FOMRHI Quarterly

BULLETIN 30
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FELLOWSHIP OF MAKERS AND RESEARCHERS OF HISTORICAL INSTRUMENTS

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FELLOWSHIP of MAKERS and RESEARCHERS of HISTORICAL INSTRUMENTS

Bulletin 30 January, 1983

A happy and prosperous new year to, as usual, less than half of our members. With luck, by the time this gets into the post, it will be to about two-thirds of you; the rest will receive our good wishes as and when they remember to renew their subscriptions! At the same time, thank you for your greetings and kind comments.

It's not surprising that many renewals are late; the last issue was worse delayed than usual, though not as badly delayed as you might have assumed from the uppermost line of the front cover (several of you noticed that and commented on it). One reason for the delay was the lack of Comms. Eph thought it looked very thin and therefore produced a couple of Comms, which he wanted to write anyway, and which would produce a rather thicker Q. My own view is that it's better to send out what we have on time than to hold it up for more material; Djilda will, I hope, add her view on this in a Bulletin Supplement, but I think we would both welcome your views. Several people have commented to me that it arrived too late for some of the events mentioned in it. However, the only ones that I can find which would have been affected were (on p.8) the Bate Flute Weekend, which was a reminder of something that had been mentioned in the previous issue, and the Baroque Trumpet Course, which they should have told me about sooner. Do let us know what you think about this. Of course, you can help to avoid any such questions by sending us Comms.

Quite seriously, I have begun to wonder whether FoMRHI is beginning to fizzle out. Has everybody said all that they want to say? I find this very improbable. There are more people joining all the time, and even if most of them are beginners, who want to learn before they can help to teach, a fair number are experienced and established who surely have techniques and information they can pass on to others. For that matter, those who joined as beginners a year or two ago, now know much more than they did when they started and must already have picked up workshop knacks that they would be willing to share with fellow members or acquired odd bits of information that others may lack. Do remember that we are all learning all the time and that everything that we learn or think up may be new and useful to someone else. Glance at the short Comm. on crwth I've written in this Q; all or most of it may be well known and obvious to some of you, but it was new to me and I hope may be new, and perhaps even useful, to some of you; that's why I wrote it. I've invented a new supporting bracket for displaying clarinets, but I've not written that up because I can't imagine that many of you drill holes in the wall to display instruments; those that do are likely to see it for themselves when they come here for the CIMCIM Conference in July, and most of them will probably say it's an old idea. Despite that, I had to think of it for myself, and if it had been a workshop thing I would have put it in here in case it helped any of you. You, or most of you, must have thought up such gadgets — pass them on to others in FoMRHIQ.

AIR MAIL TO EUROPE: Further to what I said on p.2 of the last Bull, we have had a slight apology from the Sheffield post office, and it seems that the last Q did go through as it should have done. We shall have to try to keep this up, and I suppose that Enzo will have to stress to the Post Office that this bundle is All-up and that it must go by air and so on, in other words treat the post office as the incompetent idiots that they are. And they've just
announced today that because they made a good profit last year, they're going to put up the charges in April so that they can make an even better profit this year. A monopoly is a wonderful thing to have. Are you all as rude about the post office in your country?

LOST MEMBERS: Laurence Marshall is worse than lost now; according to the envelope he's been demolished. Does anyone know where he has gone to?

C.H. and K.L. Greaves have 'Gone Away' from Rugeley in Staffordshire; does anyone know where to?

Peter Nyman "is now in Finland"; does anyone know his address there?

George Stoppani has "Gone away" from York; does anyone know where to?

If you move, please try to remember to tell us; it usually means that you get your Q on time at your new address (there are sometimes difficulties when you tell me just as they are going out and it's too late to change). For that matter, in this country at least the post office will redirect mail for quite a small fee for the first few months (a bouquet for them instead of a brickbat), though it gets a bit pricey after the first year; I've had to pay £12 for a second year to get things sent on from Dulwich.

BATE NEWS: I've moved this up front for this Q because it is quite exciting. We have managed to raise enough money to acquire the Edgar Hunt Collection of Instruments, thanks to the generosity of the University Equipment Committee and the National Heritage Memorial Fund. The Collection includes a number of important instruments, especially of course the recorders, among them the most famous of all Bressan treble recorders, a fourth flute by him, a bass that may be by him, a voice flute by Hail, trebles by Wijne and Urquhart, and two Rudall Carte copies, a 'Stanesby' tenor and a 'renaissance' tenor. There are also a number of other instruments that fill gaps in the Bate Collection, among them a 4-key Walch clarinette d'amour, double and single flageolets, a Zuleger oboe and so on. In addition to all this, the National Art-Collections Fund has provided the money with which to buy Michael Morrow's renaissance bassett recorder (double plume mark). None of these are here yet, but I hope that they will be before you read this; I'm picking up Michael's recorder next week, when I have to be in London for the day, and Edgar will bring his over shortly. The instruments will be available for study, measurement and use, like everything else here. It would be nice if we could publish measurements of the recorders, like Frans Brügger has done (see Comm.426 in the last Q), but whether we could afford to pay someone to do them properly I don't know. Perhaps we should try.

To celebrate this major accession, the next Bate Weekend will be a recorder one, with Edgar Hunt of course. Dates are April 30th/May 1st, with recorder playing, teaching, coaching, etc from 11 to 6 on the 30th and an open rehearsal and concert (with Maria Boxall, harpsichord) at 2.30 and either 7.30 or 3 (not yet decided) on the 1st. We had a measuring etc session for the first time at the last weekend, and this was so successful that we shall keep it in on future occasions; that will be with Robert Bigio from 6pm onwards on the 30th and from 11 till 1 on the 1st. All sessions, except the rehearsal and concert, will be in the Bate at the address on the front of this Q; rehearsal and concert will be in the Holywell Music Room, the oldest concert hall in Europe. Programme is not yet fixed, but it will centre round Purcell,
Handel and their contemporaries.

Other Bate News is not much; I'm still putting instruments into cases, composing and typing labels, and so on. It wasn't all done by Christmas, as I hoped in the last Bulletin, and at the present rate of progress it may not all be done by Easter, but let's be hopeful. It's like the Forth Bridge anyway; no sooner will it be up than I'll have to start again, replacing temporary nylon loops with more permanent metal brackets. I thought that I had the flutes and bassoons set, but now I've got to reshuffle and deal to fit Edgar's in — at least doing that will be a pleasure!

FURTHER TO: Bull.29, p.7 under Materials. Cary Karp writes:

To bull.29 p.7 under Materials: I have no idea what Brummer Stopping is, and unless I did (and felt it suitable) I certainly wouldn't use it to fill wormholes in old instruments. The manufacturer's assurance that it is suitable for this task does little to change my mind, and his description of the product is no substitute for the detailed statement of contents (What inert filler? What kind of animal glue? What else is in it?) that most museum conservators would require. Such people have a general aversion to proprietary formulations for several reasons: Most manufacturers will not supply adequate analytical data about their products. Even if satisfactory data has been obtained, there is no certainty that the product will not be modified without notice (has Brummer remained unchanged during its entire 30 year history?), nor will factories in different countries making what is nominally the same thing necessarily use the same formulation. Similarly, the identical product may have trade names which vary from country to country, severely limiting the usefulness of international communication about the use of such products. There are, of course, many proprietary formulations in widespread use by conservators, but when they are cited in the literature they are followed by at least a summary generic description, such as -- "Stickum" (a PVA dispersion glue). Now, by the way, if you've never tried Brummer, do you know "that it is much easier to get into the instrument than beeswax"? Remember, filling wormholes is an irreversible procedure, and as such not to be undertaken casually. (The IIC seems to feel the general problem important enough to be devoting its next congress to "Glues and Consolidants"

As to color-strip humidity gauges, perhaps it should be mentioned that these are useful only as a supplement to a good climate monitoring system. They are not adequate in themselves for much of anything, even if they can be read reasonably accurately when new.

JM confesses that of course I tried it. When Jim O'Loughlin gave us his famous plastic contrabassoon, he also gave us a box full of odd joints, among them the bits of a Buffet type, unmarked, with all the keywork stripped off. I want to show a bassoon without keywork, so I used Brummer to stop all the screw holes where the keywork had been mounted. Can Cary now suggest something as easy to use as Brummer which would be safe to use on more valuable instruments? The reasons for stopping worm holes are not just cosmetic. One is that they sometimes reach the bore, and so produce leaks; another is that they may weaken the instrument enough that it collapses; another is that if all existing holes are filled, the appearance of a new hole shows that one did not succeed in the
initial attempt to cure the infestation and therefore that stronger methods are necessary. For minor attacks, I'd agree with Cary and leave the holes unfilled.

Bull.29 p.9, Hermann Moeck writes:

Re Crumhorn in No. 29 page 9: What should actually have prevented an instrument maker of the 16th/17th centuries from trying to make a crumhorn of two milled parts like the curved cornetti, because with prepared inner bore it would be difficult to bend?

Re Flageolet in the Tiffany picture "The Musical Boating Party of the Sharpe Family" 1781: As far as recognizable, these are two common so-called English flageolets (which were later on also produced by a man called Bainbridge; the activity of whom is, however, supported by documentary evidence after 1800 only). In the picture a man (perhaps the son-in-law of the physician Sharpe) holds the two flageolets in one hand putting his arm almost around his beautiful neighbour. This is to mean rather that he wishes to play duets with her than that he tries to play both instruments with one hand. The latter is also traditional, though, but 20 years later. The following passage, which refers to 1804, can in any case hardly be used as evidence for our picture, not only because for the two flageolets here there is no frame. This passage can be found in HARMONICON, a London musical journal, in the volume of 1830, pages 499/500:

"In the year 1804 Mr. Parry fixed two of Bainbridge's flageolets in a frame, and performed duets on them, and shortly afterwards he added a third, and played "Here's a health to all good lasses", in three distinct parts, at Covent Garden Theatre, for Blanchard's benefit. Bainbridge made from this a double flageolet, out of one piece of wood ...."

However this may be: I do not see any reason for assuming that in our picture it is matter of flageolets which are played in pairs by one player. On the other hand: This playing in pairs initiated Bainbridge's invention of the well-known double flageolets.

JM adds (there's supposed to be an agreement that Djilda, Eph and I don't take advantage over the rest of you by commenting in the same issue, but as this is an amplification I hope that Dr. Moeck will permit this) that these flageolets aren't the ordinary sort; they are specially made for one in each hand. I'll try to find time to write them up properly in a future Q.

Bulletin Supplement on p.12 of Q 29. Robert Bigio writes:

I am not entirely certain how I managed to become embroiled in an argument with Eph Segerman about making bows (I know as much about the subject as I expect Mr. Segerman knows about turnery), but it's happened and perhaps I can pass on some information that may be of use to someone, Mr. Segerman (FoMRHI 29, Bulletin Supplement) need not apologise for referring to a secondary source in Comm. 409. He should rather apologise for not having read that secondary source properly. The article quoted, on precision mechanics from the mid-18th to the mid-19th century (in History of Technology vol. IV) describes, albeit not very well, all the equipment required to produce cheap screws of sufficient accuracy for most purposes. The article does not, it is true, mention that a thread chaser can be used unassisted to produce a screw, but then present day engineers often refuse to believe that it is possible, even when they see it happening. What the article does say is that a large, very accurate screw in hard metal (such as a head screw for a machine) would need to be made by hand and would require considerable skill to produce. Such a screw need not concern us here. The article does mention that taps and dies existed from very
early times. It is almost certain that such tools would have been used to produce the small screw in a bow if the bow maker wanted a screw. Moxon, in *Mechanick Exercises* (published in serial form from 1683), describes and illustrates taps and screw-plates and states that they were essential equipment for all smiths. Plumier (*L'Art du Tourneur*, 1701 and 1749) also describes taps and dies, thread chasers and their use (and how to make them) as well as lathes with traversing mandrels. A traversing mandrel lathe, which is also described in the *History of Technology* article, is a screw-cutting machine in which the tool is fixed and the rotating work moves to the left and right. Traversing mandrel lathes were common from the 17th century and were still being made in London by Holtzapffel in the 20th century. Holtzapffel (*Turning and Mechanical Manipulation* vol. II [1859] p. 615) considered the traversing mandrel to be of use to the amateur who had difficulty in cutting a screw in a plain lathe with a thread chaser. He expands on this in vol. IV, p. 106. It is my view that a professional turner would have considered such an aid to screw-cutting unnecessary. It is interesting that many examples of early turnery exist which include screws that could not have been cut other than with a thread chaser - the tapered screw that holds the cork in some early flutes is a good example.

In conclusion, then, Mr Segerman is quite wrong. Screws were cut in the lathe from very early times, but, of greater importance to this argument, taps and dies existed and were in common use from the 17th century and probably long before. The screw in a bow could have been produced easily and cheaply. If bows were made without screws it was for some reason other than the cost. It was certainly not because the technology did not exist.

Same Supplement: Richard Webb points out a misprint: the reference to Comm. 431 should be to 432; there's nothing unauthentic about 431.

OTHER JOURNALS: I'd like to join in the felicitations to *EARLY MUSIC* on its 10th birthday. We have all learned much from it and it has had a very considerable influence. It has also set very high standards and has shown that the early music field can support a major journal produced to the highest standards. Most of us will share my regret that we are losing John Thomson and join me in thanking him for all that he has done.

There has also been a change of editor with the *GALPIN SOCIETY JOURNAL*. Maurice Byrne has taken on the task; his address is in the Membership List Supplement herewith, and anything for the Journal should go to him there, and not to Tony Baines here. He would welcome, as well as the major articles that have always appeared there, more short notes, so if you have any material that you were not sure would be long enough to make a GSJ article, you are assured that it will be welcome. Remember that GSJ is a journal of record in a way that FoMRHIQ is not. There are things that are appropriate to us, and others that are appropriate to them. For example, if I do write up the one-hand flageolets as I suggested on the previous page, that is really GSJ material rather than FoMRHIQ.

This is perhaps a moment to 'praise famous men and our fathers that begat us', though I don't want to sound like an obituary, for Anthony Baines is still going strong. I would, though, like to stress how much we owe him. *His Woodwind Instruments* is a tremendous book. The historical information is all there, but the amount of practical information is fantastic. His *European &
American is a gold-mine (I keep hoping that it will be reprinted); I could never have found the illustrations for my books without it, and it is, as has been said before, a museum between the covers of a book, with the additional advantage that no museum in the world could amass such a collection. One could say, of course, that writing books is a job, part of earning one's living (though the quality of the product comes into it; many of us write books, but few of them are in Tony's class), just as all the work he did here in the Bate Collection was part of his job and what he was paid for (but, as his successor, I can tell you that he set a pretty high standard to live up to). Editing the GSJ is another matter. All that one gets for a job like that is the pleasure of doing it, a few compliments and a lot of kicks. Tony has edited 21 issues of the Journal, from 9 to 16 and from 24 to 36, the next one which will be his last and which is now at the printer. When one thinks of the work and the time involved in editing those and also the Galpin Society Symposium, Musical Instruments Through the Ages, which was produced for Penguin, all initially done for free, just to help his fellows, that really is service to the community.

When we asked him to become an Honorary Fellow of FoMRHI we had two reasons: one, I will admit, was an ulterior motive, to add a cachet of respectability to a new venture in a field in which he was a leader. The other was as a small mark of respect and of gratitude for all that he has done for us. Now, as he retires as Honorary Editor of the Galpin Society Journal, seems the moment to spell out our gratitude as I have done (and I hate to think what he is going to say to me when he reads this!).

ARCHAEO-MUSICOCOLOGY CONFERENCE: I went over to Cambridge for this last month and it was a most successful occasion. It was the inaugural meeting of the archaeomusicology committee (if that's the right name) of the International Council for Traditional Music (the new name for the IFMC, the International Folk Music Council), of which the chairman is Ellen Hickmann and the secretary Cajas Lund, and our host was Graeme Lawson, the director of the Cambridge Music-Archaeological Research Project (see Comm.384 in Q 25). There were a number of very interesting papers on archaeological finds of instruments and bits of instruments, all of which I hope will be published in due course, and on the last day of the conference we had a public session so that a wider audience could hear of what has been going on in this field. Perhaps the most important paper was Cajas Lund's, describing the Riksinvesteringen, a complete survey of all Scandinavian archaeological musical material, something that we all hoped might be emulated elsewhere. Every museum, we can assume from this and from what Graeme Lawson has found so far in this country, is housing bits of instruments, quite unrecognised, either in its junk boxes or labelled as something quite different.

The idea of this conference stemmed from a meeting some years ago in America. It took a while to come to fruition, but now that it has done so, it will I think continue, and it is hoped to produce a FoMRHIQ-type newsletter, perhaps spasmodically at first, as material comes in, rather than quarterly, but eventually we hope regularly. Anyone interested in receiving this should get in touch with Cajas, whose address is in the List of Members.

THE EARLY MUSIC SHOP: I had a few days in town after that conference, and dropped in at Chiltern Street. Like most of you, I expect, I had heard all sorts of rumours before and after the Sotheby sale. I was very glad to hear from Malcolm Greenhalgh
that the shop is continuing in good health. They thinned out a lot of stock that they didn't want and raised a fair amount of money to lay in what they do want, and they will be able to continue as the shop-window for the early instrument world and there will still be somewhere that people can buy instruments off the peg; there are many occasions for all of us when we need something urgently and cannot wait through a maker's waiting list, and how could anyone begin in this field without such a shop? Malcolm has a number of interesting new plans and we look forward to their fruition.

He confirmed, incidentally, that there will be an early instrument show this year, at the Horticultural Hall as usual, November 24th to 26th, setting up on the 23rd. If you want a stand and haven't exhibited before, you might as well write now to Richard Wood at the Bradford shop (28 Sunbridge Road) and get your name down; old customers will hear from him in due course.

**MATERIALS:** Patrick Pearson says that he can get small discs of ivory suitable for bushing holes (offcuts from a friend), about half inch diameter and about 2mm thick (dimensions taken from his sketch). He didn't say what they would cost.

George Bowden says that he is sending under separate cover a catalogue which he picked up in Brussels at the Droguerie Le Leon, Rue de Laeken 55, 1000 Brussels. He says that a violin maker gave him the address and that he found them very, very helpful and willing to send materials anywhere. He understands that their Dragon's Blood is ordered from them as far away as Canada. The list hasn't arrived yet; you may find it in here if it arrives before this goes to the printer; if not, it can go in the next issue, and you have the address anyway.

**QUERIES:** Brian Lemin asks if anyone can give him some hints on pen and ink work on wood (see a note from him below on transfers on to wood), especially: the best sealing medium; a nib which glides over grain, instead of catching on it; the best kind of ink; when completed should it be varnished or not; is there a book of patterns?

Peggy Downie is researching the history of the kit (pochette) and is looking for information on privately owned kits for inclusion in a checklist of extant kits (she'll probably be grateful for news of any in any museums that she might not have come across). She is also preparing a catalogue of iconographic depictions of kits and I imagine would be grateful for any references. She is continuing work on rebecs, though she has now completed her thesis on these (if anyone is interested, it's available from University Microfilms, order no. DAB207522).

Horst Vladar says that he has found a lot of useful tips for authentic finishing of lute soundboards (Comms 173, 198, 432) and asks whether anybody can give similar information on finishing lute backs and necks?

I would like a volunteer, technically minded and with good Italian, to review a book that Marco Tiella sent me, Atti del Seminario per la Didattica del Restauro Liutario, the results of the conference at Premeno in the summer of 1981. There are articles on copying versus counterfeiting; tensile tests on old and modern metal strings; mechanical and chemical characterisation of strings; analysis of harpsichord sound; technological properties of woods; dendrochronology; colouring materials of 18th century; photogrammetric surveying; keyboard techniques and their application; sources
and documents on organ labial pipes in 15th & 16th centuries in Italy; transients of such pipes.

**TECHNIQUES:** Brian Lemin says that he has come across a useful trick for decorating soundboards etc. Xerox copies of designs can be used as transfers by ironing them on to the wood. His experiments show that medium heat is best, with quite firm pressure going over it several times, sometimes with the edge of the iron to make sure that the whole of the design is covered. He has then lightly sanded with 600 grit and used ink or paint, as appropriate, for the finished design. Sometimes, but not consistently repeatably, the transfer was sufficient by itself for a black and white design. He has not discovered a solvent for the transfer and therefore erases by sandpaper. He has some queries (see above) about the best way of using pen and ink.

**COURSES:** Larry Lundy says: “The Lute Society of America’s annual Seminar in 1983 will include a full week’s course for lute makers. The workshop will be held July 24-30, 1983 at Hartford, Connecticut, led by a faculty of Michael Lowe and Joel van Lennep. Michael will concentrate on historical and stylistic concerns with reference to specific historical instruments, and Joel will focus on construction procedures and maker/player communication. The course will be supplemented by one-off presentations of interest to makers, lectures for both makers and players, and a series of concerts. For more information, contact the coordinator, Lawrence Lundy, 505 Elmside Blvd, Madison, WI 53704, USA.”

Bernard Brauchli says: “SAN SEBASTIAN, SPAIN – A week long clavichord seminar will be given by Bernard Brauchli and Clifford Boehmer August 22-27th, during that city’s international summer festival. Bernard Brauchli, a specialist on the clavichord both as a performer and music historian who teaches at the Museum of Fine Arts in Boston, will cover the history of the clavichord, its social and musical role, related iconographic documents and will provide individual lessons in performance technique with emphasis on the Iberian repertory. Clifford Boehmer, a clavichord maker also teaching at Boston’s Museum of Fine Arts, will present an approach to clavichord building and restoration. This course is designed for builders or keyboard performers of any level. For detailed information write: Bernard Brauchli, 82 Oakley Road, Belmont, MA 02178, USA.”

Brian Jeffery has sent the following:

**A ONE-DAY SYMPOSIUM**
**ON**
**THE GUITAR BEFORE 1800**
**will be held**
on Sunday March 19th 1983
all day
at The London Zoo
Sponsored by Twick Editions

There will be seminars, discussions, lectures, round tables and a concert in the evening. Subjects provisionally include: makers' round tables, baroque and early 19th century technique, ornamentation, repertoires, appropriate style and strings, and restoration and reproduction of old instruments. Ample opportunity will be provided for discussion and asking questions.

Lunch is included in the day ticket, also coffee in the morning and a cup of tea in the afternoon. Free time 6-8 p.m. and a grand concert in the evening.

The speakers include
Robert Spencer introducing a makers' round table
J. L. Romanillos on early guitars
James Tyler on baroque guitar technique
Anthony Bailey on the technique of Sor's time
Leif Christensen and Maria Kamsetting on the duct repertory
Simon Wynberg on the 19th century guitar
Brian Jeffery on discoveries in the repertory

and in the evening and during the day there will be music performed by some of the above by Jakob Lindberg, and by singers and various instrumentalists including Monica Huggers (violin) and Glenda Simpson (soprano). There will be display stands.

The event takes place at the Meeting Rooms of the Zoological Society of London, Regent's Park, London. Tickets (which must be purchased in advance and
which are limited in number to the capacity of the Meeting Rooms, are £22.00 (£20.00 if booked and paid for by January 31st 1983) plus VAT 15% for the whole day including lunch and the concert and are obtainable from Tecla Editions, Preachers' Court, Charterhouse, London EC4M 6AX.

Anyone interested in having a display stand at the event is invited to write to Tecla Editions.

I wouldn't expect you to get this before Jan.31st, but as he has asked me to include it, you might try getting the discount if you write to him straight away. He says in his letter, incidentally, that he is aiming for it to be quite a significant occasion for historical performance on the guitar.

Just a reminder (see page 3) that the next Bate Collection Weekend will be on Recorders, April 30th/May 1st.

EXHIBITIONS: The Edinburgh University Collection (see a review in this issue of the last of their check-lists) is open to the public every Wednesday afternoon from 3 to 5. Serious visitors should contact the Honorary Curator, Arnold Myers (see the List of Members), so that doors can be opened.

Elizabeth Wells, Curator of the Royal College of Music Museum of Instruments, writes: Due to a reduction in staffing, from January 1983 onwards, the Museum will be open to the public only on Wednesdays during term-time by appointment, from 11 - 4. We very much regret this reduction in our staffing and opening hours, which is caused by cuts in the government grant to the College. Appointments can be made by telephoning the Museum on Wednesdays or by writing in advance. The first volume of the catalogue of the Collection, European Wind Instruments by S. A. K. Ridley, has now been published and is available from the Museum.

It's probably a bit late to tell you about the Boston Early Music Festival & Exhibition; the dates are May 24-31, so it may be too late to book a stand. In case not, the address is 25 Huntington Avenue, Boston, MA 02116, USA. Stands cost $200. The exhibition will be in The Castle. I'm a bit surprised that they left it so late to send out their notices.

See p.8 for the London Early Instrument Exhibition.

DEADLINE FOR NEXT ISSUE: 5th April, I think. The next one might be delayed a bit because if we can find a flight we had thought of visiting our member in Kiev over Easter, but at the moment it looks as though one could go anywhere except to Kiev, and if we can't go there, I'll start on Q 31 on the 5th.

That's the lot for now. Some more may arrive tomorrow while I'm doing the Members' List Supplement.

Jeremy Montagu

PS: All that's come today is a beautiful calendar from Hermann Moeck. If you're interested in non-European instruments, as I am, it could be well worth finding out whether one can buy copies. There are 13 (one for each month plus the cover) of the most beautiful pictures I've seen in years, and on the back of each pretty well a whole page of description, history and bibliography. It knocks spots off the other calendars on the market, and I'm very grateful for it.

I look forward to seeing some of you here for the Recorder Weekend, and of course any of you are welcome here any time (ring up first for safety; if I've had to go to a meeting or something, we're closed).
ON LATENESS OF FOMRHI.Q. Further to Jeremy's remarks on page 2.

We have a problem here. With every justification Jeremy wants each quarterly to come out on time, i.e. in the mail before the end of the month stated on the cover. He starts writing the Bulletin at the beginning of the month and will usually take about a week to finish. Then it's half a week in the mail to me, half a week for me to put the issue together and get it to the printers. They take about one and a half weeks, then it takes half a week to get the print run to Enzo, who can take half a week to get it into the post. So if there are no delays anywhere along the line we can maybe just make it. Delays can happen anywhere along the chain and they very often do. One source of delay is that by the time the Bulletin and Comms reach me (and Eph has a short Comm ready) he will look through and sometimes feel that the balance between practical and scholarly content is all wrong, and that the members who are more interested in the scholarly side would be disappointed. When that happens Eph will usually look out his collection of nearly-completed articles and pick one or two that can be quickly polished up, to restore the balance. The delay, due to Eph doing this, can be from half to one and a half weeks.

Jeremy gets plenty of complaints from people who don't like their Quarterly late, and there are obviously plenty of members who don't at all mind it late because they take out the cheaper Surface-Mail subscription. It would be helpful for us to know how much feeling there is for a strictly enforced deadline or favouring the somewhat lax approach I have been following with thin issues: The former would mean somewhat less from Eph (not just the same stuff later) since he often writes a paper with the idea of publishing in a posh Journal, and if not needed for our Q. he would wait for the time and inspiration to polish it to a proper readable state (not just the half-readable alternative we get).

I would like to propose an alternative which might solve this dilemma. We could change the format of FoMRHI 0, so that instead of being stapled in the centre of the sheets of paper, the pages are on single sheets stapled along one edge. This will mean that I can put it together and give it to the printers in instalments. Comms. can either go direct to me, or Jeremy can send them a week or so before the Bulletin. As soon as the Comms reach here, I can get the printers started on them, and Eph can decide if he wants to add some. When Jeremy's Bulletin arrives here, Eph's stuff will be finished (we hope). As the printing will be half done by then, we hope to cut down on that time too.

The drawback of this that I can see is that FoMRHI 0 will lose some prettiness by not opening out flat. It will also gain some, because the printers often have difficulty when a faint typescript and a heavy one are the two pages joined on one sheet of paper. We can at least ensure that the page margins allow room to punch holes for a ring-binder.

So, if you care about it, please write to Jeremy or me with your preferences:
(a) Familiar-look but less late and less Eph,
(b) Familiar-look and as late as usual,
(c) New format and on time,
(d) Any other suggestions?

Incidentally, this issue got here nearly a week late due to delay in the post, and the "Eph delay" has been just over half a week.

EDITORIAL POLICY ON CONSERVATION AND RESTORATION

Cary Karp has offered the assistance of the museum community in refereeing Comms., dealing with conservation procedures. Our general policy has been to print doubtful Comms. in the interest of quick communication. However, I cannot accept the possibility that some historical instrument is badly treated as a result of a procedure described in our Quarterly. Consequently in future I intend to accept Cary's offer; this means that conservation/restoration Comms. may well have to miss one issue. We will of course try to make sure that the delay is as little as possible.

We continue to welcome contributions on all aspects of historical instruments, and
apart from conservation, will try to print everything that reaches us by the deadline date. We don't ask for impeccable English or typing - just that your Comm is understandable and will print clearly (authors please see notes on the back of this issue).

I do reject Comms that have nothing whatsoever to do with historical instruments (eg. descriptions of modern folk instruments without anything to enlighten us on their ancestry). Also notes on adaptations of historical instruments which offer nothing towards an understanding of the originals.

FOR INSTRUMENT EXHIBITORS
Re, my last Bulletin Supplement. There are a few places left; contact Eph Segerman.

FoMRHI Comm. 439

Heinrich Schütz's Strings
Cary Karp

In Comm. 438 a letter written by Heinrich Schütz in 1621 is cited as evidence of the early 17th century use of a steel music wire with a significantly higher tensile strength than any other metal string material available "from that time until later in the 19th century". I don't know how many letters Schütz wrote in 1621 in which he mentions music wire, but here is a translation of one which he addressed to the secretary of the Elector of Saxony. The only passages which I have deleted are those of florid, virtually untranslatable, 17th century servility:

"Your most humble servant . . . calls the attention of the Court Secretary to some money which the Court sent some time ago to Nuremberg with which a purchase of strings for the court Music was to have been made from the wire drawer named Jobst Meuler who makes such excellent steel (Stäline) instrument strings, the likes of which cannot be obtained anywhere else."
However, this wire drawer has now written me that he has every desire to please us and wanted to make us these strings, but that his fellow masters did not permit him to make anything special and better than they do. That is unless a short directive from our noble Lord were forwarded to the Nuremberg Council, in which case he surely would be permitted to do so.

If the most gracious Court Secretary feels it proper that I and my professional colleagues do not have less good strings than, for example, a soldier has good pistols and other weapons, he will not be offended that I trouble him with this matter... (and arrange for) our noble Lord to make the short directive to the Nuremberg Council concerning the named Jobst Meuler, so that the Court Household can order as many of the best instrument strings as it pleases, and to send this to me at his earliest convenience (since the matter must be resolved within the next few days if the offer is not to be withdrawn).

This is not only for the best of all music, but also useful for our most gracious Lord, who should receive the greatest value for his money, and I remain... 

Dresden 3 July 1621

Heinrich Schütz

The Nuremberg Council minutes of 4 September 1621 state:

"The Lord Johann Georg, Elector of Saxony's letter of intercession on behalf of his Royal Kapellmeister Heinrich Schütz, for him to be permitted to order each year from the wire maker Jobst Meuler a number of instrument and other steel (stehlene) strings without the interference of the latter's fellow masters, shall be accepted by the councilmen, who will hear Meuler in the matter and arrange for him to comply with the wishes of the Kapellmeister."

Schütz had clearly been impressed with the quality of a steel (i.e. iron alloy) wire which Meuler alone was able to produce. Since Meuler could not fill even a royal order for this material without legal intervention, however, it seems highly unlikely that his product was in widespread use, nor was any equivalent product available. Schütz says absolutely nothing to indicate that the qualitative superiority of Meuler's wire manifested itself in a tensile strength different from that of other iron alloy wire then available. Schütz also says nothing about the wire being "essential for his ensemble". Since Schütz's letter resulted in Meuler being permitted to produce this wire, the letter suggests the date at which such wire first became available; not the date at which its use terminated.

It is also interesting that a wire drawer made strings on order, rather than making spools or coils of wire. Does this suggest custom drawing of short lengths of wire? If it does, the high quality of Meuler's strings might have been due to the care he took in manufacturing them, rather than being a result of any fundamental metallurgical difference between his special-order product and what he and his fellow masters otherwise were producing.
Ferrous Wire of High Tensile Strength ca. 1600

Ephraim Segerman

For some time I have been writing about the existence of ferrous wire during the four decades centered on 1600, wire of such superior tensile strength that it could be tuned higher than gut on the same string stop. In our 1974 G.S.J paper, we first mentioned it as responsible for an upwards range expansion for wire-strung instruments late in the 16th century. The orpharion, as described by Praetorius, was given as an example of the instruments which exploited this wire. We then suggested that this wire could be case-hardened steel, being impressed by reported advances made during the 16th century which would make it possible to convert an instrument treble string completely to carbon steel. I had no evidence that case-hardened steel wire was made at that time, or whether methods for heat-treating such steel to make it usable on a musical instrument were then known.

In Comm 830(9)(1977),45) Cary Carp pointed out that it may be possible to draw wrought iron wire to a much higher tensile strength than that exhibited in Mersenne’s measurements. This could provide a viable alternative to case hardening. He wrote “A 90% diameter reduction, which is the maximum possible before reannealing becomes necessary, can increase the tensile strength to circa 1250 MPa. Skilled workers can probably obtain tensile strengths approaching 1500 MPa.”

The pitch at which a string breaks depends on tensile strength (which is the string stress at breaking, string stress being the tension force divided by the string cross-sectional area) and density as well as string stop. A variable that should be of particular use to organologists is the propagation velocity of transverse vibrations on a string. This property combines the effects of string stress and density and it relates simply to pitch and string stop. This velocity, which equals the square root of the ratio of string stress to density, also equals twice the product of frequency and string stop. At breaking this velocity is twice the ‘breaking index’ we defined in the 1974 G.S.J. paper. ‘Breaking velocity’ is a more physically meaningful quantity than ‘breaking index’, and one can discuss the velocity along a string when it is below the breaking point. If the stress (\(S\)) is expressed in megapascals (Newtons per \(\text{mm}^2\)) and density (\(\rho\)) in \(\text{gm per cm}^3\), the velocity (\(V\)) in \(\text{meters/sec}\) is \(V=31.62\sqrt{\frac{S}{\rho}}\). The 1250 MPa and 1500 MPa figures Carp quotes are then equivalent to breaking velocities (assuming \(\rho=7.9\ \text{gm/cm}^3\) of 398 and 435 m/sec respectively. For comparison, the iron wire that Mersenne measured had a breaking velocity of about 320 m/sec. I will now compare these values with velocities that can directly be calculated from the pitches and string stops of instruments of the period.

While nominal pitches for instruments ca 1600 were reported in abundance, there is much ambiguity concerning pitch standard. Fortunately, there is no such ambiguity with respect to the orpharion described and depicted by Praetorius. Of it he wrote “wird wie eine Laute im Cammer Thon lals nemlich die Quanta ins g ) gestimmet.” He mentioned many pitch standards but four to which he attached names are ‘rechter Cornetten Thon’, ‘Cammer Thon’, ‘recht Chor-Thon’, ‘rechter Chormass’ and ‘Chor-Thon’. The first four of these seem to have been identical. The fifth was somewhat variable, but when discussing instruments rather than standards, a tone below the other standard seems usually to have been meant. The actual pitch to associate with the first four names has been the subject of much discussion (see Comm 342), but few would argue that \(a'=430\) was far wrong. A mean-tone \(g'\) pick fifth-comma for this period, \(g'\) at this standard would be at 384 Hz. The stop of an orpharion’s first string measured on Praetorius’s drawing and scaled is 0.56m. The string velocity then calculates to 445 m/sec. This is a playing velocity on the string, and the breaking velocity should be perhaps 10% higher for safety. It would seem that Carp’s guess that a skilled worker could achieve a breaking velocity of 435 m/sec is perhaps an underestimate of what was actually
accomplished. Neither I nor Carp can know whether a string with about 490 m/sec breaking velocity can be cold-drawn in wrought iron. Perhaps the use during the drawing of a coating of lime (the earliest evidence of this is from the 18th century) with olive oil or soap as a lubricant could have helped. I wonder if anyone is yet in a position to rule out case hardening either. Perhaps a primitive version of the heating, quenching and tempering process of 'patenting' invented in 1854, which gives carbon steel wire all of the properties we are looking for, could have been used.

There is no basis to believe that Praetorius made an outright error, but one can question the accuracy of measurements taken from his drawings. His purpose of providing drawings with scales appears to have been to give his German readers some idea of size when the instruments might be unfamiliar to them. It is highly likely that the major dimensions of instruments were transferred directly to the drawings by measurement, with the rest drawn by eye. Small details could therefore be considerably proportionally inaccurate, as would appear to be the case with the shortest strings on his spinets and clavichords. But with a fingerboard instrument where the string stop is a major fraction of the total length, distortions due to drawing by eye should have much less effect, and an accuracy of perhaps 10% could be expected.

As to whether the .58m treble string stop of Praetorius's orpharion is typical, this measurement as given by Talbot (c.1690) is .535 m, and of the two surviving instruments, it is .60m for the Rose and .535 for the Palmer. A 10% accuracy factor would include all of the other instruments.

If we want to bias our information towards a lower string velocity, we may argue that the Rose instrument was one of the first orpharions that was made, and perhaps orpharion size and pitch only stabilized later. If the identical treble string stop of the Talbot and Palmer instruments represents a standardisation that Praetorius inaccurately represented, the playing string velocity would be reduced by the factor .535/.58 which results in 411 m/sec. The breaking velocity would then not be so alarmingly higher than Carp's estimate of what a skilled wire drawer could do with wrought iron.

As to whether Praetorius really meant Cammer Thon for the orpharion, this is supported by his table of tunings. There the tunings given for the orpharion have the treble course tuned either to g' or a'. The a' tuning was probably for a player to learn to read in when the ensemble was playing at the tone-lower Chor-Thon standard Praetorius preferred. Otherwise the string velocity would be even higher.

If such a strong wire was available, one would expect evidence to exist for its use on other instruments. There is no evidence as unambiguous as that for Praetorius's orpharion. The small English cittern with a string stop of .34 m and a first course given at g" would have a string velocity an excessive 522 m/sec in Cammer Thon, and a somewhat more reasonable 466 m/sec in the preferred Chor-Thon. Praetorius suggested the use of small English citterns doubling violin parts on a few of his mixed vocal and instrumental pieces. If this suggestion was based on experience using the same instrument and tuning as given in Syntagm Musicum II, ferrous wire with one of the above velocities was played on.

Whether or not all of these conditions were satisfied, we need to try to understand the relationship between the usual English tuning e", d", g", b' and Praetorius's tunings g", d", a' or b' and f'. First we notice that they are a minor third apart with the 2nd and 4th courses interchanged, so it is possible that the same strings were used. If new stringing was involved when converting from the standard to the special tuning Praetorius reported, a fourth course lower than the third would have been preferable to the reentrant tuning for the use Praetorius wrote that the instrument was put to. He expressed appreciation of an English performer on the instrument who played beautiful divisions. Such divisions, mostly lying on the higher strings, are characteristic of the
large repertoire of lute treble parts used for duets and consorts. The player could exploit this repertoire on the cittern, considered his highest course to be a g (like the lute). His treble strings would have needed to be able to reach g' at the pitch standards used by instruments he played with. When playing with a lute and treble viol in the usual consort, a standard lower than the a' = 384 Chor-Thon standard (a tone below Praetorius's Cammer Thon) was very much more likely than higher.

When an English cittern player used the normal tuning with an e" treble course, he could go to a minor-third higher pitch standard if needed. This could be for playing with other English instruments that were in Cammer Thon such as the violin family, the orpharion and the 7-course bandora. A seventh course on the bandora was not used in the consort repertoire, presumably because it would not speak at that standard since its first course at .73 m string stop tuned to a (192Hz) would have only a velocity of 280 m/sec at Chor Thon. No specially strong wire was needed for stringing a bandora in its normal tuning in Cammer Thon, but at the alternative tuning that Praetorius listed, with the first course at d', a playing string velocity of 419 m/sec in Cammer Thon would be required.

Praetorius discussed the 'Gross sechs Chorichte Cither' with the highest course given as b. He wrote "1st in alles fast zwei Ellen lang", i.e. 4 Brunswick feet or 1.141 m. It was very unusual for him to give such dimensional information in the text, and it is highly likely this was done here to correct an error in the drawing, where 4 feet is the string stop while the overall length is 5 5/8 feet. This error of confusing string stop with overall length indicates that string stop was a measurement he used directly in making his drawings, at least some of the time. The proportions of the instrument in the drawing seem reasonable, so an estimate of its true string stop would be a proportionate reduction to .81m. This leads to a string velocity on the first course of 391 m/sec at Cammer Thon.

The other instruments mentioned by Praetorius that seem to require wire stronger than that measured by Mersenne are the penorcon with highest course d' at a string stop of .64m, the English viola bastarda (i.e. lyra viol) with metal sympathetic strings in unison with the gut strings, the 12 course cittern with e' at .70m and the violin (that he mentioned could be strung with metal strings) with e'' at .30m. For only the last two do we have any indication of pitch standard. Praetorius associated the 12 course cittern with Prague, a city which he specifically mentioned used the tone-low Chor Thon standard. This leads to a string velocity of 399 m/sec. The velocity on the first string on his violin in gut or metal would be 330 m/sec at the Cammer Thon standard at which we would expect it usually to play.

My dating of the beginning of availability of wire of exceptional strength is associated with the development of the orpharion. The Rose instrument seems to have been made in 1580. A letter from Sir Arthur Basset to Sir Henry Stradling in 1583, discussing the latter's servant mentioned "the rareness of his instruments with wires." Donald Gill (G.S.J.X.III (1960),15) suggested that this was the first surviving reference to the orpharion, and we (L.S.J. XVII (1975),36) suggested that the small cittern with very high tuning should also be included. My dating of the end of this availability comes from the termination of the writing of repertoire for the cittern. I am aware of no English manuscripts containing cittern music between the second decade of the 17th century and Playford's attempt to resurrect a modified version of the instrument in the 1650's and 60's. Playford's instrument was considerably larger than the small cittern and tuned an octave lower. The small cittern continued to be used after the second decade, but it used Praetorius's guitar-like tuning an octave lower, and then went by the name of the 'Gittern'. The orpharion after that time seems to have been tuned like a bass lute. At the fourth-lower pitch, the lowest bass strings would have become musically useless and the instrument suffered an unrecoverable decline.

There has been a research project centred at the Smithsonian Institution in

Continued on page 26.
TOLERANCE OF TONES.

1. On Accuracy of Measurements.

The problem of measurements accuracy is an object of mathematical transgression theory. I would like to remind the reader certain important statements of this theory. The result of any measurements contains mistakes due to various reasons. It is impossible to exclude these mistakes completely, while they would be taken into account only in average. For this purpose it is necessary to know the laws to which occasional errors are submitted. The results of actual measurements of some parameters are varying about the true value of this parameter. This variance is submitted to the law of normal (Gaussian) distribution. Without taking into account mathematical details, let us consider some practical consequences of this law.

Let the results of repetitive measurements of some dimension be \( x_1, x_2, x_3, \ldots, x_n \). Then the estimation of unknown true dimension will be mean arithmetic for all these results determined according to following formula:

\[
\bar{x} = \frac{1}{n} \sum x
\]  

where symbol \( \sum x \) represents the sum total of all \( x \) values obtained by means of \( n \) measurements. An average is usually designated as \( \bar{x} \). Variation of \( x \) due to influence of occasional errors is characterized by standard deviation \( \sigma \) determined by formula:

\[
\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}
\]  

The results of some dimension study are described by average value and standard deviation in the following form:

\[
\bar{x} \pm \sigma ( \bar{x} )
\]  

The interval of values between \( \bar{x} + \sigma ( \bar{x} ) \) and \( \bar{x} - \sigma ( \bar{x} ) \) is called confidence interval. The width of confidence interval, or, in other words, the possibility in new measurements to obtain new \( \bar{x} \) lying in limits described by equation (2) with \( \sigma = 0.05 \), is equal to 50%, with \( \sigma = 0.01 \) is equal to 67%, and with \( \sigma = 0.001 \) is equal to 95%. The last value of \( \sigma = 0.001 \) defines so called 95% confidence interval accepted in investigations of general character as reasonable objective basis for decision making.

It is useful to give an example. Let us imagine that I should make on the lathe two cylinders with identical diameters. One of them is made of boxwood, while another is made of ivory. I have made these cylinders with all possible carefulness and accurately measured their diameters with vernier calipers. Here are the results of these measurements (in mm):

Example results:
The problem arises whether I can consider the diameters of both cylinders being equal. Average arithmetical values for boxwood are 40.05 mm, for rubber 39.97 mm. Do we any reasons to consider given such initial data the diameters safely differently according to quite explainable reasons the measurement data of rubber cylinder varies more significantly, therefore final result of dimension investigation is less reliable than in the case of boxwood cylinder.

Standard deviation serves as the reliability estimate of such results. For boxwood cylinder it comprises 0.027 mm, for rubber 0.033 mm. There are several ways to decide whether the difference between averages of such standard deviations is significant. It is possible, for example, to calculate value of $d$ determined by following relationship:

$$d = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

(4)

In the case in question $d = 0.147$. I have mentioned above that the level of significance is characterised by $d = 1.960$. Our result being significantly less than this value and I can safely assume that the averages have no reliable difference and being to think that I have succeeded in my work.

So far as the question is in measurements with help of vernier caliper, it is useful to make one more remark. My calliper has vernier permitting reading with accuracy up to 0.05 mm. However it does not follow from this that the accuracy of measurements with its help is exactly such. The example considered illustrates this opinion quite well. To the readers who were not convinced by this example I can recommend to try to determine the largest diameter of boiled egg (without egg-shell) using vernier calliper. It is useful to keep in mind at that moment that there are no ideal solid bodies.

2. Confidence interval of flute tone frequency measurements.

The example considered shows that the width of confidence interval depends not only on measurement process peculiarities but also on the features of measurement object. The measurements on soft material gave more significant standard deviation, then in
solid one. The possibility arises to describe quantitatively hardness of materials through the value of standard deviations obtained in investigation of their dimensions. So far as more direct methods of material hardness investigation exist there is no sense to make use of this possibility, however the direct methods are not always available and it is easy to imagine the cases when standard deviation is the sole criterion permitting to estimate some features of measurement objects. It is important only to maintain confidence in that that such features may influence the value of standard deviation.

Frequency measurements described in Comm.181 belong to the number of such cases. Repeated measurements of characteristic frequency of some tone of flute allow to calculate average and standard deviation. The measurement method itself possessing some inaccuracy makes certain contribution to our estimate of standard deviation. However I know from many years of practice that the accuracy ensured by methods used by me at 97% level of significance is ±2 cents. At the same time the value of standard deviations for characteristic frequencies similar to those described in Comm.229 comprises about ±10 cents. How is this difference to be explained?

I would like to remind that according to initial condition (Comm.181) frequencies only of those tones are measured which were successful from tone-formation point of view (intonation considerations are not taken into account in such measurements). Guided by lip sensation I try to produce the most intensive tone without hissings and noises. Expressing in lexicon of Comm.419 tone in that case lies in optimal part of working zone of p/F-curve i.e. mutual regulation of jet velocity and "lip-to-edge" distance provide the production of tone with frequency which is the characteristic frequency of resonator under conditions of blowing-process.

To understand correctly an explanation of confidence interval width let us remember one important feature of flute-traverso structure. Changing the degree of embouchure hole closing by lip the player can change the characteristic resonance frequency. To each of these states the jet phase conditions most favourable for tone-formation can be selected. In other words with the same fingering it is possible to produce equally good (according to the sound quality) tones with different frequencies. Moreover dynamics control can proceed independently on phase conditions responsible for the sound quality rather than at their expense. Under fixed space conditions wide-bandness is connected with jet velocity variation. The phenomena of such kind are not considered in the present article context (as well as in Comm.229 - they are discussed in Comm.170). by changing of spatial conditions (i.e. "lip-to-edge" distance and connected with it embouchure hole closing with lip) some plurality of conditions arises each
of them may have its optimum. Frequency results of such optima differ between themselves forming certain interval of values to be discussed further in the present article.

Let us summarize briefly the above stated. Owing to some peculiarities of structure the traverso-flute permits to change intonation not changing the sound quality. The limits, in which such changes are possible, are determined in characteristic frequency measurements described in Comment 1. Determined by experimental data the values of standard deviations can serve as quantitative estimate of such limits.

### 3. Values of Standard Deviations

I would remind one more a statement of mathematical transgression theory. The averages determined by measurements have normal distribution relative to the true value of measured dimension. The standard deviation is also normally distributed relative to the true dispersion. Due to this fact standard deviations obtained during different measurement series can be considered as variance values and it is possible to obtain on their basis more definite representation of true dispersion. In other words standard deviations obtained in different experiments can be accumulated and used for obtaining a more general and reliable representation of confidence interval of characteristic frequencies.

Studying the instruments of Leningradian collection I have conducted a number of measurement series of characteristic tone frequencies in which for every tone 30 measurements were done. Using the data of eight of such series I have received following average standard deviations for traverso-flute tones (in cents).

<table>
<thead>
<tr>
<th>Tone</th>
<th>D...</th>
<th>B...</th>
<th>E...</th>
<th>Fis.</th>
<th>G...</th>
<th>A...</th>
<th>H...</th>
<th>Cis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dev.</td>
<td>3.7</td>
<td>10.7</td>
<td>10.3</td>
<td>10.7</td>
<td>9.7</td>
<td>10.9</td>
<td>11.1</td>
<td>12.0</td>
</tr>
</tbody>
</table>

At 95% level of significance the width of confidence interval for these data accounts for 7.1 cents. Thus the data of Table 1 characterize the limits in which the intonation of traverso-flute tones may be changed in hope to receive in this way the sound with good quality.

It was said above that the width of confidence interval at 95% level comprises 7.1 cents. It was mentioned also that some part of the confidence interval falls at the expense of error of measurement method. To eliminate this error it is expedient to use somewhat more contracted interval. Basing on this consideration I utilize the width of confidence interval equal to 7.0 cents.
The difference existing between the data of table I can't be considered as significant one at available confidence interval. In any case for practical purposes the following general conclusion would be quite reliable: when playing at traverso-flute it is possible to change tone intonation preserving good quality of sound in limits of -10 cents of characteristic frequency average value. This interval can be called as resonance band optimum zone.

4. Intonational problems.
Let us consider averaged pattern of consent maximum (s. Comm. 229). For its construction the data of consent maxima of five flutes from Leningradian collection (cat. no. 400, 402, 405, 41, 72 - s. Comm. 170, 229 and 327) have been used. With that purpose average deviations from pitch axis have been obtained, calculated on the base of deviations of corresponding tones on each of the five flutes. For each of such averages the values of $\bar{x} + \sigma$ and $\bar{x} - \sigma$ have been obtained (according the data of table 1) and put at the corresponding ordinates of diagram in Fig. 1. The points obtained have been connected and the space formed between the lines was shaded. Thus the shaded region in Fig. 1 represents the optimum zone of averaged baroque traverso-flute whose cork position correspond to consent maximum.

Diagram in Fig. 1 shows all intonationally problematic tones, i.e. all those tones in which shaded region is not crossed by pitch axis, distances by vertical serve as quantitative estimate of "problem complexity". Judging by them the most complex are $\text{E}$ and $\text{F}$ in middle register. For harmonic playing of these tones it is necessary to deviate from optimum zone by 10 cents. Then $\text{D}$, $\text{F}$ and $\text{G}$ of lower register are going with "deficiencies" price of $-7$ cents. The intonational problems for $\text{F}$ of middle register and $\text{D}$ and $\text{E}$ of upper register are less significantive ($1$- cents). The most problematic $\text{E}$ of upper register - $17$ cents - I do not discuss because 3 of 5 flutes, used for averaged pattern obtaining, are old french ones, i.e. their diapason wasn't designed for this tone taking. The summary is quite satisfactory: there are not too many problematic tones and intonational problems are not great. However only principal tones of flute were considered, while averaged pattern was utilized here only with the aim of demonstration of diagram interpretation methods based on actual situation.

As an example of actual situation I have used the data of Hotteterre flute consent maximum (cat. No 471, cork 22, A=399 cps). Diagram in Fig. 2 demonstrates the investigation results of characteristic frequencies of this flute tones. I give readers an opportunity to analyse independently this diagram and I would like to remind only that judging from playing tests the intonational problems on Hotteterre flute are minimal.

5. Optimum zone and resonance bands.
Judging from table I the width of optimum zone is the most significant in lower register, the contrary is true for upper register.
It is known from Comm.170 that the width of resonance bands is distributed by registers in analogous way. It is likely that the width of optimum zone depends on the band width and it is connected with it by some definite relationship. Basing on the data of my measurements it may be regarded that the width of optimum zone accounts for about 14% band width. This value has tentative rather than normative meaning.

Above optimum zone that of overexcitation is situated, below transition zone. Only 14% total band width fall to the share of musically exploited part. All the rest is prohibited region. To fall in it means to make an annoying slip.

One day Jeremy Montagu wrote to me: "...if the instrument sounds out of tune when I play it, I assume that is me, not the flute, that is at fault." The above cited discussion demonstrates that such position of Jeremy is more than founded. It is astonishing, however, that such examples of musician morality are sparse. As rule, the flutists prefer to blame instrument in every mistakes of their own.

To the readers of FORMHL interested in fundamentals of variational statistic without what it is impossible to understand the results of any investigations connected with measurements I would like to recommend a wonderful manual.

1982 FoMRHI List of Members – 3rd Supplement as at 6th January 1983

* in left-hand margin denotes a change of address etc from the Main List or previous Supplements. Not all of those shown have yet renewed for 1983, so that it may be that a few of them are not in fact members for this year.

Peter Berg, 46 Gt Percy St, London WC1X 9QR, UK; tel: 01-278 3196 (keyed fiddle; M,R,C,P).

Torsten Bjoerling, Grödingevägen 65, S-14700 Tumba, Sweden; tel: 0753-33089 (recorders; M).

* Arnold Black, tel: 047 571030 (add: vihuela).


Canadian Conservation Institute, Library/Bibliothèque, 1030 Innes Road, Ottawa, Ontario, Canada K1A OMB.

* William Castle, Hermann Allmers Strasse 7, 2800 Bremen 1, West Germany (vln family; M,P).

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

* Sebastian Cordes, Ditfurthstrasse 62, D-4800 Bielefeld 1, West Germany; tel: 0521/15977.

Gilbert Decock, Brusselse Stwg 504, B-1900 Overijse, Belgium (ww, bagpipes).

* Jim Downie, The Craft Centre, Aden Country Park, Mintlaw, Aberdeenhire, UK.


* Noordin Ghani, 60 Holly Avenue, Jesmond, Newcastle upon Tyne NE2 2QA, UK; tel: 0632-815872.

* Andrew Hadow, 70 George McTurk Court, Cumnock, Ayrshire, UK.

* Richard Hahn, 817 Camas, Moscow, Idaho 83843, USA; tel: (208) 882-2926.

Francis Harlow, 1928 Hollywood, Dearborn, MI 48124, USA; tel: 336-7692 (ppte, vln fam; R).

Hendrik Hasenfuss, Forsten 48a, D-5067 Kürten, West Germany; tel: 02268/7199 (lute; M).

William Hendry, 81 (b) Lothian St, Bonnyrigg, Midlothian, UK; tel: 031-663 5450 (hp.schd; M).

* Jeffry J. Hildreth, POBox 724, Pacific Grove, CA 93950, USA.

* Naomi Hirschfeld, Javastraat 18D, NL-2585 AN Den Haag, Netherlands; tel: 070-601705.

Paul Jacobs, 26A Canonbury Square, London N1 2AL, UK; tel: 01-226 7628 (flute; M,C).

* David J. Johnson, R+1 Box 18A, Crab Orchard, TN 37723, USA; tel: (615) 485-5887.

* Christopher R. Jones, 18 rue André Antoine, 75018 Paris, France.

* Jan F.H. Kalsbeek, Bornhovestr.49, NL-7201 CW Zutphen, Netherlands; tel: 05750-15469.

* Hubert Keller, (add:ren gamba, guitars, lute, M,P; recrdr, P).

* Peter Andreas Kjeldsberg, tel: 47-7-914515.

* Brian Lemin, Blue Nursing Service, 35 Sussex Street, West End, Brisbane, Queensland, Australia 4101; tel: 448051.

Thomas McGearry, POBox 2327, Station A, Champaign, IL 61820, USA (hp.schd, virglnl, clavchd; M,R,hist).

* Charles Moller, 125 Arthur Street, Surry Hills, NSW 2010, Australia (lute, hurdy-g; M,P).

Rod Nelson, Beaupré Cottage, Hay Lane, Horsley, Glos, UK; tel: Nailsworth 3061 (ren.recorder; M,P).

* Marc Nobel, 442 Queens Parade, Clifton Hill, Victoria 3068, Australia; tel: 4890371 (work) 4818754 (home).
Trevor Robinson, 65 Pine Street, Amherst, MA 01002, USA; tel: 549-0287 (wind; M,W).
Royal Northern College of Music, Library, 124 Oxford Road, Manchester M13 9RD; tel: 061-273 6283.
Huw G Saunders, 30 Clayton Road, Hayes, Middx UB3 1AZ, UK; tel: 01-573 6119 (lute; M).
* Richard E Smith, tel: Dorking 711907.
Christopher Stetson, 16 Gardner St, Waltham, MA 02154, USA; tel: (617) 899-3095 (cittern, gitar, M; lute, P).
* C Stroom, Gerrit van der Veenstraat 169 hs, NL-1077 EB Amsterdam, Netherlands; tel: 020-725533.
* Marco Tiella, Direttore dei Corsi di Liuteria, I-20122 Milano, Via Campo Lodigiano 4, Italy; tel: 02/806205.
Hugh Wackwitz, 141 Mary St, Toowoomba, Queensland 4350, Australia; tel: 076-329758 (keybds; M).
Denzil Wraight, Schückingstr. 10, D-3550 Marburg, West Germany (Italian keybds).

Organological Index

String Instrs, General: Jim Downie  Keyboards: Hugh Wackwitz
Pianoforte: Francis Harlow, Dennis & Margaret Crowe
Harp, etc: G.N.Burton, William Hendry, D.B.Singleton, Steven Clark, Thomas McGeary, Denzil Wraight
Clavichord: G.N.Burton, Thomas McGeary
Plucked strings: Steven Clark  Vihuela: Arnold Black
Lute: G.N.Burton, Hubert Keller, Martin Shepherd, Huw Saunders, Christopher Stetson
Guitar: Hubert Keller, Christopher Stetson
Cittern, etc: Thomas Rein, Christopher Stetson
Violin fam: Francis Harlow  Gamba: Hubert Keller
Hurdy-gurdy: Charles Moller, Len Stanners
Key fiddle: Peter Berg  Harp: Steven Clark
Wind Instrs General: Trevor Robinson
Woodwind: Gilbert Decock  Capped Reeds: Peter Stephens
Traverso: Steven Clark, Paul Jacobs
Recorder: Torsten Björling, G.N.Burton, Hubert Keller
Organ: Geoffrey Bridges, Brian Carlick
Crumhorn: G.N.Burton  Bassoon: Maurice Byrne
Kortholt, Cornamuse, Racket, Curtal: Greg Lewin
Bagpipes: Gilbert Decock  Sackbut: Arnold Myers

Geographical Index

Australia: Hugh Wackwitz, Qld  Belgium: Gilbert Decock
Canada: Canadian Conservation Institute, Ont.
France: Christopher Jones  Sweden: Torsten Björling
West Germany: William Castle, Hendrik Hasenfuss, Denzil Wraight
Washington D.C., collecting and metallurgically analysing old pieces of music wire. I understand that their collection includes early 17th century samples of iron wire from keyboard instruments, and none of them is significantly different from samples from other periods. This may not be relevant to the discussion here for two reasons: One is that all of the stringed keyboard instruments in fashion around 1600 had many generations of previous use and so established traditions already governed their tunings and stringings. All of the instruments with which we can associate the strong wire with were fairly new without such traditions. The second is that the special wire was probably in short supply and expensive. This would not be a serious problem with one or two treble courses on a fingerboard instrument, but a keyboard instrument is very wire-hungry.

Since only a fraction of the various types of wire-strung instruments with fingerboards seems to have used this specially strong wire, it is quite conceivable to me that all of this special wire could have been made by a secret process in one workshop. If this is true, it would be the workshop that Jobst Meuller was master of in 1621 (see the previous Comm). Guessing very roughly, if that workshop produced at least 20m of wire per day, it could provide at least 5m per year for each of the perhaps 1000 such instruments that existed.

Concerning the letter translated in the previous Comm., I can’t imagine what property other than tensile strength would have been described as “excellent steel instrument strings” and which warranted going to so much trouble in getting them. I would have expected that Meuller’s fellow masters in the Guild became upset because his strings had already reached a level of wide renown that could have reflected on their competence.* And if, in 1621, political intervention on such a high level was necessary to be able to purchase such strings, the vast majority of players requiring these strings would be finding them unavailable.

* As string makers, we have often been asked to duplicate Pirastro wound strings. The reasons why customers ask this of us rather than purchasing them directly from Pirastro could be many, and most of these reasons could have easily motivated early 17th century string customers. We can’t make such strings. Handling the very fine metal ribbons Pirastro use would require very special training and care if it can at all be done without a special automatic machine. Our self respect as string makers is nevertheless preserved because we can claim the excuse “such strings are not authentic and we are only early string makers.” It would be harder for Nuremberg master wire drawers to find as effective an excuse for their inability to make the “excellent” wire Meuller made.
On German, Italian and French Pitch Standards in the 17th and 18th Centuries.

Ephraim Segerman

The Origin and Use of Standards

When musicians have the motivation and repertoire to play together, it is at least annoying if pitch differences between their instruments put difficulties in the way. With skill and foresight these difficulties can often be overcome. Instruments with greater pitch flexibility tune to those with less flexibility. Ability in transposition helps. Extra gadgetry can help also, such as bits of plumbing and different reeds in wind instruments. But there are limitations like the breaking of strings or the expense of repitching an organ. And transposition to other than a few intervals on fixed-pitch instruments can lead to intonation problems if tuning is not in equal temperament.

Many of these problems would disappear if all instruments that would be playing together were made to sound well at a common pitch standard and kept there. This is almost a necessity for any stable musical group. Before the baroque, when the majority of good musicians in a local area were occasionally brought together for a large-scale festive occasion, a temporary pitch standard for the instruments used had to be established. In the early Baroque at least, these occasions happened regularly and usually had a religious component. It would then be hard not to use the large impressive church organ that was usually available. Since the pitch of an organ is as inflexible as can be, it was usually the prime factor in determining a local pitch standard and in inhibiting change in that standard. New organs built in the area tended to conform to the existing standard because the church involved drew from the same pool of ensemble musicians as the church with the old established organ. Those musicians had already acquired or adapted instruments to be fully effective musically at the older organ's pitch. Similarly, when old local organs at different pitches needed retuning anyway, they tended to follow the pitch of the one with the dominant musical establishment in the area. This is a way that local relatively-stable pitch standards could have been established.

One would expect that only instruments that played with the big organs or played with those that played with the big organs would be affected by the pitch standard. Instruments involved only in solo performance or vocal accompaniment or in self-contained groups still would be tuned to whatever pitches suited them best. What these pitches might be was not necessarily completely arbitrary though, since pitch and size are often (but not always) closely related, and a large fraction of the better instruments played throughout Europe were made in relatively few instrument-making centres in a limited number of sizes. So we would expect several subsidiary pitch standards for such independent instruments with relatively fixed pitches in any locality.

Stable musical groups not related to large organs established pitch standards of their own. Dance and military bands did this from Medieval times onwards. There were also chamber groups that provided music to grace various activities of the nobility such as eating and bathing, and groups that played for theater or opera. The extent to which the same musicians played the same instruments in these different groups influenced the tendency for them to use the same pitch level, which then can become a more widely accepted standard.

One can thus have a chamber pitch (Ton de Chambre, Kammer ton) that may differ from opera pitch. These may be distinct from the organ or church pitch (Ton de Chapelle, Chappell pitch), which could be different from the church choir pitch (quiere pitch, Chor-ton, thon choriste) if the choir and organ were usually related by a transposition.
These named pitch standards could be confined to quite local usage or treated as authoritative over large areas. A pitch standard can be accepted in a particular locality as a reference pitch without it being widely used there. A pitch level would usually extensively be used before it is dignified by becoming a named standard, and that standard can remain as a reference pitch after most people have stopped using it. Pitch standards could be associated with particular instruments such as the cornett (Cornett-Thon, Zinck-ton) or trumpet (Trompeten-ton) even though such instruments came in different sizes, and different pitch levels can easily be produced by each of these instruments (by breath control on the cornett and crooks and tuning bits on the trumpet). It is especially clear here that the standard represents a reference pitch easily achieved by the 'standard' size of instrument. When one instrument takes over the role of another in ensembles it can take over the name (violoncello sometimes being called 'violone') or the name of the pitch standard (Cornett-Thon becoming the usual name for the trumpet standard after the middle of the 17th century). A long-standing chamber pitch of one's own country can be called by the country's name (Teutfchen Ton) when contrasted with a newer chamber pitch used in the same country but associated with instruments imported from another country (Franzosichen Ton).

The String Band and Pitch

In the 17th and 18th centuries, bowed stringed instruments were the mainstays of chamber groups, and the violin became the king of instruments, first in Italy and Germany and later in France and England. So chamber pitch was primarily a violin pitch (though it could have been influenced by the viol in France). The highest pitch for the string band was governed by gut first-string breakage on the violin. The small-sized violin (with string stop of about 30 cm, that was popular in the 17th and less in the 18th century) could go up to about a semitone above modern pitch. The larger size of violin (with string stop of about 33 cm, that was also used then, and is the standard today) could not comfortably go much higher than modern pitch. After the invention of overspun bass strings around 1660 there was no lower limit to string band pitch level. Before then with all-gut bass strings on each instrument the lowest pitch for the ensemble was governed by the low bass and lowest viola. These were the only instruments that were expected to use their lowest strings extensively. This pitch level was about a fourth below modern for the tenor viola, bass viol and violone (double bass viol), and about a semitone higher than this pitch for the French bass violin. No pitch standards that the string band were expected to conform to went below these pitches.

There was a period in early 18th century Germany when the strings were sometimes expected to tune somewhat higher than the highest pitch for smaller violins as mentioned above. Bridge-feet marks higher (i.e. further away from the tailpiece) than the normal place between the nicks in the f holes can be found on some old violins, and this may show one way this problem was solved. Another was to use the violino piccolo instead of a normal violin. The violino piccolo was often used then in novelty pieces at pitches a fourth higher than normal chamber pitch.

The sizes of solo viols and lutes were compromises between complexity of fingering in the repertoire, which favoured smaller sizes, and the more impressive tone of larger sizes. Amateur players who did not attempt repertoire involving complex fingering tended to have larger sizes, which implies lower pitch levels. When viols were required to play with such larger instruments, and decent sound on the fourth string was required, a solution to this problem was to move the bridge down from the position between the nicks in the f holes towards the tailpiece. This can be seen in many paintings and in bridge-feet marks on the bellies of some old violins. I don't know whether the soundpost position was also moved (this could perhaps be determined from soundpost marking on the underside of the belly of such instruments). This bridge placement has the added advantage of encouraging bowing farther from the bridge, thus
softening tone and creating better balance with softer accompanying instruments.

The tuning-pitch flexibility of the string band was supplemented by a wide string-tension tolerance. So the same strings could be cranked up and down (projection and tension moving with pitch) to a considerable degree without losing musical usefulness. At stable pitch standards, string diameters were chosen which gave the desired projection and tone quality at those pitch levels (see Comm 438). Pitch flexibility was enhanced by transposition not causing intonation problems, and transposition by any arbitrary interval was a useful skill cultivated in at least some groups (see Mersenne (1636) p.248-9 in Chapman translation).

This pitch flexibility was exploited when strings played with organs, vocal choirs, opera singers and woodwind instruments, which in general were less flexible. But when the string band was not under these external influences, it gravitated to the best pitch for the violin: as high as possible for best 4th string tone, but not so high that the first string broke too often. This judgement can vary, but between modern pitch and a semitone below was a common choice. That choice would have been called chamber pitch.

Historical Approach

The historical philosophy followed here is to accept each statement of every early author as truthful and typical of his time and place. If there is direct contradiction or inconsistency, it is our responsibility to try to understand the reasons for this and then, in the light of these, to estimate what the truth might be. Condemnation of early information as false or of an early observer of his time as incompetent or confused is very much to be avoided, this usually reflecting our ignorance rather than that of the early observer.

A leading contributor to research in the history of pitch standards was Arthur Mendel. His philosophy of historical scholarship was perhaps more influenced by methods in most of the physical sciences than mine (though my training is in that field and his was not). He considered every piece of surviving historical information as suspect, and apparently considered that an historical generalization graduated from an almost-useless speculation to a statement of value only if it was statistically supported by agreement from several sources. The luxury of being able to repeat an experiment for verification in Physics and Chemistry is generally not available to scholars in Astronomy and History who are not able to manipulate the objects of their study. In both of these latter fields, one can only observe that which is available to observe and do the best one can to understand it.

Mendel put a lifetime of work into collecting historical information on pitch and trying to understand it. The final summary of his work "Pitch in Western Music Since 1500, A Re-examination" was published in Acta Musicologica (1978) and reprinted by Barenreiter (1979) as a 93 page paperback. My paper here is a re-examination of a part of the subject of his book, primarily using the information he provided there. My great debt to him is obvious. The reason why I need to cover the same ground again is that I have a different scholarly philosophy. While Mendel came to a few tentative conclusions, his general view was that the problem was unsolvable. Using the same information, I make up what I believe is a reasonable story about what was. If perchance this is the best story that can be made up taking all of the surviving information very seriously, according to my philosophy, it would be the best that historical research can offer. If Mendel were still alive, he (and I dare say, many others today) would dismiss it as a load of speculation.
German Pitch Standards

A large fraction of the information on European pitch standards that we have is from German sources which were primarily concerned with German standards. Almost all of the information relates the different standards to one another. There is enough redundancy in the information in the mid-18th century for Mendel to accept three important standards: the highest being a tone higher than one called Kammerton or high Kammerton which was a semitone higher than one called A-Kammerton or low Kammerton. In the mid-18th century the high pitch was called Chorthon or Trompentin-ton or Cornett Ton. The last two are almost certainly equivalent but Chorthon seems to have varied at different times (and perhaps places).

In 1772, J.A.Silbermann wrote (Mendel p.34 fn 23) that organs were tuned in four pitches separated by semitones, with Chorthon then being between Cornett Ton and Kammerton. He called the lowest one (that was not much used anymore) 'franzosischer Thon', an apparent equivalent to A-Kammerthon. Calling this low pitch ‘French Pitch’ is understandable since it was associated with the introduction of superior French wind instruments (oboe and bassoon) to German instrumental groups. In 1732 Mejer (Mendel p.22), who was writing about German instrument usage, mentioned that some chalumeaux were in French pitch and some in German pitch. These were most likely the lower two of the above mentioned standards.

Silbermann wrote that previously German organs were generally tuned in Cornett Ton, but since the pitch was too high for the voice, the pitch was dropped to the Chorthon he mentioned. Writers who clearly put Chorthon at the high Cornett-Thon pitch were Adlung in 1758 (Mendel p.15), Agricola in 1757 (Mendel p.74) and Quantz in 1752 (Mendel p.74). Quantz stated that the pitch was too high and was being supplanted by Kammerton “as is demonstrated by some of the most famous new organs” (p.267 English transl by Reilly). After Adlung, the organs that retained the high pitch were referred to as being in Cornett-thon, no more having the authority of a vocal pitch standard.

Before trying to interpret the rather more ambiguous information about Chorthon in the first half of the 18th century it would be worthwhile to consider the more scanty 17th century information. The major source of information of pitch standards of the 17th century is Praetorius (1619). He wrote that there was a good measure of pitch standard uniformity, and when discussing the pitches of organs (p.103) as well as other instruments, the name he usually used for the standard for comparison was 'Cammerthon'. He strongly implied that this was a widely recognized standard even where organs were pitched differently. This standard was also recognized as Chorthon in most places in Germany (p.16). He also called this standard 'rechten Thon' (p.9,14,16,232) 'recht Chor-Thon' (plate XIV) and 'rechten Chormass' (p.232). Yet when discussing instruments he often used the term 'Chorthon' to refer to a standard a tone lower than Cammerthon. He wrote (p.15) that he preferred this ChorThon as used in Prague and by various other Catholic choirs because voices and instruments sound better at that pitch. He also mentioned other pitch standards (including one a minor third lower than Cammer Thon used in some German Catholic chapels) and several pitch levels organs were tuned to.

When discussing old organs, Praetorius (p.116) stated that those tuned about a tone above Cammerthon were the most prevalent. He also mentioned that some were tuned a tone low (p.103) and that a considerable number were a semitone high (p.103). These latter organs were probably responsible for the pressure to raise the general pitch standard (“unsernen thon”) by a semitone that Praetorius (p.15) strongly argued against. This pressure for a standard a semitone higher than Cammerthon plus the prevalence of old organs a tone higher (which would be a source of potential pressure) is reflected in developments in the 18th century, and possibly before then.
When discussing the cornet, Praetorius mentioned (p.41) that it was tuned at the Chorthon a tone lower than “unser rechter Cornetten oder Cammerthon”. So he considered that the proper wind pitch (represented by rechter Cornetten-ton) conformed to the general standard (Cammerthon).

Of relevance to future developments, Praetorius (p.33) wrote that the fundamental bass of the trumpet was d in Cammerthon, and that it was recently lengthened or given a crook in some courts to play in c with other instruments and voices. Normally trumpets then played in bands of up to six trumpets of the same unmodified size. Since whenever this music was notated then it was as if the trumpet fundamental was a c, the trumpet pitch standard normally was a tone higher than Cammerthon. A powerful and conservative trumpeter’s guild would tend to keep a constant pitch standard, and despite the evidence of a variety of sizes in surviving trumpets (see Baines (1978) “Brass Instruments” p.127) we assume here that the guild maintained the same reference pitch throughout the 17th and 18th century. After the Thirty Years War (1618-48), which profoundly influenced life in Germany, the popularity of the cornet in playing with primarily stringed groups declined, and its role was taken over by the clarino trumpet (see Baines op cit p.134). Smithers has thought that this happened in the spirit of beating swords into ploughshares after the war. It is not clear to what extent either the trumpet crooked down to normal string pitch (Cammerthon) or the violin shifted its bridge or was replaced by the violino piccolo to accommodate the trumpet’s normal pitch. The latter would have been more likely in performances involving the usual old German organs which were also pitched at a tone above Cammerthon. Since this pitch was called Cornett-ton in the 18th century when the cornett was rather obsolete (when played it was usually by a trumpeter), it seems likely that the trumpeters retained this name for the pitch standard associated with the cornett’s old function. Nevertheless, if we compare Petri’s 1782 statement that Feld Ton (probably a military trumpet pitch standard) was a semitone higher than Chor-ton (Mendel p.15) with Silbermann’s 1772 comparison of organ pitches mentioned above, it would seem that Feld-Ton would have been the same as Cornett-ton.

An assumption implicit in the above is that Praetorius’s Cammerthon was a continuously recognized stable pitch standard throughout the 17th and 18th centuries, becoming the German or high Kammerthon pitch in the 18th centuries. This assumption is very attractive because of several factors. Firstly it is based on an optimal violin pitch and the violin and its strings types were relatively constant during this period. Secondly, both trumpet pitch and the primary pitch of ancient organs were both stated as a tone above both Praetorius’s 1619 Cammerthon and the Kammerthon of late 18th century writers.

And now back to a consideration of Chorthon between Praetorius and the middle of the 18th century. In 1698, Muffat (see translation in Boyden’s “History of Violin Playing” (1965) p.204) compared two French lower pitch standards with ‘German’ pitch (most probably Cammerthon). He then mentioned that the French considered Cornett-ton “too forced and squalling”, and that he preferred “Chor-ton which has sufficient sweetness mixed with vivacity”. It does not appear to me that he intended here to directly contradict the French opinion, yet Mendel wrote (p.15) that “Muffat apparently considers Chor-ton and Cornett-ton identical.” In support of this he stated that amongst the contemporary translations of the Muffat book, the “French text is unambiguous on this point”. He uncharacteristically did not provide the relevant quote, but he did give the Italian translation that Chor-ton was “una voce piu Basso” than Cornett-ton. I am not enough of a linguist to sort this one out. The possibilities for the Chor-ton standard Muffat recognized would be the same as Cammerthon, the same as Cornett-ton, or even the semitone inbetween.

That some people at least did not yet consider Chorthon as high as Cornett-ton then is shown by the 1713 Wurzburg Protocol (Mendel p.15) where an additional fee was asked to fix two old organs each to play at either standard. The proposal was otherwise to
lower their pitch levels to Chorthon.

In 1717, Kuhnau wrote (Mendel p.13) that Cammerton was either a tone or a minor third lower that Cornet-ton. He apparently did not by name distinguish between the Cammerton descended from Praetorius and the new semitone-lower Cammerton introduced with the new French woodwind instruments. Kuhnau used Chorton when referring to the Nicolaus-Kirche organ and Cornet-ton when referring to the Thomas-Kirche organ. Mendel (p.13 fn6), perhaps optimistically, stated that the pitches of these instruments were the same. If this were not true, it is possible that Kuhnau's (and his successor J. S. Bach's) Chorton was a semitone lower than Cornet-ton. In Kuhnau's directions for playing a contata (Mendel p.13), it is clear that his Chorton was a tone higher than Cammerton, but which Cammerton is by no means clear.

Walter in 1732 (Mendel p.15), when defining Cammerton, stated that when a piece is not to be played in old Chor- or Cornett-tone, it should be played either a tone or a minor third lower. Here again it isn't quite clear whether Chor-tone was the same as or different from Cornett-tone, but the use of the term "old Chortone" leads me to believe that they were equal. Quantz frequently used the term "old Chorton" and associated it with the old organs. If Chorthon previously was a semitone lower than Cornett-ton, the new standard associated with the old organs would have been distinguished from the old standard by the name 'old Chorton'. This is not as ridiculous as it sounds. The Cornett-thon pitch level was extensively used since ancient times and this would just have been a belated recognition of its obvious authority.

The only other German pitch standard named in Mendel's most comprehensive review is Opera pitch. J.A.Silbermann built three organs dating from 1736 to 1750 in Opera or French pitch (Mendel p.34 fn23). Mattheson (Mendel p.15) wrote that Chorthon was from 9 to 14 commas (about a tone to a minor third) higher than Opera and Cammerthon. This probably means that Opera pitch and orchestral pitch varied between the two Cammerton standards previously mentioned. The Chorthon here would have to be the same as Cornet-ton. Mendel does not date this quote, but if it was quite early in the 18th century, it would throw out my semitone-lower possibility hypothesis for Chorton mentioned above. At any rate, the above quotes indicate that Opera pitch tended to be lower than the ordinary (or high) Cammerthon standard in the first half of the 18th century.

In summary, I know of no information that contradicts the following scheme of German pitch standards in the 17th and 18th century: The basic chamber pitch (Cammerthon) persisted throughout the period, being at times also called German pitch or high Kammerton. Trumpet pitch was also constant, and when the trumpet usurped the cornett's function in music with different instruments after the middle of the 17th century, it took on the name of Cornett-thon. It was a tone above Cammerthon. Another chamber pitch a semitone lower than the basic chamber pitch started around the beginning of the 18th century and died out late in the century. Having resulted from the introduction of French woodwind instruments, it was sometimes called French pitch. Other names for it were low Kammerton and A-Kammerton. Opera pitch varied between the two chamber pitches. There were two accepted Chorton (choir pitch) standards at the beginning of the 17th century, one being the same as chamber pitch and the other, mostly used in Catholic churches, being a tone lower. The lower one faded out as a reference pitch during the 17th century, and possibly the higher one as well. During the middle third of the 18th century, Chorthon (or old Chorton) was the same as Cornett-thon, a tone higher than the basic chamber pitch. Before then, the situation is not now clear. Around 1700 Chorthon could have been at the earlier 17th century value (basic chamber pitch) or a semitone higher or a tone higher. From shortly afterwards, only the two higher possibilities are tenable. In the final third of the 18th century, Chorthon dropped a semitone to a semitone above basic chamber pitch.
These pitches can be put on an absolute basis by an analysis of the diagrams for a set of organ pipes that Praetorius gave (p.232). A good summary of previous calculations of the resultant ‘rechen Chormass’ or basic chamber pitch is given in FoMRHI Comm 342 by G. Gwynn. The conclusion is that this pitch is about 1/3 semitone lower than modern a’=440Hz.

Mendel’s conclusions about absolute pitches used relied strongly on the pitches determined from surviving organs. He felt that before the 19th century statistical adherence to a standard could not be expected to be more accurate than plus or minus half a semitone (p.79 fn88). Thus a completely random distribution of pitches could be sorted into a series of semitone categories. He picked the category of each pitch according to the number of full semitones away from modern a’=440Hz it fell closest to. Assuming his view of accuracy, if one is to attach significance to whether a pitch is in one category or one a semitone away as he did, the central pitch of each category needs to be determined with considerably higher accuracy than plus or minus a semitone. So the choice of modern pitch as a basis is not as arbitrary as Mendel apparently thought. There are advantages to choosing 1/3 semitone below modern as a basis. For example, Mendel’s speculations on the Salzburg pitch at the time Mozart was there (p.78,80) become much less anomalous if the 1/3 semitone lower basis were used. Also the distribution of pitches derived from surviving organs which were at Cornett-thon centres better around two semitones higher than the lower basis than two semitones higher than modern.

I have more confidence in the pitch reproducibility of the blowing of a pitch pipe by a trained organ maker (not just anybody) than in the probability that a surviving organ pipe is still at the pitch it sounded when originally made many tunings ago. Restorers today can be remarkably optimistic when they declare that something is in “original condition”. They often don’t credit the instrument workers hundreds of years ago with the skill (that they themselves have) of making whatever they have to do to instruments look like it was always that way. This is a reason why I have focussed here on surviving information about early pitches rather than pitches derived from surviving instruments.

Italian Pitches

Quantz (1752) and Agricola (1757) discussed some Italian pitches and Agricola reported (Mendel p.74) that Roman pitch was a major third lower than (old) Chorton (i.e., Cornett-thon). Back in 1675, Mocchi’s letter (Mendel p.77 fn34) stated that Roman pitch was two tones lower than German organs. If by German organs was meant the majority of old organs, as is likely, then this is the same pitch as above. This testifies to a remarkable stability, and could probably with confidence be extrapolated back to 1640 when Doni (Mendel p.72) wrote that organs in Naples were a semitone lower than Rome, and those in Florence, Lombardy and Venice were 1, 2 and 3 semitones higher than Rome respectively.

Venetian pitch would then be a semitone lower than German trumpet pitch (later called Cornett-thon). Quantz wrote that Venetian pitch was then the highest and almost the same as old Chorton (i.e., Cornett-thon). But Agricola wrote that in Lombardy and especially in Venice, harpsichords and other instruments were tuned almost a semitone lower than the same Chorton. There is clear disagreement here. One can assume (as Mendel did) that Quantz’s Venetian pitch was a fraction of a semitone lower than that Chorton and Agricola’s Venetian pitch was just a larger fraction lower, with the difference just being expected observational error. But this would imply that Quantz’s
old Chorton was not used any more since Venetian pitch was then the highest. Mendel would not have accepted this implication, but I consider it a decided possibility, always expecting writers to be optimistic and to oversimplify. When historically discussing "the disagreeable Chorton", Quantz wrote (p.267 of English translation (1966) by Reilly) that "the high Chorton began in Germany to be supplanted by Kammerton". The above assumption has the particular attraction of agreeing (except for a fraction of a semitone) with Doni's difference between Roman and Venetian pitches, supporting the hypothesis that neither of these pitch standards changed much during the interim. The apparent pitch rise of Lombardy to that of Venice as reported by Agricola, if generally true, was only temporary, as will be seen below.

Doni's pitches probably extend back to Praetorius's time because there seem not to be any factors favouring pitch-standard change in the first half of the 17th century. But Praetorius only mentioned two Italian pitch standards without identifying the region, probably not realizing that there was such a diversity. He mentioned (p.15) that organ Chorton in Italy had become the same as that of the German princely chapels. From the context this would be his Cammerthon, equivalent to Doni's Lombardy pitch. He also mentioned (p.16) that a pitch a minor third lower than his Cammerthon was much used in Italy. This corresponds with Doni's Naples pitch.

Italian pitch diversity would seem to have precipitously ended in the 1760's since in 1772, J. A. Silberman mentioned (Mendel p34 fn23) that all of Italy conformed to Kamerthon (i.e., the constant basic chamber pitch). This seems to have been the acceptance of a mean pitch (un chorista di mezzo) throughout most of Italy, as mentioned in 1800 by Gervasoni (see translation by Ellis reproduced in Grove's Dictionary 5th ed. Vol 6 p795). There were rapid changes in music throughout Europe (especially opera) after the end of the Seven Years War (1756-63), and a measure of pitch reform in Italy seems to have been part of them. Gervasoni wrote that the pitch in Rome was much lower than Lombardy, but most of the other provinces more or less accepted the mean pitch, which was that of Lombardy. This would place the Lombardy pitch in 1800 at the same level as in 1640, and makes Agricola's 1757 report that it was as high as Venice anomalous. Venice and Lombardy are adjacent provinces in the Lombardy Plain, with much interchange between them. It is possible that there may have often been instrumental groups in Lombardy that followed Venetian practices. Perhaps these were particularly popular there when Agricola visited.

In summary, the pitch of Venice was the highest in Italy, being almost a semitone above the German basic chamber pitch. It seems to have been constant throughout the 17th century and the first 2/3 of the 18th century, after which it dropped about a semitone to the Italian mean choir pitch (chorista di mezzo). The pitch in Lombardy was about a semitone below Venice pitch and seems to have stayed constant throughout the 17th and 18th centuries except for fleeting flirtations with Venice pitch. Florence pitch was about 2 semitones below Venice pitch in the first half of the 17th century, and we know no more about it until it probably joined the Italian mean pitch in the final third of the 18th century. Roman pitch was constant throughout the 17th and 18th centuries at about 3 semitones below Venice pitch. Naples pitch was about 4 semitones lower than Venice, and we know no more about it until the final third of the 18th century when it probably joined the Italian mean pitch.

French Pitch Standards

In 1698 Muffat wrote that the "Lullists" instrumental pitch was a whole tone lower, and that their theatrical (i.e., opera) pitch a further semitone lower than German pitch (i.e., Cammerthon). Perhaps he didn't use the term 'French' pitch because this already had a different meaning in Germany. That would be the low Cammerthon a semitone higher, which could be as high in pitch as the new French woodwind instruments could easily be raised by modifying reeds and staples. It is also possible that this pitch was
already in use, primarily as a woodwind pitch in France, but not yet given recognition as a standard, so then the name 'French' may have been ambiguous. And perhaps he used 'German' rather than 'Cammerthon' because of the ambiguity between the two Cammerthons.

Quantz (1752) wrote (Mendel p.74) that the pitch in Paris "about 20 years ago" (actually, he visited there in 1726-7) was the same as Rome. Agricola wrote that the former French pitch was about the same as Rome. This is the same pitch as Muffat's French Instrumental pitch.

Quantz also mentioned a "very low French chamber pitch" (p.268 of English translation) and that A-Kammerton was the mean of this pitch and Venetian pitch. If Venetian pitch was as high as old Chorton, as Quantz would seem to have implied, the very low French pitch would be 6 semitones lower. If, as seems more likely, Quantz was not attempting to be as precise as Agricola was, and Venetian pitch was more like Agricola's semitone lower than old Chorton, the very low French chamber pitch would be about the same as Muffat's Opera pitch.

This pitch a minor third lower than Muffat's 'German' pitch is what I deduce as the most probable pitch for Mersenne's viols (1636) by an argument involving Praetorius's statement (1619) that English viols playing without accompaniment were tuned to the same pitches as German viols (but were nominally a fourth higher) and Mersenne's statement that English viols played at a tone lower than French ones at the same nominal pitches. Both authors made errors in writing about the subject, and since this has caused some confusion and controversy, a fuller discussion of these statements is given in the Appendix.

Since France was administratively and financially a highly centralized country we are not surprised about the lack of reports of regional pitch differences. Similarly we should not be surprised that the terms for orchestral pitch standards 'diapazon' and 'Ton de Chapelle' relate to the organ, indicating that the difficulties of playing other instruments with the organ were largely eliminated by pitch standardization. So we can expect that the French instrumental pitch standard mentioned by Muffat Quantz and Agricola was also an organ pitch. This would correspond with Praetorius's preferred Chorthon (a tone lower than 'rechte Chorthon' or Cammerthon) which he said was prevalent in Catholic Chapels. He wrote nothing about French pitch, probably because he didn't have the information, French musicians travelling in Germany then being very rare. It is quite possible that French organs were at this pitch then since there was no apparent source of pressure to change their pitches during the 17th century.

As for the second half of the 18th century, Quantz wrote that current (1752) Parisian pitch was "beginning almost to equal that of Venice." (p.267 of English translation). One might have suspected him of gross exaggeration if there wasn't the confirming evidence of Gervasoni (1800) that the pitch of Paris was much sharper than that of Lombardy or the Italian mean pitch (which according to Silbermann was the same as German Kammerthon). Silbermann (1772) also mentioned that all kinds of instruments were generally tuned to Kammerthon. So this pitch (or just possibly the A-Kammerthon standard a semitone lower) would have been Leopold Mozart's normal pitch when he wrote a letter in 1764 (Mendel p.80) stating that the pitch in Paris was very low. There obviously are two pitches here. In fact, there are at least three French pitches written about in the second half of the 18th century. The single pitches mentioned by some authors reflect some combination of their own limited experience and interests, variations in true popularity of a standard and the adherence to a well recognised standard ignoring deviation. In 1789 Laborde (Mendel p.75) wrote that the actual pitch used in all sorts of music was much higher than "le diapazon" (a recognized pitch standard) and that the pitch of the organs of ordinary cathedral churches was much lower, like that of many old churches. His high pitch could easily be the same as Quantz's and Gervasoni's Paris pitch. Rousseau (1768) wrote (Mendel p.75) that there
was Ton du Choeur for plain chant in churches, and for concerted music a Ton de Chapelle and Ton d'Opera. He added that the latter was not fixed but in France it was normally lower than any of the others. Rousseau mentioned no independent chamber pitch, and since the Ton de Chapelle served as the main sacred and secular standard, it probably corresponds with Laborde's "le diapazon" and the pitch that Leopold Mozart commented on. This is probably the universal Ton de Chapelle that Dom Bedos (1766) wrote about (Mendel p.75). Rousseau's Ton du Choeur could reasonably be associated with the lower church pitch Laborde mentioned.

Placing these pitches from these statements is an impossible task. But assuming that the statement of 'much lower' by Moiart means a semitone, and that his normal pitch was Kammerthon, leads to a rather attractive result. The Ton de Chapelle then becomes a semitone lower than Kammerthon, a standard the Germans called 'French Pitch'. Perhaps when Silbermann wrote that it was not much used anymore, he was referring to France as well as Germany (the high pitch was taking over in France; Laborde wrote that it had 8 years later). If we make the same semitone assumption with Laborde's statement about the relationship between this pitch and the low pitch associated with old organs; that low pitch becomes the same as Agricola's former Paris pitch which goes back to the 17th century and possibly earlier. Whenever Rousseau's Ton d'Opera drifted down to a semitone lower than any of the other standards he mentioned, it would have been the same as Muffat's Opera pitch almost 3/4 of a century earlier.

To summarize, the scheme of French pitches that results from the above discussion is as follows: There seems to have been a low French chamber pitch at about a minor third lower than the basic German pitch (Cammerthon) that was used during the 17th and at least the first half of the 18th century. It was also used for Opera during the latter part of the 17th century and occasionally during the 18th century. About a semitone higher was the usual instrumental and church pitch of the 17th and first third of the 18th century. After that it was just a church choir pitch and the usual higher limit of opera pitch. About a semitone higher was a pitch of woodwind instruments late in the 17th century adopted some by orchestras early in the 18th century. By half way through the 18th century it was adopted as the standard Ton de Chapelle for organs and instruments. But the situation then was confused by strong pressure to raise the standard to a tone higher. The Ton de Chapelle remained dominant during the 1760's, but during the 1770's dominance in practice passed to the very high pitch (almost a semitone higher than German Kammerthon) for chamber instruments. This persisted to the end of the century.

Appendix

Mersenne on English Viols

Mersenne wrote (Harmonie Universelle Vol III (1636) p.198-9 in Chapman translation), "The English play their pieces a tone lower than the French, so as to render the harmony softer and more charming, and consequently their 6th open string makes the C sol, whereas ours makes the D re sol ... From this it follows that they mark more flats and sharps of which we ordinarily make no use." As an example of viol music, Mersenne reproduced a Fantasie in six parts by 'Anglois de Nation'. It is in D with a key signature of one flat. As shown by Vaught (Galpin Soc J.XVII (1964) 17), this piece is a fancy by Alfonso Ferrabosco II which appears in 6 English manuscripts in C with a key signature of 2 flats. This piece also requires the sixth string of the bass viol to be tuned down to C. The version Mersenne reproduced, by being transposed up a tone, did not require retuning the bass viol's 6th string and also reduced the number of flats in the key signature.

There are two competing hypotheses for trying to understand the statement. First,
only the 6th string of the English bass viol was lower than the French bass viol, and second, all the strings of the English treble and bass viols were tuned lower. These sizes had the same nominal tunings that the French used. We will not consider the tunings of middle-sized viols, some of which (at least) would have had lower nominal pitches than the French used. Since the final part of Mersenne's statement mentions marking sharps as well as flats, that part was not just the consequence of what happened with the example he gave, but rather that English viol players were willing to play music with a signature having more sharps or flats than French players. The big problem with this part of the statement, shared by both hypotheses, is how the relationship "from this it follows" (d'ou il s'enfuit) can make sense. In reality, neither tuning hypothesis would lead English viol players into more remote keys, so we have to imagine how Mersenne could have made this mistake. The hypothesis which offers the most convincing explanation adds to its credibility. I can't think of any way retuning the lowest string of a bass viol could effect the key a piece is written in. But if all the strings of most viols were tuned a tone lower than they should be, and Mersenne imagined that they had to play with other instruments at 'proper' pitch, they would have to transpose.

There are no other problems with the second hypothesis. The phrase of the statement involving the retuning of the 6th string of the bass (or treble) viol naturally follows as an example of the tuning being described. But there is a serious remaining problem with the first hypothesis: It is how the retuning of one string on one of the six viols can possibly render the harmony softer and more charming. The low C (English version, D in French version) doesn't even appear in the first third of the composition that Mersenne reproduced. This just doesn't make sense and I can't imagine any misinformation Mersenne could have received or misunderstanding he could have arrived at that would have warranted that statement. Translating "un ton plus bas" as "a softer sound" rather than "a tone lower" shifts the problem, and then "consequently" (consequemment) makes no sense. In conclusion, the hypothesis that English viols played at a tone lower pitch standard than the French is by far the most probable.

Praetorius on English Viols

Praetorius (1619) when discussing viols (Syntagma Musicum Vol 2 p.44) wrote (translation in Bassaraboff p.368,9 with some modification) "The English when they play them alone [i.e. without other types of instruments] sometimes tune them all a fourth; sometimes a fifth lower [than the usual pitches] so they [usually] reckon and hold the lowest string of the small bass in D, of the tenor and alto in A and of the treble in e; the other way, they [the viols] are tuned as may be seen above in the table [of German viol tunings], each one (reckoning by the Cammerthon) a fifth lower; namely the bass in GG, the tenor and alto in D, and the treble in A. And this tuning gives much more pleasant, magnificent and majestic harmony than the ordinary tuning."

He knows, for example, from the unison voice and viol section of Robinson's "The Schoole of Musicke" (1603) that English treble viols were tuned an octave above, and tenor viols a fourth above the bass, so Praetorius's tunings for these are a tone too high. He wouldn't have made this error if he actually played the instruments or received enough competent information about them from English players. Partial information from fleeting experience with English viols or an English informant could have allowed him to infer his wrong conclusions. He particularly referred to the lowest strings of each size, and if he only plucked these after a performance, and if the bass happened to have its D down to C at the time, he would have noticed that the relative and absolute tunings (he probably carried a pitch pipe) were just like his German ones. If he subsequently asked what tuning pitch the English read the bass viol at and was told D, he would have inferred what he did.

This scenario for his error places the normal English viol 6th string pitches (playing
alone) at A, D and A, a fourth below nominal pitches (in Cammerthon). But Praetorius's pitches are a fifth lower than the nominal tunings he erroneously assumed. He stated that the English tuned their viols a fourth or fifth lower. The inclusion of the fourth in this statement could only have come from an English informant who knew what German Cammerthon was. The inclusion of the fifth could have been either from the informant as well or from his own observations according to the above scenario. If the former was the case, the English viols used both standards and if the latter was the case, only a fourth below Cammerthon would have been used. This would be the situation with any scenario that led to a fourth-lower standard.

A competing scenario which leads to a standard a fifth below Cammerthon is that Praetorius only tested the bass viol's pitch and found that it was the same as his own. He asked what pitch at was assumed to be at and was told D, a fifth higher. He then assumed that the pitches of the other viol relative to the bass were the same as in Germany, and so reported all of their pitches a fifth higher. I like this scenario less than the other because the assumption of constant relative pitches between different viol sizes was a big one. Praetorius was familiar with the writings of Martin Agricola (p.204) where the relative pitches given are very different. I feel that if he hadn't thought that he had found the pitches of the smaller viols directly, he wouldn't have mentioned them. This argument is not a very strong one and this scenario is still quite possible. A consequence of it, considering Praetorius's statement that both a fourth and fifth lower were used, can only be that both standards were used. Any scenario that leads to a fifth lower has the same consequence.

I can't imagine any scenario which seriously takes into account Praetorius's statements that they tune either a fourth or a fifth lower and that English playing pitches were the same as German pitches, that would lead to a standard different from a fourth or fifth lower than Cammerthon. Therefore, the possibilities are either a fourth lower or both a fourth and a fifth lower. Put another way, they are a fourth lower, or perhaps a fifth lower as well.

If, as is probable, English viols were not significantly larger than German ones, the fifth-lower possibility puts them at the very bottom of the useful ranges of their strings. At this pitch the practice of further lowering the pitch of the bass viol's 6th by a tone is unlikely (though not inconceivable). So when the English viols were to employ this practice, it is highly probable that they played at the fourth lower standard.

Mersenne's French Viol Pitch

Whatever experience Mersenne had with English viols, the example he gave shows that it included the practice of tuning the bass viol 6th string down a tone. Therefore the English pitch standard, if tuning practices remained constant during the interim, would probably have been a fourth below Praetorius's Cammerthon. The French viol standard would have been a tone higher, so it would have been a minor third below, which is what Muffat seems to have written for Opera pitch.

A Note On Historical Procedure

The above discussion will be accused of being wild speculation. It is a mixture of pure speculation and analysis. Yet this is part of a valid method in historical research. When the historical sources contain ambiguities or inconsistencies, the best way for the historian to extract the maximum amount of information from them is to try to imagine as many different scenarios of how each ambiguity or inconsistency could have arisen. To effectively compete for acceptance, each scenario must explain all of the relevant difficulties. In the pursuit of historical objectivity they are judged on the basis of which makes maximum use of the information given (i.e. which assumes a minimum of
source error). The scenarios which come out very well on this test are then judged according to the principle of Occam's razor, i.e. the simplest most plausible one is accepted as the best solution to the historical problem until some new information or a better scenario comes on the scene.

Of course, this procedure is not free of subjective judgement. For example, when there is apparent conflict between two sources differing somewhat in time or place or social level in their origins, one has to subjectively decide whether they are independently valid or in conflict. Nevertheless I believe that this is the most objective way of getting the maximum amount of historical information out of somewhat dubious sources.

FoMRHI Comm. 443 Converting note names to frequency values
Cary Karp

Here is yet another method for converting a reading taken by a Korg, or similar, tuner to a frequency value using a scientific pocket calculator.

Octaves are numbered as in standard subscript notation, i.e. the octave in which 440Hz is found is number 4 (A₄=440Hz), the octave above is 5, the octave below is 3, etc.

The note names, C, C*, D . . . , in an equally tempered scale are represented by the numbers 1, 2, 3 . . . (G*=9, etc.) Any cent deviation from a "whole-number" note is treated as a decimal fraction in hundredths of a semitone. That is, a note 50 cents above any C* has a value of 2 + .50 = 2.50. Similarly, 32 cents below A would be 10 - .32 = 9.68; 100 cents above E would be 5 + 1.00 = 6 = F, etc.

If we call the octave number "R", and the note name (including any fractional cent deviation) "N", the corresponding frequency "f" can be calculated by

$$f = 55 \times 2^{R + \frac{(N - 22)}{12}}$$

Getting a calculator to use this equation is simple. Each of the following steps indicates an operation to be performed on the result of the preceding step.

1. Key in the note number.
2. Add or subtract the cent deviation (in fractional form).
4. Divide by 12.
5. Add the octave number.
6. Raise 2 to this power. (This is the only "tricky" step. You will use the y^x or x^y button to do the actual operation, but may need to set things up using a memory, parentheses, or an x<->y register exchange. Check the instruction book for your calculator.)
7. Multiply by 55
8. Read the frequency in Hz.
We can take D₅ - 25 cents as an example:

Start by taking 3 - .25 = 2.75. Then 2.75 - 22 = -19.25;
-19.25 / 12 = -1.6042; -1.6042 + 5 = 3.3958. What happens next depends on the individual calculator. One method which should always work is to store the last result in a memory, key in 2, use the closest thing you have to an xʸ button, recall the memory, =. If done correctly the result of this operation (in the present example) will be 10.5254. Finally 10.5254 x 55 = 578.9 Hz.

To run things the other way round, for instance when using the tuner as an electronic "tuning fork" at a given frequency, do the following:

1. Key in the frequency.
2. Divide by 55.
3. Take the logarithm (to any base).
4. Divide by the logarithm (to the same base as in step 3) of 2.
6. Add 43.
8. Read the octave number to the left of the decimal point.
9. Subtract the octave number.
10. Multiply by 12.
11. Add .5.
12. Read the note number to the left of the decimal point and the cents deviation to the right of the decimal point.

As an example consider 407 Hz:

Key in 407. Then 407 / 55 = 7.4; log 7.4 = .8692; .8692 / log 2 = 2.8875; 2.8875 x 24 = 69.3006; 69.3006 + 43 = 112.3006; 112.3006 / 24 = 4.6792. The octave sought is number 4. Continue with 4.6792 - 4 = .6792; .6792 x 12 = 8.1503; 8.1503 + .5 = 8.65. The note sought is 65 cents higher than note number 8, i.e. G₄ + 65 cents, which is identical to G⁴ - 35 cents.

I would strongly urge anyone who might have use for the above technique but feels it frighteningly alien, somehow to get ahold of a calculator -- borrow one, or make a protracted visit to the local calculator shop -- and make a serious attempt at overcoming any fear of the device before assuming it to be of no personal use. There are plenty of other good uses to which FoMRHI members might put a calculator, and the results may well prove worth the effort. Those who have no difficulty in using calculators, but find them somewhat tedious, might want to investigate programmable calculators.
RELATIVE STRING LENGTHS OF THE CRWTH

I had a query a while ago about the bourdon strings of the crwth. It is normally assumed that these are the lowest in pitch, and yet, because the bridge is placed on a slant, they appear to be shorter than the other strings. How, therefore, did they work? I could not answer this, and so I sent the query down to Roy Saer at the Welsh Folk Museum. He has produced the answer, along with a scale drawing of the Foelas crwth, and since it may interest a number of you, I have asked and received his permission to quote his reply and reproduce the drawing. As he sent it to me, the drawing was half-size, but by the time it reaches you it will be reduced once at least and probably twice; still, there is a scale on it.

What Roy said was:

I enclose scaled line-drawings of our Foelas crwth and a copy of the Edward Jones trophy (1784). An essential factor, it seems, is the curvature into the yoke at the points where strings 1 and 2 enter it - the net result being that those strings are of about the same length as 5 and only slightly shorter than 6. In the Jones trophy the curvature into the yoke appears to be even greater.

Of course, placing the bridge less obliquely, even only slightly, would make 1 and 2 the very longest strings. However, both the trophy (where the bridge lies parallel with the near edge of the tailpiece) and the line-drawings (judging by the angles of the notches on the bridge) seem to argue against swivelling the bridge towards the R.H. sound-hole.

Thus the curve of the yoke has much the same effect as the side of the peg-box on the mediaeval fiddle, to which the bourdon string travelled, and the projecting nut or similar arrangement of the lyra da braccio.

I have for a long time found the interaction between the crwth and other instruments a fascinating subject. We all, I think, accept that it was initially a plucked lyre and was presumably the first recorded string instrument in Britain and one assumes a derivative of the Greek lyre (how did it get here? Is it a derivative of the Germanic, eg Sutton Hoo, variety? If so, how did it wind up in Wales, and presumably Ireland, if it was the main bardic instrument of the Anglo-Saxon invaders?). Leaving aside its mediaeval bowed form (eg Beauchamp Chapel, Warwick, Med & Ren plate 55) and any possible links further into England (eg Westminster Abbey Chapter House, ibid plate 54), the 18th century form as shown in Roy's plan has obvious links with the contemporary violin. Look at the profile of the neck and the fingerboard, which has the typical violin nick where the fingerboard leaves the end of the neck. There is much about the crwth that is derivative from the violin. If it had survived, do you suppose that the yoke and the neck would have been canted back and the surface of the fingerboard and the back of the neck made parallel as on the later violin? Unfortunately, the Galpin instrument (Bessaraboff p.314ff) was a reconstruction by an old man who remembered it as it had been in his youth, and is not therefore really evidential (it has the wedge neck but not, according to Bessaraboff's drawing, the nick).
Maid in the parish of Llanihangel by Richard Evans Instruments Maker in the year 1742

CRWTH Y FOELAS
Casgliaid Amgueddfa Werin Cymru, Rhif 39.7B/1
Dyluniwyd gan James G. Burge
© 1977 Amgueddfa Werin Cymru

THE FOELAS CRWTH
Welsh Folk Museum Collection
Accession No. 39.7B/1
Drawn by James G. Burge
© 1977 Welsh Folk Museum
Review of: Andrew Fairley, Flutes, Flautists and Makers, Pan Educational Music, 1982. £7.50 (available from Tony Bingham + 80p postage & packing, and probably elsewhere)

The author begins by telling us how he built up his large collection of flutes and of pictures of flautists, and he then proceeds to an alphabetically arranged and extensively illustrated dictionary of flutes and flute makers, players, teachers, etc. I noticed on p.2 that he had an albisiphone just like the Bate’s, and on p.7 a Bellisent exactly like ours, with the E flat key of different type from the other three keys, but I began to get a bit suspicious on p.13 when I saw that he had a Bizey ivory flute, originally one-key, with the same four added keys as ours, added in exactly the same way and with the same rather odd silver strengthening ring at the top of the foot joint. I then saw that he had four flutes by Bressan, one of them identical with that in the Victoria & Albert Museum, and by the time that I found that he had three Burghley flutes, each identical with the Bate’s, I was forced to the conclusion that he was a common pirate, using photographs of everybody else’s instruments to enhance his own reputation by not giving any source for illustrations nor making any acknowledgement at any point in the book.

There is, of course, very little that museums and collectors can do to protect themselves against this sort of theft of copyright. It is seldom worth suing for breach of copyright. All that one can really do is to make sure that Andrew Fairley never has photographs of any of our instruments again and to warn you and everybody that you and I know that we and they supply photographs or photographic facilities to him at our and their peril. I would ask you to pass this warning on. I have written, fairly vehemently, to Simon Hunt, the proprietor of Pan Educational Music, and have had a very satisfactory telephone conversation with him. He is intending to print an acknowledgement slip to insert into existing copies and will do something better if he reprints. If you think there may be flutes of yours illustrated here, check through the book quickly and if there are, write to him.

Such behaviour as Andrew Fairley’s does have further ramifications. My predecessor, Anthony Baines, was always most generous with photographic facilities, and I for one am eternally grateful — my Bar & Class and Rom & Mod would have been impossible without all the photographs of Bate Collection instruments. I have continued this policy; if someone asks if they can take photographs, I have always said ‘of course’. I have not made stipulations about what happens when or if they are published; I had assumed that anyone would have the normal politeness and decency to give due credit and either offer us a fee or at least a copy of the book (Tony Baines normally asked for the book when one offered him a fee if he thought that the book would be useful). However, I shall now have to change my policy. I shall have to devise a contractual form for everybody who buys or takes a photograph which will acknowledge our copyright, promise not to publish without our express permission and agree to credit the Bate Collection with a specified formula. Once upon a time we were friendly and informal, relying on custom and good manners, but it only needs one yobbo to spoil things for everybody.

Now let us take a look at the book. There are a great many photographs of famous and lesser known flautists; there are also a lot of line drawings by the author’s wife of portraits which
were not clear enough to reproduce as they stood (the author takes
great care to claim his own copyright in these — presumably he
does not want anyone else to do to him what he has done to us and
to other museums. With a very few exceptions, he does not say
where any of the portraits were taken from, so perhaps....).
There are numerous entries, which may or may not be reliable, on
players, makers, etc. One is a bit hesitant after finding that
Buffardin is said to have been born "in 1690. He was one of the
first to adopt the one-key flute." One of the first? In his
cradle? One becomes more hesitant when one reads that D'Almaine
went out of business in 1866; for one thing, read GSJ 35, and for
another, I was buying from them in Honour Oak in South London in
1976. Then I found, listed as "by Drouet", a photograph of the
Bate flute no.14, which is clearly stamped DROUETS. The wide-
spread contemporary forgery of Drouet flutes is well-known, and
when I started collecting Morley Pegge very generously gave me a
four-key flute marked DROUET, which he warned me was a fake.
Every genuine Drouet flute I've ever seen (eg Bate x14) had the
diaeresis on the e: DROUET. Finally, every reference to non-Euro-
pcean flutes is grossly inaccurate (and they're not all flutes,
either — the author is a bit reminiscent of Welch, to whom every-
thing straight was a recorder) and the illustrations are worse
(the shakuhachi looks more like the sloughed skin of a caterpillar
than an instrument; the proportions are hopelessly wrong and the
description, even though it is only one line long, has two errors
in it). So, if a number of entries one can check are wrong
(many more than those mentioned), how accurate are the rest?
Still, if you want such a dictionary and think that the pictures
would be useful (they're all a bit muddy; they're printed by
photolitho in the margins), have a look at the book. I know that
Tony Bingham stocks it as he sent me the review copy, and I ima-
gine that other music shops will also do so. And if you want any
further information about the flutes illustrated photographically
(as distinct from catalogue engravings etc — I wonder what he
did about the copyright of those? A firm's copyright does not
die like an individuals as long as the firm continues in being)
try us first; at the point at which I stopped counting, 50 out
of 80 were Bate Collection, plus a few doubtfuls.

FoMRHI Comm. 446

Jeremy Montagu

Review of: The Royal College of Music Museum of Instruments,
Catalogue Part I: European Wind Instruments by E.A.K.
Ridley, RCM, 1982, £4.00 plus 70p postage UK and
Europe, £2 elsewhere.

Brief, clear descriptions of all the European wind instruments,
illustrations of 84 of them (the bassoons shown both thumb and
finger sides, an excellent idea too seldom employed), well and
clearly printed. An excellent production and much credit is due
to Edmund Ridley, for not only did he compile it on a voluntary
basis, but much of its contents he presented to the RCM. All of
his collection, which was once on loan to Luton, is now in the
RCM. My only reservation is the price; £4 is quite a sum for a
38 page booklet, even with this number of photographs. I suppose,
though, that we wouldn't begrudge £12 or £16 for a complete cata-
logue of this collection, and this is probably most of a quarter
of it. We look forward to the succeeding volumes which will cover
the rest of this very important collection.

I take this to be the last fascicle of the Reid School check lists. I reviewed the Single reeds, the Plucked & Hammered strings and the Percussion in Q 29, the Bowed strings and Flutes & whistles in Q 28, the Double reeds in Q 26 and the Brass and the Ethnic instruments in Q 24. The only other group of instruments in the Edinburgh University Collection is the Keyboards and these are housed separately in St Cecilia Hall in the Cowgate and are the subject of a separate catalogue (S. Newman & P. Williams, The Russell Collection and other Early Keyboard Instruments in St. Cecilia's Hall, Edinburgh, Edinburgh, 1968). So we now have complete check-lists and catalogue of all the Edinburgh instruments, and a most impressive collection it is. Unlike many other collections, the lists really are complete, as can be seen especially in this latest fascicle; things that other museums tend to collect but to regard as rubbish and not to catalogue, at least not in print (one hopes that they appear in their own files), are listed here. As well as the pitch-pipes in the sense of wooden tubes with graduated stoppers, such as all museums display and catalogue with pride, there are the modern guitar tuners. There are motor horns and other such odds and ends. There are also more serious instruments, the Free Reeds mentioned in the title and also the plucked free reeds such as sansas and jews harps (with a curious repeated misprint: allow for alloy presumably) and the musical glasses, and also various organ pipes, mostly for acoustical experiment and demonstration. If I remember rightly from the 1968 Galpin Exhibition, the organ in the concert hall next door was also of interest, with a special tuning, but that seems to have escaped cataloguing.

The collection is now accessible; it is open on Wednesdays from 3 to 5 pm, and the address is Reid School of Music, Teviot Place (according to the check-lists; Bristo Square according to the poster), Edinburgh EH8 9AG. It is well worth a visit and the check-lists are well worth having.
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