off by Mr. Jansen's English; he says in the Preface that he is Dutch and writing in English and that as a result "there may be...things not fully complying with The King's English" - there are indeed, but there is never any difficulty in understanding what he means, so let us be grateful to him that he does write in English to our benefit, instead of writing in Dutch which would have been much simpler for him and much more difficult, and probably impossible, for us.
Review of: Divisions, A Journal for the Art and Practice of Early Musick, Vol. I no. 1, September 1978. P.O. Box 18647, Cleveland Heights, Ohio 44118, USA. $9.50 in USA & Canada, $14 overseas, per annum; published quarterly.

A hearty welcome to a new contemporary, especially as the editor, Walton Mendelson, and several of his colleagues and contributors are FoMRHI members.

Divisions is much posher than we are, appropriately enough as it deals with performance and performance practice and will thus lie on the table or desk rather than on the work-bench. It is nicely printed with an elegant cover and keeps the cost down to little more than ours by including advertisements. This first issue is 44 pages long, and it will presumably grow in size as it acquires subscribers and authors. It welcomes contributions from all who are interested in performance, and there must be many FoMRHI members who are interested in playing their instruments as well as in the aspects we cover; after all that's why most of us make them.

There is a Comments & Suggestions column, and two subjects on which you may have ideas are: information on the pochette and the correct use of crumhorns (what dates, what places, what ensembles). An interesting suggestion from Dr. J. Schaffer is that it may well be impossible to duplicate early oboe (and thus presumably all other reeds) reeds because "of the strong likelihood that the cane used for oboe reeds has been selectively bred" during the last couple of centuries.

There is an article by William Hullfish on how to improvise your own divisions, based mainly on Simpson's Division Violist (he doesn't seem to know that Curwen produced a facsimile in 1955) and one or two other sources. It is presumably useful for those who haven't got, or can't cope with the prose in the original. Djilda's and Eph's Comm. 138 from FoMRHI Q 12 is reprinted (and since Divisions is properly printed it may well have been sent to them before it appeared with us), thus spreading the word about catline strings, one of the most important developments of the last few years. Pauline Durichen has translated Antoine Mahaut's transverse flute tutor, and the first part of it appears in this issue. This dates from 1759 and includes information which is not in other tutors of the period. There are reviews of books and records.

We look forward to future issues and we hope that Divisions will grow in size and subscribers as we have done. It fills an important gap and is highly recommended to all who play as well as Make and Restore.

BULLETIN SUPPLEMENT. Continued from page 13,

PINE-RESIN VARNISH NOW AVAILABLE

All chemical analyses of Italian varnishes dating from before 1750 that we know of indicate that the primary constituent is a pine resin. Fulton (The Strad, Dec. 1974, p. 491-501) has published a method for making such a resin from turpentine. An intense and absolutely stable red-brown colour is built into this resin by appropriate heating in the presence of metals. The superior mechanical and optical properties of a varnish made with this resin are well known to those who have experience with it. NRI is now producing such a varnish for sale.

FOR SALE: HURDY-GURDY (Vielle-a-roue) PLANS. Set of 5 sheets. Instrument by Pimpard, late 19th. cent. Plans sold under licence from leading French maker. £20 per set. V. Muskett. Address as above. (p. 13)
The finish on the soundboard of early lutes and guitars is quite a problem for modern makers. The surviving examples are not varnished in the ordinary sense, yet there is certainly some finish, for they are of a uniform colour with no sign of the dirty patches familiar from our own unvarnished efforts.

Several people have used egg-white as a sealer, either on its own or mixed with water. This is a clear glutinous fluid, which can be applied with a brush, and dries to a very slight gloss. The action of warmth, air and daylight oxidises it to form a waterproof elastic film, very suitable in many ways. The only trouble is that the wood remains pale, and shows the dirt in an annoying way.

Some time ago I was discussing the matter with Friedemann Hellwig, who remarked on the yellowish colour of lute soundboards in many old paintings, suggesting that perhaps they used the yolk of the egg as well as the white. At the time I treated this as a joke, but it stayed at the back of my mind. Some time later I was reading Max Doerner's The Materials of the Artist (Revised edition, London 1963), which has a section on Tempera painting, where egg-white is much used as a medium. Mention is made of the use in the Renaissance of the whole egg, both as a medium in which to grind colours and also as a surface finish. The drawback of this is that (a) it starts off rather yellowish and (b) it darkens to a uniform brown with age. This seemed to be just what we were looking for, whatever the artists thought of the darkening.

Natural emulsions, particularly egg and casein, adhere well to grounds even if they are slightly oily. Egg acts as an emulsifier between oils such as linseed and water, which of course otherwise will not mix. When properly prepared, such an emulsion will dry without leaving an oily mark, and will mix with water in any proportion. It has a yellowish milky appearance when first applied, but this clears when it dries and the yellow colour mellows with time. The emulsion eventually forms a hard, brown, waterproof yet very elastic film, and is very simple to prepare.

**Ingredients:** 1 whole egg; boiled linseed oil (dries more quickly than raw); water.

**Method:** Break egg into screw-top jar; shake until yolk and white mix together into one uniform liquid. Note quantity in jar. Add an equal quantity of linseed oil; shake and mix again. Add up to two equal measures of water; shake and mix as before.

**Note:** Order of ingredients is important; oil must be added before water, or emulsion will not form. Freshness of egg is important for best results. Emulsion should be made up fresh each time, but will keep in a refrigerator for a few days, though it separates into two layers. Shake well before using!

**Application:** Apply with a brush, not quite so soft as a varnish brush. A good quality household paintbrush is ideal. Brush well in; the idea is for the emulsion to sink into the grain, not to stay on the surface like varnish.

**Drying** is partly through evaporation of the water, partly through oxidation of the oil and partly through chemical change in the egg. So warmth, fresh air and unfiltered sunlight or UV light will all help the process.
Bob Marvin asks (FoMRHI 12, p7) about pitch and lutes in the early 16th century. I can't help directly for that period, but I have been considering the problem in relation to English lute songs c1600. I had always thought that when one finds a song where the voice part starts on d' and the open top string is given as the singer's note, a bass lute is implied. Where there is only an apparent difference of a tone, I had assumed that this was to avoid a 'difficult' key for the singer to read. In the first case the lute part would be transposed; in the other the voice. But John Ward (JLSA X, 1977, p148, fn265) states that the former approach is incorrect, and that such discrepancies always imply vocal transposition to suit the lute. In other words, whatever the actual pitch of the lute (which we now know, thanks to E.S. & D.A., is dictated almost entirely by its string length), the singer takes his note from it. This would cause no problems at all with contemporary sight-singing methods.

None of that helps much in matching lutes and flutes, but it is perhaps significant that, in the only two English publications specifying these two instruments (Morley's and Rossiter's Consort Lessons), the 'Treble' lute is called for. In almost all the song books, the size of lute is not mentioned, but Dowland's Book III (1603, No21) contains a dialogue, 'Come when I call' with two lutes. The one at 'ordinary pitch' is designated 'Meane' on the title page. In view of what E.S. has been telling us about English viol sizes and pitches 'at least a tone below the modern standard', it rather looks as if the songs were normally done at quite a low pitch, using a fairly large lute and bass viol. So for playing up to flute pitch a much smaller lute was required, labelled 'Treble'. (A small bass viol would also be needed, of course, but what of the treble viol or violin?)

There were plenty of lute sizes to choose from, according to Praetorius (I do hope he soon got rid of that red herring on his foot; it must have been both smelly and uncomfortable!). His 'Tenor' size has its top string at e' (perhaps our 'Meane'?) above which are others with top strings at g', a', b', c'' and d''. These ought to cope with any flute, no matter how high its pitch!

Another complication in the case of transcriptions of vocal music for voice and lute, such as Bob Marvin's frottile, concerns the clefs used in the original versions. It seems certain that the transposing-clef code ('Chiavette' or 'Chiavi transportati') was in widespread use throughout the 16th century, by which certain clef combinations implied upward or downward transposition. One would have to know the clefs of the original vocal parts before suggesting a suitable lute pitch for the transcriptions.

Incidentally, this whole knotty problem of English lute-song pitch is one of the subjects to be discussed at the Lute Society's whole-day meeting at the Art Worker's Guild on January 27, 1979. Other topics will be ornamentation and pronunciation.

Ian Harwood

*Or perhaps Dowland had to specify 'Meane' for this dialogue because he wanted a smaller (and higher-pitched) lute than the usual 'Tenor' instrument used for lute-songs, in order to accommodate the 'Bass' lute needed for the other voice part. (I.H.)
ON THE TIME OF INVENTION OF OVERSPUN STRINGS. D. Abbott and E. Segerman

The advertisement for a new kind of string with metal wrapped around silk or gut, in the back of Playford's 1664 edition of "Introduction to the Skill of Musick" was first noticed in modern times by Bob Spencer who quoted it in a review in Musical Times (December 1970). It was then given further circulation by Ian Harwood in Early Music (October 1974).

Some skeptics, citing Playford's obvious commercial interests, have asked: "If such a fundamental advance in string technology happened at that time, how come the only surviving evidence for it is this one source which might be quite prone to exaggeration of its newness?"

We now have an independent source. Jacques de Dixmude has kindly sent us a photocopy of pages 224 and 225 of Claude Perrault's "Ouvres de Physique" printed in Amsterdam in 1727. The relevant section was probably carried over from the 1st edition in 1680 (we have yet to check whether this is so). It is titled: "Invention nouvelle pour augmenter le son des cordes" which in translation says "New invention to increase the sound of strings". Laurence Wright has kindly translated this passage for us. It is full of assertions about the acoustics of instruments which sound rather silly today. The relevant passages are:

"... the recently-invented way of loading gut strings makes their sound much louder; for the drawn metal wire, with which they are wound, gives vehemence to all of the vibrations, ..." and "... the wire, being seven or eight times longer than the string, it is so loose that neither its parts or particles undergo movement in its vibrations which is able to cause any noise, so that only the string can produce noise, and it can only produce that which is natural to its tension, the winding of metal wire not being able to give it any stiffness or hardness, ..."

In a later passage, Perrault seems to be approaching the insight that the added vehemence of overspun strings is related to an increase in the higher-mode content of the string tone.

Perrault must have been writing the 1st edition of his book in the late 1670's, and so we learn from him that overspun strings were considered a new invention then. This is also about the time when we would have expected St. Colombe to have introduced them to France (as Rousseau indicated in his 1689 book).

We can also conjecture that Perrault would have pulled a string apart to determine the length of winding to be 7 or 8 times the length of the gut. Generalising from just one careful observation was not uncommon in 17th century science. All we can derive from this information is that the diameter of the winding wire was either equal to (if it was close-wound) or less than (if it was open-wound) between 65% (if the factor was 8) and 80% (if the factor was 7) of the diameter of the core. All of these possibilities are quite reasonable, and so, unfortunately, the information does not narrow down any possibilities. This information could have been useful if Perrault had mentioned what course on what instrument the string came from.

Let us hope that other sources like this but with a bit more useful information will turn up.
Recently I undertook the restoration of a number of stringed instruments belonging to the Castle Museum, York. These included two 'English' Guitars, an Imperial Harp Lute(sic) and an 18th century Lute type instrument. It is intended to publish full restoration reports on each of these in the, hopefully, not too distant future. However, the purpose of this present paper is rather to mention some of the views I formed as a result of a detailed examination of the Lute type instrument.

For present purposes the most interesting features of the instrument are: typical Lute construction, very light, nice cut in rose in a unique(?) knot design, back of 13 ribs, neck with 10 ivory frets (replacements for earlier tied frets; the indentation of the fret knots and varnish wear are evident), tablature letters inscribed against each fret knot, Violin-type peghead ending in a plaque, neck secured to the top block by one large iron nail, Late 'baroque' lute barring (three bars below the rose, two above, one through its centre, 6 small 'fan' bars below the bridge, the rose reinforced by 6 very small bars), bridge for 6 courses (first single), nut grooved for 6 courses (first single), string length 698mm., body length 472mm. (String length/Body length ratio=0.69), printed label reading 'Mathaeus Lenceslaus / Stautinger, me fecit, / Ursenburgi 1773' (the last two numbers are inked in). With the single exception of the ivory frets, I believe the instrument to be in its original state. It is housed in a case clearly especially made for the instrument (the fit is perfect) of typical lute case construction (i.e., ribbed wooden back, lid hinges at point of greatest body width, etc.). The top clasp of the case is punched 'P: KILLIAN PEPPER SCOTT/ 1773.' Some of the more obvious questions raised are: is the instrument unique?, if not what is it, how was it strung and played and what is its repertoire?

In those very few reference works (e.g., Baines: European & American Musical Instruments, pg. 33), which mention them at all, merely passing reference is made to 18th century 6 course Lutes; often describing them as lute shaped Guitars, with little, if any, explanation for their existence, repertoire, etc. This is rather surprising, since there are quite a large number of similar instruments dating from the 18th century extant (Pohlmann: Lute, Theorbe, Chitarrone, 4th edition, 1975; under the heading 'Knickhals-Lauten' lists 29 of them, all by German makers, excepting two Italians, covering the period 1710 to 1764). The Stautinger instrument is not included anywhere in Pohlmann and it is highly probable that a substantial number of similar instruments exist, which he has not noted. To place the numbers in perspective, it is interesting to see that from 1650 to 1764 he lists fewer recognisable 'baroque' Lutes than these particular instruments. The string length of these listed instruments ranges from 55 to 75cm, the great majority falling between 65 and 73cm with a mean of 69cm. The ratio of body length to string length ranges from 0.55 to 0.88, the great majority falling between 0.65 and 0.75 with a mean of 0.70. Thus, with the exception of the peghead type, the Stautinger instrument is clearly a member of the same set as these other 'Lutes' and is therefore not unique.

Accordingly, what are these 30+ instruments? Most certainly they are not Guitars: the 6 course/string Guitar did not become at all common until the 1750/90s, at least 70 years after the first of these instruments were made; further, the 5 course 18th century Guitar proper had its own, if rather poor,
repertoire and was known as the Guitar. To make further progress towards identification, it is necessary to beg the question of the instrument's repertoire by examining 16th century tablatures and indeed it is here that the first hint may be found. Three instruments, other than the Lute and Guitar, commonly had music in tablature: the Angelique (Angel Lute), the Mandora and the Colachon (Calichone, Falchion, Callochon, Calichona, Calascoine, etc.). The identity of the Angelique is well established, so by elimination these unidentified instruments could be 18th century Mandoras, Calichons or possibly both depending on size. However, the general understanding of these two instruments, based largely on Mersenne (Harmonie Universelle, Paris, 1636) and Kircher (Musurgia universalis..., Rome, 1650) writing a century earlier, is that the Mandora is a rather small instrument (a sort of small descant Lute) with only 4 courses and that the Calichon is a small bodied, very long necked Lute with only 2 or 3 single strings. Fortunately there exists direct evidence that the Calichon had changed its form, at least in Germany, by the early 18th century: in 1713 Mattheson writing in his 'Neueroffnetes Orchester' describes the Colascione as a 6 string/course instrument tuned D G c f a d'. Even in England Talbot writing in 1690 regarding the Colachon quotes from Mersenne and Kircher, but describes a 6 string instrument tuned C (or A) D G c e a, although his instrument does have a small body and an extended neck (it has been suggested that Talbot confused the Calachon stringing and tuning with that of the Mandora; this is indeed a possibility since the common Mandora tuning is C D G c e a. Certainly one would not expect a regional instrument, as the German Colichon seems to have been, to have penetrated to England by 1690). Assuming that Mattheson's Calachon was tuned at early 18th century German orchestral pitch (say a tone below modern pitch) the string length of his instrument with gut strings could not have been longer than 83cm and by analogy with Theorbo string length and tuning, probably no longer than 76cm. The larger of these Lute type instruments would therefore seem to fit the description of his Colascione quite well.

If the larger instruments of this set can be identified as Calachons, what of the smaller (say string lengths 55 to 63cm)? Here again an examination of 18th century tablatures shows that by the early decades the Mandora possessed 6 or even 7 courses, one known tuning being (D) G c f a d' f*. (Musikbibliothek der Stadt Leipizig, Ms. III, 12, 18). Analysing Pohlmann's listings for the Mandora between 1700 and 1798 (his latest) produces much the same results as from the earlier analysed 'Lutes'. The string length ranges from 54 to 80cm, but with a mean of 60cm. The ratio of body length to string length ranges from 0.62 to 0.92 with a mean of 0.74. Indeed there are larger relative variations within each separate list than within the two lists combined. Assuming that Pohlmann's criterion for the identification of an instrument as a 'Lute' or a Mandora was simply the type of peghead, such a difference could easily be explained as a function of the individual maker's style rather than any fundamental difference between the two types of instrument (it is interesting to note that the majority of Pohlmann's Mandora makers are Italian, whereas those of his 'Lutes' are German). Accordingly, I feel that both sets may be combined and that analysing this set produces two sub-sets: string lengths between 54 and 62cm and between 64 and 80cm with means about 59 and 69cm respectively; both with a similar body to string length ratio between 0.65 and 0.80 for the great majority with a mean ratio of 0.70. On this basis I speculate that the smaller instruments may have been known as Mandoras and the larger as Calachons, irrespective of peghead style. However, it does seem as though a certain degree of interchangeability was not unknown even at that time, for a MS in the Sachsische Landesbibliothek, Dresden (Mus.2/V/7)
contains two compositions both entitled 'Duetto. Mandora 1^a, 2^a, Flute traverso - Violine e Cello'. Pohlmann writes of the first by J. P. Schiffenholz (1660-1758): "Entgegen der Titelbezeichnung 'Mandora' steht auf der Einzelstimme 'Callichona'. Die 2. Callichona-stimme fehlt"; and of the other (anonymous) piece "Obwohl auf dem Titel 'Mandora' steht, ist auf der Cellostimme 'Callichina' vermerkt. Die prima-stimme ist nicht mehr vorhanden". I have not seen these manuscripts, but in view of Pohlmann's comments it would seem that the choice of names may be dependant on the Composer as on the size of the instrument.

Some of the repertoire is very good (certainly better than contemporary Guitar music). The '12 Partitan fur Callichona solo' by G. A. Brescianello (Dresden: Mus. 2366/V/1 and 2) are outstanding and amongst the chamber works those by Telemann (e.g. 'Concert a 2 Fl. traverse avec 2 Violins, Viole, Calichon et Basso', Dresden) and Schiffenholz (e.g. 'Parthia a 2 Callichona, 2 Violino con Violoncello', Dresden: Mus. 2006) also look rather interesting. The substitution of a small Bass Lute or a large Tenor Lute would easily enable these works to be performed today.

Three reasons occur to me to account for the development of these 'new' instruments in the 18th century: the increasing use of overwound strings, which produced a good bass response even with a relatively short string-length; the difficulty in playing (well) the 13 course Lute (alas a problem still evident today); and the new 'classical' style of composition requiring less introspection and more brilliance from the instruments. With the introduction of the 6 course/string Guitar around 1780, the Mandora and Calichon came increasingly to be used as Guitars and single strung versions ('Lute-Guitars') were specially made, as they still are today in Germany. Accordingly the theory that 'Lute-Guitars' were a reversion by Guitar makers to the Lute shape is not one I would share. Indeed, one may even speculate that the existence of the 6 course Mandora and Calichon inspired the addition of the 6th string/course to the Guitar.

To summarise: large 18th century German or Italian 6 course Lute type instruments may be identified as Mandoras or Callichons; precise identification depending on size and place of origin.

It is all too clear to me that the above presentation is far from complete and I would greatly welcome the views of Organologists, especially those who have access to the relevant music for Mandora and Calochon, particularly when played in concert with other instruments, to further establish tuning, pitch standards, sizes, etc. Finally, have you spotted this week's deliberate mistake(s)? The variation in my spelling of Calochon are not just a result of my rotten spelling, rather a reflection of my uncertainty in the face of numerous alternatives. If standardisation is felt to be essential (a modern disease) may I suggest Callachon for the 18th century instrument and Colascione for the earlier type.
In Comm. 142 William Samson discussed the reconstruction of an early 16th century Bass Lute of the 'Maler' (Almond shaped) type and requested views on the disappointing bass response of the instrument.

Without a detailed examination of the instrument, any views must, of course, be highly speculative, however, for what they are worth, here are mine:

Assuming the materials and basic construction are right (e.g. pine and not cedar for the belly), the most obvious explanation is that the bridge is somewhat too near the base of the belly. The vibrational and hence acoustical properties of simple plates are too well known to require a detailed exposition here, but in simple terms a large (area) plate fixed to a rigid (or near) boundary will oscillate at a lower frequency than a smaller plate of the same material and thickness. Accordingly, if the bridge is too near the semi-rigid boundary formed by the back/belly joint at the base of the Lute, its ability to respond to low frequencies will be inhibited. This is even more marked for the slender almond-shaped Lutes, where the semi-rigid boundary of the sides is closer to the bass end of the bridge, than for the wider bodied type; resulting in yet further degradation of bass response (hence Djillde's wide-bodied Lute, Bull. 12, p. 11, will not suffer the same deficiencies as would a slender-bodied instrument). In short, simplistic theoretical considerations indicate that the bridge position is too low.

The subsequent question is: what evidence have we for very low bridge positions on these early Lutes; or to be more precise, what evidence is there that the bridge position was 1/5 the distance between the end of the belly and the rose centre (Comm. 1)? Certainly, even a cursory glance at contemporary iconographic evidence indicates quite a wide variation around such a mean ratio, so clearly we cannot take the figure of 1/5 as an absolute (and I think it was not so meant in Comm. 1). Indeed, on most Lutes the ratio bridge position/length of body to top block = 1/8 (as stated in Comm. 128) will usually produce a slightly higher bridge position (up to 1 cm) than the ratio in Comm. 1. Although, of course, it all depends on the position of the rose and the size of the top block, further, as I interpret him, Arnault de Zwolle places the bridge at 1/6 of the body length, which is closer to the position more frequently found on late 16th century Lutes and approximates closely to Mersenne's information (Harmonie universelle, 1636). It would seem remarkable were the bridge position to be significantly lowered in the late 15th century only to be raised to its 'original' position a century later.

Finally, it is too imprecise simply to state that 'the position of the bridge is ...'. This could mean the position of the front, the mid-point or the rear of the bridge; itself leading to errors of 1 to 2 cm depending on the width of the bridge.

Accordingly, in view of the theoretical considerations, iconographic and other contemporary evidence and the probable errors in bridge placing formulae, I would speculate that a higher bridge position is indicated to improve the bass response. I would suggest moving the bridge up a cm or two (possibly to the mid-point between the end of the belly and the first bar, again all depending on the point of greatest width, viz. Comm. 1). This should result in a gain in bass response with some possible loss of
treble. This treble loss can in turn be rectified by placing one or two small bars on the treble side below the bridge; and so on to the 'classical' renaissance Lute barring.

A postscript, even more speculative than the forgoing, is that I intuitively feel that a belly thickness of 1.2 to 1.5mm is somewhat rather too thin. I appreciate that the simplistic theory of plate acoustics indicates that thin plates respond better to low frequencies than do thicker. However, from a purely empirical stance I would suggest a minimum thickness of 1.5mm, possibly increasing to 1.7mm in the central area. There really is no hard evidence, as far as I know, that these early Lute bellies were so very thin. Moreover, shrinkage over a period of almost 5 centuries must cause some reduction in the thickness of extant original Lute bellies. I feel that a belly, which is too thin, tends to behave rather like an unstressed drum skin and will be too 'flabby'; resulting in some very odd vibrational effects. This is, naturally, very much a personal opinion, but is based on the practical experience of constructing a wide variety of Lutes and similar instruments.

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**FoMRHI Comm. 177**

A TABLE TO CONVERT PLAIN GUT (OR NYLON) STRING SIZES TO EQUIVALENT OVERWOUND STRING SPECIFICATIONS.

- **Martyn Hodgson**

I am sure we are all very grateful to Djilda and Eph for the String Calculator (Comm. 162); it will certainly render obsolete, thankfully, most of the tables and graphs I previously used.

However, for some late baroque 'gut' plucked stringed instruments, overwound strings are still, in my opinion, more appropriate than Catlines. This is particularly the case for late 17th and 18th century Lutes, where music composed in the new 'style galant' requires a well defined, independent treble and bass line, often in concert with relatively large forces of other instruments.

To obtain the appropriate overwound string specifications, especially if the preferred silk (or nylon) multi-strand core is used, requires some rather tedious calculations or a conversion table. The following table was prepared simply by comparing the overwound string specification for a given tension and string length obtained from the rather limited tables provided by Messrs Karl Junger ('Pyramid' Lute strings) with the plain gut and nylon sizes derived from using the String Calculator, so as to give the necessary conversions. Test calculations indicate a maximum reasonable error of half a semitone.

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**These figures are for 'Pyramid' plain nylon strings.** Comparison between Pyramid tension lists and the String Calculator for plain nylon indicates a Pyramid nylon density of 1.04±.01. This accounts for the small differences between Pyramid string dia. and string dia. determined from the Calculator.

**The code for 'Pyramid' overwound Lute strings is:** the final digits of the number give the dia. in mm. of the overwinding (usually a silvered copper alloy wire); the first digits give the number of nylon strands in the core; the suffix 'Al' indicates an overwinding of Aluminium. e.g. 1014A1 is a string with 10 strands in the core overwound with 0.14 aluminium wire.

***My own subjective assessment of gut substitutes, but, of course, variable dependent on string length, tension and personal preference.

The conversion table may also be of some use to makers, who are faced with customers still insistent on plain nylon and overwound strings for all types and sizes of Lutes, early Guitars, etc. Accordingly, I have extended the range beyond that covered by Catlines and High twist strings to include the thicker plain gut and nylon strings.

Finally, a comment about the upper range for plain gut as given on the String Calculator. Modern violin plain gut strings (as supplied by Pieroni, Pirastro, etc.) are expected to be tuned up to e" at current concert pitch (a=440) on a modern or modernised fiddle. Now the string length of a full size modern(ised) Violin is 328±5mm. This places the highest pitch for modern Violin gut almost a semitone higher than shown on the Calculator. Taking into account the higher orchestral pitch standards common in the latter part of the last century, when plain gut e" strings were general, I think a semitone higher for good quality gut would not be stretching things too far.
Christopher Simpson (1665) used the phrase "from the Bridge (duely placed) to the Nut". Talbot (c.1690) gave many dimensions on many instruments but rarely this one. He was aware of its importance since he quoted Mace's rule on how this dimension varied on the different sizes of viols in a set for consorts, and the fragmentary dimensions he gave on these viols added up to support these rules precisely.

If one really wants to talk about something one will find words for it, but there is also a case to be made that a concept which is cumbersome to express in words will be expressed less often than one that is neatly expressed.

Today we often say "string length" which is ambiguous because the actual string is longer than this. "Vibrating length" and "vibrating string length" are also ambiguous since they can be shortened at will by stopping the string. The only unambiguous term that says just what it means is "open string length". But it requires the knowledge that "open" is the opposite of "fingered" or "stopped", and is somewhat cumbersome.

The German term "mensur" is gaining considerable acceptance in American English. It is short and direct but to my eye and ear rather ugly. My German-English dictionary translates it as "measure, diapason". "Measure" could be the measure of anything. "Diapason" is more attractive since one of its definitions in the Oxford English Dictionary is "A rule or scale employed by makers of musical instruments in tuning" followed by an 18th century quotation from Chambers Cyclopaedia mentioning its use in adjusting pipes or organs or cutting the holes of flutes, and indicating that there are different kinds of diapasons for trumpets, sackbuts, serpents and bells. The quotation does not mention stringed instruments and indeed there is a difficulty here in that this noun has already been in use in the strings field meaning a bass string (the original meaning of the word "diapason" was the interval of an octave and it later referred to the lower string of an octave pair).

The term "scale length" is used in several books on guitar construction, and "string stop" in some books on bowed instruments, all published in England. The former is ambiguous since "scale" could be expected to apply to any important dimension. The latter has the problem that "stop" or "open length" is used in a different way by the Hills in their book on Stradivari. They give the definition: "Length of string from bridge-foot to top of the belly-edge" (I haven't been aware that any string passed through these points). One should not be surprised if people in the violin trade who will traditionally chop off and replace the original neck of the most esteemed instrument without a twinge of conscience will just as readily chop off the neck part of a measurement. If the noun "stop" were used, the grammatical context would easily distinguish it from the verb "to stop" which is the act of left-hand fingering, but it could be confused with the noun "stop" which is a left-hand fingering position. Yet "stop" remains attractive as a component of the name of a measurement because it focuses attention on ends.

Original early instruments were played solo much more than their modern counterparts. When they were expected to play together with other instruments at the same pitch standard then players expected to go to some trouble to assemble a matched set. Today, to minimize such trouble, we conform to pitch standards more rigorously, and so more precision in matching open string length to string properties and instrumental resonance is worthwhile. So we need an efficient term to use for communication which was unnecessary in the past.
But "mensur"? Ugh! It has but two syllables, though. In my view the best proper English-language term is "open string length" (4 syllables) with "string stop" and "scale length" (2 syllables each) following in decreasing order of obviousness as to what is meant. If we have to compete with "mensur" in efficiency I would vote for "string stop".

May we have other opinions please?

FoMRHI Comm. 179

FRET DISTANCES FROM THE NUT FOR EVERY INTERVAL IN CENTS ABOVE THE OPEN STRING

D.A. E.S. and Pete Spencer

We have received so many warm comments from people who have found our String Calculator very useful, that we thought another calculation aid might deserve space in this quarterly. It will be useful mostly to makers and players of fingerboard stringed instruments in exploring various temperaments (see Comms. 88, 89 and 124).

We have found that theoretical fret positions as given here lead to instruments which fret quite truly, as long as the point where the strings take off from the bridge is not what the simple theory supposes (relative to the frets), but is experimentally determined with the types of strings and tensions used in practice. According to the simple theory, there are stationary points (nodes) of the string's vibration at both ends: the nut end and the bridge take-off point. But obviously the bridge is moving shoving the soundboard around, so the actual node is somewhat shifted. Also, depending on the height of the strings above the frets, the stretching of the string when it is pressed down onto the fret increases tension and makes the note sharper than simple theory predicts. (We have found the shift of the bridge take-off point due to these effects to be as much as 8 mm on a bandora 7th course.

Thus the string stop (or open string length) involved in using this table is theoretical and only an approximation to the actual string stop. With a moveable bridge this presents no problem. With a fixed bridge, one experimentally determines the position of the twelfth (octave) fret, (even if no actual fret is ever going to be fixed there). Then the theoretical string stop is twice the distance between the nut and this position.

The numbers in this table, when multiplied by the theoretical string stop give the fret distance from the nut. These numbers are a tabulation of the function

\[
\left( \frac{\text{cents}}{1200} \right) \cdot \frac{1 - 2}{1200}
\]

Each cent is an interval of 1/100th of an equal-tempered semitone, or 1/1200th of an octave. This table was produced by Pete Spencer's friendly computer.
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FoMRHI Comm. 180  Making Reamers on a Shoestring

Actually, the title above is misleading, since shoestrings, even the extra strong kind for the fashionable orthopedic shoe styles, are not rigid enough for making reamers, and I recommend using a lathe.

For the dimensions usually found in flute type instruments, reamers can be made with wooden bodies and steel blades attached. They take only a couple hours to make and will last through one or two dozen instruments, depending on the wood reamed. While this may not impress the mass-production minded, I hope it will give heart to the impecunious neophyte. Monetary considerations aside, such reamers seem the quickest way to test a design.

Unless you are very sure of a design, I recommend dividing a bore into two or more segments, each with its own reamer. This gives later possibilities of bore adjustment, as well as giving each reamer less work to do. Recorder bores especially seem easily divided into tapering sections with some cylindricity in-between.

I prefer to rotate the wood in the lathe's headstock, while pushing the reamer into it. A hexagonal rod (½" to ¾") extending from the reamer can be gripped by a large tap wrench (with its jaws reground to 120°). The arms of the wrench then can be supported from below on one side by a tool rest, and from above on the other side by a similar arrangement. This prevents rotation but allows other degrees of movement. And this makes things much easier for a poor weak wooden reamer, while also giving more accurate reaming than by pushing the wood onto a rotating reamer by hand.

I use maple for reamers, although it seems the weak limit, and other woods or even plastics are safer and stronger. For a long and thin reamer, such as for the middle section of a flute & bec, I'd recommend plastic or a strong wood such as massaranduba (what?).

On the lathe, bore a hole in the end of the reamer blank, the size of the extension you will use. It should go one or two bore diameters into the wood. Make it true with the other end of the reamer. To hold the reamer blank for turning, I use a spur center that has a convenient hole down the middle and a set screw which can hold a rod with a small cylinder on its end, which has the diameter of the hole drilled in the end of the reamer blank. (Rockwell spur center). Thus centered and held, the reamer blank can be turned (after, of course, octagonalizing off its corners). If the reamer's head diameter is less than the spur center's, a little shoulder (1mm or so) can be left next to the spur, to be knocked off and filed smooth later.

Mark out every 10 or 20 cm along the length, and turn the appropriate diameters with a parting tool (I use a 1/8" square tool steel rod that I've ground trapezoidal and hardened). Leave a cylinder on the big end (about 1½ - 2 times the depth of the hole) for the extension handle. Tapers of less than about 1/30 don't seem to need a pilot, but above that, reamers tend to wander and dig into the sides. So a near-cylindrical pilot of 10-20mm length can be left on the small end. After turning to the same diameters as the desired bore, you can sand down 0.1 - 0.2mm more (leaving it about the same at the small end where it joins the pilot). Less than this, and the blade won't stick out enough and the reamer may rub too much. More than this, and the reamer may chatter. The surface of the reamer doesn't need to be very smooth, just so it isn't fuzzy and compressible. Use coarse sandpaper.Relieve the big end with a reverse taper on the cylindrical section so it won't rub
I cut out a little less than half of the diameter on a bandsaw, leaving a "Y" cross section (and leaving the end sections—pilot and extension socket—round). The growth rings of the wood should be arranged so the blade will experience minimum shrinking and swelling. To make the reamer a little stronger, don't make the angle between the blade's flat and the end of the cylindrical section at the big end a sharp 90° angle. Give the intersection a little curved radius to distribute stresses.

The flat should be fairly straight lengthwise, and a little concave laterally, which can be done with a coarse file and a scraping knife. A straighter cut with the bandsaw can be made if a jig is used to keep the reamer from rocking, so the angle of cut is always the same. A small board with a small peg sticking out of it, which fits into the hole in the end of the reamer does this.

For blades, I use bandsaw blade stock, from a manufacturer (without teeth). The steel is hard enough to cut wood well, but soft enough to be filed. It's about the same hardness as drills, so I use a punch (Whitney Jr.) to put holes in it. I screw it to the wood with sheet metal screws, and keep it from shifting with 1/8" steel pins. Punch all the holes in the blade first, then mark the screw holes in the wood, drill them, and screw the blade to the body (using a little oil to make the screwing easier). Then drill the pin holes in the wood through the holes in the blade. Pound in pins (with one end rounded for true pounding). The tips of the screws can be ground off as they image on the other side. File the protruding edge to the desired diameters. The angle of cut isn't very important; I make it a little less than 90° (if it chatters, increase the cutting angle). But be careful while filing—*one slip at the last (and the round reamer slips easily, although a little "Y" cradle can be made to hold it) and you've got a place that won't cut.

Then turn down an end of the hexagonal steel rod to fit into the hole in the reamer's end, and fasten them with a taper pin. Be careful in drilling the hole for the pin, to get it through the center of the hex rod, and in reaming for the pin, so it fits well. Pound the pin in so it fits snuggly, so it won't rattle about.

You're ready to ream, and you've spent only a few hours and a day's ration of Ovomaltine's worth of materials. Do it at slow speeds (1-2 revolutions per second) with plenty of oil. When the reamer's new and sharp, it may dig in and chatter for a while, so be careful. If you have the opposite problem, with rubbing, heat, and powdery scrapings, cover the quadrant of the reamer next to the edge with soft pencil marks and see where they're rubbed off. Scrape there with a knife. The blade can be sharpened once or twice lightly without changing its dimensions much. Changes of humidity usually make the blade rub, so it will have to be scraped as above. Check the temperature of the reamer while using it, especially when doing several instruments together. Heat will drive oil into the wood, softening it, and letting the blade shift.

I've tried fastening the blade with epoxy, without success. But perhaps, it would make a good backup for the screws (as might a powdering of rosin).

I'll be very happy to hear from anyone with improvements.

Bob Marvin
CHARACTERISTIC FREQUENCY MEASUREMENTS OF BAROQUE TRAVERSE-FLUTE BLOWN-RESONANCE

Introduction

There is a curious paradox in frequency measurement practice of flute blown-tones: the maximal distortions of resonance characteristic frequency, i.e. the upper and lower limits of its band yield to the determination significantly easier than the characteristic frequency itself. The most well-known evidence of determination difficulties is the intonation problems of flute playing. Every flutist knows well that to take bright and beautiful tone and to take a well-tuned tone is not always the same thing.

One is deeply right considering that to take brightest and the most beautiful tone by the given fingering means to take the tone whose frequency is equal to the characteristic one. However, then when the frequency of taken tone does not differ too much from the characteristic frequency, the tone quality is high enough. In other words, the optimum of resonance band has wide bandwidth also and there are no formal grounds for simple diagnostics of blown-tone resonance band centre.

The causes of what is called here as the wide-band-widthness of optimum have been discussed repeatedly (see e.g. John W. Coltman, Acoustics of the flute. Physics today, vol. 21, #11, p. 25–32). In given case it is not important what are these causes, but that they exist. There is a lot of them and they may act independently one from another. This important circumstance permit to consider tone frequencies obtained in resonance band optimum as normally distributed relatively to characteristic frequency. Then the characteristic frequency is expressed by mean arithmetic for all frequencies measured for given occasion.

Such being the determination method theoretical foundations of characteristic frequency bands of baroque traverse-flute blown-resonance tones, which I utilize in my work and which I intend to describe.

*Every flute specifically has such tones whose characteristic resonance frequencies lie above or below the pitch axis, such sort of deviation being allowed quite consciously by instrument makers just in order to receive the flutes equal by timbre and pitch.
Frequency measurement data obtainment

Data received by actual measurements should meet the requirements of uniformity. Otherwise they could not be considered as comparable. The rules whose fulfilment should ensure the initial data uniformity are given below:

1. It is very important that all bore joints are hermetical and that the key is closing the hole tightly. The hermeticity of joints and keys should be checked constantly.

2. Before approaching to the measurements the flute should be played up in order to warm it. Otherwise the results obtained in the beginning of measurements will be underestimated.

3. During playing a condensate is formed inside the bore. The condensate layer diminishes effective bore width, this influence significantly the frequencies of tones. To avoid this the bore should be rubbed from the inside as often as it is possible. I repeat this procedure after every 5-7 tones.

4. The cork position influences considerably the tones frequencies. Thus it is important to conduct the different measurement series in the same connection by the same cork position.

5. Air temperature under which the measurements are conducted influences the frequencies of tones. Therefore it is important to write it down for each of series.

6. Several attempts of sound extraction are made on every of the fingering until the sensation of successfully taken, beautiful and bright tone, so well known to every flutist would be obtained. The frequency of such tone is measured and written down.

7. Every tone should be taken outside any musical context, otherwise an unconscious tuning by the mode is inevitable. I use the movement by chromatic steps, prolongly sustaining each of the tones measured and making a long enough pause between the tones. As such pause serves the time necessary for the recording of the frequency just measured.

8. It is important to use the same fingerings by different measurement series on the same problem.

9. It is useful not to have before oneself the records of previous measurement series. It will help to avoid the unconscious adjustment of results.

10. The conducting of measurements is tiresome, and the work in fatigue condition succeeds worse. Therefore it is important not to make too much measurement series at once. I do not conduct more than
series of measurement during a day.

Measurement results treatment begins with the inclusion of temperature correction term. The fact is that sound velocity increases with air temperature augmentation and labial woodwinds especially sensitive response to such changes, rising noticeably the frequencies of their tones.

Standard determinations of absolute pitch height besides everything else specify the air temperature as equal to 15°C. If the actual measurements of flute tones frequencies are conducted under the other temperature, it is necessary for the subsequent work to recount the values received by the measurements taking into account the difference between the measurement temperature and the standard one of 15°C. I use the following formula for this:

\[
\lg f_c = \lg f_m + 0.00076 d; \quad d = 15^\circ - t_m
\]

where \( f_m \) — frequency obtained by measurement, \( t_m \) — air temperature during measurements by centigrade, \( d \) — difference between \( t_m \) and 15°C, 0.00076 — frequency variation logarithm at air temperature change by 1°C, and \( f_c \) — frequency with temperature correction term. The formula is simple enough in action and gives a good approximation in usual conditions for the practice of such kind.

After the introduction of temperature correction term, there is nothing for it but to calculate the mean arithmetic. It is calculated by the formula:

\[
\bar{f} = \frac{1}{n} \sum_{i=1}^{n} f_i
\]

or, in other words, all \( f_i \) frequencies obtained during measurements on the given fingering and on the given oscillation mode are summarized. The resulting sum is divided by the item number — \( n \). The mean arithmetic \( \bar{f} \) expresses the characteristic resonance frequency on the given fingering and mode.

However \( \bar{f} \) does not represent the true value of characteristic frequency. It has so called confidence interval in whose limits it can accept different values with great probability. The width of the confidence interval depends on the value of \( \sigma \) standard deviation determined by the formula:

\[
\sigma = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (f_i - \bar{f})^2}
\]

This formula has the same designations as in (2) and it is cited here only to show that \( n \) increase results in \( \sigma \) decrease. In other words, the increase of initial data number contributes to the decrease of confidence interval width and makes \( \bar{f} \) value more reliable.
What are reasonable limits for selection of number of initial measurements necessary for receiving of characteristic frequency reliable evaluation? The following standards have been acquired in practice of such investigations: 1) if the investigation does not raise high requirements to the reliability of results and tends to receive the orientation estimates, \( n \) should not be less than 5; 2) if more reliable results are needed, \( n \) should be equal to 30. In other words, in order to receive normally reliable values of one flute characteristic frequencies it should be necessary to conduct 30 series of frequency measurements of all its tones by the same cork position.

Félix Roudonika

FoMRHI Comm. 182

PLANNING A WORKSHOP

John Rawson (Harpsichord Maker and Architect)

If one is installing a bench and a few machines in any space, however small it is worthwhile thinking it out first so that labour is minimised.

Considerations

There are various legal constraints on what even a self-employed person can get up to. There are industrial zoning or Planning Laws that stop you setting up an industry in a residential area. There are Building Regulations concerning the details of construction. There are Health & Safety Regulations, which are much like the Factory Acts. There is the Fire Brigade and their Means Of Escape and Fire Prevention controls.

The one set of people who are absolutely sure to find you out are your own insurance men. They will make certain stipulations before insuring you.

It is worthwhile making a reasonable attempt to comply with Fire Prevention requirements, such as - having a steel dustbin, a steel inflammables cupboard, two fire extinguishers - and cleaning up regularly.

Bench Space

This obviously varies a lot, but what you are likely to need is:-(a) space to make something (b) space to put the thing you are making while making etc. (c) space to stand and sit while doing it (d) space to keep tools (e) space to keep the next job and the last job. So measure up the exact area you need for each of these for planning purposes.
Practical problems

Dust. The biggest problem is milling timber and doing painting or polishing in the same room. If it is at all possible use a separate room for machines. If not there is no alternative to some dust extraction equipment at any rate for machines like thicknessers that produce huge quantities of chips. It is a help on bandsaws also as they make dust. Sometimes saws may not need it much as the sawdust is heavy enough to fall on the floor out of the way.

Electrical. It is useful to bring electricity into the workshop to a big breaker so that you can turn everything off at one switch when you go home. You can get a single socket wired separately if you want a fridge left on at night. Wiring MUST be in pyrotenax or conduit if it is to survive, let alone be legal. Trailing cables will not last three months, as well as being dangerous. Lights over benches need to be good i.e. double 8ft fluorescent, or triple or quad 4fts. Local anglepoises in certain places. Machines need No Volt starters and fused isolators. You find out the need for protection when you have an accident, so be warned.

The Solution

After marshalling all the points that need consideration you need to sort them out in a logical way. Consider it from the point of view of certain basic activities i.e. Dusty activities/clean activities, or machine work / hand work, or storage / production / waiting space etc. Then using as many colours as possible on your drawings to show up important things, proceed as follows:-

1. Draw a plan of the available space to a scale of 1" to 1' or 1:25 metric. The drawing office suppliers sell rulers ready calibrated in such scales which read directly.

2. Draw elevations of the walls as well if you are interested in shelf layouts.

3. Draw all the major items of equipment on separate sheets of paper, with their appropriate timber feed spaces attached and cut them out and move them around. Draw access space adjacent to each machine or bench, suitably hatched. Generally you need access to all four sides of a machine, so they cannot be placed next to a wall, but they can often be close together corner to corner in echelon.

4. Mark in access routes, if only the path from the door to your bench, a reasonable width. This must be clear of ALL fixed obstructions, but if space is limited a machine feed can project into it.

5. Mark in rubbish bins in central positions where you can throw things into them.

6. Mark in dust extraction and the piping necessary, if only plastic flexibles.

7. Mark in ceiling lights and the electrical layout. Feeding freestanding machines on the floor can be a problem.

In fact getting it all into a small space can be very complicated and can need many layouts. But it is worth persevering with the drawings as it saves a lot of hard work moving heavy equipment around. The final layout should end up on tracing paper so that dyeline prints can be taken from it for electricians, plumbers etc if required.
Interpreting Mersenne's metal string data is more of a problem than Eph and Djilda would have us believe. Mersenne clearly states that he tested two gold alloys—"pure" and "working" (defined elsewhere in his book as 23½k and 22k respectively)—and that there was no perceptible difference in their tensile strengths. Assuming that what he regarded as 23½k gold was in reality 18k (75/25 alloy) is to assume quite literally that he did not know what he was talking about. This is not a good way to demonstrate the reliability of his data.

There are three sections in Mersenne's book which are relevant to the problem. The following material is page referenced to the Chapman translation, but it must be noted that this differs in important points of word and number from the CNRS annotated facsimile, and that the marginalia are often highly relevant to the text. Underlined numbers differ from Chapman but agree with CNRS.

Page 57:

- Pure gold 1/6 line diameter breaks under a load of 23 pounds.
- Working gold
- Silver
- Iron
- Copper
- Brass

Page 203:

- Pure gold is 23½k yellow.
- Working gold is 22k yellow.
- Fine silver is 1000/1000.
- Working silver is 997.4/1000 with copper.
- Copper, brass, and iron are "common"—which we can assume are 90/10 and 75/25 brasses and 99% pure wrought iron respectively (typical values for material found on old instruments).

Page 528:

- The densities of metals relative to water are:

  | Pure gold     | 18          |
  | Coin gold     | 17½        |
  | Silver        | 16         |
  | Copper        | 8 1/3      |
  | Brass         | 8 1/2      |
  | Iron          | 7 1/2      |

Densities for Mersenne's alloys according to modern data (Smithells) are:

- 23½k yellow gold 19101 kg/m³
- 22k
- 999/1000 silver 10500
- 997/1000
- 90/10 brass 8800
- 75/25
- .01C iron 7870
It is obvious that with the exception of the gold which is too light, i.e. more highly alloyed than Mersenne claims, his density figures are very well in agreement with modern data. That he was confused about the type of gold he had is obvious from his statement (p.530) regarding the gold-water weight ratio, "... others who found the ratio of 19 to 1 used lighter water than ours...". It is indeed likely that what he thought was 23k gold was 18k — explaining both the discrepancy in density and the otherwise highly implausible tensile strength. We have, however, not yet come to the real problems with Mersenne's metal string data.

Mersenne clearly states that his linear measurement standard was the pied du roi, and that his weight standard was the livre poids de marc. The standard for the latter which was in use in Mersenne's Paris still survives, although the standard for the former is lost. Both are, however, well recorded in the literature and are standardly given as 489.506g for the poids and 0.3248m for the pied. (This last figure differs slightly from the one given by Chapman. It is, incidentally, the metrologist's practice to give conversion factors with seemingly ridiculous accuracy.) If we use these figures to convert the weight-length-diameter data on p.203 to densities we get the values in the first column below. These values are clearly too high, but can be brought into better alignment with the previous density data by reducing all values by 28.8%. The adjusted figures are given in the second column below.

| Pure gold    | 23881 kg/m³ | 16985 kg/m³ |
| Pure silver  | 14818 "     | 10539 "     |
| Working gold | 14757 "     | 10496 "     |
| Copper       | 12369 "     | 8797 "      |
| Brass        | 11838 "     | 8420 "      |
| Iron         | 9340 "      | 6643 "      |

18k gold has a density of 16906 kg/m³, so it becomes all the more likely that this was what Mersenne was using. The brass would also appear to be more nearly 65/35 than the thus far assumed 75/25. (Any value down to 60/40 would be perfectly reasonable.) No conceivable iron composition could explain the 6643 figure. One possibility is that the weight on p.203 should read 10 8/15 greins instead of 9 8/15. In this case the iron density is also perfectly acceptable.

The problem that remains is the nearly 30% discrepancy between the density data which Mersenne provided from direct measurement and the densities calculated from his mass/volume data. Obviously the error lies either with our conversion factors or with deviations between Mersenne's own measuring devices and the standards to which he referred. Metrologists regard 10% deviations between standards and their copies as quite normal during the 17th century. As we are dealing with two standards a large portion of the discrepancy probably results from this. Also, despite great claims for the precision of his weight measuring apparatus, Mersenne is quite realistic about the limited accuracy of his string diameter measurements (pp. 180-2). This may mean that there is greater uncertainty with the linear data than with the weight data.

Be this as it may, Mersenne's mass/volume data after conversion to modern units must be reduced by 28.8% to be in agreement with his own, and modern, density data. If the entire error lies with the volumetric data the linear conversion factor will have to be increased by 12%. If the entire error lies with the mass data the mass conversion factor will have to be decreased by 28.8%. Therefore, without knowing how the discrepancy is to be divided between the two conversion factors, the closest we can calculate the tensile strengths of Mersenne's string materials is to between circa 20% and 30% lower than the values obtained using Chapman's conversion factors.
In light of the above, all of Mersenne's metal string tensile strengths lie within resonable limits for the respective materials. Despite this, the strengths of the various metals relative to each other differ from what we might expect, that being: iron stronger than brass, and brass stronger than the gold and silver alloys. In fact Mersenne himself says (p. 155) that iron strings can be tuned higher than brass, and that brass can be tuned higher than silver and gold! Here we have a plain contradiction, and judging from context the latter statement is more likely to be descriptive of actual practice than are the results of (a single run of ?) Mersenne's tensile experiments.

Considering the imprecision with which we can convert Mersenne's reported tensile strengths into modern absolute terms, and the fact that these tensile strengths are contradicted by Mersenne himself, we would be well advised to approach his tensile strength data with an extra-ordinary amount of caution.

Further information on the reliability of Mersenne's data can be found in a scathing commentary in Hubbard's Three Centuries pp.93-4.

To return to twisted strings:
I did not bother checking out the behavior of twisted wrought iron prior to writing Comm 137 for several reasons:
1) I could not imagine that the effect reported by Benade could have been observed by people using wrought iron strings.
2) Eph and Djilda's G53 formula would predict no greater a change in wrought iron than in steel, as both these materials have reasonably similar elastic moduli.
3) The amount of slag included in a given volume of wrought iron is generally described as "minute". The inclusions in wrought iron music wire appear as isolated spots, not as long threads. It seemed impossible that twisting might generate a "slag helicoid".

Despite this I have now checked out the behavior of twisted wrought iron and find that it would appear to break long before any change in its E can be observed. I observed no difference in the material's audible properties as a result of twisting.

About the tensile strengths of hard-drawn non-ferrous wire:
I have experimented with yellow brasses of late-18th century origin, as well as with modern brass spring and dead-soft brass stock. I found little difference in the mechanical and acoustical properties of all of these materials. Old brass with an initial diameter of 0.72mm and a tensile strength of 600MPa could easily be drawn down to 0.25mm with an increase of tensile strength to 885MPa. Modern spring brass with an initial diameter of 0.70 mm and a tensile strength of 720MPa could easily be redrawn to 0.25mm with a tensile strength of 915MPa. This last value is interesting when compared to off-the-roll 0.25mm stock from the same batch as the 0.70 mm wire, the as-is 0.25mm stock having a tensile strength of 800MPa. Dead-soft hardware-store brass with a 1.0mm diameter had a tensile strength of about 450MPa. Upon reduction to a diameter of 0.25mm the tensile strength increased to 885MPa. In all cases the limiting factor on the degree of redrawing which I could accomplish was the smallest hole on my die, not attainment of the wire's maximum breaking stress.

Other experiments with red brass have indicated that red brass is clearly weaker than yellow brass. All my experimental data confirms what one might otherwise expect on the basis of modern published data.

I would be very pleased if Eph and Djilda would publish their own experimental data on the tensile strengths of metal string materials. This data lies behind the Range Guide in Comm 162, and I'm sure it would be of great use to many of us.
NOTES ON EUROPEAN HARPS  
Tim Hobrough

Quick and sketchy, as my notes are still scattered after moving repeatedly. This is merely a preliminary effort to give some idea of the diversity of harps which have been used in Western Europe, something which I don’t think is generally appreciated. I would appreciate comment from other people interested in the harp.

Starting with the basic idea of a harp being a stringed instrument on which differences in pitch arise primarily from differences in (unstopped) string length, with the strings rising within a plane which is more or less normal to the “working” face of the resonating chamber (the soundboard, to which one end of the strings are attached), we have to consider at least six Medieval instruments, seven Medieval/Renaissance instruments, about a dozen Renaissance/Baroque instruments, and several “modern” instruments (most originating in the 19th Century.) They could also be grouped according to school of construction: Northern European; German/Tyrolean; Italian/Iberian; Irish/Scottish; French; Welsh/English. There was occasional disjunction in the styles and types of instruments produced by the various schools. The chronological division is less misleading, since it doesn’t give an impression of evolution and continuity. In this comm, the harps are not listed chronologically within their time periods.

The harps can most conveniently be differentiated by considering their method of construction, geometry, and style of design. The compass varies considerably between one example and another of the same type of harp. Harps of different types may have similar or even identical features, and harps of the same type may differ radically in style. All this in addition to having to work mainly with iconography, with all the problems that causes, especially since harps tend to be shown with far fewer strings than would likely be on them. A thorough study, which would provide several graduate students with hours of joyful tedium, needs to be carried out.

Why the harp should have appeared in Europe so late as the 8th Century is not known (if, in fact, it did appear this late.) Its sudden widespread popularity is equally mysterious. Possibly it’s easier to build or play than its competitors, the psaltery and lyre, or possibly tone-balance is easier to maintain over a greater compass (did the usual compass of music expand at this time?), or both. It’s usually assumed that the social position of the people who played the instrument accounted for its rapid spread. Whether or not there is any truth in this needs to be carefully discovered. War, migration, and religion were important.

The harp was popular – not popular enough (or inflexible enough) to have warranted a large written repertoire, unfortunately, but the reconstruction of early music is incomplete without it. These were primarily aristocratic or professional instruments, as were the viols and lutes, rather than “folk” instruments.
1. **Angle Harps:** Consisting of soundbox and arm, with the strings stretched between them. Nothing is known about their construction. Modern angle harps are built in a variety of ways. If placed under too much tension the outer ends of the arm and soundbox will obviously start to come together, causing difficulties in tuning. An angle harp of 8 to 10 strings can be made to work quite well under light tension. The crude drawings of European angle harps (Utrecht Psalter) show a soundbox/arm angle of 45-60°. Most modern angle harps have the arm at 90 or greater to the soundbox.

2. **Angle harp with pillar:** The same instrument as No.1 but with a third member - the pillar - placed between the outer ends of arm and soundbox. A perfectly logical device which would occur immediately to anyone whose harp was not staying in tune acceptably because the arm was being pulled downward. To do any good it would have to be large enough that any artist would have seen it. Which leaves us with the question of why so many harps didn't (and don't) have pillars. The introduction of the pillar must reflect some functional change in harping during the 8th Century; were the musicians called upon to make more noise? was the instrument's range increased, with no increase in size (there is room for this) so that the tension exceeded the structure's limitations? did they start using the harp in consort with fixed-pitch instruments, requiring greater precision in tuning?

3. **Harp with shoulder-rise:** Bridging across the useless space where arm and soundbox meet shortens the instrument without affecting the scaling. By the 9th Century it appears to have been normal for harps to have this shoulder-rise to the arm.

These first three instruments are geometrically indistinguishable. The scaling is artificial (two converging straight lines). The representations are too crude to permit definitive reconstruction, since distortion of size has to be estimated.
4. **Harp with "swelling shoulder"**. More precisely it is the soundbox that swells out below the shoulder, or is cut away at the shoulder. This "swelling" may be front-to-back and/or side-to-side. My interpretation of the drawings favours an increase in both, as the strings seem to indicate that the soundboard is drawn in 2-view. The illustrations of this instrument are the first which show soundholes, and some people feel that they are shown in the sides of the soundbox. If this is so, then in several pictures the strings also come off the side of the soundbox, which is unlikely, but possible. Artists tend to record only the soundholes on their side of the strings, leaving out those which are seen through the strings.

(The "swelling" does not appear to me to be a representation of the soundboard being pulled up by the tension of the strings, as this results in the greatest height occurring just above the middle of the soundboard.)

A harp in St. Albans Psalter has a soundbox which swells front-to-back, and also appears to be of semi-circular section.

It is impossible to do more than guess at the construction of this family of harps. Most likely the soundbox is hewn rather than fabricated, and the semi-circular section would naturally result if taken from half a log. The arm may have been set at the rear of the shoulder to avoid the cracks which would tend to develop on the flat face of the timber. This would entail a separate soundboard (see No. 5, below.) The arm gives the appearance of a limb bent forward into position, which is the method used for some bow harps. If the stringing were taken to the treble end of the soundbox, the extra space created by setting the arm at the rear of the shoulder would make it easier to get at the treble strings. Otherwise I can see no reason for going through all the work required by this tricky construction.

These harps vary widely in all respects and could be subdivided further. I believe they encompass what Curt Sachs called the "Romanesque" harp.

5. **Welsh harp**: With "mare's skin" soundboard and "horse hair" strings. No further description available. Perhaps it was an angle harp, similar to No. 4 above. Leather soundboards and hair strings work very well when properly built. This may have survived for some time as a training instrument for apprentice professional harpers.

6. **Quadrangular Irish "harps"**: Shown on various monuments. Nothing practical is known about them. They existed, but there is no way of telling what they were. They may have been related to No. 3 above, or not, or they may have been psalteries or lyres.

**MEDIEVAL/RENAISSANCE HARPS**

1. **Irish harp**: The heavy wire-strung instrument so brilliantly described in my last Comm. (No. 104, Jan 78) Except I retract my statement that they had string-pegs; they weren't necessary, and the impressions left by the toggles on the inner face of the soundboard of the Lamont harp fill a complete circle, which would not be the case if a peg had been in place to restrict the toggles' movements. Although it is still likely that some Irish harps did
have string pegs, it would not have been the usual thing, but merely a way of filling string-holes which were made large enough that the toggles could be inserted through them when stringing.

2. **Gothic harp**: Standard issue; angels, for the use of; Virgin, for the praising of. Also popular with mortals. This harp has a very low string/soundboard angle, making the instrument very long in proportion to its compass, and possibly affecting its strength and timbre. It can be large or small, the soundbox is of either rectangular or "oval" cross-section, and the instrument usually had bray pins.

The rectangular soundbox is a single piece of wood hollowed out with a back let in. The "oval" is two pieces (or one split in half) carved and glued together.

Bray Pins, or Harpions, are string pegs (the pegs that close the string-holes in the soundboard) which are shaped and are fitted into the soundboard so that the strings buzz against them. They are difficult to set up, but the sound produced is quite pleasant and unique. Their former popularity will surely reflect on performance practice, but as yet no one has done enough work with them to discover how and if they affect the harper's technique.

There were two styles of Gothic harp, which may be distinguished by the scaling. In one the arm has a complex curve (e.g., the Nürnberg harp), in the other the arm has a simple curve (e.g., the harp in Bosch's Garden of Delights.) The harps with complex harmonic curves generally appear to have more strings than those with simple curves.

This also appears to have been the Welsh harp of the 16th and 17th Centuries. When it reached Wales is not certain, it may also have been the Italian harp of the 14th and 15th Centuries.

3. A small harp, similar to the Gothic harps, but with a greater string/soundboard angle, which, in theory, should affect the timbre. There is definite disjuncture between the sweep of the harmonic curve, the shoulder-rise of the arm, and the soundbox. Sometimes with bray pins.

4. Another small harp, that I'm selling under the name "Flemish", which is vaguely correct. The arm is a simple curve, which goes straight into the face of the soundbox, (although this angle, and consequently the scaling, varies considerably). It has a relatively high string/soundboard angle. Sometimes plain, sometimes carved and decorated. It appears to have been popular, possibly more so than the Gothic harps. It certainly would have been cheaper.

5. A very ornate harp of moderate to high string/soundboard angle, with elaborate and pronounced scrolls at the ends of its members. It usually appears as a "heraldic" or symbolic device, but is sometimes shown in realistic settings, so it probably actually existed. Possibly related to No. 4, above.

6 & 7 Two harps which could possibly be psalteries (there are a lot of "harps" which may have been psalteries!); I can't recollect a good source for either of them, but I've seen them both illustrated several times. No. 6 may be Iberian.
MEDIEVAL/RENAISSANCE HARPS (sketches of typical instruments)

1. IRISH

2. GOTHIC

probably "heraldic" only

3. [Sketch]

sometimes with scalloped edges.

4. [Sketch]

5. [Sketch]

6. [Sketch]

7. [Sketch]

8. [Sketch]

9. [Sketch]

SINGLE OR DOUBLE-STRUNG

RENAISSANCE/BAROQUE HARPS (sketches to show general shapes)

3, 6, 8 III GERMAN

4, 8 IV SPANISH

9 III ENGLISH/WELSH

TRIPLE-STRUNG

two possible dispositions
of strings on soundboard:

BASS

TREBLE

TRIPLE-STRUNG

Both for playing with right hand in treble.
Various unique harps in museums or artworks, which are attributed to the period. They are all different, and are lumped here only for convenience. They are usually described as "troubadour" or "minnesinger's" harps, or some such term.

RENAISSANCE/BAROQUE HARPS

1. Gothic

2. Irish

Both still popular, the Gothic harp surviving until at least the end of the 17th Century and the Irish until the late 18th. There appears to have been a general trend to increase the compass (or add chromatic strings.) The methods of construction did not change, except for three or four very late and somewhat crude Irish instruments, which have fabricated rather than hewn sound boxes. Also, the Irish harps with longer scaling in the bass had their arms morticed into the pillar (instead of vice versa on harps with shorter scaling).

3. German/Tyrolean harp: diatonic, with a sinuous, shallow, triple curve to the arm. The soundbox usually of rectangular cross-section, fabricated. Occasionally fitted with bray pins.

4. "Spanish"; or Iberian, as it was also found in Portugal. The soundbox was "coopered" with several ribs, and was very wide at the bass end. The arm was of the same general appearance as No. 3 above, and I have not yet discovered if there were any geometric differences between the German/Tyrolean, Spanish, and English diatonic harps.

5. "English": as described by James Talbot, in his confusing manuscript of the late 17th Century. It would appear that he regards the Welsh harp as being something along the lines of the Gothic harp and always fitted with brays, while the English harp has a fabricated soundbox with nine ribs to the back, and may or may not have brays (he also takes this opportunity to introduce the term "lute harp" to describe harps without brays; fortunately it never caught on.) The fact that his entries for English harps are headed "Welch" may indicate that both instruments are of Welsh origin but that the one with the "ill shap'd shallow body dug out of one piece and put back in afterwards" was only used in Wales. Or not, as the case may be.

6. Hook harps; mostly German/Tyrolean examples of No.3 but with hooks to shorten certain strings by an amount sufficient to raise the pitch by a semi-tone, giving the harps semi-chromatic capabilities. I believe this instrument was popular throughout the Prague - Berlin - Vienna area even after the pedal harp had become the standard instrument.
7. Single-row Chromatic harp; a short-lived "Spanish" instrument, (though I have heard it said that the principle was employed in Brittany). It was probably abandoned quickly in favour of the double-strung harp. Bermudo describes an instrument with black strings interspersed within the normal diatonic row. His description seems to confirm my suspicion that, up to this time at least, harps did not normally have coloured strings to indicate important notes, as per modern practice.

8. Double-strung chromatic harps; with strings in closely-spaced parallel rows. The treble half of the outside row (when held in playing position) & the bass half of the inside row are tuned to a diatonic scale (whichever one is most useful.) To obtain needed chromatic notes, the harper reaches between the diatonic strings to the treble of the inner row or the bass of the outer row, which are tuned appropriately. The chromatic row usually contains either 5 or 7 strings per octave, depending on whether or not some of the diatonic strings are retuned to change keys. The two rows are usually in parallel planes with the strings offset longitudinally to make it easier to reach the chromatics. Often the two rows approach each other as they rise to the arm, making it harder to distinguish but easier to get at the chromatics. Sometimes there are fewer than 5 chromatics per octave, and often the highest and lowest diatonic strings have no corresponding chromatics. There are five types of double-strung chromatic harps:

I) Gothic: There is a harp shown in an intarsia in the Vatican, which is a very elaborate gothic instrument, but appears to be double-strung. The intarsia dates from the 15th Century (I think). See Winternitz' Musical Instruments and Their Symbolism in Western Art.

II) Irish; a mystery.

a) Vincenzo Galilei made a statement about Irish harps and double-strung harps that, in translation, has become infamous. The standard translation is either anonymous or Joan Rimmer's, since everyone else cites her and she cites only Vincenzo. Part of it is as follows:

"A few months ago (through the offices of a most courteous Irish gentleman) I carefully examined the stringing of that kind of harp. I find it to be the same as that which, with double the number of strings, was introduced into Italy a few years ago..."

This could refer to a double-strung Irish harp; a wire-strung double "introduced into Italy a few years ago"; or an Irish harp, single or double strung, with approximately half the number of strings of the Italian double.

I have been given a partial photocopy of another translation, but unfortunately I've lost the name of the translator (I think it's an American Doctoral thesis.) It disagrees with the "standard" translation on many points, including the relevant passage:

"I obtained the distribution of the strings of this harp a few months ago - by means of a most genteel lord of Ireland - after having examined it carefully, I found [it] to be the same as that which was introduced with double strings a few years ago in Italy..."
Now "distribution" could mean an Irish double, or simply that the compass of the Irish harp (traditionally four octaves and one note) was the same as the compass of the Italian double (four octaves and one note.) Both have a range of C-d'''.

Or, if you accept Rimmer's statement that Galilei showed "a characteristically illogical sequence of statements", then it is just possible that he made a sudden jump and what the Irish lord helped him obtain, or obtained for him, was the tuning of the Italian harp. The double-strung harp was by this time one of the most highly regarded instruments in Italy, and without its tuning the Dialogo would have been incomplete. Galilei says that the double harp players "hold this tuning in so much esteem that they have ungratefully denied it to many." The entire incident may have been fabricated to hide Galilei's purloining the tuning.

b) R.B. Armstrong (Musical Instruments, Vol. 1, The Irish and Highland Harps) refers readers to Bunting's collection of 1809, wherein Bunting apparently states that in his opinion there were double-strung Irish harps. I haven't been able to look this up, so I can say no more.

c) In 1653 Evelyn wrote that the Irish harp was "neglected in England because of its extraordinary difficulty" although it is "much esteemed". This can be explained by the difficulties in controlling and damping the resonance of metal strings. Or it could have been a single-row chromatic harp (four octaves and one note, semi-chromatic. There is some evidence to suggest this.) Or could it have been a double-strung chromatic harp? No Irish doubles have survived, if any existed.

d) Galilei could have seen a one-off folly. I could build an Irish double that would fulfil all historical criteria (except lineage) and they could certainly have done it then if they had had a mind to.

e) Could a diatonic instrument have gained such high praise from sophisticated music lovers as the Irish harp did in the 17th Century? No one has explored the music sufficiently to provide an answer.

III) German: Brussels and Copenhagen both possess instruments very much like the German and Tyrolean singles and hook-harps described above. The two better-made harps have rectangular-section soundboxes, the third is rather crude and its soundbox is coopered with 5 ribs. The soundboxes are quite narrow, and the arms seem very thin. These harps are equipped with bray pins.

IV) Iberian; a lost instrument. They had 5 chromatics per octave and were quite large. Talbot describes one. This instrument was popular with Spanish organists and composers. Very large soundbox.

V) Italian; no real information on the geometry or construction of these, except on beautiful instrument in Modena that appears, under all the gilt and adornment, to be a large gothic double. Galilei's statements already quoted may imply that the double is an Iberian (probably Spanish) invention, brought into Italy by the immigrant Spanish courts of northern Italy. The earliest
Italian harp music was printed in cities under Spanish rule.

9. **Triple-strung chromatic harps**: these have three parallel rows of strings; the inside row is a complete diatonic row from top to bottom; the outside row is diatonic, in unison with the inside row, but usually stops about 3/4 of the way down and may go higher than the inside row; the middle row is longitudinally offset and contains the flat of every note in the outer rows (7 chromatics per octave.) There may be no chromatics for the lowest few diatonic strings, particularly with later Welsh examples.

The continental multi-row harps were strung on the left of the arm and played with the right hand in the treble, while the Welsh harps tend to be strung on the right of the arm, with the left hand playing the treble. This is a reflection of technique, not any functional difference, and has no structural effect beyond reversal of the profiles of the arm. In England both styles were known. Talbot states that on some harps both diatonic rows were carried all the way down into the bass and up into the treble. This would make the instrument of equal use to musicians playing in either fashion (“that it may be of equal use to both hands”).

It is often said that the triple harp has 101 strings, but I have yet to come across one with this romantic number. Besides, why state the total number of strings on such an instrument? By itself this is a particularly useless piece of information, rather like giving the total number of keys on a three manual organ (only worse.) The compass, the number of strings per row, and their disposition are more useful.

The triple illustrated by Mersenne has a compass of 4 octaves, surviving 18th. and 19th. Century instruments a compass of 5 octaves or a bit more.

There are three types of triple harp:

I) “Low headed”; described by Mersenne and Talbot. Comparative short heavy bass strings. There are no known surviving examples. Superceded by:

II) English/Welsh types; the high-headed harp described by Talbot, which survived until the end of the 19th Century, eventually becoming known as the “Welsh Harp”. There are three schools of construction discernable in Welsh 18th and 19th Century instruments, I know of no surviving 17th Century instruments, and have not had time to reconstruct anything from Talbot’s notes, but it’s not unreasonable to suppose an instrument like the 16th Century harp, but with a shorter range.

III) Italian; A heavy instrument, probably with a very wide soundbox. There are only two known surviving examples, and these are so different and unique that it would be dangerous to draw conclusions from them.

Whether the “Arpa doppia” so praised for its “perfection” by Italian composers and theorists was double or triple strung is a matter for conjecture. I suspect that if the triple was the norm, these men would have been intelligent enough to tell the difference between two and three rows of strings, and Italian must contain an adjective equivalent to the word “triple”.
Ann Griffiths has suggested that some of the more difficult chromatic harp pieces may be easier to play on a double than a triple. The common theory is that "doppia" referred to size, not number of strings (4 or 5 octaves as opposed to the old 3 octave instruments.) Certainly for continuo a good bass would be as essential to "perfection" as chromaticism and a correctly tempered tuning. The advantages that triples have over doubles are that parts may cross, and both hands may be used in rapid passages.

It seems that the triple was primarily a solo instrument that was frequently employed to play continuo.

10. **Pedal harps**: There are three or four schools of construction of this instrument, but I haven't studied it and so have little to say. This is a single-row chromatic harp. A pedal at the base of the instrument operates a mechanism in the arm which shortens the string by an amount sufficient to raise the pitch one semitone. Later harps have two such devices per string, both controlled by one pedal, so that each string will give its flat, natural, or sharp. There are usually seven of these pedals, and the arm mechanism is so linked that a given string and all its octaves are changed simultaneously. The linkage can be run through the pillar or sound-box.

11. There were also a number of miscellaneous diatonic harps, as might be expected in a continent with such cultural diversity.

**BAROQUE TO MODERN**

1. **Pedal harp**: as the harp's popularity waned, the pedal harp was perfected and came to the fore. It is now the best-known member of a little-known family.

2. There is a distinctive Tyrolean pedal harp, characterized by its narrow, arched soundbox, and generally light construction. I am not familiar with its history. It is still built today, but whether as part of a continuity or as a revival, I don't know.

3. **Hook (lever) harps**: Popular mainly because of the price. Its descendants are still used today, primarily by students. The hooks have generally been replaced by more sophisticated devices, but these are still manually operated, one string at a time. This is still a semi-chromatic instrument.

4. **Cross-strung chromatic harps**: with two rows of strings, and sometimes two arms and two pillars. The string rows are longitudinally offset, and are widely spaced laterally at soundboard and arm but cross through each other so both the chromatic and diatonic row are available to both hands, above and below each other.

5. **Triple**: eventually displaced by the pedal harp, even in Wales where it held on until very recently.
Modern Irish harp ("neo-Irish"-clarsach). Invented at the opening of the 19th Century, (although most available instruments are of 20th Century design) this has caught the fancy of the world, and is now the second best known harp. Somewhere along the line it acquired an unfortunate association with the helplessly-noble, ivory-breasted languid femininity that the Victorian artists foisted upon us. Played well it exhibits a lightness and power that convinces me that it would be even more popular if more good instruments were available.

It is usually equipped with semitone devices (hooks or levers). Its inventor, Egan, of Dublin, made several instruments with a mechanism in the arm similar to that of the pedal harp, controlled by buttons set into the rear of the pillar (see R.B. Armstrong, Musical Instruments, Volume II.)

Interest in most of these harps is now reviving, with the current re-growth of non-symphonic music.

At present many manufacturers are indiscriminately usurping adjectives (like troubador, gothic, etc.) for proprietary names of their instruments. This, and the general tendency to regard anything without pedals as a "folk harp", and a romantic lumping-together of everything that occurred before the French and American revolutions, have resulted in a slipshod terminology that renders most of the simple adjectives useless. Where it used to need only a word or two, it now takes a sentence to name a harp properly. Since the public is largely ignorant of the history of the instrument, the onus is on builders and dealers to be scrupulous about what they call their instruments. The public is easily misled in this. Equally confusing is the habit of putting pictures of early harps on the fronts of books and records of music played on modern harps. This gives the ill-informed a false impression and totally unrealistic expectations of what they could do with an historical instrument. Again, it is up to the builder to put the prospective customer right.

FoMRHI Comm. 185.

Geoff Mather

**Peg Taper Finisher / Cutter**

Drill and ream a piece of silver steel $\frac{1}{2}$" x 1" x the peg length, with the same taper as required on the pegs. Now mill or face turn metal away from the length of the cutter until after just breaking into the bore, the gap is .125 wide. Vis 2. Oilstone this face to a good finish. Now place a hard piece of .375 diameter steel on top of the groove and strike all along with the hammer Vis 3. File away the left hand sharp edge to a round edge Vis 4. Heat cutter to cherry red and quench in warm brine. The edge turned in by the hammering will now cut the pegs rough turned taper to the correct taper and a good finish.
THE VIOLA POMPOSA

I hope my definition of the viola pomposa and outline of evidence will be of interest. This is a re-assessment not only of the viola pomposa, but also of Bach's 5-string cello and of the viola da spalla.

The term viola pomposa has probably been used to describe two different types of instrument, both of which were made in the 18th century, and both of which had five strings. The first type was somewhat larger than a normal viola, supported by a ribbon and held on the arm in front of the player's chest; and had the tuning and pitch of a cello with an extra string on top tuned to e (c-g-d-a-e). This is the instrument associated with Bach and described by Forkel (1782), Hiller (1784), Gerber (1790-2) and Koch (1802). It is likely that this is the instrument Bach called "violoncello piccolo" in his cantatas, and is likely also to be the instrument intended for his sixth suite for unaccompanied cello. Four examples of this type made by Hoffmann are known to exist, as well as at least one by another maker. The length of the body of these instruments is about 45.5cm. This type, together with the fagottgeige and the viola da spalla were all similar in size, method of holding and pitch. The only difference may have been that the fagottgeige had four strings and the viola da spalla alternatively four, five or six strings, not only the five of this type of viola pomposa.

The other type of viola pomposa was the same size as a normal viola, or slightly smaller, was held the same way as a normal viola, and had added to the normal four strings of the viola an extra and higher string tuned to e (c-g-d-a-e, an octave higher than the tuning for the large viola pomposa). This type was alternatively called a violino pomposa. The only known compositions (two by Telemann and one by Graun) in which the term "viola pomposa" is used, were all written for the viola pomposa of this type.

EVIDENCE FOR THE LARGE TYPE OF VIOLA POMPOSA

1 The accounts of Forkel, Hiller, Gerber and Koch. These are the only early accounts of the viola pomposa; Forkel in particular is usually regarded as a careful and thorough scholar; all four accounts agree with each other, the later three not merely repeating Forkel but each giving additional information.

2 Music by Bach appropriate for such an instrument. The tuning c-g-d-a-e is given for Bach's sixth suite for unaccompanied cello. This tuning also suits the violoncello-piccolo parts of his cantatas Nos. 6, 41, 49, 68, 65, 115, 175, 180 and 183, although Nos. 6, 49, 85, 180 and 183 do not go below the cello g-string. The cantata parts match Gerber's statement that the viola pomposa enabled the player to execute more easily the high and fast passages in the bass parts of Bach's music, because the art of cello-playing was then undeveloped.

3 The surviving Hoffmann instruments. There exist four instruments by Hoffmann, each with five strings and each of the size given for this type of viola pomposa. This situation matches Hiller's statement that Hoffmann made several viola pomposas to the specifications of Bach. I do not know of any larger 5-string cellos by Hoffmann.

4 The given tuning is possible for an instrument of the given size. Kinsky found that one of these Hoffmann instruments could be tuned c-g-d-a-e at cello-pitch if wound strings were used. Recently, Ulrich Koch made a recording of Bach's sixth suite for unaccompanied cello using a viola pomposa.

5 Similar instruments differently named or un-named. These are (a) the viola da spalla, (b) the fagottgeige, and (c) un-named instruments shown in pictures. From records and writings from the 1660's to the end.
of the 18th century it can be inferred that the viola da spalla was reasonably common, that its players usually also played the normal cello and that the term viola da spalla usually meant a very small cello held diagonally across the player's chest, the bottom of its body against the right shoulder (hence the name "shoulder viola") and the pegbox down to the left of the player. Viola da spellas should not be confused with the larger cellos which hung by a band from the shoulder, and which were held upright and vertical, with the player standing. These larger cellos were held by a band to enable them to be carried while playing (as in a procession). The viola da spalla could have been played either in processions or with the player sitting. A different reason is likely for this instrument to have been supported by a ribbon. It was probably not to enable it to be used in processions, but because of its size; the viola da spalla was too small to be efficiently held between the legs, yet too large to be held like a violin ("on the arm") without the support of a ribbon.

The viola da spalla is listed in the records of St. Mark's in Venice from 1688 to 1698 and mentioned by many 18th-century writers, notably Mattheson in 1713 whose account is largely repeated by Walther in 1752, Majer in 1732 and Koch in 1802. Of the four viola da spalla-players at St. Mark's, at least three (including the famous Bononcini) also played the normal cello. There does not seem to have been processional music at St. Mark's at that time, and it is unlikely that Bononcini, a highly esteemed cellist, would be employed especially for such a humble job as playing a cello in procession. It is much more likely that Bononcini would be a solo cellist to accompany singers in arias, for which a smaller cello (like the viola da spalla I have described) may have allowed greater facility and a better tone for accompanying.

Although at first Mattheson says that the bassa viola, viola da spalla and violoncello were all of a similar size, his later remarks suggest that the viola da spalla was smaller than the others. His remark, "thrown as it were on the right shoulder" probably means that the body of the instrument was against the right shoulder and the pegbox on the left side of the player. The instrument would need to be small to be held this way.

The fagottegeige described by Speer in 1687, Majer in 1732, and L. Mozart in 1756, was slightly larger than a viola, held on the arm, and had wound strings tuned (at the same pitch as the cello) C-G-D-A. It is likely that the viola da spalla and the large viola pomposa (being of a similar size and pitch) also had wound strings, and that all three instruments were held in a similar manner.

I have found three pictures of instruments slightly larger than a viola, apparently hanging, and diagonally in front of the player's chest with the pegbox down to the player's left. However, the first two pictures (of the early 17th and mid 17th century) are too early for the instruments to have wound strings. Therefore they probably were not tuned at cello pitch, and not likely to be examples of the very small cellos that I have described. On the other hand, the third picture, being of the mid 18th century, is of a suitable date and is of considerable interest. It shows such an instrument played by the famous cellist Lanzetta, who is seated. Admittedly the picture is a satire, but at least it indicates that cellists played instruments of this very small size and held in the way I have described.

5 The Hoffmann 5-string "Violon Cello Piccolo" listed in the 1773 inventory of the Cöthen Capelle. This is probably one of the instruments mentioned by Hiller and called by him "viola pomposa". It could well be that the term violoncello piccolo (or piccolo) was used for a cello of any size smaller than normal, not only those with a body-length of between 55 and 70 cm (the size usually called cello piccolo today). Bach's use of the term violoncello piccolo is the earliest I know.
Bach's sixth suite for unaccompanied cello and the violoncello piccolo parts in his cantatas could have been played by the larger 5-string cello piccolos with a body-length of between 55 and 70cm which were usually held between the legs. There exist such 17th and 18th-century instruments and 17th and 18th-century pictures of them; and these instruments can be used very effectively to perform this music. (I own one of these cellos.) However, as indicated above, there is good evidence that instruments like the large viola pomposa were played by many cellists, and that Forkel and the other three early writers were at least mostly correct. Therefore the large viola pomposa is more likely than the larger cello piccolo to have been the instrument used in Bach's music.

EVIDENCE FOR THE SMALL TYPE OF VIOLA POMPOS A

1 Compositions in which the term "viola pomposa" is used. These are (a) and (b) Telemann, two duos for "flauto traverso e viola pomposa o violino", no later than 1728; and (c) J.G. Graun (1705-1771), double concerto in D for "flauto concertato, violino pomposo o violettta" and other strings - another manuscript has "...violino o viola pomposa concertata". Another composition, Lidarti's "Sonata a solo per la pomposa col basso" of 1760, is evidently for the same type of instrument.

2 The term "viola pomposa" was an alternative to the term "violino pomposo". This is shown by the two manuscripts of the Graun concerto mentioned above.

3 Accounts of the violino pomposo. The first account was by Petri in 1767, who says that the violino pomposo is the size of aviola and has five strings so that it represents both viola and violin, and that it was not much in use. The second account was by Koch in 1802, who at the end of his section on the (large) viola pomposa writes (in translation) "On the other hand, there is still used now and then a viola in usual form and tuning with the e-string of the violin, which is called by some also Violino pomposo." The end of this sentence is somewhat ambiguous, and it is tempting to give it the meaning that this instrument was called by some violino pomposo, but that it was otherwise known as a viola pomposa.

4 Violino pomposo tuning suits the music for the (small) viola pomposa. The compositions by Telemann, Graun and Lidarti mentioned above, would seem to be comfortably playble on an instrument with the tuning given by Petri and Koch for the violino pomposo.

References

5. Vox Tumabot, T V-S 34430, V S 3590.
8. Walther, Musikalisches Lexicon....,Leipzig 1732.
10. Speer, Grundrichtigen....Unterricht der Musicalischen Kunst, Ulm 1687.
De ces grands Maîtres d’Italie
Le Concert servit fort jolibe,
Si le Chat que l’on voit ici
N’y voulut Chanter sa partie

CONCERT

ITALIEN.

De deux coeurs que ta chaine lie
C’est ainsi, petit Dieu d’Amour,
Que quelque Animal chaque jour
Vient troubler la douce harmonie

83. Satyre auf den Kastraten Gaetano Majorano, genannt Caffarelli (1703–1783).
Domenico Scarlatti am Zweimannaltflügel, Tartini und Locatelli als Geiger, Salvatore Lanzetta mit verkehrtem Violoncello, ein Martini als Oboebläser. (Sammlung N. Manskopf, Frankfurt a. M.)
MORE ON THE SIZES OF ENGLISH (AND OTHER) VIOLS
Eph Segerman and Djilda Abbott

INTRODUCTION
In Comm 158 we presented a graph of body width vs. length on surviving English viols of the 17th and 18th centuries. There were two clusters of viols (each representing both centuries) which we identified with what would have been then called "treble" and "tenor" viols, and a wide spread of body sizes representing bass viols, all considerably smaller than the size given by Talbot for a "consort bass". Talbot's consort-bass size needs to be taken very seriously since it is confirmed by Simpson who wrote that the division viol was somewhat smaller than the consort bass, and that the distance between the bridge and the nut (the string stop) of the division viol was 30 inches (see Appendix). On the consort bass this distance was 32 inches according to Talbot.

The disappearance of all such large consort basses was attributed to the adoption of overspun strings in the 18th century. Overspun strings allowed a smaller instrument to give as much bass tone as would a large consort bass with all-gut strings. The smaller bass viols became very popular because they were easier to play and more convenient to use.

When an instrument goes out of fashion at the same time as does its own idiomatic repertoire, that repertoire will still be cherished by some people and those people will save some examples of the instrument through the dangerous (for survival) period before it is old enough to have antique value. On the other hand, when an instrument is replaced by what is considered to be an improved version, with no significant change in style and repertoire, it will not so readily attract nostalgic champions and so the chances of any specimens surviving are rather small.

Our conclusions concerning English bass viol sizes were:

1.) Early in the 17th century there were instruments called "small basses" which were tuned like tenor viols i.e. a fourth higher than larger basses (the word "small" was inadvertently left out in the Tobias Hume quote in Comm. 158 - sorry).
2.) During the 17th century there were a variety of sizes of viols called "basses", leading to Mace cautioning his readers to be sure to pick large ones for consort and lyra purposes, and probably being the reason why Simpson felt he had to specify the division viol's string stop.
3.) During the 18th century the large basses that were preferred for consort use were abandoned in favour of the smaller ones (which adopted overspun bass strings).

In the 18th century, chests of viols included the same treble and tenor sizes as in the 17th century.

FRENCH VIOLS
Peter Tourin's list (as of April 1978) of surviving French viols involves a much smaller fraction of 17th century instruments than in his English list, and since survival distribution reflects the latest (i.e. 18th century) practice, this might imply that 17th century treble and tenor as well as consort bass sizes would not have been used in the 18th century. This is borne out by the plot which shows:

1.) A pardessus cluster of over 2 dozen with 18-20 cm body width and 31-34 cm body length,
2.) An adjacent cluster of one dozen with 20-22 cm body width and 34-37 cm body length - these could have been called "dessus",
3.) Four 5-string stragglers (probably called "dessus") with body length 37-40 cm, two of them unusually thin for their length and two unusually wide for their length.
(One of these is from the 17th century, a 1677 Midard, and we suspect that it has been cut down.)

4.) One instrument with body dimensions like the English trebles (with a late 18th century label and unusually long neck).

5.) One 1633 instrument with body size like the English tenors.

6.) A spread of 1½ dozen basses from 35-41 cm width and 64-73 cm body length - this spread extends to longer bodies than the surviving English viols and does not cover the small-size region in the distribution of English bass viols occupied by the early 18th century Barak Normans. (Modern bass viol sizes are more influenced by this group of Barak Norman viols - which are obviously atypical - than any other model sources.)

Mersenne in 1635 gave the total length of a bass viol that he illustrated as 4½ Paris feet. (Harwood has pointed out that the illustration referred to in the text appears in the earlier Latin edition only.) This is rather longer than Talbot’s consort bass. We can be confident that Mersenne intended to illustrate a typical instrument since in that section he was not advancing either a theoretical argument or some reform or other. No French viols of this size survive in Tourin’s list. So the French situation is the same as the English; that none of the large bass viols recommended by the authorities in the 17th century appear to have survived.

The 1633 Demouchi instrument seems to be the sole surviving French 17th century tenor viol in Tourin’s list. 18th century French bass viol technique involved much high-position work, so most tenor parts in ensemble could be readily played on bass viols. There is an instrument illustration which appears to have tenor-viol body dimensions but had been converted to a 7-string bass (with 10 frets on the neck like a French lute) in Nathalie Dolmetsch’s book “The Viola da Gamba” plate 15.)

It seems that the 18th century French treble viols (dessus) followed the bass viols in reducing their size. Many had only five strings, so there was no problem with poor tone on the lowest string with a short string stop, which, with 6-string examples, was solved with overspun strings (following the violin’s example in this country). We don’t know whether or not the name “quinton” used then was associated with this size as well as string number.

COMPARISON WITH PRAETORIUS

We haven’t made a plot of German viols yet, but we have 17th century size data kindly provided by the scaled drawings of Praetorius. A chart comparing the various dimensions discussed above follows:

<table>
<thead>
<tr>
<th>17th Century Viol Dimensions (in English Inches)</th>
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<tbody>
<tr>
<td><strong>English</strong></td>
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<tr>
<td>max. width</td>
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<td>body length</td>
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<td>string stop</td>
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<tr>
<td>string stop</td>
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<tr>
<td>total length</td>
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</table>
Notes:

1.) Since the necks on 17th century viols are rarely original, the present string stop and total length are not very interesting. Dimensions given refer to the centres of clusters in Comm. 158.

2.) Given as a result of Mace's rule as paraphrased by Talbot; this figure was not measured on any viol.

3.) The Demouchi 1633 instrument.

4.) Mersenne 1635.

From this chart it can be seen that a strong case is building up for as much international consistency in 17th century treble and tenor sizes as there is today, but with sizes up to 20% bigger then. There was more consistency in names then, with Treble = Dessus = Cant or Diskant, with Tenor and Bass using the same words in the different languages. The confusion between German and English size names today is that 20th century writers have associated names with nominal pitches instead of with sizes.

PITCHES

The English nominal tunings for viols had the top strings at d'', g' and d' for the three sizes. Because of their string stops the actual highest safe pitches for gut would be 2 or 3 semitones lower than modern pitch. Praetorius gave the nominal tunings of 6-string viols as a', d' and a or g (in Cammerthon which was about 1 semitone below modern pitch). Taking the a bass tuning, these nominal pitches are: (i) 5 semitones lower than the English nominal pitches, (ii) 3 semitones lower than the highest actual pitches used by the English and (iii) 5 or 6 semitones lower than modern pitch. But Praetorius wrote (translation in Bessaraboff p.368-9) that the English tuned their viols lower [than their stated nominal pitches] when playing by themselves, and ended up with the pitches given in Praetorius's own table. This, he added, resulted in "more pleasant magnificent and majestic harmonies ..."

Praetorius got his information on English nominal pitches somewhat wrong, but his direct observations as expressed in the above passages are to be respected.

When playing in consorts with other kinds of instruments, early 17th century English viols tuned up to some higher pitch or pitches.

Mersenne was impressed by the English viols playing alone, and he wrote (p. 257 in Chapman's translation) that "the English ordinarily play their pieces lower than the French, so as to render the harmony softer and more charming". He then went on stating that the difference was 2 semitones. This implies that the pitch standard of the French viol at this time was about 3 semitones below modern pitch. This is consistent with the large size Mersenne gave for his bass viol. Mersenne was mistaken when writing about how the English notated their viol music, but, as with Praetorius, if we accept statements which result from the direct hearing of Englishmen playing their viols, a whole picture emerges which fits together remarkably well.

A DIGRESSION ON TERMINOLOGY

When we start discussing English viols playing together with other instruments we run into a problem of terminology because modern use of the word "consort" is opposite to early 17th century usage and certainly not identical to late 17th century usage. Early in the century the term only referred to an ensemble of different kinds of instruments playing together. There was no ambiguity which required any adjective such as "broken" or "mixed". At any time in the century when a group of only one type of melodic instrument of different sizes played together (as the group of viols that Praetorius said played at the same pitches as he listed in his table) it was called a "sett" or "chest". It was never called a "consort". There was an intermediate kind
of group, which included a set of one kind of instrument playing together with another instrument which played (or at least gave the impression of playing) all of the parts. For this sort of group we know of no special name early in the century. Dowland's publication "Lacrimae or Seaven Teares" was for one such. The only name he claimed was "Lute-Lessons" in his 'To the reader" introduction. This could be because the lute was the necessary instrument and any number of set members could play along ad lib. Later on in the century, as the general mixed ensemble dwindled in popularity, this latter type of group took on the name 'consort'. The instrument that played all the parts was the focus and least expendable member of any ensemble called a "consort". Charleton in 1654 wrote "... Consortive Instruments, such as the Virginalls and Lute".

We have found no early use of the terms "viol consort" or "consort of viols". This modern terminology seems to have been introduced late in the 19th century in the first edition of Grove's Dictionary. A few years later the first edition of the Oxford English Dictionary (and every edition since) has pointed out this error, but which musicians read O.E.D.?

The term "consort bass" was used late in the 17th century to denote a viol that belongs to a set that played in consorts after the word usage had changed.

BACK TO PITCHES

The term "consort pitch" was used then, and since Playford indicated that the consort bass was tuned as high as it could go, given Talbot's string stop for it, we can deduce that this pitch standard was at about 2 (or perhaps up to 3 ) semitones below modern pitch. This standard was probably indistinguishable from Merseme's viol pitch or Praetorius's Chorthon.

It is clear from writers such as Simpson, North and Mace that the consort was the most common ensemble that viols participated in during the second half of the 17th century. So when music from earlier in the century was played by consorts late in the century, keyboard parts were required. Thus surviving keyboard parts do not necessarily imply that they were part of the intention of the composer. An important problem is to determine the original instrumentation of that earlier repertoire, i.e. in which circumstances did the set play with or without a keyboard or lute. The pitch implications are obvious.

There is no problem with the "greate dooble base" used by Gibbons. At the fourth-low pitch standard one can see why the A₁ lowest nominal pitch, which at modern pitch seems not particularly low, would truly require a large instrument to reach E₁. Since the smaller viols in Praetorius correspond in size to the English viols, one could reasonably expect a correspondence between Praetorius's "Gross Bass" and the "greate dooble base". The lowest string of the Gross Bass was tuned to E₁ in two of the tunings given, and D₁ in the third.

If an early 17th century consort included a treble viol (as Morley and Rosseter specified), it would be tuned no higher than about two semitones below modern pitch, and a full-sized bass viol (the same size as Praetorius's Klein Bass) could be used. If no treble viol was used in that consort, but a violin instead, a pitch standard a tone higher (which some of the instruments prefer) could have been used. Then the bass viol might have been a smaller one (such as the Victoria and Albert Rose), or the bass viol part could have been played by a tenor viol at the fourth-low tuning, reading as if it were a bass. This is probably the reason why a tenor viol could also be called a "small bass" at that time.

We do not know of any modern sets of viols which have been made in Praetorius's sizes, the sizes we now know were the most likely to have been used by the English also for playing viol ensemble music. At NRI we are now working on a set in these
sizes, based on the V&A Rose. We are looking forward to using these violins to play
the music of Byrd, Coperario, Ward, Ferrabosco, Jenkins etc. at the original fourth-
low pitches, and hearing the "softer and more charming harmony" and the "more
pleasant and majestic harmonies" that Mersenne and Praetorius (respectively) raved
about. The effect can be simulated somewhat by modern violins if they are tuned 2 or
3 semitones down from normal tuning.

APPENDIX

As given in Engineering Heritage Vol. II p. 2:

1.) The English yard (equalling 36 inches) was first standardized in 1305 by Edward I.
2.) This standard was refined by Henry VII in 1497. His yard was about 1 mm shorter
than the modern standard yard.
3.) Elizabeth I restandardized the yard in 1598. It then became about ½ mm shorter
than the modern standard.
4.) The standard yard was refined to its modern value in 1824.

With such a long-standing and essentially unvarying length standard in England,
we have not been able to imagine any possible reason why an English author such as
Christopher Simpson, publishing a book in England for a primarily English readership,
would use a length unit different from the one his readership would expect, using the
same name for that unit and without any explanation. Yet several eminent authorities
(hayes and Donnington many years ago and Francis Baines in Oct. '78 Early Music)
have appeared in print expecting us to consider this as a serious possibility! How
preposterous!!

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