

# FoMRHI Quarterly

BULLETIN 85	2
Bulletin Supplement	5
Membership List Supplement	21

## ANNOUNCEMENTS

- Galpin Soc. Colloquium on Hist. Mus. Instr. Acoustics and Technology - Call for Papers 8

## COMMUNICATIONS

- 1474 Review: *The Keyed Flute* by J. G. Tromlitz, ed. & trans. by A. Powell J. Frank 10  
1475 Review: *The Collection of Musical Instruments* at Kinitachi College, ed S. Gunji et al J. Montagu 12  
1476 Review: *Collection of Paintings and Sculptures, Wallraf-Richartz-Museum, Cologne, CD-RoM Catalogue* J. Montagu 13  
1477 Review: *Piano: Evolution, Design and Performance* by D. Crombie M. Cole 14  
1478 Review: *De Clavicordio II: Symposium proceedings*, ed. B. Brauchli K. Mobbs 16  
1479 [Response to Comm. 1454] R. White 20  
1480 In search of the well tuned clavier - I R. K. Lee 22  
1481 Some points raised by E. S.'s reply, Comm. 1468, on English citterns P. Forrester 27  
1482 [Reply to] Comm. 1445 & 1468 (para 9 & p. 69, para 1) D. Gill 29  
1483 Vihuela string quality and thickness, and the Paris vihuela E. Segerman 30  
1484 The changes from baroque to modern violins E. Segerman 31  
1485 Dividing a circumference into five A. V. Loretto 33  
1486 Old recorders for new [interesting recorder patents] P. Madgwick & A. V. Loretto 35

FELLOWSHIP OF MAKERS AND RESEARCHERS OF HISTORICAL INSTRUMENTS

Honorary Secretary: Jeremy Montagu, 171 Iffley Road, Oxford OX4 1EL, U.K.

FELLOWSHIP of MAKERS and RESEARCHERS of HISTORICAL INSTRUMENTS

Bulletin 85

October, 1996

This is a bit later than I had intended, partly because of an excellent conference here last week at the Maison Française on Arabic Music, specifically Ottoman and that of the Beduin. I read a much enlarged version of my FoMRHI Comm on the Forked Shawm (Comm.304) and prepared a small catalogue of all my non-orchestral double-reeds (a good deal of discussion on typology, classification, etc, but not yet full details such as dimensions of the instruments – this is the sort of thing that I'm slowly working on now that I'm retired with 'plenty of time'). Copies are available if anyone's interested – £1.50 or so (stamps would do) (\$2, DM 5, etc) to cover photocopy and postage. Also we've been having our own local post strike here in Oxford, which caused some additional delay.

**SUBSCRIPTION RENEWALS:** It's time to renew again. Rates are the same as last year and the year before; we have benefitted greatly from the change of printers and they are enough cheaper than the old one that we can go on holding the rates even though postage has now gone up. The basic subscription, which covers surface mail worldwide is: £10.50. For airmail to Europe add £1.50, making it £12.00; for airmail outside Europe add £3.00, making it £13.50. If you pay by personal cheque in anything except pounds, please add the equivalent of at least £5.00 (around \$8.00) to cover conversion costs. If you sent a dollar cheque for \$21.00, which would translate to about £13.50, we would only actually get about £8.50, and as a result, you would only get three quarterlies, instead of four, and those by surface instead of by air! But Eurocheques made out in pounds are OK and so are bank drafts in sterling – you pay the conversion costs with these, so don't add the £5. If it helps with exchange costs, get together with some friends in the same country and send one cheque between you (but you must include a list of all the names, otherwise you'll be OK but your friends won't get their Qs) because we only need the £5 for each cheque, not for each person. As always, if you can add a little to help those in countries where currency conversion is either impossible or ludicrously expensive, it's much appreciated.

There is a renewal form in this Quarterly. Please send it back, with your cheque, to Barbara Stanley, 21 Broad Street, Clifton, Beds SG17 5RJ. **But first look at the back of it.** A number of people are already in credit for 1997. If your name is on that list, don't pay again!

And please, unless you have to from your end, don't send your renewal by registered post – if you do, Barbara has to go down town to collect it, and she doesn't have time for such interruptions to her own work.

And please send your subscription back by the beginning of January and at the very latest before the middle of the month. As in past years, if we have not received it before the Qs are posted, you won't get your January Q until it arrives with the April one.

**LOST MEMBERS:** Has anyone come across Piero Mazzotta of Oakville, Ontario, Valdis Muktupavels of Riga, Latvia, and Marco Perini of Trebaseleghe, Italy? Piero Mazzotta's Q came back marked 'address incomplete' and I don't know what they want in addition to his name,

street name, house number, town, province, country, and zip code (and a message to his email address bounced back); the other two just came back marked RD which doesn't help us at all.

**FURTHER TO:** Comm.1460: It occurred to me a bit belatedly that I'd promised to write something on this, and what with the conference mentioned above, and that of the European Seminar in Ethnomusicology (of which, thank heaven, I'm no longer president) in September, I'm afraid it got forgotten – next time. At least I have found the old correspondence I referred to.

**A LETTER OF ENQUIRY AND ITS FATE:** One of our members (I'm keeping this anonymous because I want to argue with him here, and it's not really fair otherwise; he's welcome to come back again, named, in the next Q if he wishes, of course) wrote to me with an enquiry, which I answered, by no means by return, but apparently adequately. He wrote back (on 22nd July), and suggested that I put this part of his letter into the Bulletin: "I have finally had a brief acknowledgment from [somebody else] to the letter I sent him in February, but only after I had asked a friend of mine to send him a reminder on the Internet. As I suspected, it seems that these days people are enjoying themselves so much playing with their computer toys that they scarcely bother replying to ordinary mail. How rude! It seems a parallel to the situation before I retired some years ago, when the only way to get an answer from some businesses was to send them a fax. No matter how unimportant, a fax seemed to get an instant reply, whereas a carefully prepared letter covering important matters would be put aside as being too troublesome. Surely the decent thing is to answer correspondence in the order in which it is received, bearing in mind that not everybody has, wants, or can afford access to electronic mail. Whether being sent by normal or electronic means, every symbol, letter and punctuation mark has to be handwritten and/or punched into a machine. The only difference is that normal mail needs an envelope and stamp. I am prepared to suggest that the time taken organising them is not much different from despatching the message electronically."

I'm not sure whose side I'm on in this matter, but I would, hoping he does not mind, like to comment on it because I do get quite a lot of enquiries, some by email and some by post. Leaving aside the odd ones by post that get buried by mistake and therefore not answered until they suddenly surface, I don't think it makes much odds which way a query arrives – there's an email one sitting unanswered at the moment from Arnold Myers about horn mutes, and it has sat there for a week and will have to wait till I've finished FoMRHL. In my experience, queries don't get answered for two reasons: a) I'm busy on something else for the moment, and what's urgent for the enquirer is merely an interruption for me; b) in order to answer it, I've got to go and look something up (and first find the right book), look for a horn mute and measure it, or make some other effort which, just at the moment, I don't feel like making; and c) it seems to me a silly question (that was one that came by email a month or two back which I simply ignored). Now which of these reasons applied to the chap he asked, I don't know (he may have been away, of course; some of us do go off for quite long periods on research trips connected with our jobs), but I think that it is important to stress that a lot of people go to a great deal of trouble to answer questions (I owe immeasurable thanks to a great many people for help over the years) and that they do this entirely in their spare time, often taking time away from work that may be more important, certainly more important to them than answering my questions, and from work that they are being paid to do. And equally important to stress that people don't

always have the time to do this, especially that they don't always want to spend time, and postage (air mail letters now cost 43p just for the stamp), saying 'sorry, can't help' – that is something that is much easier to do on email, of course. It looks as though I'm coming down against David, but I don't think I am – we do all try to help – just don't blame us on the odd occasions when we fail!

**OTHER NEWSLETTERS:** David Way/Marc Ducornet/Zuckermann have sent out an interesting *Early Keyboard Notes* with new address and new emails (see Memblist Supplement herewith) and useful information and gossip about their own and others' activities.

**CONFERENCES:** The third International Clavichord Symposium will take place in Magnano next year, September 24-28, with a special theme of Haydn's keyboard works and that of his Viennese contemporaries. Anyone wanting to give a paper or a performance needs to get in quick to Via Roma 48, I-13050 Magnano (BI) with, for the former a synopsis and, if you've not been there before, a cv (ie, why should they listen to you?). You'll find a review of the proceedings of the second Symposium herewith.

The American Musical Instrument Society has a meeting in Washington next May 15-18, but it's already too late to offer a paper.

Arnold Myers is organising an Edinburgh meeting of the Galpin Society 21-23 August next year with a subject of Historical Musical Instrument Acoustics and Technology. If you want to read a paper, send him an abstract (150 - 200 words) as ASCII text (plain ASCII or HTML, not as an encoded attachment) by e-mail or on diskette by 2nd December; he's in the List of Members.

**COURSES:** West Dean College (West Dean, Chichester PO18 0QZ) has a series of instrument-making courses, several on the weekend of January 10-12 (a bit silly really; you have to choose whether to make moulds and jigs for viols, violins, or fretted instruments because they are all on the same weekend) and a 9 day course March 26-April 4. They've also got some playing weekends, Viol consorts with Alison Crum, Nov 29-Dec 1; Renaissance music with Nancy Haddon, February 14-16; Renaissance band with Jeremy Barlow April 4-6.

**CODA:** That's it for the moment. Remember to send in your renewals, please – it helps us, as well as making sure you get your January Q on time, to have the renewals before Christmas.

**DEADLINE FOR NEXT Q:** 2nd January, I suppose – there's no post on the 1st – but it would help to have things earlier since mail is always delayed at that time of year. Why not get your Comms, notes for Bulletin, and anything else into the post NOW with your renewal! Remember, too, that you can always send by email, either to me or Eph – as far as I'm concerned, it has to be ordinary email – I've had no luck with 'Attachments' – they arrive as strings of funny numbers etc. Have a good winter.

Jeremy Montagu  
Hon Sec FoMRHI

## BULLETIN SUPPLEMENT

Ephraim Segerman

Sutton Hoo lyre

A strings enquiry also asked for suggestions for peg designs for an instrument based on the Sutton Hoo lyre. Some of you might be interested in my reply. The Crane book indicates that original pegs survive, they were made of willow or poplar (generally, before the late baroque, tuning pegs were made of softer wood than whatever they were inserted into), and were 'evidently made for use with a tuning key'. An ordinary peg head without a tuning key would probably have done the tuning job for the six strings well enough for practical purposes, but the tuning key most probably had important symbolism. We often see medieval depictions of King David with a stringed instrument, holding a tuning key in one hand. Since the greater leverage lets us tune a gut string much more finely with a tuning key than with a peg head, as Lawrence Wright once explained to me, this apparently symbolised full understanding of music theory and masterful execution of its proportions in tuning. This lyre was buried with a king of East Anglia, and the tuning method of a lyre made for him could well have been intended to broadcast that his musical prowess was in the same league as King David.

Possibly the most widely known depiction of an early lyre is *British Museum Vesp. A. i.*, published as Plate 2 in Galpin's *Old English Instruments*. I don't remember seeing discussion of what the player is holding in his right hand, which looks like a mushroom or champagne cork. It is the wrong shape and is held the wrong way to be a stiff plectrum, but it could be a convenient way of holding a quill embedded in it. Then the strings could be stopped by the nails of the left hand. Alternatively, the left hand nails could be doing the plucking and the object held in the right hand could be stopping one or two strings against the soundboard, with sliding around like on a Hawaiian guitar a possibility.

Response to Roy Chiverton's Comm. 1464

As mentioned in Comm. 1200, I measured the total lengths of sackbuts directly from the drawings, including mouthpieces and bells. The *gemeine* (A) did not have the mouthpiece inserted, so since its width was about the same as that of the *alt.* I assumed that the amount of insertion was the same as with the *alt.* In Comm. 1371, the added contribution to the total length of the Schnitzer sackbut by the mouthpiece was given. Thus the measurements were all of the same thing (total length), and thus are comparable. No account was taken of the considerable effect on pitch of the detailed construction of the mouthpiece or the bell. This does not in any way challenge the validity of the measurements or of the comparisons. Because these effects were not taken into account, the increase in total length for an equal-tempered semitone will not be the theoretical 12th-root-of-two factor, and was measured from the slope of the plot of the real variation of length with pitch.

Roy's reluctance to lip to pitches he is less comfortable with is a consequence of his training and experience. I don't have any of his training and experience, and find it no easier to lip near the top of the pitch range for a note at a particular slide position (the modern norm) than to lip a semitone lower. I am not going for the projection he is. Lipping up from the modern norm without breaking into the next vibration mode is very difficult, but it is obviously very easy from the semitone-lower standard. Praetorius's trumpet had the same relationship between total length and blown pitch as his sackbuts, so the same blowing style was used on it. With no slide, notes other than the natural modes had to be lipped. The surviving 17th century trumpet repertoire includes pieces where natural modes had to be lipped up and down a tone for short ornamental notes (see Peter Downey in *Early Music*, Aug. 1990 pp. 417-29 and May 1996 p. 267).

I am not experienced enough to comment constructively on the observation about the relationship between pitch change and slide movement that Roy reports.

The English cittern in the second quarter of the 17th century

Another bit of the history discussed in Comms 1422, 1445 and 1468 has come into focus. For a few decades after the strong wire became unavailable, the cittern (usually specifically the cittern head, which was that of a fool) was mentioned frequently in theatrical scripts, often

associated with barbers. Robert Fludd, writing in 1618, offers a possible explanation. When discussing the cittern, which he said was commonly played alone in barber shops (as well as in Consorts), he mentioned that the strings were all brass. The tuning given was an octave lower than the tuning with the strong wire. Unless a very low pitch standard was used, only a small cittern could be strung and tuned this way. Thus it is likely that the small cittern, with brass strings tuned an octave lower than previously, was played largely in barber shops in those decades, and thus was well known to theatrical audiences.

As time progressed, more of these citters were probably tuned so that players familiar with lute or bandora fingering could play them. This would be relatively as Praetorius's Englishman did except, since alternative tuning as a cittern didn't have to be catered for, the fourth course was an octave lower (lower than the third). Either iron strings on top or twisted brass on bottom would be needed (both would be appropriate if normal pitch standards were applied). By the middle of the century, almost all such instruments that Peter Leicester (writer of the Tabley ms) knew of were tuned this way (as gutters), and renowned players could be discussed. These were the improvisers, while those who couldn't improvise had to be contented with reading the earlier cittern repertoire which was still available. The readers were almost all amateurs who only attempted easier pieces. These players resurrected the larger cittern, which for such pieces, required less precision in fingering and sounded more impressive. As this was only an amateur's instrument, there were no renowned players for Leicester to mention.

#### The professional early musicians rule OK

The problem of too few younger members was being discussed in the Committee meeting of my local Early Music Forum, and I suggested that we promoted performing early music to young people as something to do that is classier than folk music but much easier and quicker to learn enough to play proper music than in most aspects of classical music. Several other members of the Committee objected because the professional early musicians wouldn't like anyone to say that. For the same reason, the editor of one of the early music magazines was uncomfortable about my writing in a paper that using a particular historical practice could attract more amateurs because it was easier than the modern way. There are many in the movement who believe that what is good for the professionals is automatically good for the whole movement. Their success gives the whole field respectability, so they need to be supported in every way without question. I can't agree, but do appreciate the feelings of the professionals. They worked very hard to gain the respect of the classical music world by demonstrating that they meet all the standards of professionalism in that world, and don't want to lose that respect.

I am sure that the position that the early-music professional musicians have achieved is robust, not fragile as they feel it is. The standards of professionalism that they meet are those of the music-performing industry today, with no concessions to historical standards. So the industry has no criterion by which acceptance of early music professionals can be withdrawn. Also, I have never heard of what the amateurs do in any field of music ever discrediting the professionals. More playing of easy music by amateurs would only affect them by adding to the sizes of their audiences. Professionals either avoid that easy music or 'professionalise' it (either by playing it ridiculously fast, orchestrating it, or occasionally, following early practices, embellishing it up to professional standard). They are keen to maintain the distinction between professional and amateur, and there is no reason why they would not be able to continue to do so. Classical music has very many amateurs, and much music that relative beginners can play. The difference that my proposal was intended to exploit is that in the classical field, the easy music has the reputation of being exercises for children to use in learning, and then to move on, while the easy early music is proper quality music and can serve both amateurs and professionals in their own ways.

For the growth of early music to be secure, we need to get more young people involved. Converting mature modern musicians to it, which is mostly the case nowadays, is not enough.

Unrelated to the above, my recent answer to being asked for a definition of early music is 'music over 2 centuries old'. This reflects the lack of new insights into 19th c. music offered.

#### Interpreting evidence and interpreting music

I've been wondering why so many intelligent musicians and musicologists have difficulty with keeping a detached objectivity towards the evidence they collect so well in their researches. I've just realised that a possible reason is that they are interpreting their research evidence in the same way that most interpret music. That is to immerse oneself in it, and with little conscious logical thinking, a judgment emerges from one's inner self that one feels is most attractive and thus believable. A conclusion about evidence arrived at in this almost spiritual way (rather than by detached analysis) is much harder to shift if it can be shown that a different conclusion logically fits the evidence better. Luckily, it is rare that one has to face such a disparity between attractiveness and objective fidelity to evidence. When it does happen, it is much harder for the researcher to admit to him/herself that the judgment that one's professional pride is based on was wrong, than that one had just made a mistake in logic.

#### The term 'fully authentic'

A customer we've had for many years phoned up about strings. She was a cellist in the first wave of players in the baroque orchestras, and has always bought her high-twist gut D's from us, using Pirastro for the other strings. She asked about the difference between our 'first quality' and 'best' strings, and I explained that the gut is identical, but a 'best' string has a very thin coating that resists moisture penetration, acid attack and scuffing. She then asked if the coating was authentic or modern, and I replied 'modern'. Her reply was that she was 'fully authentic', and so wouldn't have the 'best' string. I decided not to upset her by explaining how much more unauthentic Pirastro strings are, and just finished taking the order.

Her concept of 'fully authentic' puzzled me. After some thought, I concluded that it makes a kind of sense if it is defined as: 'no less authentic than was considered acceptable at the beginning when the musicians and their musicologist advisors sorted out what was to be considered authentic and what was not'. I'm unhappy about my silence. While avoiding unpleasantness and preserving her peace of mind, I was in effect insulting her intelligence.

#### Baschenis Exhibition in Bergamo

Mimmo Peruffo suggests that members would be interested in the Exhibition held from 4 October 1996 to 12 January 1997 entitled *Evaristo Baschenis e la natura morta* [still life] in Europa being held at the Accademia Carrara, Galleria d'Arte Moderna e Contemporanea, piazza Carrara, Bergamo, in celebration of their 200th anniversary. It is the most complete collection ever assembled of depictions by this Bergamese artist who specialised in still lifes including musical instruments. Mimmo will be asking the Galleria if there is a catalogue or book associated with this exhibition available for purchase.

#### On the CD-RoM catalogue of museum paintings reviewed here by Jeremy

Less than half of the capacity of the CD-RoM is recorded on, giving 2,500 full-colour illustrations of 2000 inventory numbers. The resolution with the picture filling the screen is rather like that of UK television, and when one uses the software that is on the disk to look at a small area expanded, one sees no more detail of the picture, just the coloured spots it is made of. So, as Jeremy points out, when for example, one can't count the strings on the lute or harp on the Lochner *Madonna*, and may not know if one can in the original, the value to us of pictures at this resolution has some limitation. The dots are the evidence of the museum's copyright, and I doubt whether resolution will improve soon in future catalogues of this sort.

Jeremy's printouts of Lochner's *Madonna* are rather unattractive, and not being in colour, don't do justice to this new way of publishing catalogues. After being screened for printing here, they would look much worse, so I gave them a miss.

There are some museums that show their pictures free on the Internet. I expect that pretty soon, when paying for looking at things on the Internet is so automatic, easy to work and safe from fraud, that very small charges are worth making and accumulating, we will be able to look at most pictures from most museums this way, at a small affordable charge for each. That would make CD-RoM catalogues like this one largely redundant for instrument researchers.

Meeting of the Galpin Society in Edinburgh, 21-23 August 1997

## COLLOQUIUM ON HISTORICAL MUSICAL INSTRUMENT ACOUSTICS AND TECHNOLOGY

### Call for Papers

There will be a meeting of the Society in August 1997 at which papers will be read and during which visits to collections of instruments in Edinburgh will take place including the Russell Collection of Early Keyboard Instruments and Edinburgh University Collection of Historic Musical Instruments.

Edinburgh, capital of Scotland, is one of the most spectacularly beautiful cities of Europe. The Colloquium takes place during the Edinburgh International Festival which runs from 10th to 30th August 1997. The technical sessions will be held in premises of the Faculty of Music of the University of Edinburgh in the centre of the city. Accommodation will be available at very reasonable rates in Pollock Halls, picturesquely set at the foot of Arthur's Seat and Salisbury Crags yet only a fifteen minute walk from the city centre.

The papers on the acoustics of historical instruments will be held on August 21 and 22, and will be joint sessions with the International Symposium on Musical Acoustics which will be taking place in Edinburgh (August 19-22). On August 22 (and possibly 23) there will be sessions organised by the Galpin Society at which papers other than on acoustics will be presented; the theme of these sessions will be the technology of historical instruments and the history of musical acoustics.

There will be a Symposium and Colloquium Dinner in the evening of August 21st. On the other evenings there will be concerts of historical interest, possibly as part of the Edinburgh International Festival.

The Symposium and Colloquium have been timed to follow on from the International Musicological Society conference in London, August 14-20.

Papers are invited on any topic concerning the function, manufacture and technology of historical instruments: keyboard, string, wind or percussion. Papers are also invited on the history of musical acoustics. Papers should be based on the author's original research and discoveries. The language of the abstracts and presentations will be English.

An abstract (150 - 200 words) should be submitted as ACSII text (plain ASCII or HTML, not as an encoded attachment) by e-mail or on diskette by 2nd December 1996 to

Arnold Myers,  
University of Edinburgh,  
Reid Concert Hall, Bristo Square, Edinburgh EH8 9AG, Scotland Tel: +44 (0) 131-650 2423  
Fax: +44 (0) 131-650 2425  
E-mail: A.Myers@ed.ac.uk

Abstracts should be delivered electronically wherever possible rather than on paper or by fax.

Authors will be notified of acceptance of abstracts in January 1997. It is envisaged that the abstracts will be published on the Society's World-Wide Web site.

Papers should be delivered in person at the Colloquium by one of the named authors. A time of 20 minutes will be allowed for each presentation, to include 5 minutes for discussion. It is intended that there will be no parallel sessions.

At this stage, The Society cannot guarantee the publication of submitted papers. Suitable

contributions may qualify for publication in the Galpin Society Journal.

Details of Colloquium fees and registration procedure will be published in January 1997.

**2nd December 1996 - deadline for submission of abstracts**

**31st January 1997 - notification of acceptances of abstracts**

*Please notify Arnold Myers as soon as possible (preferably by e-mail) if you expect to attend the Colloquium - whether or not you intend to give a paper - to help with planning, and so that you will receive further information about the meeting and about ISMA '97.*

A full programme and information for participants will be sent to all Galpin Society members in Spring 1997.

Enquiries to:

Arnold Myers,  
Edinburgh University Collection of Historic Musical Instruments, Reid Concert Hall, Bristol Square, EDINBURGH EH8 9AG, Scotland Fax: +44 (0) 131-650 2425 (Faculty of Music) E-mail: A.Myers@ed.ac.uk

Further information will be available from the Society's Web site:

**Web URL:** <http://www.music.ed.ac.uk/euchmi/galpin/>

Review of: Johann George Tromlitz: *The Keyed Flute*; edited & translated by Ardal Powell. Clarendon Press, Oxford, 1996. 268 pp, £40.00.

THE KEYED FLUTE, Tromlitz's flute-tutor plus is the translation from his *Über die Flöten mit mehrern Klappen; deren Anwendung und Nutzen*, Leipzig, 1800 and a sequel to the same author's *Ausführlicher und gründlicher Unterricht die Flöte zu spielen* of 1791, translated as THE VIRTUOSO FLUTEPLAYER (Cambridge University Press, 1991).

The book aptly hides its true contents, as if the Art-Department (!) picked its colour scheme for jackets in advance and separate from the books proper. This one's is a fierce Barby-blue and would make the manager of a posh beauty parlour wild with joy. As would the stain-free vinyl covers. The typography-set came with the computer hardware, together with a handbook for the operator. Who evidently followed this to the letter, (pardon my pun). Believing in unity in form and content to enhance the latter, the non-design of this book proved a severe assault on my tolerance. Happily more than fully compensated once the book proper is embarked on.

The average fluteplayer will not be familiar with Tromlitz either as an authority on the flute, a prominent maker of flutes or more generally for his rôle in the musical scene of his own time. If no other praise were due, the mere fact of his translating these books would have indebted the general, and specifically the English-speaking readers to Ardal Powell, because till he undertook these translations, only a facsimile edition in German was available. (Frits Knuf, Buren, 1973, R/1991)

More, and even higher praise is merited by the fact that Mr. Powell placed this text in its historical context and perspective. Or, as he puts it in his introduction... "to acquaint the reader with the background to Tromlitz's work with the flute: to show first what was happening around him, and then how this affected him and his own contribution... (while) to provide a coherent interpretation of sources..." Of which there are: The flute market in Late Eighteenth-Century Europe; Tutors, Instruments, Music, and Performance; Aspects of Flute-Playing in Late Eighteenth-Century Europe; Tromlitz, his Flutes and the 1800 Tutor; The Text of Tromlitz's work proper, and 5 Appendices, a Register of Instruments Cited, a Select Bibliography and Sources (of the instruments examined and/or cited). All which is preceded by a Terminology, which seeks (and accomplishes) to establish the meaning of special terms in the book in advance. All of which amply fits into 268 pages.

Tromlitz's book represents a major phase in the history of (the development of) the transverse flute because its author was eminently instrumental in the development of the keyed flute. Placing its contents in its proper socio-cultural Cadre is a most fitting way indeed to handle such matters. Resulting in a book that is filled with layer upon layer of facts and figures. The occasional hiatus in that lamination of information is a flaw rather than an omission. To pick some at random: his qualifying the playing qualities of certain flutes described, becomes less arbitrary till one realises that a) Mr. Powell is a trained player as well as a maker of flutes and that b) as background research for this book he has studied in extenso over 300 flutes. The mention of the development of the French flute-scene into, ultimately, the Conservatoire could have done with some dates to put things in perspective. He is somewhat erratic by giving initials or a full name without any apparent logic. On page 20 the footnote 58 was not referred to in the text. Not expressly aiming for a specialist reader, by giving key configurations on flutes he describes only very few readers would want to (or be able) to exploit this information further. By putting them in a simple chart or giving them as another Appendix would have seemed more logical. It is an example of any scholar's dilemma: selecting one's amassed data comprehensively. As to the introduction, the mention of Gerber describing Tromlitz's tone as 'Trumpetlike' (p.50, para.1), without mentioning that Gerber has his contemporary (18th c) instrument in mind, is misleading

because most readers automatically think of the largely different instrument we call a Trumpet today. Lastly, one could get the impression that the Tromlitz flutes were the standard generic keyed-flute for the better part of the 19th century. This they were not. (If so, the amount of extant flutes by him would have been much greater than the mere handful now known.) Yet Tromlitz, though without due credit, did indeed – as the book shows – play a crucial rôle in the general acceptance and design of the flutes with (8)keys that are as representative of the 19th century as the one key flute has been for the 18th;

I would have liked a fingering chart proper in addition to the rendition of all the fingerings by numbers that Tromlitz gives. Such a purely practical flute-playing tool would have made a sensible addition to a book which, by both author and editor, is as learned as it is instructive.

Such minor complaints in a book that is enlightening, intelligently organised and very elaborately annotated are primarily intended to keep Mr. Powell's feet on the ground while we have his head – rightly so – in the clouds.

On page 44, para.2, he writes: "...The Tromlitz system flute provides the first opportunity flautists today have had of experimenting with Tromlitz's (accompanying) instructions on tone and intonation in classical music. Other keyed flutes of the 1780s and 1790s, both in English and German, support only incomplete practice of his rules, unacceptable compromise, or a complete disregard for them in favour of a system with equal-sized semitones – a system unsupported by historical theory or evidence of practice, though in widespread use by today's 'historical' performers." Here Mr. Powell in no mean terms washes the ears of those 'experts' who tend to discard the theory behind the practice. And who, by doing so, jeopardise the reasoning behind the reconstructive interpretation of 'early and less early music' in favour of yet another trend. Like 'easy listening'.

The translation of Tromlitz's text makes fluent and comfortable reading. It does not feel as a translation. No mean feat!

Ardal Powell succeeds eminently in establishing Tromlitz, with Johann Joachim Quantz before and Theobald Boehm after him as the pioneering maker, teacher and theoretician he undoubtedly was. Providing the flute world with a book that puts the development of the flute from 1800 to this day in a better and more consequential perspective. Bravo.

Review of: Sumi Gunji & others, eds, Kunitachi College of Music, *The Collection of Musical Instruments*, 2 vols, 440 & 82 pp, revised and enlarged edition, 1996, ¥20,000 for both volumes, Vol. 1 ¥17,500 (Order no. 253432), Vol. 2 ¥2,500 (order no. 253447), available from Academia Music Ltd, 3-16-5 Hongo, Bunkyo-ku, Tokyo, 113 Japan.

I reviewed the first edition of this excellent catalogue in Comm. 844 in January 1988 (Q 50) and in even more detail in *Galpin Society Journal* 41 (same year), so I won't repeat too much of what I said then, especially as regards Sumi Gunji's somewhat exotic classification system, some of which I still don't understand. What I will repeat is that the collection is worldwide in coverage and that, for early music instruments, there are many reproductions where they could not obtain originals, and that all instruments are treated, as they should be, as instruments without 'class distinction' as it were – there is no relegation of reproductions to lesser status as in many museums, nor are Japanese instruments regarded as more important than European instruments, though the reverse would happen in many European museum catalogues. Every instrument is illustrated in a small (around 35mm contact size) but clear photo, and every photo includes a scale, though as I said before this is not always in the best position.

Catalogue details are minimal; if you can see that it's got fingerholes, it's got fingerholes; if you can't see, then maybe it has and maybe it hasn't – of course it helps to know the instrument! You get the catalogue number, the number in Dr Gunji's classification system, the name, often just a class name (eg *flute*) but where identifiable the name given either by Grove or Marcuse (noted with G or M), the regional name if it's known (why is 'piston flute' a regional name and 'swanee whistle' the name?), the region it came from, the

maker if known, the date, and sometimes a one- or two-line note (eg the range of an organ and who restored by).

The collection is a major one, as you'll know from my rave reviews of their teaching catalogues of each various type of instrument in past Qs, and it is very useful to have a complete list of what's in it and, for the instruments of that part of the world, very useful indeed to have photos and specific names of so many instruments which are less familiar to us.

Volume 2 covers animal bells and such like things ('sound tools for animals') and toys. It is, I suppose, useful to have all toys together and perhaps also all animal instruments, but I wonder whether it is sensible to separate animal bells from other bells (who can tell whether this bell was tied round an animal and that one on somebody's costume, thinking of some of the folk customs in Europe), and indeed toys from other instruments of the same type, eg a toy panpipe from others, in other words an adult musician's panpipe from a child musician's panpipe?

At least we know what's in the collection, at least we have a picture of each instrument, at least we have some idea of its size, and there are very few other museums in the world of which we can say the same things – I only wish that more museums would (and/or could) follow this example.

Review of: CD-RoM Catalogue: *Collection of Paintings and Sculptures, Wallraf-Richartz-Museum, Cologne*, Diskus (Digital Information System for Art & Social History), Bildarchiv Foto Marburg, K.G.Sauer Verlag München (Postfach 701620, D-81316 München), ISBN 3-598-40309-7, DM 148.00

This is one of a whole series of CD-RoM catalogues from German museums in which every picture (and sculpture for this one) is described in detail and illustrated on the CD. Others include (mentioning only the ones that may include musical instruments) 'Italian Drawings of the 14th to 18th Century, Kupferstichkabinett Berlin'; 'The Paintings of the Nationalgalerie, Nationalgalerie Berlin'; and perhaps 'Printed Portraits 1500-1618, Germanisches Nationalmuseum, Nürnberg'. All are available both in English and in German (though see below on this).

The standard of reproduction is fantastic – on screen, or at least on my screen which is mono (ie black and white only) it's not wonderful, but printing out on my dot-matrix printer I have really quite tolerable black and white prints of paintings. Presumably with a colour monitor the screen would be better, and perhaps (I wouldn't know, not being in that class) a colour printer would produce a good colour print. If I'd got a laser printer I'd certainly ask Eph to include a print with this review; even as it is, in case he thinks them good enough, I'll send him a couple of prints to choose from of the Lochner *Madonna in the Rose Garden*; one is printed at 180 dots per inch and the other at 360 (the disc gives you the choice!); the former is less detailed, but the latter is darker. I couldn't count the strings on the harp or lute on either, but I think I can count the pipes on the portative organ. I'll also send him the CD-RoM itself in case he can print better than I can and, if he has a colour machine, to see whether he can see more on screen than I can.

One problem is that while I asked for the English version, and indeed the description of each painting is in English, the Index of

subjects remains in German. It is also very unreliable partly for that reason and partly because it pulls up everything within a class. For example, 'trombone' pulls up a painting which has any one of horn, trumpet, cornet, trombone, tuba, as does each of those words, whether the painting you look at has that individual instrument in it or not; sorry, I'm not putting this clearly; 'trombone' would pull up a painting with trumpet in it and not a trombone, and vice versa. A further complication is that the keyword is not 'trombone' but, because it's in German, 'posaun', and as *Posaun* is used in German for Latin *tuba* (as in *tuba mirum*) confusion can indeed be confounded. On the other hand, I suppose that it is better to get every necked string instrument when one calls for 'lute' than to miss one. But this is where the inaccuracy of the list comes in; the Lochner painting does indeed include a lute, and also a small lute-type, but 'lute' does not appear in the call-list for that painting, whereas clavichord-harpsichord do (no sign of one) as do lyre-cithara-psaltery (which aren't in the painting either). *Mandtrommel* doesn't appear in the Index at all, but I spotted one in a painting – what I saw on screen was quite detailed enough for that.

So how useful would these CD-RoMs be? For an art-lover, wonderful of course – to have the whole of a major museum at one's fingertips would be a dream fulfilled. As a way of seeing what there is in a museum before travelling, I think extremely useful if one had the patience to go right through the list, but without such patience the inadequacies of the Index and the inaccuracy of the listing would be very frustrating. I think that the publishers do need to call on experts in the fields which they index to make sure that they get things right. Not being an expert on, for

example, weapons, furniture, or costume, I wonder how well and how accurately they have indexed those subjects.

For what you get, the price seems to me to be extraordinarily reasonable – surely you would not get a fully-illustrated (in colour) catalogue of the museum in book form for around £55? More and more museums are publishing such catalogues and it is obviously something that we need to look out for if we are

interested in iconography and in knowing where we can find good paintings of any particular instrument. I have to confess that in this case I cheated – I asked for this museum as the one to review because I knew that the Lochner painting was there. However, I have now also found other paintings that I did not know were there, for example a superb painting of a cellist, useful to one of my students who is working on that instrument, as well as the trump mentioned above which wasn't even in the Index.

POMRHI Comm. 1477

Michael Cole

**Review:** PIANO: Evolution, Design and Performance, David Crombie, published by Balafon Books (UK), 1995. 320x260mm (13"x10") 112 pages. Colour illustrations on almost every page. £19.95. Available through SRTL, Record House, Emsworth, PO10 7NS (UK postage £3.95; Europe add £7.50; Rest of World add £14.50.)

Surprising, colourful, ambitious - here is a book on the piano such as we have never seen before. Publishers 'Balafon' have produced an amazingly lavish, pictorial presentation of pianos old and new: pages and pages of superb colour photographs, many of them specially commissioned, brilliantly printed on a scale never before conceived of. The quality of the pictures, the inventiveness of the page layouts, and the comprehensive scope of the work are all quite astonishing. At £19.95 it's excellent value and would make a lovely Christmas gift for an aspiring young pianist. Compared with other picture books on the piano this one is streets ahead.

'PIANO' is the most ambitious in a series that has otherwise concentrated exclusively on the electric guitar and related instruments in the pop music scene. Previous titles include 'The Fender Book', '50s Classic Guitars', 'Rock Hardware' and 'The Drum Book: a history of the rock drum kit'. So this new title 'PIANO' exhibits features that you might expect from such a pedigree: large format (thirteen inches by ten); page layouts with plenty of ZAP!; pop magazine style paste-up with multiple entry points scattering the attention across the page. But the downside is an inevitable degree of superficiality.

It seems to be a golden rule of editorial policy that no block of text should exceed 750 words. Most of the textual units are a lot shorter than that; punchy paragraphs in short columns. One thousand words has to suffice for the whole history of the Viennese piano; eight hundred words for more than a century of square pianos; and six hundred for the English grand to 1815. It doesn't leave a lot of space for meaningful comment.

To some extent author David Crombie has attempted to rectify this with a kind of add-on supplement, filling the last eight pages with a more studious attempt to describe the nature of the instrument, under the title 'How the piano works'. This is what one might call a general background of scientific and technological information. Some of it is quite penetrating and easily intelligible. Taken all in all, David Crombie's technical descriptions are as good as one

has read elsewhere, and full of simple insights that leave the reader better informed than before. But as you read it through you become more and more uncomfortable when the errors give you a smack like pellets from a potato gun. Try a sample: piano keys are generally made from *hardwoods* such as fir, spruce, or sugar pine (p.92, my italics). On the same page: *The introduction of the iron frame to the piano in the mid 18th century ... [Presumably he means 19th]*. Or in a section that purports to give serious information about string tensions: *Each string of a square piano with a wooden frame is under approximately 80lbs of tension* (p.87) [About four times the true figure]. And there's plenty more of a similar kind. It's very aggravating. On harpsichords and clavichords there are some spectacularly daft statements. For example, we read (on page 9): *Early harpsichords were essentially large spinets... 'Stops', operated by levers, were used to introduce various effects, the most enduring being the 'forte' stop, which lifts the dampers away from the keys, and the 'piano' stop, which leaves the dampers on the strings when plucked*.

On the modern upright and grand pianos the material is generally good, with clear pictures that contribute a great deal to the intelligibility of the message. Featured on the dust jacket is a stunning photo-montage of a model D Steinway grand with the action withdrawn, apparently suspended in mid air; the actions stands are also lifted up to show the keys and hammers separately. Inside one finds this is replicated in a fold-out feature, which is in effect a four-page spread completely devoted to the Steinway grand. Here David Crombie's copy is quite fulsome, amounting to about one thousand words, if we include pulses of text scattered all over the page as picture captions. But that's all there is on 'The Modern Grand'. No other maker gets a look in. For some unexplained reason the Bösendorfer Imperial Grand is relegated to a small entry on a later page dealing with 'The Modern Upright Piano' where the Bösendorfer 130 is featured. But this is a very poor pay-off when compared with the eulogies devoted to the model Ds from New York and Hamburg. Electric and electronic pianos are given four pages, but an explanation of the relative merits of acoustic, electronic and electrically amplified pianos is trifling, and I think, rather dishonest by omission. In '20th Century Instruments of Significance' we get all manner of eye-catching frivolities - such as a see-through piano from Kawai, or Liberace's gaudy, spangled Baldwin piano - all good fun but there's no instrument of 'significance' in a musical sense.

Historic pianos are an important part of the book, accounting for more than half of its total length. Surprisingly, this highlights its greatest weakness. I shall pass over a potentially interminable catalogue of errors concerning the early piano in Britain. As to Mr. Crombie's unfounded assertion that Gottfried Silbermann invented a Prellmechanik system for his first two pianos made in the 1730s, I suppose one could gloss over it as an irresponsible speculation. But when he says that the 'primitive Anglo-German action' had the hammer heads pointing away from the player, I begin to have some doubts. And when he says that, because Zumpe's action had no escapement it was 'impossible to play the same note repeatedly' I know we are treading on very thin ice. (Erard and Burney said precisely the opposite.)

In spite of the superb illustrations of the externals of the piano, the actions are very inadequately displayed. Rather than making technical drawings, time-lapse photographs of action models are used. Unhappily, the lighting was hopelessly inadequate and to make matters worse the pictures are reproduced on a very small scale. I defy anyone to understand them. Either these things are worth explaining or they are not. Someone needs to decide whether to do it properly or not at all.

Ultimately one's assessment of David Crombie's book depends upon the intended audience. For whom is it written? Is this a serious book hidden under the guise of a pop-culture encyclopedia? (Which is what I suspect.) Or is it a basic introduction for children and browsers? Well, if you read the flyers you find it has already had a fistful rave reviews. Michael Cockram in 'Music Business' is reported to have said that it is 'The last word in books on the piano. No other title is necessary.' I do hope he's wrong.

Review of: *De Clavicordio II: Proceedings of the International Clavichord Symposium, Magnano, Italy, 21-23 September 1995*. Edited by Bernard Brauchli, Susan Brauchli and Alberto Galazzo. Published by Musica Antica a Magnano. Text in English, abstracts in Italian, pp. 274, 22 b/w illustrations. Paper. Price: 90.000 Lire plus postage, payable in advance by international postal giro or bank order from Edizioni Gariazzo Mario & figli, Via Milano, 161, I-13069 Vigliano Biellese (BI), Italy. Tel: (+39) 015 51 03 45, Fax: (+39) 015 81 15 76. Also obtainable, price £42 plus postage, from Tony Bingham, 11 Pond St., London NW3 2PN, Tel: 0171-794 1596, Fax: 0171-433 3662

Readers who possess *De Clavicordio I* (1993) will have a good idea of what to expect from its successor: a handsome volume in A4 format, cleanly printed, containing papers (some of real importance) from scholars, conservators, makers, musicologists and performers on a wide range of subjects connected with the clavichord. The differences immediately noticeable in the second volume are that it is lacking both the short biographies of contributors and the record of the discussions after papers; also the illustrations are not quite so clear, being on inferior paper. It is remarkable that there should have been such a surge in scholarly and practical activity in this one direction. Bernard Brauchli and his colleagues must be thanked for the energy and enthusiasm which has brought forth so much, and congratulated for getting it into print so quickly (in the case of the present volume only eight months). In addition, a third symposium is already arranged for September 24th to 28th, 1997.

The twenty-three papers, inevitably of varying standards of presentation, reviewed here can be roughly divided into five categories, give or take the occasional overlap: twelve are musicological/historical (with seven of these devoted to individual composers), six organological, three scientific and two philosophical. Let us consider them in this order, even though they are arranged virtually chronologically in the book.

Jane Johnson discusses "The clavichord and sixteenth-century Iberian music for keyboard, harp, or vihuela". She considers the existence of the augmented second and tritone, tempo and metre. Some of her examples appear to the reviewer to be suspect: for instance, an augmented second or tritone to qualify should surely be in the same part and on adjacent notes, and her second example of mixed metre does not convince if one considers the relationship between strong beats and the preparation, sounding and resolution of suspensions. Christopher Hogwood, seeking "A repertoire for the clavichord" and "including a brief history of *bebung*" considers what can be gleaned from publishers' prefaces and then examines carefully and thoughtfully how *bebung* is produced and discusses different authorities' descriptions of it. Beverley Sing surveyed thirty musical journals aimed at the general public in various languages between the dates of 1829 and 1890

for her contribution "The clavichord in the musical press of the nineteenth century". Moving to later in the century, the arts and crafts movement and its relationship with the clavichord through Arnold Dolmetsch is considered by Derek Adlam. This thoughtful paper is only marred by a strange slip attributing Mendelssohn with post-mortem activity. Arriving at the twentieth century, John Barnes parallels the harpsichord revival with that of the clavichord. He shows that, although the differences between a "revival" harpsichord and a historical copy are plain to see, the differences in clavichord design are much less obvious. For we are, in effect, about twenty years behind in our building of historically-based clavichord copies compared with what has happened in the harpsichord world.

As befits his place in clavichord history, C.P.E. Bach is the subject of the most important paper in the book. This is by Joel Speerstra, and entitled "Towards an identification of the clavichord repertoire among C.P.E. Bach's solo keyboard music: some preliminary conclusions". Speerstra points to Bach's own statements, attempts to grasp the slippery terms *cembalo* and *clavier*, and proceeds to devise a method of computer-based analysis using five levels of identification: (a) frontispieces, (b) range (c) ornamentation, (d) dynamic markings and (e) compositional techniques (harmonisation, tessitura, chord textures, use of the treble area). He demonstrates his method using the Rondo "Farewell to my Silbermann clavichord" as example, incidentally showing how, in an apparently good modern edition of the work, small discrepancies from the holograph can creep in (as do, in fact, a couple of errors in his description). Twenty closely-packed pages then provide a print-out of his analyses and his present conclusions. The other paper devoted to C.P.E. is by Beverly Woodward. She carefully surveys the unfortunate continued separation of the eighteen short study pieces (the *Probestücke*) from their parent book (the *Versuch*), whereby over the years the complete understanding of the latter has been made so much more difficult. It is estimated that the book has outsold its companion pieces by about six to one!

There are papers of varying lengths on the music of Ernst Wilhelm Wolf (Paul Simmonds), Johann Gottfried Müthel (Menno van Delft) and Franz Seydelmann (Bernard Brauchli), each author staking a claim for the importance of each composer in the literature of the clavichord. "Herbert Howells: aspects of twentieth-century English revivalism as seen in Lambert's clavichord", by Bruce Glenny gives details of the dedicatees of these most charming pieces and then attempts a short analysis of some harmonic, melodic and rhythmic features. Particularly striking is the first piece of the set, "Lambert's fireside", with its mixed key-signature of B flat and F sharp and other related accidentals appearing during the course of the piece. The author suggests that this is in the phrygian mode transposed to D, with a major third. Equally valid, surely, if one has to try to nail this butterfly down, is to think of it in a modal type of G minor, with two of its elements in the key-signature and the sixth degree of the scale being inflected both ways according to the linear movement of the parts. After all, the piece does end in G with a *tierce de Picardie*.

What can one make of Jean-Jacques Dünki's "Tetrapieron, a keyboard quartet: the difficulty of integrating the sounds of piano, harpsichord, celesta and clavichord"? Having stated that the unity of keyboard instruments impresses him, he goes on to discuss "the inherent insoluble balance" in writing for this "impossible combination" (his words, not those of the reviewer). Even the suggestion of selective amplification is turned down: it must be for all the instruments or none at all. Two pages of musical illustration are not enough for the inner ear to assess things further.

Now we come to the articles on makers and instruments themselves. Luigi Ferdinando Tagliavini reveals some very interesting detective work in restoring a curious, much altered eighteenth-century instrument, leading to the conclusion that there was originally a second soundboard stretching under the keyboard. Bohuslav Čížek gives a brief history of the early clavichord in the Czech lands and then lists thirty-eight extant instruments found in Bohemia and Moravia, including one from 1839 and six from the twentieth century. (Incidentally, one of these, a Baumgartner of 1683, also has an additional soundboard under the keylevers). Bernard Brauchli and Jörg Gobeli provide a detailed restoration report on a German instrument of 1781 by Egidius Heyne. One could however query their alteration to the French-style outer case in order just to increase the amount of sound coming from the instrument.

Grant O'Brien, after providing detailed measurements of the G.C. Rackwitz (Stockholm, 1796) clavichord in the Russell Collection in Edinburgh, goes on to consider the pros and cons of restoring an instrument which can then take its place with the other five playing clavichords in the collection. He admits to his having changed his belief on this matter: "If an instrument exists in isolation either in a collection of other instruments or in total isolation, the claim that it should be restored is much weaker than if it can be compared directly after restoration with other instruments of a similar kind". As the standard examination question would say: Discuss.

Koen Vermeij has been examining documentation by eighteenth-century players and composers to find the clavichord builders they preferred. He quotes from letters, prefaces to tutors and music publications, newspapers, treatises on music theory or philosophy, and musicians' private journals. Awarding a personal points system to the twenty-five quotes found puts G. Silbermann and Friderici in equal first place, with Stein and Fritz next in order of preference. A list of preserved clavichords is then used to attempt a correlation with the earlier findings, anomalies are discussed, and a map of the main centres of construction is provided.

The final paper on instrument makers concerns the thirty-four clavichords made under Arnold Dolmetsch's direction during his five years in the United States with the Chickering company. Number 27 is compared in great detail with its putative model, namely the 1784 C.G. Hoffmann formerly owned by Dolmetsch. Among other differences, the copy is more lightly strung in

the treble than the original, nevertheless the author concludes "I do not believe the result would be received as a foreign entity by eighteenth-century musicians. One could wish that the revival had continued along the lines suggested by these clavichords".

Benedikt Claas considers "the clavichord - the spiritual foundation of musical instruments" and attempts to divine its unique character by pseudo-science mixed with philosophical jargon. We are on rather firmer philosophical ground with John Koster's paper on "The still, small voice and the exploration of inner musical space" even though his title may still seem enigmatic. We are treated to a thoughtful exposition, exploring both the compositional concepts of reaching the utterly infinitesimal in sound and also that of sound juxtaposed with silence. Examples come from a range of composers, one of which is Emmanuel Bach's striking enharmonic change in his A minor Rondo. Here E flat and G flat in one bar are converted to D sharp and F sharp in the next, but in his comments the author fails to mention that on the clavichord these notes are not necessarily the same, as they can be inflected by finger pressure in the direction of the new tonality.

We are left with three papers on scientific subjects. Thomas Friedmann Steiner surveys eighteenth-century scientists in various European countries and their (rather meagre) references to the clavichord. Particularly interesting is a geometrical construction which allows one to obtain an approximation of the string lengths necessary for equal temperament on a monochord. Next we have "A simple stringing method or an ancient craftsman's trick?" - the title of Harm Vellguth's very messy, user-unfriendly, short contribution. He does not say from whence the formula he proposes comes, he does not give the units involved in it, (the reviewer eventually found them two pages later), and he states with no further evidence at all that this magic formula will, amongst other huge claims, demonstrate "the correctness of the majority of all original gauge numbers found on early instruments built in Germany, England, France, Italy and Sweden". But the reviewer has to say that, in doing three spot checks on the formula with regard to English gauges, the calculations came at least into the ball-park (as the Americans would say): namely the diameters were within 5.9, 8.1 and 6.4 % of what are now generally accepted to be the probable values. The last paper takes us back into the realms of sober logic, where Alan S. Caro makes the case for "The Keybase project: a proposal for a standard historic keyboard archiving database". It will be a wonderful example of international co-operation if it eventually comes to fruition, but the logistical problems are mind-boggling. A report of the discussion after this paper would have been particularly interesting.

A final thought: thank goodness that not all countries were as biased against the instrument as apparently England was in 1801. In the third edition of the *Encyclopaedia Britannica* John Robison states "The clavichord gives a fretful, waspish kind of sound, not at all suited to tender expression". We have come a long way since then.

FoMRH1  
Comm. 14-79

R. White

In Comm. 1454 the Editor offered his personal thanks for Comm. 1426, before going on to correct an error about Queen Elisabeth the First's tempo in the Volta which 1426 had questioned. The Queen's tempo was not faulted. But the chief issue was the exceptional height of Her spring into the air acclaimed by observers' reports, a height function related horizontally to tempo and little related vertically.

The Editor goes on to say a poet and not an analyst will explain musical Gestalt with the least difficulty. He is, he confesses, as an analyst disadvantaged by shortage of knowledge about components and their interaction. Then it seems wrong to accept the term Gestalt. How may we describe Gestalt as a totality of parts if we don't quite know what the parts are? For that matter, how does Comm. 1454 happen to elect a poet for the explanation?

In Comm. 1454 the playing field next shifts to music as meant by the composer to create atmosphere (film music and domestically as "wallpaper music"?), as discriminatively intended for the response of those who play it or for those confined to attentive listening, or for trawling those listeners conditioned to music in utero or rewarded in infancy with morphine-like endorphins when they cried out. 1454 concludes that it will be a very long time before we really understand our emotional response to music.

Comm. 1454 omits psychologists and their helpful endeavours, from Seashore onwards. It does bring in poets and poetic sensibilities are not rare (30,000 entries for one poetry writing competition of the serious sort). One aspect of poetry is its value as "word music". Further, ancient Greek poems are rated highly by people able to cope with Greek, but this is in spite of what has long been acknowledged (1894, W.W. Goodwin in Greek Grammar, MacMillan, London, page vii) : that ancient Greek with its intricate patterns of quantities, three pitch accents available for distribution on vowels, and the uncertainty about the "w-like" sound of the digamma cannot be spoken in this era so as even to have been intelligible to Greeks in the ancient era. So what causes the acclaim for the Greek poetry? Does it, when fine, perhaps offer exposure to patterns spoken in our way of imitation that command our response with a maintained, unbroken involvement? Is the Gestalt centred in such a pattern and is the same explanation applicable for Gestalt in each of the arts? I believe an analyst would agree the factor of pattern is common in all the arts. Is Gestalt born of a pattern with special and peculiar qualities whether its elements are sounds, muscular movements, shapes and colours, or notions of things inanimate or alive and their patterns of interrelations?

1996 FoMRHI List of Members — 2nd Supplement as at 13 October 1996

\* in left hand margin = change of address or other change

- Giuseppe Alfonso, Savignano 5, I-50049 Vaiano-Firenze, Italy; 0574-946173 (recrdr; M).
- Andreas E Beurmann, Rothenbaumchaußee 116, D-20149 Hamburg, Germany; 40-44 80 757; fx +40-448-0747.
- \* Atelier Marc Ducornet; 101447.1765@compuserve.com.
- Hans Granberg, Contrada Cozze 35, I-70014 Conversano (BA), Italy; 80/4950 009 (recrdr, gmba, hpschd; M, P).
- R J Grindley, 11 Mill Road, Denmead, Hants PO7 6PA, UK; 0117-913 6292 (sml pip; P).
- Haags Gemeentemuseum, Stadhouderslaan 41, NL-2517 HV 's-Gravenhage, Netherlands (Postbus 72, NL-2501 CB 's-Gravenhage, Netherlands; 070/514181).
- Mike Hansford, 15 Oxford Street, Rugby, Warwickshire CV21 3NF, UK; 01788-541493 (str instrs; M).
- \* Bruce Haynes; fx +1-(514) 845-5382; haynesb@ere.umontreal.ca.
- \* Steve Heavens; 106202.303@compuserve.com.
- William D Hendry, Ancroft, 4 Viewbank Road, Bonnyrigg, Scotland EH19 2HB, UK; 0131-663 1785 (keybds; M).
- David P Hunt, 26 Station Road, Willingham, Cambridge CB4 5HF, UK; 01954-260962 (early pfte; R).
- Takatumi Ishii, 30-2 Hommoku osatocho, Naka-ku, Yokohama City, 231 Japan; +81-45-625-3652 (dbl reeds).
- \* Tetsu Ito, 13 Hargrave Road, Archway, London N19 5SH, UK.
- Bibliothek, Kunsthistorisches Museum, Burgring 5, A-1010 Wien, Austria; +43-1-52524-412.
- István Magyar, Lehel u. 19, Budapest 1133, Hungary (hpschd; M).
- Thorsten Niebuhr, 1 Major Close, Brighton, E Sussex BN1 7EE, UK; 01273-542072 (ww; M,R).
- Glynn Parry, 7 School Walk, Letchworth, Herts SG6 1QD, UK; 01462-674792 (recrdr, shwm, ctrl; P).
- Tom Pockley, Suttons, Hornells Corner, Lt Leighs, Chelmsford, Essex CM3 1QW, UK; 01245-361428 (oboe; M).
- Malcolm Prior, 36A Gorst Road, London SW11 6JE, UK; 0171-228 3761 (gmba, lute; M).
- Peter Taylor, 4 Laneland Cottages, Plaistow Road, Kirdford, Billingshurst, W Sussex RH14 0JY, UK; 01403-820489 (keybds; M).
- \* Yuri Terenyi, c/o D Martig, Greenhill Rd, Motueka, RD1, New Zealand.
- \* University of Kansas Libraries, 201 Watson, Lawrence, KS 66045-2800, USA
- \* David J Way & Zuckermann Harpsichords, 65 Cutler Street, POBox 151, Stonington, CT 06378, USA; (860) 535-1715; fx (860) 535-3724; richard@zuckermann.com.

Museums:

- |           |   |
|-----------|---|
| The Hague | Gemeente ( <i>Rob van Acht</i> )              |
| Vienna    | Kunsthistorisches ( <i>Gerhard Stradner</i> ) |

## IN SEARCH OF THE WELL TUNED CLAVIER - I

*by Roger Kenneth Lee, June, 1996*

In my Communication 1124, October, 1992, I described how springs could be used to compensate for the structural deficiencies peculiar to Italian harpsichords. My spring system has continued to function well since 1992, but I am still troubled by the fact that unison strings go out of tune much too easily in both Italian and Flemish types of instruments. The recent publication by Denzil Wraight, the Galpin Society Journal XLVI, March, 1993, page 120, described some unusual harpsichords made by Celestini at the end of the 16th Century in which the close pairs of strings were plucked by the same dogleg key (rather than the opposite pairs as in most other harpsichords). In the course of my investigations of the tuning sensitivity of unison strings, I can propose a very practical reason for Celestini's method of arranging jacks in a cembalo; a cembalo arranged to pluck the close pair of strings as unisons will stay in tune much better than the standard arrangement.

The customary equation for the vibrating frequency of a thin string is shown in (1):

$$f_1 = \frac{1}{2L_1} \sqrt{\frac{gT}{\rho A}} \quad (1)$$

where  $f_1$  is the frequency of mode 1 (lowest) and  $L_1$  is the vibrating length of mode 1.  $\rho$  is the string's density and  $A$  is its area.  $T$  is the string's tension. "g" is the acceleration due to gravity and (used below)  $E$  is Young's modulus of elasticity.

Because I am interested in the sensitivity of the string to tension and length changes, I solve the equation for  $T$  and obtain (2):

$$T = 4L_1^2 f_1^2 \frac{\rho}{g} A \quad (2)$$

The tension  $T$  was created by winding up the string from zero extension to an extension of  $\Delta L_1$ , which is a quantity more directly and easily observed than tension:

$$T = AE \frac{\Delta L_1}{L_1} \quad (3)$$

We equate (2) with (3) eliminating the tension; please observe that the equation then becomes independent of the string's area which can be eliminated from both sides:

$$AE \frac{\Delta L_1}{L_1} = 4L_1^2 f_1^2 A \frac{F}{g}$$

(4)

To temporarily simplify, let  $K=4\rho / gE$ , properties of the string material only, and solve for  $f_1^2$ :

$$f_1^2 = \frac{1}{K} \frac{\Delta L_1}{L_1^3}$$

(5)

Let the sounding length change by  $dL$  and the wrestpin move by the same amount as might be caused by a change in width of the wrestplank from a climate change; the consequence of the length change is a frequency change  $df_1$ . Equation (5) becomes equation (6) to include the length change in  $\Delta L_1$  and  $L_1$ :

$$(f_1 + df_1)^2 = \frac{1}{K} \frac{(\Delta L_1 + dL)}{(L_1 + dL)^3}$$

(6)

In order to obtain only the difference quantities we subtract equation (5) from (6), and obtain the expanded result:

$$(f_1^2 + 2f_1 df_1 + df_1^2) - f_1^2 = \frac{1}{K} \frac{(\Delta L_1 + dL)}{(L_1^3 + 3L_1^2 dL + 3L_1 dL^2 + dL^3)} - \frac{1}{K} \frac{\Delta L_1}{L_1^3}$$

(7)

We expand and cross multiply

$$df_1 + \frac{df_1^2}{2f_1} = \frac{1}{2f_1 K} \frac{[L_1^3 \Delta L_1 + L_1^3 dL - \Delta L_1 L_1^3 - 3L_1^2 dL \Delta L_1 - 3L_1 dL^2 \Delta L_1 - \Delta L_1 dL^3]}{L_1^3 (L_1 + 3L_1^2 dL + 3L_1 dL^2 + dL^3)}$$

(8)

We remove the smallest terms and simplify to obtain:

$$\frac{df}{dL} = \frac{1}{2f_1 K} \frac{dL}{L_1^3}$$

(9)

The quantity  $df/2F_1$  amounts to 1% and was the largest term discarded; if the accuracy becomes necessary, it can be easily found by successive solution and trial and error. Finally,

$$\frac{df}{dL} = \frac{1}{2f_1 K L_1^3} \text{ or in terms of string properties, } \frac{gE}{8 \rho f_1 L_1^3}$$

(10)

The quantity  $df/dL$  describes the sensitivity of the strings to length changes in terms only of geometric quantities and material properties. If two strings are of differing lengths tuned to the same frequency, it is inescapable that the rate of change of tune to an end motion is different for the two strings and that a beat will inevitably appear.  $df/dL$  increases as the inverse cube of string length and thus becomes very important to the tuning stability of the treble of any harpsichord or piano. The effect is most noticeable above middle c'. It is not inconceivable that the modulus of elasticity can be controlled to compensate for differing string lengths by utilizing the amount of inelastic yield present when tuning the string (the modulus is not a constant, but is the slope of the stress strain curve for a material).

While I am uncertain as to when piano makers equalized their string lengths by notching the bridge, harpsichords by tradition, for practical reasons do not have unison strings of the same length. In most harpsichords, there is a shorter and a longer course of strings for each 8' note when the jacks are facing away from each other. Because of the constant offset used in string layout, only one register of strings can be ideally pythagorean in their layout. Figure 1 shows the observed seasonal wrestplank motion and the beat rate resulting (computed from the equation above).

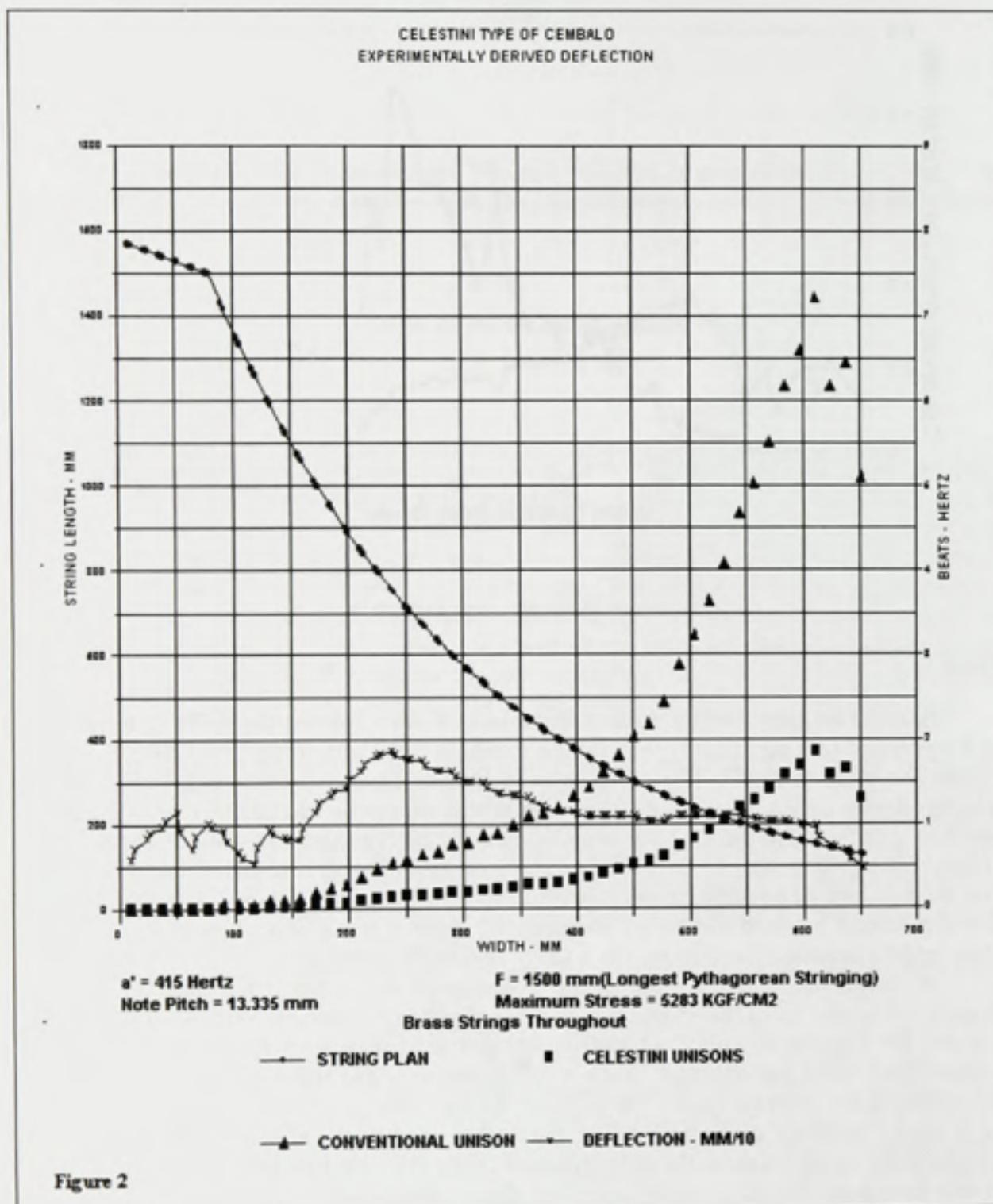
The quantity  $df/dL$  can be used to measure the change in length seen at any string on the harpsichord as seasonal changes occur. I use the German made CTS-4 tuner which can be used very conveniently to measure the pitch change on each string in the instrument. From knowledge of the pitch change and  $df/dL$  one can compute  $dL$  for each string. This observation makes it easy to spot structural problems in a systematic manner. For instance, the data source from the Gemeente Museum Plan of its Delin does not show a frame member that Delin used in his other instruments near c''. The instruments built according to this data showed a marked lack of tuning stability near c''. By adding a strut and a directly connected gap spacer near that note, the instability was eliminated.



Figure 1

In order to more clearly present these facts, I have applied the deflection curve of my harpsichord to a mythical typical Italian cembalo of 50 note range, GG/BB-c'', strung in brass at a pitch of  $a' = 415$  Hertz. In figure 2 one can observe a direct comparison of the Celestini design with a conventional cembalo that is otherwise identical. Even Celestini's approach is not perfect, since I have assumed that the bridges and nuts are not notched like a piano. The differential  $df/dL$  is very sensitive to string lengths around c'' and above and even a 1 mm lack of equality causes a substantial error in unison tuning. I am considering adding a second notched nut to my harpsichord, since it is possible then to equalize the string lengths between the unisons (in a fairly reversible manner).

A further unexploited item to be investigated is to tailor the structure of the harpsichord so that all of the strings rise in pitch together at the same rate. In this manner, it should be possible to create an instrument that is in tune with itself even though the absolute pitch level has changed. Such a design requires 140 times greater rigidity in the treble than in the extreme bass. The pitch of the bass strings is pretty much unaffected by the kinds of motions discussed above; the treble is strongly affected. This approach hypothetically could preserve the light structure of the classical harpsichord and increase its relative tuning stability at the same time. Our piano making predecessors threw out the baby with the bath water by using enormously rigid frames for harpsichords earlier in this century; the classical Italian harpsichord was inconcievable to them.



Some points raised by Ephraim Segerman's reply, comm. 1468, on English Citterns.

Eph has taken my comm. 1445 seriously enough to give considerable space to his somewhat discursive and dogmatic reply. I will try to be briefer.

1. Meuler's wire.

Let us consider the pitch range of the orpharion implied by Praetorius' eight course orpharion, his penorcon, and the orpharion by Palmer. This should be in each case, two octaves and a fifth. (The remains of extra pegs in the Palmer peghead suggest the use originally of more than nine courses). According to Abbott and Segerman, Galpin Society Journal, 1974, this range should be just possible on parallel frets, using high (1.6) twist brass on the lowest course and iron one semitone less strong than gut for the trebles - which I suggested in comm. 1445 was the usual best strength for Meuler's wire. Both Praetorius and Palmer use angled frets for this pitch range. Why? Either the iron wire available was less strong or, more likely, they found the lowest acceptable pitch to be a tone higher than that suggested by Abbott and Segerman.

It is important to remember that the availability of Meuler's wire to Rose pre-dates the use of angled frets. These are not for improving bass sound. They are for reducing the likelihood of treble string breakage, combined with adequate bass sound. Whilst making some chord shapes more difficult for the left hand of the player, they also make others easier; but they do necessitate some muscular re-learning for accurate fretting and thus incur some customer resistance.

Eph suggests that Meuler's wire could go two or more semitones higher than gut. With this extra tensile strength available on the orpharion and penorcon the necessity for angled frets would not have occurred. I can only conclude that, because angled frets were considered necessary, then the extra tensile strength required by Eph's cittern tuning did not exist.

Eph is quite right to point out that Praetorius' text states that the orpharion is tuned to g' at cammerthon. Why did Praetorius do this? He previously stated that throughout the entire book all the references are to chamber pitch, including presumably the English zitterlein. Its gittern style tuning is included in the table; unless it has been added in my translation (Blumenfeld), and it of course receives detailed attention in the text. What is missing is unfortunately its cittern tuning. Four course citterns played by cobblers and gardeners are not omitted as Eph states, but are termed Italian or called French according to their tuning. Where instruments did not play at cammerthon this is mentioned in the text - shawms a tone high, cornamusen at chorton, etc.. Exceptions are also labelled in the plates. The zitterlein plate also contains the chorlaute and chorzzitter. (Evidence of the cittern's use in church?). Most likely the representation of the orpharion is also of chorton size, and this is the reason for Praetorius' unique special mention in the text - rather than having the block for his plate altered. Of relevance is its string length which is 5cm. or more longer than the instrument by Palmer. The Palmer orpharion has a nominal 'g' fretting and with a similar string length the Braunschweig orpharion is fretted for 'a'. This suggests that the Braunschweig orpharion is in chorton, the Palmer in cammerthon, and Praetorius' illustration in chorthon with a nominal 'g' tuning.

This again, as stated in comm. 1445, leads to the conclusion that Meuler's wire was a semitone less strong than gut. The g" of Praetorius' zitterlein tuning requires wire five semitones higher than this in Praetorius' stated cammerthon, or three in Eph's preferred chorthon.

2. Eph suggests that a reason for triple stringing is to preserve the service of a course if a string should break. As he says, brass breaks more often than iron, so that I always supply my customers with extra brass wire for the second course which is the most likely to need it. Unfortunately for his theory the second course is the one which is never triple, so that his explanation is, as he would say, just a non-starter.

My conclusion that triple stringing implies one twisted string and a pair of octaves started for the purely practical reasons that I gave before. As most of the citterns that I have made have been for the English or Flemish repertoires, I had put Mersenne's triple first course aside for consideration in the future.

When Eph's comm. 1422 necessitated a reply I was both surprised and pleased that a solution should have been provided in Robinson's conflation of his lute instructions from 'The Schoole of Musicke' and a continental cittern tutor. Although I too would like confirmation from an additional source, a simple calculation will show that the chances against *one sounde* ( unison ), and *one tune* ( octave ) falling so patly into place in his tuning instructions and the Tabley ms. are 16:1.

Eph has invented a triple course for the Toppel Cythar - it does not exist - and also hints 'there are more'. Not to my knowledge. Mersenne actually says ( Chapman's translation ) '-always at the unison, although one can place one of them at the octave. They are ordinarily of brass -'.

Any maker or player of wire instruments will know that it is considerably easier to fit a new string than to replace a previously used one with its attendant kinks and twists. That some Italian cittern players and museum restorers did on occasion use loops on single strings as Eph describes is demonstrated by frequently damaged or now non-existent combs, eg. Plebanus, Paris; Anon, Rome, but the use of a doubled string and rod as an available and probably recommended system is shown by the lack of damage on eg. Salvatori, Paris. In the heat of performance it would have been, and is, much quicker to fit a new doubled course than to make a loop, and also easier to play upon it than upon a single, unreliable ( it has just broken once ) string. A cittern recently returned to me for repair had the remains of a single string loop tightened immovably around one of the end-pins. Subsequent string replacements had been doubled courses.

The repair was necessitated by the collapse of the belly. This is the first of my citterns to suffer in this way, and it is now sixteen years old and has had twelve years professional use. This seems reasonable, and reinforces my suggestions for string tensions. I hope Eph has some good repairmen available.

### 3. Some minor points.

The Italian citterns mentioned in my comm. were those made by, and written for, by the Virchis. Their open string range is not the sixth given by Eph but rather, a ninth for the six course instrument and an eleventh for the seven course. While it may be possible to make any instrument play at any pitch, given a suitable (?) string material, the instrument's response will also be governed by its soundboard area and body size. ( See comm. 858 ).

I rejected '*set up your Trebles so hie as you dare venture for breaking.*' as deriving from Robinson's lute instructions. Eph seems to want to retain this in order to confute my argument whilst not noticing how it could affect ( P 46, para.5 ) "-those early cittern players ( who ) apparently tuned up and down quite freely to meet the pitch requirements of voices and other instruments.". At least one other cittern tuning instruction starts from the third course, making an interval of a fifth with the second course, etc., and in practice this seems a very satisfactory method.

Leycester may well have written his Miscellany Collections for the use of his son, in the enforced tranquillity of imprisonment in Chester Castle. Besides Holborne, Robinson and Playford, his Musick-Bookes ( listed by Ward, Lute Society Journal XXI, 1979-81 ) included:

*Another book of Psittyrne-Lessons with some notes before the same, by me PL: a manuscript.*

*Another old booke of Psittyrne Lessons in manuscript.*

*Another booke of Gitterne-Lessons with gilded leafes.*

This would seem to imply more knowledge of the instrument than Eph suggests.

## FoMRHI Comm. 1482

Comms.1445 & 1468(para 9 & p.69, para 1)

Donald Gill

I feel that I have inadvertently walked into the cross-fire here. In my article that Peter Forrester quotes from I was bringing forward evidence that the klein Englisch zitterlein (17th century gittern) and the cithrinchen (bell gittern) had such closely similar string sizes that tuning in the same octave was a reasonable assumption. Eph's reaction to this simple observation is a string of 'could easily have been', 'most probably was', 'it could be', some speculation about preferences and then a remark about 'logical sense' and historical evidence, all to support his arguments for high pitch tunings. If the Praetorius and Wenster G30 string sizes are not historical evidence, what is?

As to the point about an untwisted third course, my klein Englisch zitterlein is quite happy with plain wire, as apparently was the historical cithrinchen, to judge by Wenster G30.

I am as puzzled as Eph by the Wenster fifth course being called 'octaven'. I cannot think of a possible explanation. The puzzle is deepened by the Wenster table also including a 'conter octave of No.1 twisted brass' but the music in this Ms is all for five courses, as is all the other cithrinchen music that I have seen. There is a six-course cithrinchen by Michael Parker, Copenhagen, 1729 illustrated in Baines, European & American Musical Instruments, Pl.248, but all other cithrinchens that I know have ten pegs. Presumably we are entering the area of the later 18th century 'citterns'. Can anyone out there help us? I do not think that Eph's typically ingenious suggestion of single basses on the cithrinchen can be made to fit the actual evidence of five courses and ten pegs.

### Vihuela string quality and thickness, and the Paris vihuela

Mimmo Peruffo has written asking for the evidence that I claimed in Comm. 15 existed for superior treble strings having been used by the Spanish vihuela players. That evidence is that the first course on vihuelas was doubled. This was discussed in Comm. 30. Doubling of first courses requires that the strings be particularly uniform. Non-uniformity in the strings available was the reason given in the Mary Burwell book for having only a single second course on the baroque lute. Evidence for the availability of strings uniform enough for doubling the first course early in the 16th century is given in Agricola, where a 14-string lute is mentioned. This complements the evidence for the availability then of uniform strings from Munich given by Vitali in the Capirola book. In the 1690's, after the Barley book, both Dowland and Robinson refer to the first course strings only in the plural. During most of the 16th century in-between, only the vihuela had a double gut first course.

Evidence that vihuela thick strings were of higher sound quality than those generally available for lutes at the same time is that their bass strings were pairs in unison, which with lutes required catlines. After describing the 16th century Spanish ordinances of the carpenters' guild for apprenticeship to an instrument maker (*violero*), John Ward, in his classic 1953 PhD thesis at N.Y.U. *The Vihuela de Mudo and its Music (1536-1576)*, p.22 wrote:

'Though of a different type, regulations also controlled the makers of strings, *cordieros de vihuela*, at least in Barcelona. Two master *corderos*, elected for a term of one year by the members of the guild, were required to inspect three dozen strings each day for three days, testing each string for its material, quality and general suitability. Only sheep gut was used. Each string had to be about three *varas* (about 8.4 feet) long, of one piece, and judged suitable for the instrument on which it was to be placed. *Corderos* who made strings without examination, those who failed to meet the standards, and above all those who gave away the secrets of the craft, were subject to fines and, on a third offence, the loss of their *officio*. The skills required of this craft were of a simple nature, yet a term of at least two years was demanded of all apprentices.'

This is evidence that there was a flourishing string-making industry in Barcelona, and thus supports the hypothesis that the origin of the string name Catlin (or Catline) was Catalan.

Ward also mentioned (fn. p. 29) that 'The quality of the 16th-century *cuerda* [strings] may be judged by the fact that at least one escape from prison was effected with the aid of *cuerdas de vihuelas muy gruesas*'. From the tensile strength of roped-gut strings, if the prisoner lowered himself on the string and he weighed at least 50 Kg, I calculate that the string was at least 2.9 mm thick. Covarrubias (1611, Ward p. 28) wrote that as the size of the instrument varied, so did the sizes of the strings. Thus a string of the lowest course of the largest size of vihuela could not be thinner than this figure. This evidence is in conflict with the evidence of the neck and nut width of the sole surviving vihuela, now at the Jacquemart-André museum in Paris, which is one of the largest size. That nut width is a bit over 4 cm, and I can't see a possible design of nut spacings that can place the other strings with such a 6th course. The neck and pegbox are unlikely to have been thinned since the neck block is a continuation of the neck.

Further evidence that the diameters of vihuela bass strings were considerable is that Bermudo wrote (Ward p. 27) that since the vibrating lengths of the strings should be the same, and as the thickness of the loops around the strings at the bridge shorten them according to the string diameter, the bridge should be angled with respect to the nut to compensate for this.

This supports the hypothesis that the Paris vihuela was made as an examination showpiece of skill as a craftsman and was not intended to be a playable instrument. The *examen de violeros* included making a lute, an organ, a clavichord, a harpsichord and a vihuela made of many pieces (not the usual type). The Paris vihuela is one of the latter. With its neck width seriously in doubt as a typical vihuela characteristic, one should approach its other design characteristics with some caution.

### The changes from baroque to modern violins

Peter Armitage wrote asking for an explanation of the historical technology of the changes that converted a baroque violin to a modern one. His main worry was the apparent contradiction between what he had always understood (from reading the violin literature) was an increase in string stop and a rise in pitch. I cannot find support for either a systematic increase in string stop or a rise in pitch then from the evidence I am aware of.

From late in the 18th century to early in the 19th, when the structural changes were made, there was no rise in pitch except in Italy. By the last quarter of the 18th century, all of Italy except Rome (which remained about a tone lower) had settled on Lombardy pitch, which was the same as German Cammerton (unchanged at about half a semitone lower than modern since before Praetorius). Rome finally conformed after 1800 (Cosio's colourful report of this could have been the origin of the surmise about rising pitch). Paris pitch of almost a semitone higher than modern during the second half of the 18th century dropped to  $a'=435$  within the first few decades of the 19th. English concert pitch was at about that figure from the first half of the 18th century. Nevertheless, there was a pitch rise in the middle of the 19th century. Orchestral woodwinds throughout Europe temporarily forced a rise of orchestral pitch of up to a semitone. This was not associated with any structure changes, since violins by then had essentially become fully modern.

The modernisation of baroque violins did not systematically lengthen the string stop. Violins have always varied in size and string stop. Modern violins are rigidly classified into full, 7/8, 3/4, 1/2 sizes etc, with all smaller than full size considered to be cheaper training instruments for those with not fully-grown hands. All sizes of early violins were played by professionals. Praetorius's violin happened to be a particularly small one with the bridge shifted towards the tail piece as much as it could go to get a longer string stop. The string stop of the violin measured in the Talbot manuscript (c. 1694) was 13 inches, slightly long for a modern full-sized one. The evidence of lengthening seen on quite a few modernised baroque necks was to bring smaller instruments up to the more-valued full-size specification.

The purpose of the modernisation seems to have been both to get greater projection and to make playing in higher positions easier once using the chin for position changes became standard. Jobs for musicians on the payroll of wealthy patrons or noblemen had been steadily evaporating, and the main other way of making a living playing was for bigger audiences (in poorer acoustics) in public concerts. Stainer violins lost supremacy in reputation to those of Stradivari because the latter had greater projection.

Making the bridge taller improves projection. Bowing only moves the string back and forth in the direction of bow motion. This mainly rocks the bridge about some point between its two feet, the oscillations of which transmit the energy to the soundboard. A taller bridge increases the leverage of the string forces on the top of the bridge about that point. Decreasing the obtuse angle that the strings make over the bridge can somewhat improve projection as well. This happens because a larger fraction of the oscillation in string tension during string vibration gets transmitted by the bridge to the belly (this mainly affects the octave to the fundamental since that is the frequency of tension oscillations).

The second half of the 18th century saw a large increase in playing in higher positions. In Leopold Mozart's time (the middle of the century), the range of playing on the top string was an octave and a fifth, and the length of fingerboard only catered for this range. Before then, occasional virtuosos (e.g. Locatelli) played much higher than this (even higher than a modern fingerboard), and they fingered the string in mid-air past the fingerboard. (Modern baroque violinists playing Locatelli need a longer fingerboard because their strings are thinner than originally used, and one needs a minimum thickness-to-length ratio for this to work well). By the 1790's it was normal to have a two-octave fingerboard and position changes in the music required supporting the instrument between the chin and shoulder practically all of the time.

The neck of the violin in earlier baroque times was decidedly thicker as one went to higher positions, and so was the fingerboard because of the wedge shape. Thus the distance between the left thumb and the rest of the fingers increased considerably with higher positions, and a squeezing component helped 'crawling' back to lower positions without using the chin (the chin was only used if there was no time for a 'crawl'). When the use of the chin became standard most of the time, the 'crawling' procedure was abandoned and if one kept the distance between the thumb and the other fingers to a minimum in lower positions, playing in higher positions became more comfortable. This requires eliminating the wedge in the fingerboard and thinning the neck for even thickness over as long a length as possible, making the curve where the bottom of the neck goes into the heel much sharper.

Another effect of continuous use of the chin was the attack by perspiration on the part of the tail gut that was exposed at the top of the tail piece. This led to new tail piece designs which eliminated that exposure, and were otherwise chin-friendly (the chin rest was not inverted yet).

With the bridge taller and the fingerboard wedge eliminated, the top of the fingerboard would have to be brought back to its proper relationship with the strings, and that was done by resetting the neck onto the body back at an angle. To keep that angle change to a minimum, the top of the neck was raised above where it had been before (i.e. at the top of the soundboard where the neck and body meet) and a piece of wood was added to fill the space this creates between the neck heel and the heel button of the back. This change amounted to adopting the design of the relative relationship between the neck and body that had been used by violins throughout the baroque.

Changing the neck angle happens also to decrease the obtuse angle the strings make over the bridge, thus increasing the force with which the string tension makes the bridge press on the soundboard. The soundboards of old venerated and expensive instruments distorted slightly from the added pressure, and to minimise this, there was a tendency to use a heavier bass bar and a thicker soundpost. For more surface area of support, the ends of the soundpost were carved to be flush with the plates, while before, they were often dome-shaped. For the same reason, bridge feet got wider by adding thin toes. When string tension increased considerably in the second quarter of the 19th century, whichever instruments were not modified to reduce soundboard distortion (induced by bridge pressure) when the neck was angled back, were so modified then. The problem was more a fashion of increased fussiness about distortion than actual danger to instrument structure or function.

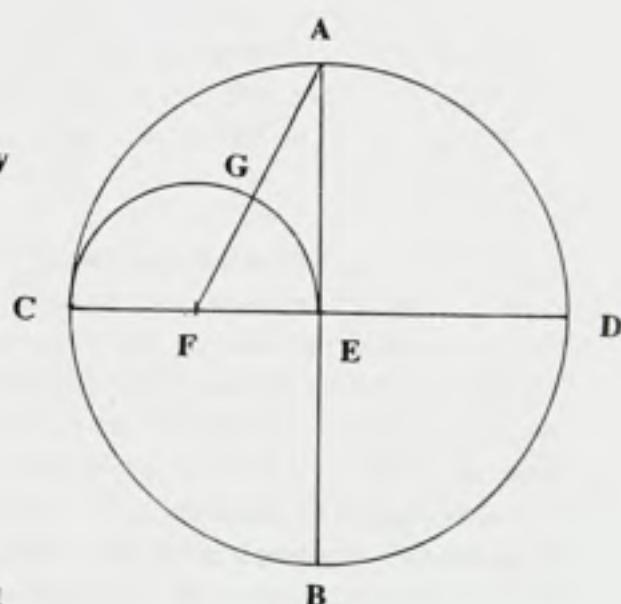
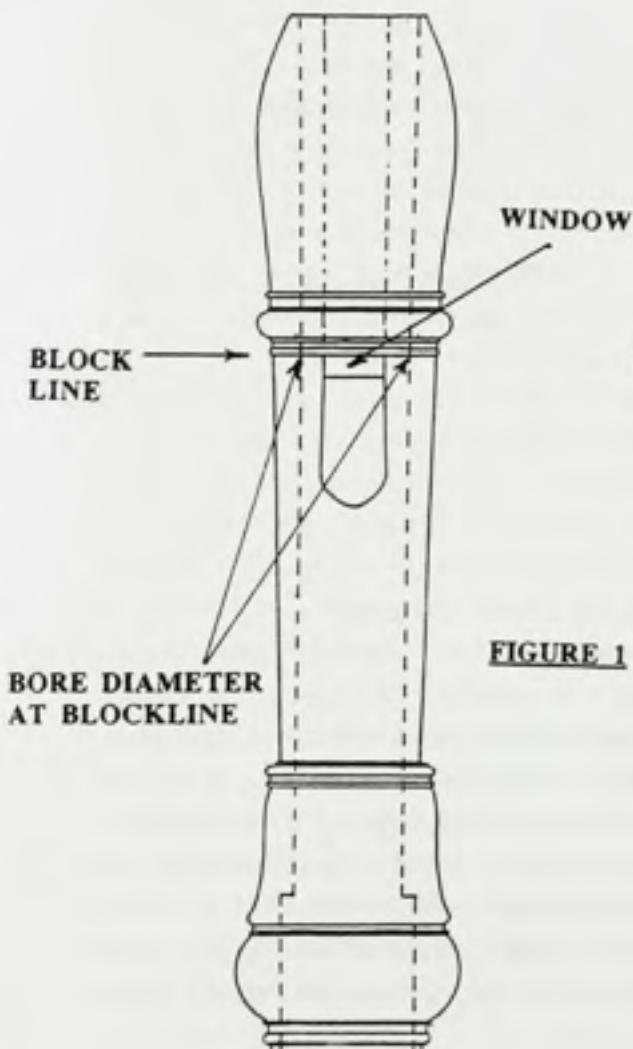
It is very likely that early violin makers, as modern ones usually do, used some method to optimise the vibration characteristics of their top and back plates before assembly. That includes optimisation of the effect of the bass bar. It is fortunate that such optimisation can usually be made both with a shorter lighter bass bar and a longer heavier one. Heavier longer bass bars were also used in the baroque, and those presumably were not replaced, usually not recognised as original.

The craftsmen who replaced the necks probably had trouble getting the nails out, and often had to replace the neck block. Probably to avoid such trouble in the future, they designed a dovetail joint between the neck and neck block that kept the desired alignment between the neck and body (while the glue hardened) without having to use nails. To maintain strength with the dovetail cut in, the new neck block was usually bigger than the original one. The piece sticking out from the neck in the dovetail replaced strength against the neck splitting in the heel that was lost in the thinning.

How far the changes would eventually go was not clear in the period when they were being made, so the changes and new instruments made then were often to a variety of intermediate designs of neck and fingerboard. So an earlier instrument that was continually kept up to date would probably have suffered several modifications between its baroque and modern state, and the sequence could well have been different in different places.

Dividing a Circumference Into Five

In a recent issue of an American woodwind magazine my attention was drawn to an article that contained diagrams of irregular pentagons. It reminded me of an incident from some years ago while I was teaching recorder making in Dublin, Ireland, the outcome of which might prove useful to FoMRHI members. I had been asked how one determines the size of a recorder's window if the bore diameter at the blockline is known - see figure 1. I mentioned that as a starting point, it was necessary to divide the circumference of a circle into five equal parts. Picking up a celluloid protractor I began to explain that if one divides by five the 360 degrees contained in a circle, when I was interrupted. We were informed that the operation could be performed with compass and straight edge - protractors and arithmetic were not necessary! Using the blackboard, one of the students then demonstrated how it could be done - and if I ever learned this during my study of Euclidean Geometry then it had completely slipped from my memory.



Proceed as follows, and check each step with figure 2. Set compass to suitable radius to scribe a circle. Construct two diameters at right angles - AB and CD. Designate as E [the circle's centre] the point where AB bisects CD. Bisect radius CE, designating the mid-point as F. With centre F construct a semi-circle on CE. Join AF. Designate as G the point where the straight line AF cuts semi-circle on CE. With compass set to AG strike arcs around the original circle, and with accurate work it will produce ten equally spaced points. Joining every other point will produce a regular pentagon. QED!

I was curious to know how my student had acquired such an unusual piece of information. It happened that some years previously he had worked for the United Nations in parts of Africa, exactly where I can't recall. Some of the tribes with whom he worked produced beautiful rugs, shawls, carvings and other decorated items most of which featured shapes and figures derived from regular five and ten sided figures. The above method, which they had no doubt used for generations, served their purposes admirably. And I thought yet again that when one becomes involved in teaching, whatever the subject, there are so many opportunities to learn.

**FoMRHI Communication Number - 1486****Old Recorders for New**

Paul Madgwick and Alec V Loretto

**Introduction [AVL]**

Before presenting an International selection of Recorder Patents, a few words of introduction. I first met Paul Madgwick on the Breiteneich International Course, Lower Austria, where he made with me a Renaissance Treble Recorder. During the Course we all had time enough to talk over a variety of topics, including what each of us did for a living. Paul, we learned, was a European Patent Attorney, and had with him a large file of pretty well every recorder related patent ever registered, all neatly annotated. This continually up-dated collection had been assembled over a period of years. Paul displayed a prodigious memory regarding who had patented what, where, why and when. After numerous requests, Paul agreed to give a talk on the history of patents with the emphasis on music in general, and on the recorder in particular. The talk was attended by those on the recorder making course, by other instrument makers, and by members of the general public. From his talk came the idea of this article, and although nearly ten years have passed, our intentions were always to present these words sooner rather than later! Not surprisingly, one of the biggest problems was to select a few patents from the many hundred that Paul has collected over the years. Page after page reveals the fascinating world of the recorder designer, maker and player and to comment on even the smallest fraction of the collection would fill the pages of this publication, many times over.

**An Introduction to Patents [PM]**

Every day we use and come into contact with products that are the subject of patents. Amidst our daily routines we take little notice of these until controversy arises, as recently happened over patent claims for genetically engineered life forms. A new moral dilemma had arisen - to what extent should living animals be subject to patent? While that argument still rages, it is helpful to take a closer look at what patents are. The word patent, from the expression Letters Patent, derives from the Latin *patere* meaning to lie open or to expose. Letters Patent, in earlier times, were open [ie public] letters from the sovereign conferring on a subject the title to a property, or granting the subject some privilege. Such recognition was often the reward for services to the Crown or an acknowledgement of a new and improved way of manufacturing something. Sometimes Letters Patent were granted to confine some politically sensitive activity to a safe and trusted citizen. Letters Patent could also be used to grant a monopoly for a specified term to protect a commercial activity. For example, among the musicians in the Chapel of Queen Elizabeth I, were William Byrd and Thomas Tallis. In 1573 they petitioned the Queen for an extra source of income. By Letters Patent she granted them a monopoly on the printing of music and music manuscript paper. Neither was a printer, but by licensing others and charging for this service, their

incomes increased. Their patent lapsed in 1596. On July 23 1598, in a petition to Sir Robert Cecil, Thomas Morley applied for similar privileges and on September 28 of the same year, Queen Elizabeth I granted the patent. This however, conflicted with another patent and a dispute arose, prompting Parliament in 1600 to rule that after the expiry of Morley's patent no further patents for music printing would be granted. The controversy developed during the reign of the Stuarts culminating in the Statute of Monopolies, 1625, which abolished all monopolies except those related to new methods of manufacture. For an inventor, it was this statute which firmly related the granting of a patent, with a monopoly over the new invention. Similar developments regarding patents were taking place in Italy, France, Germany and later in the USA. Initially most of these early systems granted patents upon the invention of some new device, machine or process. Gradually however, inventing by itself was not sufficient, and there emerged the principle that the invention must be fully disclosed to the public for a monopoly to be granted for a specified length of time - a system which still operates to this very day. An inventor is encouraged to make new ideas public, enabling others to build on them and develop them further. To balance this revealing of full details, the patent rights give the inventor the controlling monopoly of his invention. Against this however, competitors are free to develop different ways of achieving the same ends, or by further ingenuity, circumventing the monopoly completely. Both the revealing and monopoly aspects are reflected in the patent application papers which comprise two main parts. The first describes the invention, thereby *revealing* it to the public. The second part contains the claims relating to the invention thereby defining the *monopoly*. In most countries patents are granted only after an extensive examination, which determines among other things whether the invention is in fact a new one or merely a slight modification of an old idea. The invention must be described in sufficient detail to show that something new has definitely been invented and that there is in fact a contribution to the fund of general public knowledge. Around the world major and specialist libraries contain extensive collections of patent specifications to inform today's inventors of yesterday's inventions and patents. Imagine that today an enthusiast wishes to market a recorder which converts rapidly to a pipe, allowing for a quiet smoke while counting one hundred and sixty four bars rest before the entry of Great Bass IV in a favourite multi recorder-choir arrangement. A visit to a Patent Library is an obvious starting point where a search will reveal whether such an invention has already been patented and if so when, and whether the patent is still current, and if so in which countries of the world. In the light of such information a Patent Attorney will advise the best course of action. The inventor will need to decide whether the extraordinarily high cost of obtaining patents around the world is worth it, bearing in mind, in this case, the limited not to mention eccentric nature of the invention. Patents generally have a maximum life of twenty years, and large fees are required to keep them in force. But even if the inventor's outlook seems bleak, and it appears that limited finance and years of work might yield little profit, there is still hope! When Rubick's Cube was invented in the

mid 1970's, Rubick obtained a patent but only for his native land, Hungary. While he would have been able to use his patent to prevent cheap imitation Rubick Cubes entering Hungary, his markets in the rest of the world were threatened. Fortunately for Rubick, a team of ingenious lawyers found other ways to protect his interests that did not rely on patent law. When discussing patents reference is made to 'monopoly'. However, it must not be overlooked that it is a negative monopoly and not a positive one. It is not a case of *I can do it because I patented it* but rather *you may not do what is covered by my patent*. The consequences of this are important where there co-exist several patents relating to the same invention. The final design of the 'recorder that converts to a pipe' might be an imaginative refinement on similar, earlier patented designs. In which case the latest patent holder can prevent others using the refinement, but cannot produce it him/herself because the refinement is based upon the inventions of others, all of which are protected by a variety of patents! In practice such deadlocks are resolved by cross-licence agreements allowing the parties to use each other's patents. Over the years thousands of patents have been granted relating to the manufacture of musical instruments. The surprising thing is that an instrument as basic and as modest as the humble recorder, has been the subject of hundreds of them.

#### **Some Interesting Patents [AVL]**

The patents described below have been chosen to show a few of the contrasting problems which face those concerned with the recorder, and the ingenuity displayed in solving them. Some patents are intended to offer the recorder player an instrument with increased expressive qualities; others to make the instrument more reliable; others are aimed at solving some of the technical problems faced by recorder players, but all are the ideas of highly original thinking. Where relevant I have referred to some of my own attempts to venture into the world of recorder design.

**Bell Key** - invented by Carl F Dolmetsch. The original patent, number GB 852165 based on a 1958 application [see fig 1], shows hole 8 plugged, it appearing instead from the side of the instrument very near the south end of the foot. This new hole 8 was covered by an open key, operated by the little finger of the right hand. The patent specification explains that to provide a key over hole 8 in its normal position poses tricky problems of construction. But these problems were overcome, for the final version appeared with a graceful key covering hole 8 in its usual position - at the very south end of the recorder. The Bell Key is operated by the little finger of the right hand which can carry out its usual function and close hole 7 when required, or operate the Bell Key when necessary and even do both at the same time if demanded. Many instruments have problems with a few of the notes they are expected to play - notes sounding muffled, notes lacking resonance and stability, and even notes difficult to produce. The recorder has its fair share. On the treble recorder for example are the difficult to obtain top F sharp, and an in tune B flat above that. The recorder also happens to be an instrument whose tone colour cannot be varied enormously. The Bell Key overcome both of these problems. Many first octave left hand notes and some 'faked notes' in the upper register can be given quite different tone colours when the Bell Key is closed. More importantly the tongued top F sharp becomes a safe note to

play. It had been known for a long time that this note could be approached by slurring from other notes and with the correct technique it was a safe operation, even under concert conditions. Also known was the technique of fingering F [ $\varnothing 145$ ] the semi-tone below the elusive note, or G [ $\varnothing 13467$ ] the semi-tone above, and tonguing them with hole 8 [the bell] closed. These produce top F sharps. On a few recorders it was possible to obtain a reasonably acceptable tongued top F sharp using a special fingering, but this was the exception rather than the rule. Blocking hole 8 for every tongued top F sharp was difficult while standing and looked ridiculously dangerous with its technique of '*stand on one leg, lift other knee up to close the bell!*' It was of course easier while seated with legs crossed, but still posed problems when numerous top F sharps, with other notes in between, had to be tongued *allegro*. While sympathetically composed recorder music might not contain such passages, music 'borrowed' from other instruments did. And there have always been composers who at times write against the recorder rather than for it. They delight in testing the performer by gleefully writing difficult passages with rapid arpeggios containing tongued top F sharps. By selecting the most convenient fingering and operating the Bell Key, the problem is solved. The top B flat in the recorder's extreme upper register becomes a safe note, if rather strong. Finger the B [ $\varnothing 1245$ ] with the Bell Key closed, and with high breath pressure one obtains a clear B flat. The Bell Key also does strange things to the pitch of certain notes. Play a note then close the Bell Key and the pitch changes much more [or maybe less!] than the pitch of another note subjected to the same treatment. This phenomenon can often be put to advantage. One had to become adept at using the Bell Key and numerous players did, gaining musical confidence and advantage by so doing. All in all an imaginative patent and a very useful recorder extra. [Another Carl Dolmetsch invention [fig 2] shows a side mounted closed key operated by the usually idle little finger of the left hand. While this key made possible a tongued top F sharp, it did not help the missing top B flat.]

**Echo Key** - invented by Carl F Dolmetsch - patent number GB 852135. In spite of what un-informed critics say, the recorder does possess dynamic possibilities and can play its own *forte* and *piano* using a variety of techniques. Not as obviously for example as can the clarinet and trombone, being altogether a more miniature instrument. The Echo Key [fig 3] adds to the dynamic possibilities of the recorder, operating on the principle that by drilling a small hole near the blockline, the pitch of all notes is raised a little. [It is one of the tuning techniques traditionally used by bamboo pipe makers who, finding the instrument's overall pitch a little flat, drill such a hole and leave it permanently open.] The Echo Key, also dating from 1958, offers a choice. Leave it closed and play normally, or open it and all notes become a little sharper. Correct this sharpness by using less breath to lower the pitch, and this will, at the same time, produce softer sounding notes. QED! It is possible, where appropriate, to play the louder high notes quite softly, making for more musical performances. An *mf* phrase can be convincingly repeated *pp* using the Echo Key. It is operated by the chin and not by fingers or thumbs, many of which already have enough tasks to keep them

busy. Hold the instrument at a comfortable playing angle and the Echo Key is shut. Lower the recorder a little, and the Key, closely following the contour of the beak, impinges on the chin and opens. The up and down movement of the instrument - when one has developed the necessary technique - is minimal, and not distracting for player or listener.

One sometimes heard criticism that this un-historical appendage as well as the Bell Key, detracted from the recorder's purity! But the truth is that an instrument fitted with the Bell and/or Echo Keys, can be played as a normal recorder simply by ignoring these extras. If you don't like 'em, don't look at them and don't use 'em! A Dolmetsch descant and treble recorder so equipped [also with thumb rests] can be seen in The Bate Collection, Oxford, England.

**Absorbent, Stable Windways and Blocks** - invented by Hermann Moeck. All woodwind instruments experience wetness problems from the moisture in the breath. Few suffer as much as the recorder! And few people can have given it as much thought as the inventor of this patent. Delicate labiums warp and twist; wood fibres in the windway lift and cause turbulence; and wooden blocks expand and forget to return to their original size. Dr Moeck states that dimensional changes in the order of 0.02mm [0.0007874 inches!] lead to a detectable change in tone quality. Correcting such changes is known as *revoicing*. To overcome these problems a great deal of research has gone into the simple recorder block and windway. The aims have been to find a material which absorbs moisture yet unalterably retains its shape. In addition it must be a material that is easily worked by hand and machine. Finally, it must not cause allergy problems. An early patent application [3178986 in the USA; 1235122 in Germany] dating from 1962 shows how the windway was to be lined either completely or in part by stable, moisture absorbing materials - [fig 4]. These were to be slotted into position or cemented in place using suitable waterproof adhesives. After extensive tests it was decided to tackle this problem using a different approach. The final 1974 patent [3988956 in the USA; 2432423 in Germany] used a different design and highlights one of the most ingenious attempts to solve this condensation problem - [fig 5]. An absorbent and very stable artificial material - looking something like chalk - was inserted into a normal wooden block. I remember being most impressed with this idea and subjecting a recorder head with such a block to a couple of tests. First, the block was removed and for two days, tap water dripped very slowly onto the insert. There was no change in its size. It possessed amazing stability. Second, after replacing the block an electric pump at a suitable pressure was arranged to blow the instrument's head, the whole set up being governed by a time switch - two hours on, twenty minutes off, repeated *ad nauseum*. It ran for days, the block coming through with flying colours. In spite of these results, it was the recorder players themselves who gave this patented windway insert little chance of success. If one took care, and rinsed the mouth or cleaned one's teeth before making music, such a windway behaved well and lasted for ages, giving none of the problems normally associated with plain wooden blocks. But saliva from an unrinsed mouth, particularly if it contained traces of alcohol seemed to affect the block insert. Sadly, recorder players seem to be an

impatient lot with perhaps an above average alcohol intake, and it was asking too much expecting them to cleanse the mouth before playing and to refrain from drinking before and even during music making sessions. Windways were subjected to a breath/food/alcohol condensate that slowly eroded the artificial insert. It is to be hoped that Dr Moeck is successful in seeking a solution to this recorder problem. It would be of enormous benefit to recorder makers and players. Of course research continues with laminated blocks, chemically impregnated blocks, stabilised blocks, non wooden blocks etc etc. Fame and the eternal gratitude of recorder players still awaits the inventor of a suitable material! And riches as well maybe, if wider applications can be developed. But relying on mouth rinsing, non alcohol consuming recorder players seems to be quite out of the question.

**Four Sided rather than Round Recorders** - invented by Joachim and Herbert Paetzold - German Application 2558627. I remember being attracted by such an idea, and as long ago as 1967 made a contra base in F along these lines. Photos of the proto-type appeared in The Recorder and Music Magazine of December 1970, pages 278/9. The one piece instrument was long, straight and cumbersome, because it never occurred to me as it did to these patent holders, to double the recorder back on itself, like the bassoon, with a down bore and an up bore. Making doubled back recorders of rectangular/square cross section with tapered bores calls for skill and ingenuity. So for original thinking this 1975 patent scores highly. The resulting bass in F, contra in C, great-bass in F and sub-contra in C [fig 6] might look odd and even offer some tests of intelligence when it comes to putting them together, but they dismantle into surprisingly small parts and fit into small carrying cases. They are comfortable to play and are available with an ingenious stand which makes holding the instrument unnecessary. The keys are large, paddle like pieces of wood, that produce a *thwack* having a musical sound of its own. As with many keyed recorders, small hands can easily cope, the stretch being little more than needed on a treble recorder. One might be surprised that the designers of such a radical instrument come from a family where traditional recorder making was well established. Organ pipes have for generations been made of wood, some so long that they are bent and angled under the floors of churches. So maybe it was inevitable that recorders showing similar characteristics appeared above boards, so to speak! For those traditionalists who don't like change, this unusual looking recorder will have little appeal. But for many, this instrument is perfectly acceptable creating interest whenever it appears in public. I have never been able to conduct blindfold tests to determine whether the version made from plywood sounds any different from the natural wood version, nor whether a large four sided recorder sounds any different from the traditional round model. But whatever the results of such tests, this patented instrument adds a booming bass to a recorder ensemble.

**Tilting Windway** - invented by Arnfred R Strathman - European Patent 0431344. To achieve a better balance between the highest notes of the recorder and the lowest, both in volume and speech, recorder makers have for years modified the angle at which the airstream impinges on the labium edge, in part by controlling the angle of the

windway floor, relative to the roof. Even after completing the instrument, adjustments can still be made. This is achieved by attaching thin packing materials to various parts of the block thereby making the windway entrance or exit, bigger or smaller. The windway floor could maintain its relative alignment with the windway roof, or change its angle depending on whether the packing material simply raised or lowered the block, or tilted it from its entrance end or from its exit end. This 1994 patent allows the windway floor to be tilted without the use of packing pieces, changing the windway entrance size hardly at all. It is more the size of the windway exit which can be varied. The width of the windway is not affected. The reasons for this unusual patent are best explained, rather surprisingly, by observing a good flute player. Request that a variety of pieces be played covering a large portion of the instrument's range. Stand at the side of the flautist and at the front, closely observing how parts of the face, particularly the mouth and the lips, are modified for nearly every note. The shape of the mouth and lips is referred to as the *embouchure*, a French word which the English language typically consumes, rather than seeking a translation. Watch in particular the way the embouchure adjusts when scales are played in octaves or when the music repeatedly leaps from low notes to high. Request that your flautist now tries the same thing keeping an unchanged embouchure for every note - high, low and middling. The resulting sounds are seriously jeopardised. The low notes become thin and weak and the high ones diffuse and windy. Experiments show that today's 'one-windway-best-compromise-recorder' would profit by being similarly equipped, having a different windway for every note. This is simply not possible, but if it were the result would be, among other things, a much better balance between the high and low registers. The largest descant recorder section in a massed ensemble could produce the highest notes with a sublime sweetness that would please the most irritable conductor! Now available are newly designed recorders with ranges in excess of three octaves, with a selection of keys to facilitate fingerings. For such revolutionary instruments adjustable windways are *de rigueur*. The fixed windway with its subtle compromises suited to the traditional recorder can no longer be all things to all notes over such a wide range, and fixed windways become increasingly unsuitable as the recorder's range grows even further. I attempted to solve this problem in two ways. First by designing a rotating head with a chamber containing a selection of windways, much like the chamber of a six-shooter rotates into position. It worked but was an enormous problem to produce. And secondly, by having a large slot instead of a windway. Into this slot one fitted prefabricated windways, all with identical outside dimensions, but each containing its own windway matched to the pitch of the notes being played. It worked well. This patented tilting windway addresses this complicated problem with a technical elegance [fig 7]. The windway exit can be minutely adjusted from smallest to largest with all sizes in between by using a screw thread mechanism. One simply 'dials for size'! However, whenever one wishes to make a change to the tilt of the windway floor, the music must allow for the modification to occur, in much the same way as other performers require time to carry out changes and adjustments. Composers must allow plenty of time if they expect players to double on other instruments - B flat/A clarinets;

flute/piccolo; and oboe/cor anglais for instance. String players need time to fit and remove mutes. Harp music must allow enough time for players to set pedals as modulations occur. Organists enjoy a huge range of colours by varying the registration but those playing instruments that do not have pre-set mechanisms often rely on someone else to help with the stops. Those without such help sometimes find it hard to avoid small breaks in the music as hands flit from keyboard to stops and back. It would be possible to write recorder music without windway adjustment opportunities and in the unseen recording studio an assistant could perform these tasks. But dangers lurk in all of the world's concert halls. Murphy's Law guarantees that some windway adjusters would attempt to fulfil their duties at the wrong time, affording the audience a chance to see how a performer with a mouthful of recorder attempts to escape from a misguided windway adjuster. Concert performers face enough challenges and problems without adding to them, although some rather dull performances, and not just on the recorder, could do with something to liven them up! Opportunities, even breaks in the music to allow players to carry out necessary adjustments might not please everyone, but these will be necessary until foot operated, digitally controlled windways appear on the market. Adjustable windways are also very suitable for modern baroque recorders but music written for such instruments does not contain adjustment opportunities. Consequently, the highest notes of the traditional fixed windway recorder will always be much stronger than the lowest notes - a problem exacerbated by blowing the instrument from its wider end. But this patented tilting windway, providing windway sizes more appropriate to the music's tessitura, makes possible instruments with a greatly increased range, as well as providing a better balance between the low register and the increasingly distant high notes.

**Coda [PM]** We hope that what we have written has proved of interest to readers. There's lots more - some very imaginative, others rather odd and eccentric, but all displaying great enthusiasm and imagination. The recorder seems to encourage people to develop these latter traits. And by the way, before rushing off to the workshop to make a recorder that converts into a pipe, a word of advice. It's already been done by Josef Ignaz Lausmann and can be found in the 1906 German patent 178889. Similarly, there exists a British patent 28149 from 1896 by E.E. Starck for a recorder which doubles as a gavel to be used by the Branch President to call to order noisy members at the Annual Meeting of their local Recorder Society. But there's still plenty of scope for the dreamers of this world. Nobody to my knowledge has designed a recorder that doubles as an electric hair curler, nor one that with simple attachments converts to a pasta maker. If neither of those appeal, how about a recorder with a built in flashing metronome in the foot, or one that converts to a steering wheel locking device? For inventors, the world is their oyster.

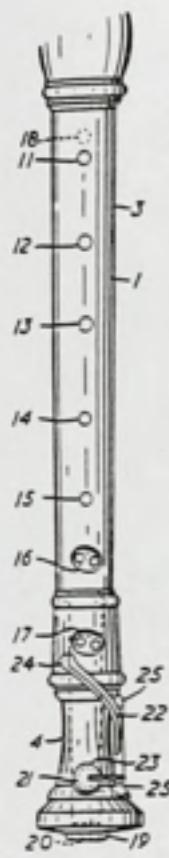


Fig 1

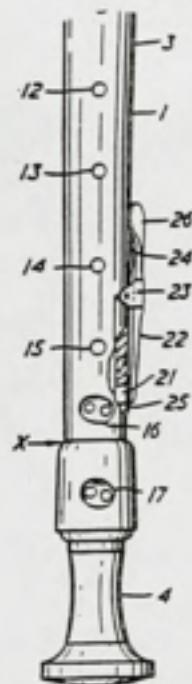


Fig 2

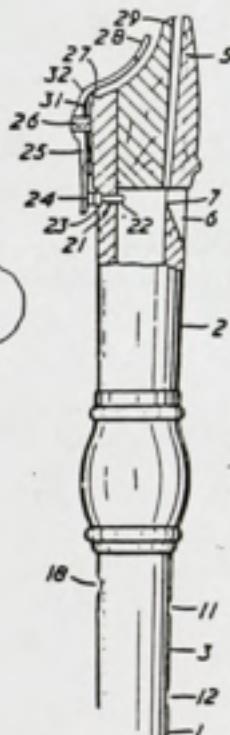


Fig 3

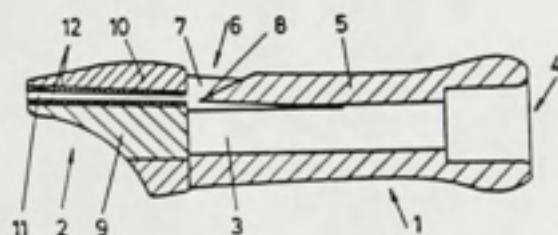
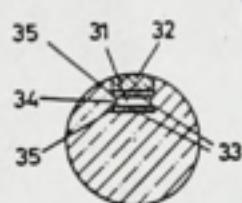
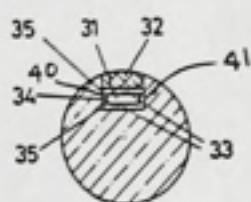
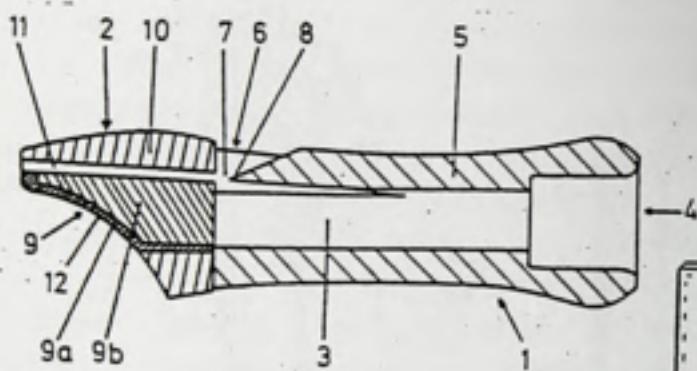


Fig 4





**Fig. 5**

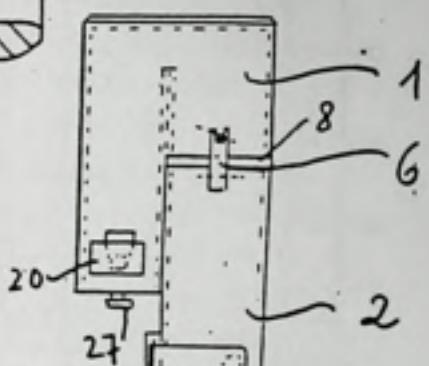


Fig. 6

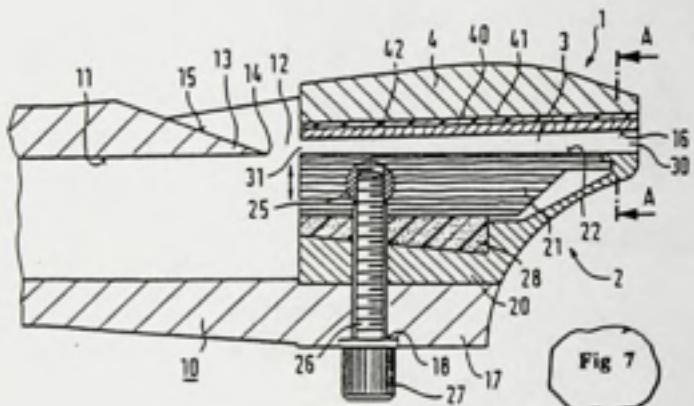


Fig. 7

