

FoMRHI Quarterly

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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 97

October, 1999

Renewals: Doubtless you're resigned to this by now, but as usual we begin the October Bull by saying **It's time to renew your subscriptions**. Same rate as last year and the last few years: £10.50, which covers the subscription plus surface postage worldwide, plus £1.50 if you want airmail to Europe, or plus £3.00 if you want airmail to anywhere else. One nasty shock for anyone who wants to pay in any currency other than pounds: the banks are on the make and are now charging us £10 pounds to convert cheques from any other currency. So if you want to use your own cheques (American, checks) we have to ask for **an extra £10 pounds**. Iniquitous, but if we didn't we'd be left with only 50 pence for the subscription which wouldn't even pay for the envelopes.

There's a renewal form tucked in here, headed Invoice just in case you can persuade anyone else to pay it for you. There's a list of names on the back – if one of them is yours, **don't pay** because you've paid already.

There are still a few places where you have colleagues who cannot get foreign currency except at even more exorbitant rates (I'm rude about our banks, but there are others far worse). If you can add a little to help them, so that we can keep them on the free list, they, and we, will be very grateful.

Please send your renewals, cheques made out to FoMRHI, **not** to Barbara, posted to **Honorary Treasurer FoMRHI, 21 Broad Street, Clifton, Beds SG17 5RJ**, well before January 1st – it makes our life much easier if you don't leave payment to the last minute. And please **don't** send them by recorded delivery or registered – Barbara would have to go down to the post office to collect them and she hasn't got the time.

Or (if this reaches you in time) you can give it me at the Royal College of Music at the Early Instrument Exhibition.

A Personal Note: Things are still a bit difficult for me, due to family illness, and I'm much in London and therefore not doing the job as well as should be, due to which apologies for errors and omissions. I have a second email address which reaches me there as well as here: jeremy@jmontagu.freeserve.co.uk

I think anyway that I've been doing this long enough. I'd quite like to see Bulletin 100 through (for fun, really, to knock up the century), so this is to give half a year's notice that we shall need a new Hon. Sec. (Translation: a Secretary that doesn't get any money except to cover out of pocket expenses such as postage stamps) after next July. It is the Fellows who elect or appoint, but the position is open to anyone, and doubtless the Fellows will welcome both offers to do the job and suggestions that anyone else might like to do it. It would seem to me invidious for me to organise this, so perhaps Eph would take charge of it as FoMRHI was his and Djilda's idea. Let's see what he adds in his Bulletin Supplement and get organised in January.

In Memoriam: A member of ours, and a Fellow, from 1978 until 1983, after he'd retired to New Zealand, the whole early music scene would never have been what it is without John Thomson. He founded *Early Music* and built that up to what it is despite all the efforts of OUP to make him stick to a tight budget. He established the Early Music Series of OUP books, still going strong (and asked me to write half of the second and all of the third, as well as an article in the second issue of *Early Music* so I owe him much). He did much else, but this may suffice both to tell you that he has gone and to render our thanks to him.

Code of Practice: I've been sent notices about a new Code of Practice for Trade Organisations, and of course as many of you will know, a new one has just been brought in for businesses in this country. We are neither a Trade Organisation nor a business, but the new Code of Practice is much the same for both, to improve access for people suffering from any disabilities. This, of course, is desirable for any organisation, including us. If you think we can make access to FoMRHI any easier, do please let us know.

An intrusion or not? I was asked by Melrose Press (St Thomas Place, Ely, Cambs CB7 4GG) to send them a list of our members so that they could ask you all if you were important enough to be in their International Who's Who in Music and Musicians' Encyclopaedia. I don't like sending out our List because why should you get any more junk mail than you do already? On the other hand, maybe you'd like to be listed there. If so, you're welcome to write to them, saying that you got the reference from FoMRHI (I'll send them a copy of this paragraph).

Job Opportunity: ICCROM is looking for a new Director General and has asked us to publicise this vacancy. I'll send their notice to Eph for inclusion here.

I get notices for museum jobs through CIMCIM but so far they have always been too short notice to list here.

Things available: I told you last October of the Musical Gift Catalogue (41 Fortress Road, London NW5 1AD; www.musicalgift.com), and they've sent me their new one. All sorts of musical motif objects, including jewelry, cushions (sit on your most hated composer – the lavatory seat unfortunately only has odd notes so nothing identifiable), clothes, etc. What caught my eye particularly last year, and is still there, is a gadget to print a stave on any odd bits of paper, a quintuple (or sextuple for lute tablature) wheel on an ink pad which you can carry in your pocket or brief case because it's in a little plastic box – extremely useful. Much else too.

Ture Bergström has "two more drawings available on my web site www.bergstrom.dk (or full size on paper): 1. Soprano recorder (in about modern d") in Dean Castle, Kilmarnock, Scotland. 2. Soprano/sopranino recorder (in about modern e♭") in a private collection, Århus, Denmark. Both are interesting transitional instruments from the 17th century. The bores are Renaissance-like in shape, but much narrower. They play two octaves and a second with van Eyck fingerings."

Claude Lebet has produced *Il Violoncello Mainardi Baldovino* a 65 page monograph with four colour photos on this Grancino cello of 1710. Usual edition costs 60 Swiss francs (you can have a special binding etc for 400!) from 8 rue du Pont, CH-2300 La-Chaux-de-Fonds, Switzerland.

Conferences etc: The National Sound Archive is at last publicly celebrating its founder, Pat Saul (it was then the British Institute of Recorded Sound) and is introducing the Patrick Saul Seminars. This year (I hope they will continue) these are one next week and then two which this might reach you in time for: November 2nd 'The Performance History of the *Rite of Spring*' with Peter Hill, and November 30 'The Invention of Medieval Music in the Twentieth Century' with Daniel Leech-Wilkinson. Admission is free but with ticket (from BL Events Office, British Library, 96 Euston Road, London NW1 2DB, 0171-412 7222, boxoffice@bl.uk). They take place at 6.15 in Meeting Room 4, The Conference Centre, British Library, 96 Euston Road, etc as above.

West Dean has sent another list and, *mirabile dictu*, there are instrument courses listed. For players Nancy Hadden is running a course on The Court of Henry VIII based on three British

Library manuscripts: Add Mss 31922 (Henry's own), 5465 (Fayrfax), and 5665 (Ritson's), with places for singers, winds, strings, lutes, and keyboards. Pitch is 440. It runs 17-19 March 2000 and costs £105 for the course plus accommodation. Information from Rosemary Marley, West Dean College, West Dean, Chichester, W Sussex PO18 0QZ; 01243-811301. Alison Crum is running a viol consort course January 7-9 but they didn't include a special leaflet on that so that's all I can tell you about it. Same weekend there's a 'preparatory course' for their Easter instrument making courses, and Feb 27-March 1 on tool sharpening, and then April 19-28 (which presumably is Easter but I've not got a relevant calendar) there's nine days on making instruments, Modern violins, viola and cello (Robin Aitchison), Hurdy gurdies and other folk instruments - that's all it says (Geoff Bowers and Andy Butterworth), Renaissance and Baroque viols (Renate Fink), Harps (Gordon Jones), Historical woodwind (Eric Moulder), Guitars and other plucked (Zachary Taylor). Information from the address above and email westdean@pavilion.co.uk.

The International Committee for the Conservation of the Industrial Heritage has a Millennium Congress in London 30 August to 7 September 2000 and calls for papers. With the change from individual workshops to mass production on the mid 19th century high on their agenda, potentially interesting for us. More information from TICCIH2000 Congress Administrator, 42 Devonshire Road, Cambridge CB1 2BL.

Other publications: CIMCIM has produced publication no.4 on Regional Traditions in Instrument Making which looks very interesting (it arrived yesterday so I've no more than glanced at the list of contents). It's published for us by the Leipzig Musikinstrumentenmuseum and I presume it's available to non-members from them (they're in our List of Members, or you could email Arnold Myers, who's also in our List).

Latest *Lute News* (51 for September) has an interesting article on Laux Maler by Sandro Pasqual and a response to Eph from Martin Shepherd, but I presume that if you're interested in lutes you already belong to the Lute society. If you don't you're crazy because they publish vast amounts of information, including music in every issue. They're in our List of Members, too.

Coda: That seems to be the lot for the moment.

Deadline for next Q: Normally I'd say January 1 but it seems that everything is going to shut down from just before Christmas until several days into the New Year, or of course much longer if the doom addicts are right. Try to get things in before Christmas and then I can spend the time without heat light and power trying to sort out the next Q, but let's set a final deadline a week late this year to give things a chance, so Friday Jan 7th.

Meanwhile, see you (some anyway) at the RCM, and good luck with millennium bugs.

Jeremy Montagu
Hon Sec FoMRHI
171 Ifley Road
Oxford OX4 1EL, UK
jeremy.montagu@music.oxford.ac.uk
jeremy@jmontagu.freeserve.co.uk

Tolbeque's names for small-size violins

Some years ago, I reported the following little study to the e-mail violin-makers discussion group I belong to, and forgot about it. Another member recently used it to name a tiny double bass that a different member made for his 3-year old daughter. Being thus convinced that the analysis could be of some use to others, I include it here: Apologies if I've mentioned this here before, but I've looked and can't find it.

The violino piccolo was a respected instrument in the 17th and early 18th centuries. It was tuned a fourth higher than the normal violin. Seventeenth century Germans tended to call instruments a fourth or a fifth different from the usual ones as 'quart' or 'quint' instruments. When these instruments went out of fashion, they were given to the kids to play on, and probably tuned to normal full-size pitch in family music making. Thus the 'quart' name lost its original meaning of a fourth higher. There was another association though - it was smaller than a full-sized violin by the fraction of a fourth. A quarter-smaller violin can be contracted to quarter violin. With the dimensions of full size and quarter size, one can set up a consistent system for naming all of the other sizes.

A. Tolbeque's book (1903) has body lengths and vibrating string lengths for the various sizes of violin. I've been looking at his numbers, and I think that I've figured out how his system works. The quarter size is pivotal. On it, all dimensions are 0.78 times the full size (when it grew from 0.75, a quarter smaller, to 0.78, I don't know). The difference between quarter and full is divided into 3, with 1/2 and 3/4 at the other points (7/8 is halfway between 3/4 and full). The same differences are applied at the other side of the quarter, but instead of them involving fraction differences of 1/4, they involve differences of 1/16. So the other equal size increments would have size names of 3/16, 1/8 and 1/16. Thus the 1/16 size is somewhat over a true half size, and the difference in dimensions with the full size is divided into six equal increments. The sequence (with the proportion with respect to full size) is: full (1.00), 7/8 (0.96), 3/4 (0.93), 1/2 (0.85), 1/4 (0.78), 3/16 (0.71), 1/8 (0.63) and 1/16 (0.56). If one wanted to continue this naming system for three more sizes, they would be 3/64 (0.49), 1/32 (0.41) and 1/64 (0.34). If one wants to extend this naming system to even smaller sizes, it becomes decidedly unattractive, with 3/256, 1/128 and 1/256, so I'll stop here.

Praetorius's Mandora

Following is a letter sent to me by Erich Tremmel:

The spelling you repeatedly give of the small mandora based on Praetorius' *Theatrum Instrumentorum*, pl. XVI '*Mandoraen*' is incorrect.

What is meant, and used, is a low German (geographically, not socially) diminutive form of Mandora.+ (diminutive suffix) -chen. By "constructing" this word the vowel -o- is converted into -ö- (Umlaut o), in those days still written with a tiny 'e' above the o; the '-chen' suffix in Lower Saxon German has an "intensified" initial consonant and is thus converted into '-gen' or '-ken' (comp. Engl. '-kin'). But in the text of pl. XVI the 'g-' printing type of '*Mandörgen*' apparently was faulty insofar as the low curve of the letter was damaged/lost; but it definitely is no letter 'a' as can be seen by comparison with any 'a' in '*Laute*' or '*Mandörgen*' itself, the 'a', its left curvature especially being slightly larger than this faulty 'g' type.

In *Syntagma Musicum II* pp. 10, 28, 53 Michael Praetorius gave alternative spellings, but always following the same principle: '*Bandürichen*', '*Mandürichen*', '*Mandürinichen*'; by converting the "ö" into "ü", adding "i" in between and, in the last example, "-ini-", he accumulated up to three diminutive forms. The scheme is exemplified in the word-pairs German '*Mann/Männeken*' (low German) and English '*man/manikin*'.

Since German spelling was far from standardized before the late 19th century I would personally recommend to use '*Mandörgen*' or, perhaps more easily recognisable for those accustomed to modern spelling, '*Mandörchen*', or, if your typewriter/computer happens to be unable to produce German Umlaut dots, dissolve "ö" into "oe", which is correct though widely unfamiliar practice

But, excuse me to say so, '*Mandoraen*' makes no sense at all.

Jeremy's notice of quitting as Hon Sec

I am also tired of my job. It involves sticking together each Q camera-ready, numbering pages, typing the title page, and sending it off to the printer. While it is being printed, the label list is updated, the labels printed on the computer and stuck onto envelopes, on which the return address is stamped. When the Q's come from the printers, the postage stamps are bought and put on the envelopes, and air-mail stickers applied when appropriate. The envelopes are then stuffed with the Q's and sealed. A dozen shopping bags full of Q's is then taken to the post office. It's not really a lot of work, but I'm slow at it, and getting slower.

If a volunteer offers to take over the Hon. Editor. job, I will be very grateful and would be glad to quit. So both Jeremy's and my jobs are up for grabs. From the point of view of skills needed, I am easily replaceable, but Jeremy is not. So let's concentrate on finding a replacement for Jeremy, if that is possible.

As long as the members want FoMRHI to continue, it will continue. Our setup is old-fashioned nowadays, with 'professionalism' insisting that the worth of whatever one does for others must be proven by cash payment. I am proud of the value and quality of what we publish, and that is helped rather than hindered by our 'amateur' and informal ways. If worst comes to the worst, we can double our subscription and hire an administrator, but I hope that it will never come to that.

FoMRHI does not have to continue in the way it has. There have been some complaints from resigning members that the Q's have become my private journal because there are so many Comms from me, and not enough Comms that they are interested in. If my number of Comms inhibits the contributions of others, I can easily limit the number, and put the others on my web site (while the ideas keep coming, I won't stop writing them). We must try to make our Q's into what the members want. Please advise.

I disagree with Jeremy's comment in the Bulletin that it would be invidious for him to organise the recruitment and selection of his successor. He is the one who is dropping us in it, and he shouldn't evade taking any responsibility for getting us out of it. I will be glad to organise the formal aspects of getting the Fellows to elect the successor, but Jeremy should play his part in generating possible candidates.

VACANCY ANNOUNCEMENT
ICCROM - ROME
THE POST OF DIRECTOR-GENERAL

Applications are invited by the Council for the post of Director-General of the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM). The post will fall vacant in July 2000.

The Council is seeking a candidate with proven managerial and administrative experience, excellent interpersonal skills, a broad knowledge of conservation internationally and the ability to lead a skilled team of international professionals. Candidates should have a university degree in either the sciences or the humanities and should have exercised important functions, including management in the conservation of cultural property. Knowledge of the English and French languages is mandatory and a good knowledge of the Italian language would be desirable.

Applications should contain the following documentation:

- a current curriculum vitae, including a list of relevant publications;
- proof of proficiency in the two official languages of ICCROM (French and English);
- a personal statement, not exceeding 3 pages, addressing the candidate's qualifications for this position, a vision of ICCROM's role and development in the field of cultural property preservation and conservation, and how the candidate envisions accomplishing such developments in the immediate future and the longer term.

The Council intends to designate the successful candidate at its meeting in April 2000. Selected candidates will be invited to present themselves in Rome for an interview by Council at that time. Subject to approval by the General Assembly in April 2000, the new Director-General should assume the position in July 2000. At that time he/she should be free of all activities and obligations that might divert him/her from the main task.

The Director-General is appointed by the General Assembly for a period of two years, and the Council has the authority to renew the contract twice, for a further two years each time, without declaration of vacancy.

The Director-General will be resident in Rome. The post carries diplomatic privileges and a salary correlated with the United Nations personnel system level D2/1, currently (July 1999) commencing, after post adjustment for Rome, at net US\$82,657 (without dependents) and net US\$89,974 (with dependents) per annum. In addition, there are various allowances such as annual dependency allowances for eligible children, annual education grants, reimbursement for the cost of shipment of personal effects, and for the cost of home travel for staff members and dependents every three years. The salary and allowances are net of taxes but subject to various deductions such as for medical insurance and contributions to the UN Pension Fund.

Final date for receipt of applications which should be marked "CONFIDENTIAL", is 30 November 1999. Applications should be addressed to:

Lambertus Van Zelst
Chairperson, ICCROM Council
Smithsonian Center for Materials Research and Education
Smithsonian Institution
Museum Support Center - Room D2002
4210 Silver Hill Road
Suitland, MD 20746 - 2863
U.S.A.

For further information please contact Ms. Pilar House at ICCROM in Rome at the following e-mail address: ph@iccrom.org; telephone: +39+065855340 and fax: +39+065855343.

Florence Gétreau

Institut de recherche sur le patrimoine musical en France (Unité Mixte de Recherche du Centre national de la Recherche scientifique – CNRS).

Responsable de l'équipe d'organologie et d'iconographie musicale : Florence Gétreau.

The documentation Center for Musical Iconography, located since 1995 in the Musée national des Arts et Traditions populaires, moved in February and joined all the staff of the Institute in a very central and motivating place, near the musical collections of Madame Geneviève Thibault de Chambure, the founder of the Centre. New address : Bibliothèque nationale de France, Département de la musique, 2, rue Louvois 75002 PARIS. Tel. : 00.33.(0)1.49.26.09.97. Fax : 01.49.26.94.85. Email : irpmf.cnrs@wanadoo.fr.

In 1999, the documentalists of the Centre (Brigitte Devaux and Nicole Lallement) initiated the digitalisation of the documentation. About 3,500 pictures among 10,000 preserved in the documentation, were digitalised. About 5 000 analytic cards are already in the textual data base. The inventory of the popular stamps preserved in the Musée national des Arts et Traditions populaires was achieved before leaving it. The inventory of the paintings of the Louvre is also achieved and progressively published in *Musique-Images-Instruments* (Editions Klincksieck, 8, rue de la Sorbonne 75005 PARIS).

Volume 3 (1997) of this scholarly Journal, was published in October 1998. It was devoted, like volume 4 (under print) to "Nouveaux timbres, nouvelle sensibilité au XVIIIe siècle". A seminar on Regional Traditions in organology and musical iconography will be organized by Florence Gétreau in year 2000 at the Institute. Scholars interested to propose papers are welcome to contact her (florence.getreau@culture.fr).

I share my time between the museum (4/5) and the group. Every scholar interested in our musical iconographic documentation can ask for an appointment at the new address or to me.

Amitiés, Florence

This came by email, with the last three lines part of the letter rather than the announcement, but I thought worth including. The reason for this added note is a question: Does anyone know how Florence managed to include the acute and grave accents in her email? Jan Bouterse's comm herewith also came by email and I had to tidy up the funny substitutions it had introduced for acutes, umlauts, etc. If Florence's accents came through unmolested, why didn't Jan's? Or for that matter another colleague's who uses a different French provider, wanadoo? If anyone knows the answer we could all benefit! Jeremy

Review of: *musica instrumentalis*, Zeitschrift für Organologie, Ausgabe 1, 1998, Germanisches Nationalmuseum, Nürnberg.

A warm welcome to a new scholarly journal in our field. It is published by the Nuremberg museum and edited by their curator of musical instruments, Frank Bär. There is to some extent a museum bias, a very useful one, for there is a section at the end of this substantial volume listing notes and news from all the German and Austrian museums. It is also unashamedly teutonophone (is there such a word? we have anglophone and francophone, but that formation seems not to exist for other languages), covering as it does material from Germany, Austria, and the German-speaking parts of Switzerland.

It begins with an introduction by John Henry van der Meer, who was himself for many years the curator of instruments in that museum. He surveys the recent history of collections of instruments and significant catalogues and similar publications of the teutonophone world (if there isn't such a word, there should be, for how else can one cover the language of the relevant two and one third countries? – Switzerland is divided into French-speaking, Italian-speaking and German-speaking areas, but what their precise proportions are in area or population, I don't know, so 'one third' will have to suffice – and I suppose one should allow for those parts of what was the Austro-Hungarian Empire which still speak that language rather than Italian, for instance.)

There are several fairly general articles, for instance Ellen Hickmann on organology from Roman times onwards, and one on 'Lagenstimmungen' (Harmonic tuning? It's not in my dictionary) of instrumental families in the musicology of the 16th and early 17th centuries, by the editor, Frank Bär, and another, by Sabine Klaus, on the eighteenth-century keyboard instrument maker Johann Matthäus Schmahl through the eyes of his local newspaper which is an interesting and unusual angle to work from. A fourth, by Enrico Weller, is on the society of wind instrument makers in

Vogtland, celebrating their 200th anniversary in Markneukirchen.

Three are more specifically focussed on instruments. The first, by Konstantin Restle, is on Richard Strauss's use of the glass harmonica in his opera *Die Frau ohne Schatten*. He includes a brief history of the instrument and of the examples which Strauss would have known in Berlin. Apparently there was still a harmonica maker in Bohemia at that time, and as late as 1923 Curt Sachs, then in charge of the instruments of the Berlin Collection, was writing to Carl Ferdinand Pohl about the traditions of his family as an harmonica maker. I had always thought of those things as being entirely of Benjamin Franklin's time, going on long enough for Mozart to write his *Adagio and Rondo* but not much longer. But no, all sorts of people wrote for it Reicha, Donizetti – did you know there was a part for it in *Lucia di Lammermoor*? And as for people still making them in Richard Strauss's time.... Time perhaps that someone revived it?

Rainer Weber has a detailed article on the column recorders, a family of which he has reconstructed. There are only five originals known, a descant in Frankfurt, a treble in Brussels and another in a private collection in Japan (from the Van Zuylen sale at Christie's in 1988 which I wrote about in *Early Music*), and a tenor and a bass in Paris. They are clearly much more complex instruments than one would have thought, not just recorders in a funny shape. The bore of the tenor, which is the main subject of the article, goes both up and down, and presumably the others work in the same way. The embouchure is at the back, and the air then goes up to the top of the body, over the top, and down a short distance to the mouth, which is high up on the body. There are then the usual recorder fingerholes, but instead of the bore coming out the bottom it goes back up to two extension keys and an exit under an elaborate pierced brass mount. Un-

fortunately the x-ray photo has not come out as well as would be helpful in the printing, and the computer version is even less clear at the published size. There is, of course, a thumb-hole, but this comes between the bottom of the mouthpipe bore and the top of the extension bore, which allows the maker, Rauch von Schratt, to put it at the bottom of a deep well so that it goes into the main bore at the front of the instrument. Access to the well is covered by a curved brass plate, with two little doors, one for the left thumb and the other for the right, since players were then ambidextrous. The wear mark on the original in Paris shows quite clearly that its player was using the same handing as we do today.

Wulf Hein has an article on making a reconstruction of a late Palæolithic bone flute from the Geissenklösterle Cave, said to be 36,000 years old ($\pm 1,000$ years). There were all the usual problems when dealing with an instrument of which one has only one end. Using a radius from a swan for the reconstruction, a practical length was that of the usable part of that bone. What survives of the original has three fingerholes, so that was followed. With holes cut in so far to a thin bone, they work both as fingerholes and as a mouth, and played that way a scale of approximately a, b, c, e, f was produced (I say approximately because Hein gives only note names and frequen-

cies and I can't be bothered to translate these into cents). It is certainly an interesting experiment but it can only be hypothetical because we cannot know whether the original was blown, like the reconstruction, from the surviving complete end or from the other end, nor what the other end was like, nor whether there were more fingerholes originally, nor even whether a plant stem might have acted as a reed! But at least something was tried, and what is perhaps the most important aspect is the idea that fingerholes can double as the mouth.

Three more museological articles: one by Christiane Rieche of Halle on cataloguing collections in central Germany; one by Brigitte Bachmann-Geiser of Bern, a bibliography on Swiss collections of European instruments; the third, by the same author, a checklist of the instruments in the Bern Historical Museum. And finally the notes and news that I mentioned at the beginning and a list of recent organological publications (that last in all languages).

An excellent journal, well-produced, roughly quarto size, 165 pages, well worth having and a welcome companion and colleague to the *Galpin Society Journal* and the *Journal of the American Musical Instrument Society*.

Review of: Exhibition Catalogue, *Souffler c'est jouer; Chabretaires et cornemuses à miroirs en Limousin*, ed. Eric Montbel and Florence Gétreau, Musée national des Arts et Traditions populaires, 6 avenue du Mahatma Gandhi, F-75116 Paris, 1999. 158 pp, numerous illustrations in colour and many historic ones in black and white, 195 French francs.

Florence sent me a copy of this catalogue, saying that it would still be available after the exhibition from her museum as above. The exhibition was on there from April to the end of August and is on now at the Salle Attane, rue des Plaisances, F-87500 Saint-Yrieix-la-Perche, but it ends there on 1st November, so you'd be lucky if this reached you in time to see it.

The catalogue is excellent; every exhibit is illustrated, albeit postage-stamp size, and there is a list of all the other old *chabrettes* known to survive. There is a whole series of articles on the *chabrettes*, the bagpipe of the Limousin and Dordogne. Its characteristics are a chanter (*le hautbois, l'auboé*) with six fingerholes and a seventh under a forked-touch key in a fontanelle; a bass drone which lies across the forearm of the player's lower hand (players play either left- or right-handed as they prefer), and a small drone which is set in the same rectangular box-shaped stock as the chanter. The box is decorated with inset small mirrors, pewter, marquetry, other inlays, even a working clock, but above all mirrors. Occasionally there is a second box with two more drones.

There are many illustrations of players from the last century, photographs from news-

papers, postcards, and historical records, and a few earlier, paintings etc, and many of instruments, plus a large number of collections of the boxes (*boîtiers*) which seem to survive as art objects when pipes do not – presumably when a pipe wears out or ceases to be played, the box at least is kept.

There is a section on known makers. There are others, but with rather more information on the anthropology and sociology than organology. No tables of dimensions or bores, for instance, other than the initial explanation that the chanter is conical and the drones cylindrical. It is a living tradition; there is a section on its renewal and a discography as well as a bibliography, and the catalogue includes a section on instruments of current makers as well as a list of useful addresses.

If you work on bagpipes, this is a style that you should know about, for it certainly goes back to the earlier baroque, when the shawm was becoming the oboe, with little change since then, and it is one that has been continuous without a gap. Unlike the *musette du cour*, for instance, there has been no need to recreate something from museum specimens. And, especially considering the amount and quality of illustration, the price is quite reasonable.

L'arco: The multimedia guide for discovering the secrets of the bow. In 6 languages: Italian, French, English, Spanish, German and Japanese. Requires at least a 486 PC with 4 MB RAM, 5 MB hard disk space, sound card, CD-ROM drive, VGA 640 x 480 graphics and MS-DOS 3.1 or Windows 3.1 or 95 (NB does not run on an Apple Mac). Available from: G. Lucchi & Sons, Via Stazione 25, 26020 Cavatigozzi, Cremona, Italy. Price Lit. 150,000 + 20% VAT + 35,000 shipping cost to Europe, 45,000 elsewhere (total equal to around £75 sterling).

The CD is aimed (so the accompanying blurb says) at "deepening [one's] knowledge of the bow and violin making in general, through texts, photographic images, films and musical works. It addresses issues such as bow re-hairing, research, development and construction, restoration, materials used, materials technology for musical instruments in general, comprehensive bibliography concerning bows and stringed instruments, history of the bow through the centuries, and musicians' special needs. The CD-ROM has been specifically developed for educational purposes in schools and conservatories of music, and as an easy-to-use reference for musicians, amateur and professional makers, dealers and enthusiasts of bowed instruments". Another aim of this exercise seems to have been to tell us all about il maestro Lucchi

There are 3 main sections: Construction (divided into stick, nut, head, adjuster, hair and engraving); Restoration (head, stick and nut), and Further Information (Technology, Materials, History, Bow Parts, Bibliography, 'Musicians' [i.e. advice to them, little of which I found useful], 'Video' [screen show of historical paintings and modern bows by Lucchi] and 'Editing' [list of credits]). Each sub-section of Construction and Restoration contains a sequence of good quality close-up annotated photographs illustrating various aspects of bow-making, maintenance and repairs including re-hairing. The Technology and Materials sections contain some useful data on woods and testing.

However on browsing the CD in Windows 98 I was struck not by its contents but rather by what seemed to be absent (finding things on a CD is not easy without a search routine). Construction and restoration apply to modern bows only; those interested in fixed-frog bows get short shrift. There are historical paintings illustrating instruments and bows but no identification of artist or date. There is a potted history of the horse but no practical advice on obtaining horsehair, how thick it should be nor how to identify hair suitable for bowing - except to say that a worn-out hair is useless - and no advice on hair cleaning or on choice or use of rosin. Since I could not find any video or sound tracks except for the introductory muzak, I installed Real Player G2 (a 45 minute download at 56K) and got it to search the CD for audio and video files. Most are Vivaldi soundtracks, still shots or text but there are a few videos including demonstrations of acoustic testing. On returning to normal CD running mode I still could not find them. For the student of bow technology this CD is not good value as an information source, and I remain unconvinced of the benefits of 'multi-media' compared to a good textbook.

Bouwerskontakt Bouwbrief 94, My Summary

Most Bouwbrieven have substantial contributions from the organ builders, and BB-94 is no exception. The first article is by John Boersma "Welke pijpen in het orgel" (which pipes in the organ?) and discusses the various types of pipes amateur builders can include. The first choice to be made is the material, wood or metal, and Boersma states that many makers will include wooden pipes, as this seems to be the easiest. Although a good choice for some registers (holpijp 8', and others), he argues in favour for metal pipes, which are essentially not more difficult than wooden pipes. In fact, he claims that there are many advantages (reversibility, modifications, etc.) while making requires only basic metal working techniques. A few books on organ making are mentioned in the text. As an aside, Boersma claims that the circular saw was invented by an organ maker, Aristide Cavaille' Coll.

A next article concerns an alternative way for the wind supply of an small organ. Leo Schenkelaars describes his experiments to automate a bellow system with an electrical motor. Illustrated with drawings and with detailed descriptions of his trials, he comes to the conclusion that it does not work satisfactorily, but much can be learned from failures.

A short note reports on an excursion of the organ group to the organ builder company Kaat en Thijhuis in Kampen.

Reviews include:

- Werkstoffe and Zulieferteile fuer den Musikinstrumentenbau, band C (strings), ed. Bochinsky.
- Instrumentenbau Report 27 (covers xylophone, tong instruments, early woodwind).
- Akoestiek van de instrumenten van de vioolfamilie tussen wetenschap en kunst (Acoustics for instruments of the violin family between science and art), Jan James, 172 pp.
- Das Clavichordio III (3rd international symposium).

The Werkgroep Strijkinstrumenten (strings) has had an assembly where Wim Tol talked about home made lacquers and his experiences.

An article from Toon Moonen about the drilling of long holes for woodwinds. His method is lathe-based, with a drill in the head stock and the wood pushed in from the tail stock. He uses commercial drills, as used in the building trade. These metal drills have an elongated shaft of smaller diameter and a total length of about a meter and cost around fl 20 (could I say 9 Euro, or is that "swearing in the church"?). So, his drill turns, and the wood is kept non-rotating by hand (personally I prefer and do the reverse) and Toon claims that his holes (or rather the woodwind's) are very straight.

A final article by Leen van Assendelft describes (with some sketches) the square bass recorder he made out of planks. His recorder is peculiar in that the front plank is much wider than the recorder, which gives him ample space to place all metal ware of his elaborated key system (home made to match baroque fingering with some Boehm thrown in). So, looking from the top his recorder looks like:

┌

He has experimented quite a lot with labium, windway and most of them can be changed or replaced. Not a finely turned baroque recorder, but it has certainly assets.

Basta cosi.

PRIORITIES OF WORDS AND MUSIC

“By respecting the poetic form, Buxtehude expressed it to its fullest, rather limited(sic in comparison with musical form) extent. Bach transcended it and the limits of this study.” This lively quotation comes from a dissertation by Dr Stuart Frankel of New York University, which may be downloaded at his web site <http://www.dustyfeet.com>. His address for correspondence is gecko@dustyfeet.com.

The musician at work on a song probably considers if his notes may be married to the patterns of sounds in the words he is to set. Sophisticatedly, he knows that the stressed and unstressed syllables only make a partial explanation of the rhythm and beauty of the poem. Whilst limericks, mnemonics, Clerihews and marching songs rely dominantly on the crude stress patterns, less obvious patterns of vowels and consonants empower fine verse. To trace these patterns for his song and do them musical justice, exposes the musician to dilemmas and decisions. The examination of the structural relations of verse and music from the earliest times of musical records to the present offers rich pickings of illustrative material.

In a progress from ancient Greek, to Latin, to medieval French, and into Swedish, German, Italian, and modern Japanese, the dissertation links a chain of relevant examples. For instance, the morae (units underlying ancient Greek quantitative verse) enter into established and contemporary Japanese verse as a structural device closely matched with their classical Greek function. (As a difference, the Japanese also count morae for resonant consonants, like m, n, ll, and rr, as if adding each time an extra phonological unit.)

Appreciation of verse and response to its mechanics varies amongst musicians. Bar lines and conventions of stressed beats within the bars may be matched to stressed syllables, but this seldom is kept up for much of a song. Rises and falls of pitch in a tune may or may not reflect the vowel pitches in the words or the pitch inflexions that belong to the senses of the spoken phrases. Pauses in verse do not always dictate pauses in the music. Similar discrepancy may be found between the line by line arrangement of the verse and the musical cadences. Particular interest attaches to the musical practice of musician/poets, like Machaut and the dissertation examines what their practices reveal. On surviving evidence, creative impulse seems evident more than seems consistency in technique.

A well-made index and a comprehensive bibliography guide considerably the attentive reader through the clear text. The contents does not encourage skipping but, rewardingly, almost every page will add to the reader's reflections concerning verse structure or musical grammar. The author judges that on the whole he has discovered composers do show a good deal of respect for verse structure in their musical settings. He distinguishes Buxtehude in this respect. Not every reader is going to agree with Dr Frankel's general verdict. Perhaps assessment will depend on whether verse or music is a reader's greater interest.

Collections and museums: it is all in the name, or not?

Some weeks ago I got a phonecall; it was Rob van Acht, who told me that the name has changed of the museum where he is one of the curators. It is not anymore Haags Gemeentemuseum, as it was for many years, but now gemeentemuseum den haag, all in lower case as far I can see (so it is printed on his visiting card) and I do not know if this renaming was the wish of the directors of the museum, or if it was the designer who made a complete restyling all printed matters. Of course I asked Rob how long the new name will be valid, because the new name is as indistinct as the old one. One of the problems is that the city has two Dutch names: Den Haag & 's-Gravenhage, and that most languages has their own translations: The Hague, La Haie, and so on. How many people outside Holland know about a city with the name Den Haag? And you will find in the collection of the gemeentemuseum den haag (in translation: municipal museum) hardly anything about the city, therefore you have to go the Haags Historisch Museum (in translation: the historical museum of The Hague). What ever it may be, I'll not be surprised if within some years the name will be changed again and I will wait until the last moment before I change old old names in my book. I am so afraid that the whole idea of changing the name of a museum is not the result of a well-considered plan, but a clever idea by some publicity agency, who was asked to design what is called here 'a new house style' (and so making money). But actually: I do not know what exactly happened in The Hague.

Well, the problems in The Hague are small compared with those of the museum in Brussels, Belgium. This city is bilingual by law, and so the museum has, or better, had two names: Instrumentenmuseum (Dutch) and Musée des instruments (French). Not so long ago the name was longer: Instrumentenmuseum van het Koninklijk conservatorium: museum of musical instruments of the royal academy of music. But a new development is going on: the

museum with the collection of instruments will get a new name, and only in one language (French), and will be now Musée des Instruments de Musique, but the library with the books will have a Flemish (Dutch) name. It is all very exciting, and I wonder how many people in how many meetings spent their well payed time to this changing of names. But as far as I know, they do not have a good catalogue, in Brussels...

It is of course understandable that a new museum in a new building will have a new name: so they did a few years ago in Paris, where the Musée de la Musique is the successor of the Musée du Conservatoire National du Musique. In Lisbon (Portugal), the name of the museum was Museo Instrumental, and is now Museo da Musica, after they changed to their new building in a subway station far from the centre of the city. But I heard that not everybody is very lucky with this new place, so maybe we must not be surprised if they change again their address, and maybe also their name. The Shrine to Music Museum in Vermillion, South Dakota, United States of America, is not only one of the few collections in the world with some money to buy important historical instruments, they also changed their name not long ago: it is now American Shrine to Music Museum (same place, same country). I do not know why they did so, but please, don't forget to change the name in your own list of addresses. The museum in Vermillion is part of the University of South Dakota; however, I do not know in which extent. So I do not know if I have to add the name of the university after that of the museum.

Leipzig was until 10 years ago one of the major cities in the Deutsche Demokratische Republik and their museum of musical instruments was part of the Karl Marx Universität. Not only the statues of Marx have disappeared, also his name in the university. It is now Musikinstrumenten Museum (two separate words) der Universität Leipzig. It is the

same collection, the same university, but the name is new (and not very inspired). Two other German museums did not change their names: the Germanisches Nationalmuseum in Nürnberg (Nuremberg) and the Musikinstrumentenmuseum (one word!) of the Staatliches Institut für Musikforschung Preussischer Kulturbesitz in Berlin. Well, if these two museums will change (or shorten) their names, I will this time not have any objections. Also some names of museums in other countries are inconveniently long: Edinburgh University Collection of Historic Musical Instruments. Or must I also add that some instruments are belonging to the Reid-collection in this museum?

Other problems are related to transcribing from foreign languages as Russian, Japanese, et cetera. Is it *Musei Muzikalnich Instrumentov Teatra Muziki i Kinematografi* or must I simply say Museum of musical instruments, theatre and film music? I have some cyrillic characters on my computer, but I am sure that if I use them I will make even more mistakes than I am making now.

It is of course not always clear if you are writing an article or an book about musical instruments how to refer to a collection where the instruments are found. In Vienna (Austria) you can see two tenor oboes by Richard Haka in the Kunsthistorisches Museum. But in fact, these instruments are property of the *Gesellschaft der Musikfreunde in Wien* and are kept in the museum, and you cannot get to those instruments if you don't have permission of the *Gesellschaft*.

It is not always clear if a collection in a museum is property or on loan. So are the instruments in the *gemeentemuseum den haag* with the inventory number that ends with '-x-1952' from the collection of mister J.C. Boers; they are given on loan by the *Rijksmuseum in Amsterdam*. But must I tell this whole story every time when I am writing about one of these instruments? And how do I know if collections are on loan (permanent or not) or property? I do not know and in many cases I do not want to know it as well. Some years ago I was in the Library of Congress in Washington DC (USA) to see some instruments of the

Dayton C. Millar collection. Is this collection including all instruments in the museum building; that means: is the collection still growing en including more instruments than mr. Millar ever has collected?

Another problem is how to refer to private collections. Rob van Acht gives in his articles full names of private owners, including the names of the places where they live, but he didn't ask them for permission to do so. I disagree with him about that, because I know that some people do not want to have their names to be published. Some months ago, a voice flute by Willem Beukers was stolen from a private collection in Utrecht. In fact, the name of the owner was published not so long before and although I do not believe that the thief was looking for the recorder, it is better to avoid giving any indications at all. Actually: the thief in Utrecht robbed a complete safe from a wall in the house, and the recorder was in the safe. If the instrument had been preserved somewhere else, he (or she) would not have noticed it.

What I do myself in my publications is that I mention only the names (without addresses) of the major private collections. In The Netherlands for instance: Frans Brügger, whose recorder collection is well known, because of the publication of the drawings and measurements by the late Fred Morgan. But is is no secret that some owners of instruments, even when they are professional players (or makers of copies) of historical instruments, are involved in buying and selling and that they do not like to give too much insight in their trades. And if I say that an instrument is in a private collection in Brookline, Massachusetts, United States of America, many people will understand that there might be a relation with a well known woodwind maker who is living there.

It is of course a problem for all researchers that instruments will change from owner, and it is not possible for me to know the past and future whereabouts of all these 'private instruments'. So I still don't know how many bass recorders by Boekhout were in the shop of Tony Bingham in London, or how many Deut-

sche Schalmeien by Haka were in the hands of the oboe player Han de Vries in Amsterdam. Of course I am interested in the history of each recorder, flute or oboe. It can be important information where the instrument is found, in which part of which country, if it was for many generations in a family, and so on. If an instrument is sold at an auction, the greater part of the information about the history is lost. Also, most museum collections have in their files only the name of the last owner, or nothing. We have no information where the great collectors, who were active 50 to 100 years ago, found their instruments: Boers, Scheurleer and Ehrenfeld in The Netherlands, César Snoeck in Belgium.

My final problem: many people know that I sometimes sell drawings, descriptions and photos of woodwind instruments. Not that I

am asking much money, but as it takes much time answering letters, going to a copy-shop for getting good prints etcetera, and I do the whole job not for only the costs of the photocopies and the stamps. Of course, I am never selling drawings and so on when the instruments are property of a public collection. But sometimes I have seen instruments before, when they were (still) in a private collection. For instance the beautiful ivory alto-recorder by Steenbergen, now in Vermillion. What must I do now? As far as I know, the American Shrine to Music Museum has not made a new drawing, so people come to me and ask for information. And so there are more instruments of which I even do not know where they are know. Is it a consolation that I myself do not know what happens with the drawings and photos I sold in the past years....

FoMRHI Comm 1667

Donald S Gill

An unusual method for stabilising wood

While on holiday in Switzerland I visited the Uhren und Orgel (Clock and Organ) museum in Oberhofen. The guide who took me round pointed out that the early clock makers preferred iron for the best quality clocks but for the cheaper end of the market they had to use wood for the mechanism. They needed the wood to be stable and solved the problem in two ways. Firstly they chose inherently stable woods but then they soaked the wood in (and here the guide hesitated because he thought he might be using rude words) cow piss. I was too busy assuring him that no offence had been caused to follow this up but he was quite sure that this was what was done and that it worked.

We know (Comms 1423 and 1438) that instrument makers boiled their wood to make it more stable but I have never before heard of this method of stabilising wood and I wonder if any of the early keyboard makers copied the clock makers in this respect. Can any of our experts in the structure of wood tell us whether it is likely to work? Is there anyone out there with access to the appropriate liquid brave enough to conduct a trial? Or have I come across something that is already well known?

Charles Trute Pianos --- appeal for information.

Can anyone assist me to locate square pianos by Charles Trute? He worked in London in the 1780s but then migrated to America where he is reported to have worked with Wiedberg from an address in Philadelphia.

In Birmingham last month I encountered a very interesting instrument, inscribed :

CAROLUS TRUTE LONDINI FECIT 1781.

It is a small instrument, with a 58 note compass GG-f'', with such a small soundboard that the overall size is smaller than the earliest Zumpes. On the back of the nameboard there is a well preserved printed label of J&J Simpson, at the sign of the Oboy, Flute and Viol, in Sweetings Alley, Royal Exchange. The text is enclosed within an ornate baroque border incorporating instruments of music.

Internally it has been subjected to some very unfortunate 'restoration' by unskilled persons whose knowledge of early pianos appears to have been very limited. This a particularly unhappy circumstance as the piano is unusual in many ways.

To try to work out how the piano was originally I would like to collect information on other survivors. *Clinkscale I* lists only two extant pianos from the London period, one of which was sold by E.C.Legg in Cirencester many years ago. I am acquainted with Mr Legg's son, but he does not know where the piano is now. So, if anyone can help to trace this example, or any others from the 1780s I would be most grateful.

Tel: 01242 517192 or temporary e-mail address [c/o w.cole@bigfoot.com](mailto:c/o_w.cole@bigfoot.com)

FoMRHI Comm. 1669

"Bestes kleines Clavier"

In the beginning of September a 4-day clavichord congress was held in Italy at the invitation of the International Centre for Clavichord Studies (directors: Bernard and Susan Brauchli, Christopher Hogwood). It took place at the picturesque village of Magnano, situated between Milan and Turin, with nearly 60 people from Europe and the USA attending, of whom c. two thirds were active participants.

About a dozen makers had brought along their clavichords, and there was ample opportunity to present and try out copies after Domenico Pisarenis and later instruments. The range of topics included C. P. E. Bach's Lieder as works for the clavichord (Darrell Berg), keyboard practice in the Bach circle (David Schulenberg), the clavichord in Sweden so popular about 1800 (Eva Helenius-Öberg), the discovery of a clavichord made in Peru in the 17th century (Alfons Huber, Ana Savarin de Graf), a couple of Spanish clavichords (c. 1800) now in America (Laurence Libin, Sabine Klaus), conservation ethics (Derek Adlam), reflections of a modern composer trying to write music for lute plus clavichord (Jean-Jacques Dünki), and presentation of clavichord iconography (myself). A great variety of instruments and playing styles was shown in the concerts of Paul Simmonds, Jane Johnson, Andreas Erisman, Jaroslav Tuma etc., the most noteworthy being a moving recital of 18th-century German songs praising the clavier (Almut Hailperin, Sally Fortino).

This 4th International Clavichord Congress was highly inspiring in many ways, with an excellent working atmosphere in friendly surroundings. Papers (all read in English) will eventually be published. If you are interested in the Proceedings or feel like attending the next congress in 2 years' time, please get in touch with Bernard Brauchli (see FoMRHI List of Members).

Uta Henning

Basic Accountancy in Organ Pipe History

In Comm. 1398 I presented an analysis method for testing different theories about the succession of pitch levels of old organs. It applies that theory to the succession of marked pitch names on an individual pipe, and then predicts the succession of absolute pitches of that pipe as shown by the work done on it. Martin Goetze & Dominic Gwynne have collected such information on the pipes of the Dallam Magdalen College chair organ. A list of the pitch markings on the front pipes was published by Dominic Gwynne in Table 4 Appendix B of his article 'Organ Pitch in Seventeenth Century England' (*BIOS Journal* 9 (1985)). In Comm. 1329, Martin Goetze described the cutting down and patching of a particular pipe (number 5), and the sequence of pitches it would have produced.

Martin produced his own analysis of the pitch history of the pipe, and how it fit in with the others. In Comm. 1398, I used my analytical method to offer solutions to the problem that could fit both his and my assumptions of the pitch history of the organ, and did not discuss the analysis he presented. My solution for his assumptions was not his. I assumed that the superiority of my method would be self-evident. That was a mistake, because he ignored what I wrote. Why should he use his valuable time to try to understand my method when he was quite satisfied that his own solution was as good as can be expected from the evidence at hand? The purpose of this Comm is (1) to point out how his solution is quite inadequate in explaining the evidence he gives, (2) to show that solutions that adequately explain all of his evidence can be postulated using my analysis, and (3) to present my analysis method more clearly, hoping that the organ people will be tempted to use it on other pipes.

Evidence

Let us summarise the evidence. Markings on the pipe in time sequence are $g\sharp$ (original Dallam mark), g , $DD\sharp$ (Harris-style mark), ee and $DD\sharp$ (18th century-style mark). The actual pitch of the pipe (at modern standard) was at about e after a scoop was cut, after which the scoop was filled in to sound about $d\sharp$, and then an extension dropped the pitch to about d , and a final scoop raised it a fraction to $d+15$ cents, its current state. At modern standard, the original pitch of Dallam's organ was $F\sharp + 40$ cents (± 12 cents) for C (about $6\frac{1}{2}$ semitones above modern). The calculation of this is in Comm. 1290. If one calls the C an F (choir pitch for that organ), its pitch is about $1\frac{1}{2}$ semitones above modern. The final pitch of the organ is about $\frac{1}{2}$ semitone below modern. Renatus Harris worked on the organ in 1690. According to the contract, before his work the organ was at the pitch called 'Gamut in De Sol Re', and he lowered the pitch by a semitone to a pitch that he did not name. He also reduced it from 51 notes ($F-g'''$) to 50 notes, implying a $G-c''''$ short octave (G, A, c plus $d-c''''$ chromatic). There was work done on the organ in the 1730's.

The $g\sharp$ original marking on the pipe (actually $G\sharp$) is a minor 6th above C , so its original pitch (at modern standard) was a somewhat sharp d . The final 18th century marking of $DD\sharp$ (actually $d\sharp$) on the pipe is consistent with its final state of having the same pitch that it started with, and the final pitch of the organ being half a semitone below modern. Thus the initial and final absolute pitch levels of the organ and of the pipe, and the initial and final nominal pitches of the pipe are all known, and are not matters of controversy. What is disputed is the organ pitch level represented by 'Gamut in De Sol Re' (which appears to have been related to the previous '10 ft pitch' without pipe movement), and the rest of the history of the pitch of the organ and of the pipe.

The Goetze interpretation

In Comm. 1329, Martin attempts to explain the 'apparent contradictions of pitch movement between 1631 and 1730's: going down a semitone [and down a fourth] and then back up one and yet ending up a tone lower.' The contradiction seems to stem from a reluctance to choose a definition of organ pitch (as relative to its keyboard or its pipe holes) and follow it.

definition of organ pitch (as relative to its keyboard or its pipe holes) and follow it.

Some quite unlikely assumptions occur at various places in that explanation. The first is to consider that the second marking of *g* on the pipe was a mistake, where 'the person remarking this pipe in 1690 thought that by making a *g#* a *g*', it would lower it a semitone.' This is highly improbable because that person would be employed by Harris to do things Harris's way, and in that craft culture, he would just not dare to act following his own ideas on how to lower the organ's pitch. This is especially true since this is such an incompetent idea - this change, on its own, would raise the organ's pitch, not lower it.

The next is Martin's account of Harris's 1690 work. Harris was supposed to first have marked the pipes that would be retained with their Gamut in De Sol Re pitches, and then he moved them for the organ to play a semitone lower with a *G* short octave, renaming them accordingly. Harris was a thoroughly competent organ maker, and it is hard to imagine that he would need to make two markings to keep track of the pipes in a particular organ rebuild. If there were any Gamut in De Sol Re pitch markings, they would have been made before 1690, whenever that pitch was established. I wouldn't expect any pipe markings then since there would be no need to move pipes.

Another assumption that is apparently an error is that the pitch a semitone lower than Gamut in De Sol Re, that Harris rebuilt the organ to, should have been called 'Gamut proper', and not stating this in the contract 'was an oversight of the scribe'. This is inconsistent with what Martin wrote elsewhere in Comm. 1329, where he concluded 'that 'Gamut proper' is a tone lower than choir pitch' which is 'evident from pipe markings (both at Magdalen in 1690 [!!!] and New College in 1713)'. He also stated 'that 'Gamut in D' means a 10 ft 'transposing' organ', which is at 10 ft choir pitch.

In Comm. 1329, Martin show what appears to be the distribution of pipes (with their appropriate markings) in the pipe holes for the organ at various times: originally in 1631, when in Gamut in De Sol Re, when Harris dropped it a semitone, and after the work in the 1730's. So under the *G#* of the original state is *d#* of the Gamut in De Sol Re state. That can't be the same pipe in the same hole because the choir-pitch equivalent to *G#* is *c#*. Thus either the *d#* marking was not for the Gamut in De Sol Re state, or this pipe was cut down and shifted. I can't see what Martin might be showing that would make sense.

The analysis

It seems evident that an analysis should be made of the history of this organ and its pipes that is self-consistent, makes no unlikely assumptions, and takes all of the evidence into account (we have the evidence on one particular pipe). To do this one needs to systematically follow in time the changes in the organ pitch level, the pipe nominal pitch (from the markings) and the pipe actual pitch (from the scoops and patches).

The sequence of pipe nominal pitches is: *G#*, *G*, *d#*, *e* and *d#*. So the sequence of changes, in number of semitones, is -1, +8, +1 and -1. The total change from the beginning is -1, +7, +8 and +7. We don't know when these changes occurred, or whether other pitches were pertinent but unmarked.

The sequence of pipe actual pitches (relative to modern) is sharp versions of *d*, *e*, *d#* and *d*. So the sequence of changes is +2, -1 and -1 semitones, and the total change from the beginning is +2, +1 and 0. We don't know when these changes occurred, and it is possible that more scoops or patches occurred, the evidence for which has subsequently been cut away.

The sequence of pitch levels of the organ includes a -5 semitones change when going from early organ pitch to Gamut in De Sol Re, and -1 semitone change for Harris's subsequent rebuild, and a total change from beginning to end of -7 semitones. Otherwise, we don't know what the changes were, and when.

For any actual pipe pitch, a pitch change of the organ is compensated for by a change in nominal pitch. In general, any pitch change of the organ plus the pipe nominal pitch change equals the change in actual pipe pitch. This applies to each change as well as total changes from the beginning. This relationship between the numbers must apply at all times. Pipe movements are irrelevant. If one assumes a test sequence of organ pitch levels, one can see whether one can place the sequence of changes in pipe nominal pitches in a way that the absolute pitch changes of the pipe are consistent with the evidence of work done on it.

Let us first test Dominic Gwynne's theory that the sequence of organ pitches was: a fall in pitch of a fourth and of a semitone in 1690 and a rise of one semitone in 1730. This sequence of pitch changes is -5, -1 and +1, and total pitch changes is -5, -6 and -5. We know that the final number has to be -7, so another pitch change of -2 must be inserted in the sequence somewhere, between 1631 and 1690, between 1690 and 1730, or after 1730. These possibilities of sequences of changes are -2, -5, -1, +1 and -5, -1, -2, +1 and -5, -1, +1, -2. A table is useful to keep track of the numbers. Let us try the first sequence:

pipe markings	<i>G</i>	between 1631 and 1690 <i>G#</i>	at 1690 <i>d# and e</i>	between 1690 and 1730	at 1730 <i>d#</i>	after 1730
organ pitch changes		-2	-5 and -1	0	+1	0
total from the beginning		-2	-7 and -8	-8	-7	-7
pipe nominal pitch changes		-1	+8 and +1	0	-1	0
total from the beginning		-1	+7 and +8	+8	+7	+7
pipe actual pitch changes		-3	+3 and 0	0	0	0
total from the beginning		-3	0	0	0	0

The first row is the sequence of organ pitch changes assumed. The third row is the sequence of pipe nominal pitch changes from the pipe markings at the appropriate times. All of the other rows are calculated from these. It predicts a 3 semitone extension of the pipe which was then removed. This is inconsistent with the evidence, so this set of assumptions cannot work. Let us try the second sequence:

		between 1631 and 1690	at 1690	between 1690 and 1730	at 1730	after 1730
organ pitch changes		0	-5 and -1	-2	+1	0
total from the beginning		0	-5 and -6	-8	-7	-7
pipe nominal pitch changes		-1	+8 and +1	0	-1	0
total from the beginning		-1	+7 and +8	+8	+7	+7
pipe actual pitch changes		-1	+3 and 0	-2	0	0
total from the beginning		-1	+2 and +2	0	0	0

The prediction here is that there was first a semitone extension, it was later removed and a 2-semitone scoop was cut, and then filled in. This is also not consistent with the evidence. Let us try the third sequence:

		between 1631 and 1690	at 1690	between 1690 and 1730	at 1730	after 1730
organ pitch changes		0	-5 and -1	0	+1	-2
total from the beginning		0	-5 and -6	-6	-5	-7
pipe nominal pitch changes		-1	+8 and +1	0	-1	0
total from the beginning		-1	+7 and +8	+8	+7	+7
pipe actual pitch changes		-1	+3 and 0	0	0	-2
total from the beginning		-1	+2 and +2	+2	+2	0

This one is equally unsatisfactory.

A similar result comes from assuming that the 1730's work was to drop rather than to raise the organ a semitone.

pipe markings	<i>G#</i>	betw 1631 and Gamut in D <i>G</i>	Gamut in D (<i>c</i>)	Harris at 1690 <i>d#</i>	betw 1690 and 1730 <i>e</i>	at 1730	after 1730 <i>d#</i>
organ pitch changes		0	-5	-1	0	-1	0
total from the beginning		0	-5	-6	-6	-7	-7
pipe nominal pitch changes		-1	+8	+1	0	-1	0
total from the beginning		-1	+7	+8	+8	+7	+7
pipe actual pitch changes		-1	+3	0	0	-2	0
total from the beginning		-1	+2	+2	+2	0	0

A better result comes from the above assumption of organ pitch changes if we change the times of some of the nominal pitch changes of the pipe, and assume that Gamut in D was unmarked:

pipe markings	<i>G#</i>	betw 1631 and Gamut in D <i>G</i>	Gamut in D (<i>c</i>)	Harris at 1690 <i>d#</i>	betw 1690 and 1730 <i>e</i>	at 1730	after 1730 <i>d#</i>
organ pitch changes		0	-5	-1	0	-1	0
total from the beginning		0	-5	-6	-6	-7	-7
pipe nominal pitch changes		-1	+5	+3	+1	0	-1
total from the beginning		-1	+4	+7	+8	+8	+7
pipe actual pitch changes		-1	0	+2	+1	-1	-1
total from the beginning		-1	-1	+1	+2	+1	0

This set of assumptions works because it is consistent with the absolute pitch evidence on the pipe. An initial extension of a semitone between Dallam and Harris is cut away by Harris, who cut a one semitone scoop. Between Harris and 1730, this scoop was deepened by another semitone. The latter scoop was filled in at 1730, and a patch of another semitone was added after 1730. This agrees with the pipe pitch sequence of +2, +1 and 0 after other changes the evidence for which would have been removed.

This is the only sequence I have found which fits Martin's assumption that Gamut in D was $1\frac{1}{2}$ semitones above modern, implying that 10 ft standard pitch was $6\frac{1}{2}$ semitones above modern, a semitone lower than the pitch calculated from a 10 ft pipe.

If we want to keep track of which hole the pipe is in, the same kind of arithmetic applies, with the hole shift for the pipe equalling the keyboard shift relative to the holes plus the pipe nominal pitch change. The keyboard shift was -5 semitones when the organ was put in its Gamut in D state, and was -3 when it was put in the G-short octave state. The table then becomes:

pipe markings	<i>G#</i>	betw 1631 and Gamut in D <i>G</i>	Gamut in D (<i>c</i>)	Harris at 1690 <i>d#</i>	betw 1690 and 1730 <i>e</i>	at 1730	after 1730 <i>d#</i>
semitones keyboard shift		0	-5	-3	0	0	0
total from the beginning		0	-5	-8	-8	-8	-8
pipe nominal pitch changes		-1	+5	+3	+1	0	-1
total from the beginning		-1	+4	+7	+8	+8	+7
pipe hole shift		-1	0	0	+1	0	-1
total from the beginning		-1	-1	-1	0	0	-1

This solution then implies the the pipe was shifted one hole to the left before Gamut in D, back again between Harris and 1730, and one left again after 1730.

There is a solution that allows real 10 ft pitch to be the same as theoretical 10 ft pitch. The organ pitch assumptions (besides the drop of a fourth for Gamut in D and Harris's drop of a semitone) are that the pitch was raised a semitone to theoretical 10 ft pitch between 1631 and Gamut in D, and dropped a tone at 1730.

pipe markings	<i>G#</i>	betw 1631 and Gamut in D <i>G</i>	Gamut in D (<i>c</i>)	Harris at 1690 <i>d#</i>	betw 1690 and 1730	at 1730 <i>e</i>	after 1730 <i>d#</i>
organ pitch changes		+1	-5	-1	0	-2	0
total from the beginning		+1	-4	-5	-5	-7	-7
pipe nominal pitch changes		-1	+5	+3	0	+1	-1
total from the beginning		-1	+4	+7	+7	+8	+7
pipe actual pitch changes		0	0	+2	0	-1	-1
total from the beginning		0	0	+2	+2	+1	0

In this solution, Harris cut the 2-semitone scoop, one semitone of which was filled in in 1730, and another semitone filled in after 1730. The pipe movements would be:

pipe markings	<i>G#</i>	betw 1631 and Gamut in D <i>G</i>	Gamut in D (<i>c</i>)	Harris at 1690 <i>d#</i>	betw 1690 and 1730	at 1730 <i>e</i>	after 1730 <i>d#</i>
semitones keyboard shift		0	-5	-3	0	0	0
total from the beginning		0	-5	-8	-8	-8	-8
pipe nominal pitch changes		-1	+5	+3	0	+1	-1
total from the beginning		-1	+4	+7	+7	+8	+7
pipe hole shift		-1	0	0	0	+1	-1
total from the beginning		-1	-1	-1	-1	0	-1

This solution implies the the pipe was shifted one hole to the left before Gamut in D, back again at 1730, and one left again after 1730.

In case there is lingering confusion, let me summarise how the above change and shift tables are constructed. The columns are a sequence of times, from the original building of the organ to its final time of use, that can be distinguished from one another. The odd rows of numbers are numbers of semitones of pitch change or shift at the time of that column. In the change tables, the pipe nominal pitch changes on row 3 come from the sequence of markings, with some leeway about when they happened, and the organ pitch changes in row 1 are the theory of the organ pitch history that one wants to test. The shift tables have the same row 3, and row 1 is the keyboard shifts of known amounts at known times.

All the rest of each table is calculated from these rows 1 and 3. The even rows are totals from the beginning, and each entry is the sum of the number on the left with the number above. Each number in row 5 is the sum of the numbers in rows 1 and 3 in that column, and each number in row 6 is the sum of the numbers in rows 2 and 4 in that column.

This is a simple accountancy system for keeping track of how the pipe would respond to any theory of organ pitch history, and a possible solution is found when the actual pitch changes of the pipe are consistent with the apparent work that has been done on it. It is a discriminating test of a pitch-history theory, and will reject most because they can't work. I've found two solutions that work from the evidence on one pipe. The evidence from another pipe could easily show that one would not work. If both don't work on it, we will need to look for others that do. One solution must work for all pipes.

The pitch history of this organ is solvable from the surviving evidence. There is no point in continuing to try to feel one's way through confusion to get the answer. Analysis can do it.

Instrument history and 16th century English choir boys

There are two questions about 16th century instrument history that I have been wondering about that English choir boys might have had something to do with. One is how did the English 10 ft. organ pitch standard come about, and the other is where and when the small set of viol sizes, as measured by Talbot and Praetorius, originated.

At the bar during the NEMA conference at York, Andrew Parrott reminded me that the total range (over all the parts) of English choir music increased early in the 16th century. I remember reading the suggestion somewhere that this was associated with extension of the treble range of boys voices. The two other possible explanations for the expansion of the total range are: an extension downwards in the bass range, or a fuller exploitation than previously of a larger always-available total range. Whichever is the true explanation, the greater the range used, the less leeway in the chosen pitch level there is, and so the closer to some pitch standard the choir must sing.

It therefore may not be coincidence that the earliest evidence for the 10 ft *CC* specification for an English organ also appears early in the 16th century: that of Duddington in 1519. If this pitch standard was used for singing, it makes the bass voices go much too low. So we must consider the alternative mentioned by Schlick (1511), of assuming that a keyboard could be considered to start with either a *C* or an *F* key. A reasonable pitch results if we assume that the *C* key was treated as an *F* key for vocal music, as Nathaniel Tomkins (1665) reported that his father assumed. That this pitch standard is particularly high (over 2 semitones above modern) supports the hypothesis that the total range expansion was due to an upward expansion of the treble range of boys voices.

Rousseau (1687) wrote that the English reduced their viols to more convenient sizes before the French did. Since we have good reason to expect that the English viol sizes did not change in the 17th century, the reduction apparently happened in the 16th century. It could have been in England or elsewhere. High nominal tunings that would be fine for the small sizes at normal pitch standards were in use in Italy and France from the beginning, but there is evidence (Rousseau on *Jambe de Fer* for France and Ganassi for Italy) that the sizes were large, and the viols with these tunings played at pitch levels lower than the normal pitch standard. In Germany, where mixing instruments was more usual, low tunings were consistent with large sizes and normal pitch standards. There is some evidence of some smaller viols in Germany, but these seem not to have had any lasting influence.

In lieu of any evidence indicating where and when the size reduction occurred, we should consider all possibilities. One such possibility is that smaller viols were made for children to play. Such smaller instruments could have been, and likely were, made in many places, whenever viols were needed in an environment primary of children. For such instruments to become standard in a musical culture, performance on viols by children would have to have been a major and respected use of viols in that culture. Just this happened in England around the middle of the 16th century, when choirboys from St. Pauls and Westminster were the only professional viol-playing groups in London, and they were very popular for several decades.

Woodford quotes an inventory of the instruments belonging to Philip II of Spain in 1602, listing 'seven large viols ... used to teach the children of the choir'. He had heard the English choirboys playing viols in 1554. Perhaps the inventory viols were called 'large' because they were of 'normal' sizes, not the smaller ones the English choirboys played, and by then were standard in England and had been adopted by many (but not universally) in Italy and Germany.

Virgiliano on instruments and transpositions

Aurelio Virgiliano wrote a manuscript entitled *Il Dolcimelo* that is currently in the Civico Museo Bibliografico Musicale in Bologna. A facsimile edition has been published by Studio per Edizioni Scelte as *Archivum Musicum, Collana di testi rari II* (Firenze 1979), with an introduction by Marcello Castellani. The manuscript has very little text, most of it being in chart form. It was a work in progress, much of it laid out but not finished.

The manuscript is in three parts. The first gives examples of *passaggi*, providing divisions of a semibreve depending on the interval to the next note, of two and four minims in scalewise passages, and of a few cadential phrases. The second part includes 16 florid instrumental *Ricercate*, with the statements about intended instruments being: *viola bastarda* for one, *viola bastarda* and lute for one, *flauto* and other instruments for two, *flauto*, *cornetto*, *violino*, *traversa* and others for seven, *traversa*, *violino*, *cornetto* and others for one, and *cornetto*, *violino*, *traversa* and others for two. There are two without titles. The third part, of primary interest here, is concerned with tunings (*accordi*) and transposed tunings of instruments.

There are a number of pages with titles concerning tunings and fingerings of particular types of instruments, but which are blank below the title. Pages of these with titles (with & implying the same page) of the form *Come si accordi ...* (tunings) include *organo*, *gravicembalo*, *salterio*, *arpa*, *lauto*, *tiorba & chitarra*, *cithara* and *lira*. Pages with titles of the form *Modi da sonar ...* (fingerings) are *armilloni*, *cornamuse*, *dolciane*, and *pācalamo & piva & trōba marina & ti[m]pano & gnacch[e]fra & triangolo & tabali & trōba & tamburro & buttafoco & campana*. These are interesting because Virgiliano appears to have tried to be comprehensive, at least for instruments gentlemen played.

Just pictures appear under the title on some pages. One with the title starting with *Come si accordi* has the title completed by: *insieme il concerto delle viole*, or viols of sets. There are five instrument drawings in 3 sizes (arranged symmetrically with the largest in the centre). Each has 5 strings and 8 frets. The body shapes are all the same, what we would consider to be those of fiddles (Virgiliano's maker apparently made fiddles and viols to the same basic design). Another page has the title completed by *il cōcerto de' violini*. The drawings are similarly symmetric with 5 instruments in 3 sizes. The title on another such page is *Modi varii da sonar il violino*, and it has 3 copies of the smallest drawing on the *violini* page.

This is another example of the singular term *violino* applying to a particular instrument that is not just any one of the set that the plural *violini* refers to. Of the three sizes of *violini*, the smaller two have 4 strings each and no frets, while the largest one has 5 strings and 8 frets. The measured string stops on the drawings are 27, 36 and 92 mm if we assume that the bridge positions are defined by the tops of the bridges (they are depicted lying down, but the strings change angle, as they do with an upright bridge, when they pass over the depicted tops).

If we assume that the dimensional proportions in the drawings are accurate, I can only make sense of the relative sizes if the scale is 1/10 full size, with the smallest being the size of a *soprano viola da braccio* or *violino piccolo*, the middle size that of a *contralto viola da braccio*, and the large size that of the Praetorius's *Gross Quint Bass* that was in the tuning tables but not depicted. It had the tuning of *FF, C, G, d, a.*, which would be *GG, D, A, e, b* at the Italian *corista* pitch standard. It is listed in the table of Baroque tunings for fiddles in Comm. 1658. This evidence could suggest that the the large fiddles in Praetorius's book were Italian developments. When gentleman-musicians got interested in playing fiddles late in the 16th century, and had success with usually adapting the French *dessus de violon* to be their *violino*, they apparently also had very large French-like bass *viole da braccio* made for them.

The Italian use of the term *concerto*, as appears here, was apparently the inspiration for the 19th century redefinition of the English term 'consort' to mean a set of instruments of one type in different sizes, as given in the first edition of the the *Grove Dictionary*. Those 19th century scholars did not seriously investigate early English usage of 'consort'

A page entitled *Modi da sonar i pifari* shows 14 identical shawm drawings, implying a range of 14 diatonic notes, but the fingerings and names of the notes are not indicated. On the page after *armilloni* are three drawings of turned double-reed instruments with crooks inserted into the centres of the tops. The central largest one has a *tonante* label above it. To the left of it is one of about half its size with a *alta mira* label beneath it. On the right side of the central large one is another that is somewhat longer than the one on the left, with a label *armilla* beneath it.

There are three pages, each of which shows a fingering chart and expected transpositions for a wind instrument. The *cornetto* page shows 17 cornett drawings forming a diatonic fingering chart from *a* to *e'''*, with placings of C and G clefs indicating transposition possibilities for a key with a *b* flat of up a tone, and without this key restriction, of up a 5th and down a tone, a 3rd, a 4th, a 5th, a 6th and a 7th. The *traverse* page shows 19 flute drawings forming a diatonic fingering chart from *d* to *a''*, with placings of C and G clefs indicating transposition possibilities for a key with no flats, of up a 4th and down a 5th, and with a *b* flat, of down a 4th. The *flauti* page shows 14 recorder drawings forming a diatonic fingering chart from *g* to *f''*, with placings of C and G clefs indicating transposition possibilities for a key with a *b* flat of up a tone, and without this key restriction, of down a tone, a 3rd, a 4th, a 5th, a 6th and a 7th. The transposition method is clef substitution, without being fussy about key signatures.

One page has the title *Segni per conoscer tutti i modi da sonar qualsivoglia instrum[ento]*. Below it is a stave with the following associations, apparently 'good' transpositions. The C1 clef with no flat: at pitch (i.e. no transposition), the C1 clef with a flat: a tone and a 3rd lower, the C2 clef with a flat: a tone higher, the G2 clef without a flat: a fifth lower, and the G2 clef with a flat: a tone and a 4th lower. The 'good' transpositions limit the transposed key to having no more than three flats or two sharps. These transpositions would be necessary to get the ranges of many of the instruments mentioned in the titles of the *Ricercate* into the range of the music.

Finally there are two 2-page spreads dealing with a set of viols in one, and an ensemble with a *cornetto* and three *tromboni* (sackbuts) in the other. The organisation of both spreads is the same. The top half deals with the low set of four clefs, called *ordine primo*, of C[antus] C1, A[ltus] C3, T[enore] C4 and B[assus] F4. The bottom half deals with the high set of four clefs, called *ordine secondo*, of C[antus] G2, A[ltus] C2, T[enore] C3 and B[assus] either F3 or C4. Each clef is on a stave on a row of its own except for the high-clefs Bassus alternatives. The columns from left to right are: the clefs with no flat, the clefs with one flat, ascending diatonic scales of natural notes, and then four columns of different transpositions of these scales shown in instrumental tablature.

For the top half (the low clef set), the indicated transpositions are a tone up, at pitch, a tone lower and a minor 3rd lower. For the bottom half (the high clef set), the transpositions are down a 4th, down a 5th, down a major 6th and down a minor 7th. Except for the Cantus C1 row in the top half, the scales in the two spreads are the same. For the top half, the scale range is *g* to *e''* for the viol C1, *a* to *d''* for the *cornetto* C1, *g* to *b'* for C3, *c* to *f'* for C4 and *G* to *b* for F4. For the bottom half, the scale range is *c'* to *g''* for G2, *g* to *c''* for C2, *g* to *a'* for C3 and *c* to *d'* for F3 (or *e* to *f'* for C4). In both spreads, the tablature applies to the F3 clef only.

On the viol spread, the tablatures are the same as standard Italian lute number tablatures, on 6-line staves. Chromatic alternatives are given by numbers below each tablature. The highest line in position (lowest in pitch) is not used, implying five-string instruments. This is consistent with the drawings of viols, which also depict 5 strings in all three sizes. Comparison between the scales in tablature with the scales in mensural notation establishes that

with both high and low clef sets, the Cantus part is played on an instrument tuned to *d, g, b, e', a'*, the Altus and Tenore parts on instruments tuned to *G, c, e, a, d'*, and the Bassus part played on an instrument tuned to *D, G, B, e, a*. Ganassi (see Comm. 1660) wrote that most people used 5-string viols, and gave tunings that were the same as these (the *c'* in the treble tuning in that Comm. is an error - it should be *b*). It is likely that these tunings were the most common in Italy in the 16th century, and that they were adopted in Germany when the viols were, as expressed in the tunings given in the Munich ms 718 and by Gerle.

The theoretical string-stop ranges for viols in these tunings from Comm. 1660 are 37-55, 51-82 and 64-110 cm respectively. These ranges allow both large (roughly 50, 75 and 100 cm) and small (roughly 40, 60 and 80 cm) sets. The measured string stops on the drawings are 55, 68 and 95 mm assuming that the bridge positions are at the tops of the lying-down bridges (where the strings in the drawings change angle). If we assume that the dimensional proportions in the drawings are accurate, the size ranges reduce to 41-55, 51-68 and 71-95 cm respectively. It is possible that the scale for the drawings is a tenth of full size, in which case the string stops would have been 55, 68 and 95 cm, a version of the large set.

Above the *cornetto-tromboni* spread is the title *Nuova intavolatura di tromboni per sonarli in concerto*, below which is a 4-line tablature representing the four slide positions, the highest being with the slide most in, and the lowest with the slide most out. On these lines are note names given in capital letters with no dots above them for *E* and *F*, one dot from *G* to *f*, two dots from *g* to *f'*, and three dots for *g'* and *a'*. In the tablatures of the transposed scales, the highest note is *b'*. The lowest note is *D*, shown by a ÷ sign below the tablature lines, presumably lipped down from the *E* normal lowest note with the slide fully out. All of the *tromboni* used for the Altus, Tenore and the Bassus parts, are of the same size, with that lowest note. The tablature does not distinguish between natural notes and those notes sharp or flat (e.g. the harmonic a major third above *a* is given as *c'*).

The *cornetto* tablature is a normal woodwind tablature with a vertical row of circles representing the fingered holes. A circle is filled when the hole is stopped, and not filled when the hole is open. There are three horizontal lines between the circles. The thumb hole is above the highest line, and the next line separates the two groups of three holes that are controlled by the other fingers, and the lowest line is below the second group of three holes. The normal lowest note, with all holes covered, is *a*, consistent with the fingerings given on the page devoted to the *cornetto*.

When the lower note *g* is required in the transpositions, a filled circle appears below the lowest line. That could possibly mean that the end of the *cornetto* was covered somewhat as well. But some of the transpositions require even lower notes, namely *d, e* and *f*. These are just represented by all holes covered without this extra covering. Perhaps lipping down, and extra covering at the end cannot work together. There is much blotting in the *cornetto* tablatures, so it is often unclear as to whether particular holes are open or covered, but the fingerings on the page devoted to the *cornetto* are particularly clear, so the tablatures can be reconstructed.

This manuscript is consistent in not distinguishing between natural notes and sharp or flat versions of them when specifying the slide positions on the *tromboni* and the fingering patterns of the *cornetto, traverse* and *flauti*. It appears that including the chromatic variation on wind instruments was more complicated than Virgiliano wanted to get into. Nevertheless, he did specify chromatic variation with the fingerings of viols. A possible reason for the difference is that there was some ambiguity about how much sharpening or flattening of notes was accomplished by slide-position or fingering changes, and how much of it was done with the lips. This would depend on how the musician wanted to shape each note, with pitch shape as well as with dynamics. Modern music interpretation is much more interested in shaping phrases than shaping individual notes, and uses pitch variation in note shaping mainly just for jazzy humour, so we would tend to do all pitch control with slide-position or fingering changes. It is unlikely that this is what early musicians did.

FoMRHI Comm. 1673

THE SISTRUM – AND HOW TO MAKE ONE

Jonathan Little

The ancient **sistrum** (plural *sistra* or *sistrums*) is best described as a percussion instrument consisting of a thin oval or U-shaped metal frame, incorporating (usually 2-4) freely-moving transverse metal rods or wires bent over at either end, which may make a soft "sshssing" or bright jingling sound when gently shaken to and fro by means of a handle. Indeed, the word *sistrum* derives from the Greek *σειστρον* [*seistrōn*], meaning "to shake". In later versions, metal discs or rings may run across the rods, producing a slightly different effect. A description by the influential biblical and linguistic scholar Wilhelm Gesenius (1786-1842) refers to the *sistrum* "used in the worship of the ancient Egyptians" as "a musical instrument or rattle, which gave a tinkling sound on being *shaken*".

Surviving today in the Ethiopian Coptic Church, the *sistrum* seems always to have been associated with some sort of mystical ritual. The *sistrum* is believed to be referred to in a list in the Bible in II Samuel vi:5, where, in the presence of the Ark of God, "David and all the house of Israel played before the Lord on all manner of instruments ..." (AV).

The *sistrum* has a long history, and among its evolutionary forms in the ancient Middle and Near East are some which have wooden or clay frames. The earliest dated surviving *sistrum* is the U-shaped instrument known in Sumer around 2500 B.C., and similar types have been found in the Caucasus. It also appears in rectangular form in Anatolia around 2100-2000 B.C.. The Phoenicians knew the *sistrum* well, and may have helped spread its use.

Even in Egypt different versions are known, although they are characteristically closed at the top. The quintessentially Egyptian *šesheshet* bears the striking shape of a temple front, while the *iba*, sometimes called *šehem*, resembles a closed horseshoe. Egyptian texts, sculpture and paintings make it clear that priestess-musicians whose lives were devoted to the goddess Hathor would employ *iba* in their sacred rituals. The most famous use of the *sistrum* is now associated with Isis, a later metamorphosis of Hathor (goddess of the sky, love, joy, and also erotic music and dancing), with whom she was merged when the cult of the maternal, life-bestowing Isis was promoted throughout the Roman Empire. It is this close association which led Trevisa to write in 1398 of how he understood it to be proved "that Isis quene of Egypte was the fyrste fynder of Sistrum".

The Egyptian Antiquities department of the British Museum holds a fine example of a bronze sistrum (No. 36310) from the Late Period (after 664 B.C.). It is currently displayed in Room 61 in a case demonstrating what a central role music played in all aspects of daily life. The elaborate decoration of this sistrum is remarkable, not only at the handle/sounding-oval junction, which is cast in the shape of the feminine head of Hathor (with the protruding ears of her sacred animal, the cow), but also around the sounding-oval itself, with its further scenes of religious significance in raised relief (such scenes typically featuring cats, and birds' heads). Standing about one foot high, this sistrum was believed to have been used to pacify the goddess and other deities as its delicate jingling sound wafted through the air. Nevertheless, some sistra could produce a very strident, bright tone, so that the classical scholar Holland was not exaggerating when in 1603 he spoke of "That brasen Timbrel which they sounded and rung at the sacrifices of Isis, named Sistrum", further describing how "Upon the Absis or rundle of the Sistrum toward the toppe, they engrave the forme of a cat". Isis is usually depicted in Egyptian iconography as holding a sistrum in her right hand. When shaken by a procession of high-born priestesses, sistra were not only said to repel evil, but in different circumstances could also express a range of emotions, from mourning to joy.

The aforementioned sistrum, one of five in the British Museum, may be compared with the later, more stylized examples found at Pompeii, dating from the 2nd century B.C.. Both types are made of bronze, although it should be noted that copper and other metals – such as brass and silver – were also used for making sistra. Unfortunately, in many cases the thin metal jingles (and sometimes the rods) have so badly corroded on extant sistra that it is not possible to determine their exact nature.

The sistrum is an idiophone of the rattle type, which explains why Lister in 1698 refers to the instrument both as a "Sistrum" and "Ægyptian Rattle". Widespread use of the sistrum is now well documented throughout the Ancient Orient, but when divorced of its religious context, it effectively died out in its pure form in modern Western Europe. At best, the traditional sistrum could be said to have influenced, or been transformed into, like-sounding instruments. Indeed, it has been argued that the contemporary triangle evolved from the sistrum, inasmuch as jingling discs were originally strung along the triangle base. (Such discs or rings were still to be found on triangles well into the nineteenth century.) Even the early shape of the triangle can be said to owe much to the sistrum in its medieval incarnation as an isosceles trapezium (the pattern of the stirrup in the Middle Ages). Significantly, the Renaissance form of the triangle was referred to as a "sistrum".

As it fell out of use in later centuries, confusion arose over the term "sistrum", and what was meant by it. A few authorities mistakenly took it to denote the cittern (French: *cistre*). To others, "sistrum" represented a whole class or type of sound, and thus became generic for any soft, metallic, jingling instrument. By contrast, the *sistra* in Rossini's *Barber of Seville* refers specifically to a bell glockenspiel or "Chinese bell-tree": a set of tuned, cup-shaped bells, also existing in a keyboard version called "celestette". In more popular music, including folk and rock music, there are many related "jingling" instruments – too numerous to mention here – from the "spurs" which Johann Strauss calls for in *Die Fledermaus* (played on a single rod of steel discs with handle), to the sharp, brilliant sound of the modern headless tambourine ("jingle ring").

The reasons for making a sistrum today are not merely academic – sistra are sometimes required in orchestral scores. *Les Troyens* (completed in 1858), the epic opera by Berlioz set in Troy and Carthage in the Ancient East, suffices as a fine example. Berlioz was inspired by the "Oriental" cult of Isis and its associated music, a fascination stemming from his exploration of Pompeian relics. All the paraphernalia of the great Temple of Isis in cosmopolitan Pompeii, including the musical instruments, were strictly Egyptian in origin. Many bronze sistra were

excavated in Pompeii, most being approximately 20cms. in length, and having four bronze rods. Berlioz and other orchestral innovators were intrigued both by the look and the imagined sound of such instruments.

Alongside the upsurge of interest in civilizations of the past, a host of reference guides to Ancient Oriental lands were published in the nineteenth century, often with plates. In Dr. John Kitto's eight volumes of *Daily Bible Illustrations* (New York, 1867), the author describes the sistrum as being

generally from eight to sixteen or eighteen inches in length, and entirely of bronze or brass. It was sometimes inlaid with silver gilt, or otherwise ornamented, and, being held upright, was shaken, the rings moving to and fro upon the brass.

Later in the century, the aesthete Walter Pater speculated in *Marius the Epicurean: His Sensations and Ideas* (1885) on the high-pitched festive "clangour" which might be heard in ancient religious ceremonies, and wrote of a host of initiates to the worship of Isis, each

carrying a *sistrum*—the richer sort of silver, a few very dainty persons of fine gold—rattling the reeds, with a noise like the jargon of innumerable birds and insects awakened from torpor and abroad in the spring sun.

Berlioz felt that "historically-authentic" details and sounds (local colour) would enhance the intensity of his dramatic situations. Thus he attempted to introduce into *Les Troyens* the look, and where possible, the sound, of ancient "Oriental" instruments. The most exotic instruments he used were "cymbales antiques", "double flûtes antiques", "sistres antiques" and "tarbuka" (a goblet-shaped Middle-Eastern drum). Should "originals" not be available (as reconstructions) in the case of the three former instruments, Berlioz wrote complementary parts for modern substitutes – suitably "adapted" if necessary – to obtain his desired sound. As with the antique cymbals he examined in the Pompeian Museum in Naples, Berlioz's "historic instruments" were to be "improved" for the modern orchestra, in order to make a bigger, brighter sound. In his famous *Grand traité de l'instrumentation et d'orchestration modernes* (1843), Berlioz stated that in his ideal orchestra he would have "12 Pairs of Ancient Cymbals (in different keys)". He gave advice not only on how they should be played, but also explained how they could be cast in brass or copper by any bell-founder, then turned in order to tune them.

Berlioz did not attempt to define "the ancient Sistrum, &c." in his 1843 *Treatise on Orchestration*, referring the reader instead to Georges Kastner's "excellent" *Traité général d'instrumentation* of 1837, in which his friend described a rudimentary sistrum, and a host of lesser-known instruments. With better evidence to hand, Kastner was to revise his understanding of the sistrum by the time of the publication of his *Manuel général de musique militaire* (1848). Kastner was one of the few writers on instrumentation who pursued research into the instruments of the ancient world, the better to appreciate the historical development of musical instruments and their characteristic sound.

Berlioz calls for "sistres antiques (sur la scène)" in the solemn procession in Act I, no.4 of *Les Troyens*, during which Aeneas and other dignitaries proceed towards an altar for the purpose of thanksgiving. Berlioz, who was aware of the exotic literature of writers like Théophile Gautier, as well as documented musical finds in Egypt and Pompeii, also had the opportunity to view a selection of genuine sistra on display at the Louvre. He was probably reminded of the use of the sistrum – "the Egyptians' principal sacred instrument" as Ian Kemp puts it, "associated with religious ceremonies and with war" – while reading Virgil's *Aeneid*. A passionate devotee of that text, Berlioz is likely to have come across a brief reference to the painted shield of Aeneas, which

included one scene in which Cleopatra rallies her fleet at the battle of Actium (31 B.C.) with the aid of her native sistrum (*"regina in mediis patrio vocat agmino sistro"*). Other sources confirm that during this decisive battle – shortly after which Egypt became a Roman province – Cleopatra was said to have employed the sound and symbolism of numerous sistra (hissing like snakes and glinting in the sun) to intimidate her enemies. It is not surprising then, that the exotic and luxurious cult of Isis should for many years have been associated with Cleopatra in Roman minds, and initially viewed with suspicion. By 38 A.D., however, the cult was receiving active imperial promotion.

The sounds of Berlioz's sistra in *Les Troyens*, if not emitted by the replicas on stage, are to come from the orchestra. As aural substitutes, early nineteenth-century triangles, of the type incorporating rings on their bars, were intended to be used. Berlioz rather adventurously asks for a set of seven of these instruments, each differently pitched (they are marked "Jeu de triangles" in the score). In the absence of such triangles today, it may, ironically, be just as easy (and more informative) to make a simple sistrum, which both looks and sounds reasonably "authentic".

A PRACTICAL SISTRUM

- COMPONENTS:
- * COPPER TUBE (wall 1mm thick), 25mm diameter, cut to 150mm long
 - * BRASS STRIP (0.5mm thick), cut to 40mm wide and 440mm long
 - * 3 BRASS WIRES (2mm diameter), each cut to a minimum of 130mm (but preferably longer to allow for trimming)
 - * 13 BRASS RINGS (3mm diameter, solid or hollow), max. 32mm diameter or slightly smaller
 - * 3 FIBRE WASHERS (4mm thick; 25mm diameter).

The manufacturer should feel free to depart from these recommended materials and measurements provided they enhance the tone, or if a particular sound quality is desired. Bear in mind, however, that *the sounding-oval should emit a definite high-pitched ring, in addition to the metallic clatter of the rods and rings (or discs)*. In the following version, both the rods and rings move to and fro, heightening the overall effect. However, this practice may not be strictly "authentic", as evidence points towards the fact that versions with jingles had fixed rods, and those with moving rods no jingles. Versions with rods only would benefit from a thicker diameter wire (e.g., 5mm), and possibly a thicker brass strip (e.g., 2mm).

HANDLE:

1. Flare out the base of the COPPER TUBE, forming a 4mm lip, and file smooth each end.

SOUNDING OVAL:

2. Smooth the edges of the BRASS STRIP and carefully, around a wooden oval former, shape into an oval approximately 85mm wide at the middle, and 135mm long, leaving 30mm at either end to feed into the handle. At each end, the width of the strip will need to be cut down to 30mm also to fit into the handle (i.e., trim 5mm off each side). The protruding edges should be rounded, and definite bends made in the strip where the ends enter the handle, to maintain a wide oval shape.

FORMING THE JOIN:

3. Start to crush the copper tube in a large vice. Feed in the ends of the sounding-oval, sandwiching inside the tube the three FIBRE WASHERS between and either side of the brass ends, before firmly crushing the tube to hold all in place. The tube cross-section should now have become an oval of 20mm x 30mm.

DRILLING THE ROD HOLES:

4. Mark three sets of holes in the middle of either side of the sounding-oval, approximately 20mm, 55mm and 90mm from the top of the oval. With a punch, confirm the marks once you are sure they are horizontal. Because the rings hang downwards, ensure that the rods start far enough up so that the bottom rung has plenty of clearance. (The bottom rung sounds poorly if placed too low because the sounding oval is fixed at the bottom. The top sounds the next best, but the middle, which resonates most freely, sounds best of all.) Also check that the rings clear each other on the rods. Once satisfied, drill the three sets of holes, using a 3mm drill bit (or smaller to start the hole), slipping the original wooden former into the oval against which to drill.

INSERTING THE RODS AND RINGS:

5. Insert the BRASS WIRES with five BRASS RINGS on the bottom rung and four each on the middle and top, checking their clearance if not already done. Remove the rods again and make a sharp bend in one end of them, in order to form a right angle (or greater) with a 15mm long bend. Reinserting the rods and rings, mark the bend at the other end allowing for approximately 15mm total side-to-side movement in the rods. Make the bend at the other end in the opposite direction to the initial one, cutting off the wire if the second bend extends more than 15mm. If unhappy with the sound, unbend one end sufficiently to remove the rods, and experiment with different sizes and types of brass rings (or discs), or even thicker, longer rods.

Finally, make music with this ancient and mystical instrument!



The Intentional Sideways-Tilting of Necks

It seems reasonable to come to the conclusion that it is of no consequence that some early violins, violas, and cellos have the neck slightly tilted to one side. For example, originally, their necks were normally attached by comparatively weak methods, which would have allowed the neck to be knocked askew easily, and the accuracy of work may not have always been high; in any case, like perfection in life, creating a perfectly-upright neck is perhaps an unattainable goal. However, there are some reasons why consideration needs to be given to the possibility that sometimes early makers deliberately tilted the neck sideways, namely that (1) the necks seem to be tilted more often one way than the other; (2) many of these instruments appear to have been made very accurately; and (3) the side-tilting of the neck appears to be related to other asymmetries in these same instruments.

Most significantly, on most of the instruments with side-tilted necks that I have studied, either the neck is joined to the body off-centre towards the treble-side, or the sound-holes (and therefore probably the bridge) are off-set to the bass-side, or sometimes both the neck and bridge are off-set. If this off-setting from the central line occurs, it is obvious that the neck will have to be tilted to the treble side, otherwise the fingerboard, bridge and strings will not be aligned with each other. (See the diagram at right. The off-setting and tilting have been exaggerated to make them more obvious.) Also, on some instruments, the tailpin (and therefore the bottom of the tailpiece) is off-set to the treble side (as in the Widhalm violin drawn in this Comm.).

There are other asymmetries which are less obviously related to the side-tilting of the neck, which I think may be at least partly due to an intention to make the tilting of the neck less obvious to the casual observer, i.e. to make it appear that the neck was straight, when it was not. These subtle asymmetries (all viewed from the front) include: (1) the right shoulder (next to the neck) lower than the left shoulder, (2) the right corners lower than those on the left, (3) the sound hole on the right, lower than that on the left, and (4) part of the scroll lower on the right than on the left. All of these asymmetries can be seen in the Stainer violin I have drawn in this Comm.. Stainer has long been known for the lop-sided scrolls and soundholes in many of his instruments. It has been presumed that these asymmetries were the result of capriciousness. However, perhaps there was a practical basis to Stainer's asymmetry.

On the lion's head of the Widhalm I have drawn, even the right eye and eyebrow are lower than those on the left, which perhaps amusingly reflects the asymmetry in the scrolls. Also in the Widhalm (which is unaltered), there is a twist to the base of the neck, so that the fingerboard is off-set to the treble-side, even though at the back-plate, the neck is centred. There are further variations of asymmetry, which may be related to the sideways-tilting of necks, on other instruments I have studied.

Fifteen (or about half) of the early violins, violas and cellos that I have studied at first-hand, measured and drawn, had some of the asymmetry listed above. Most of these asymmetrical instruments, including those with new or re-set necks, had necks tilted to the treble side. The few that did not



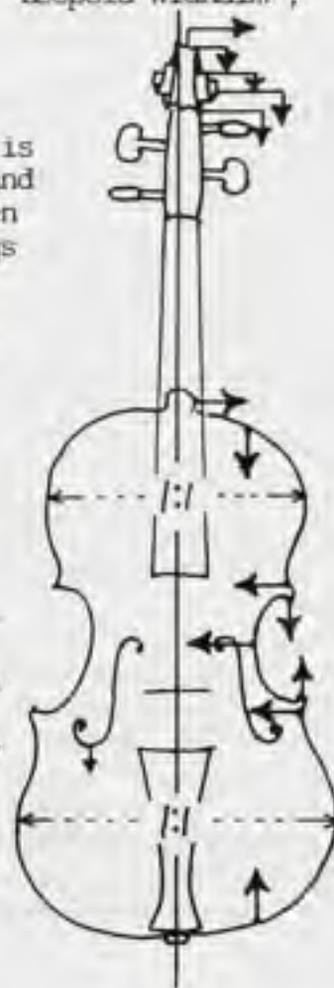
(all with new necks), seem likely to have originally had tilted necks, because of their asymmetry. None in my sample of 30 had the neck tilted the other way. The 15 asymmetrical instruments, all with the neck tilted to the treble-side (or evidently originally so), are: (1) violins - Stainer 1654, Stainer-copy c.1700, Storioni 1736?, F.Gagliano c.1750-80, and Widhalm? Ist-half 19thC. (unaltered); (2) viola - Richard Duke 1779; (3) violoncello piccolos (viola pomposas) - Hoffmann 1731/2, and Hoffmann undated (unaltered); (4) cellos - Stainer 1647, anon. English early 18thC., Barak Norman 1720, P. Walmseley? c.mid 18thC., anon. Saxon c.1800 (unaltered), anon. Italian c.1850 (unaltered); and (5) chamber bass - anon. Italian? c.1800 (unaltered). This has not been a comprehensive study, and has been limited to the instruments that I had easy access to, or had studied for other reasons.

Although my sample is small, I suspect, from a careful study of photographs, that this phenomenon of necks tilted to the treble side may not be isolated. Admittedly, using photographs is difficult and risky, because (1) in published photographs, sometimes the edges of instruments have been trimmed (which diminishes our ability to judge the outline, and the angle of the instrument); and (2) one does not know precisely the angle of the camera in relation to the violin, viola or cello. For example, if the camera had been placed slightly left of centre, the slightly-seen backwards-angle of the neck, in effect compensates for the side-tilting to the right, which makes it appear that the neck is upright. There are many published photographs of violins and other bowed instruments, in which the neck appears to be perfectly upright, but in which the body appears to be slightly turned; did the photographer photograph these violins slightly off-centre (perhaps even unintentionally), so as to make side-tilted necks appear to be upright? (There are many apparent examples of this in the fine book by Klaus Martius and others "Leopold Widhalm", Frankfurt 1996.)

Plans by Others

Among the plans by others that I have at hand, there is one which shows the neck tilted to the treble side, and another which has evidence that the neck may have been tilted to the side originally. Both of these drawings come from two admirable series by John Pringle. The first is of the large Guarneri viola of 1664 (unaltered), in the Shrine to Music Museum, in Vermillion, U.S.A.. After superimposing my own central line (according to the method I describe later, which is different from Pringle's), I found that (1) the neck is tilted to the treble side, (2) the base of the neck at the back-plate, is c.4mm off-set to the treble-side, and (3) there are various asymmetries in the body and scroll, which I have indicated in the schematic drawing shown here at the right. Pringle has aligned the neck with the tailpin, but this means that the bridge (or at least the strings at the top of the bridge), would need to be offset c.2mm to the treble -side. Should the neck be tilted slightly further, so that the bridge is centred?

The second of these drawings by Pringle, is of the famous "Messie" violin of 1716 by Stradivari, in the Hill Collection, Oxford. In this drawing, the base



of the neck at the back-plate, and the tailpin, are both c.2mm to the treble side (the bridge is centred), the right "shoulder" is lower than the left, and the right side of the scroll tends to be lower than the left, which is unusual for Stradivari. The neck, although original, has been lengthened and reset. That it may have had a tilt to the treble side originally, is suggested by the off-setting of the neck-base and tailpin.

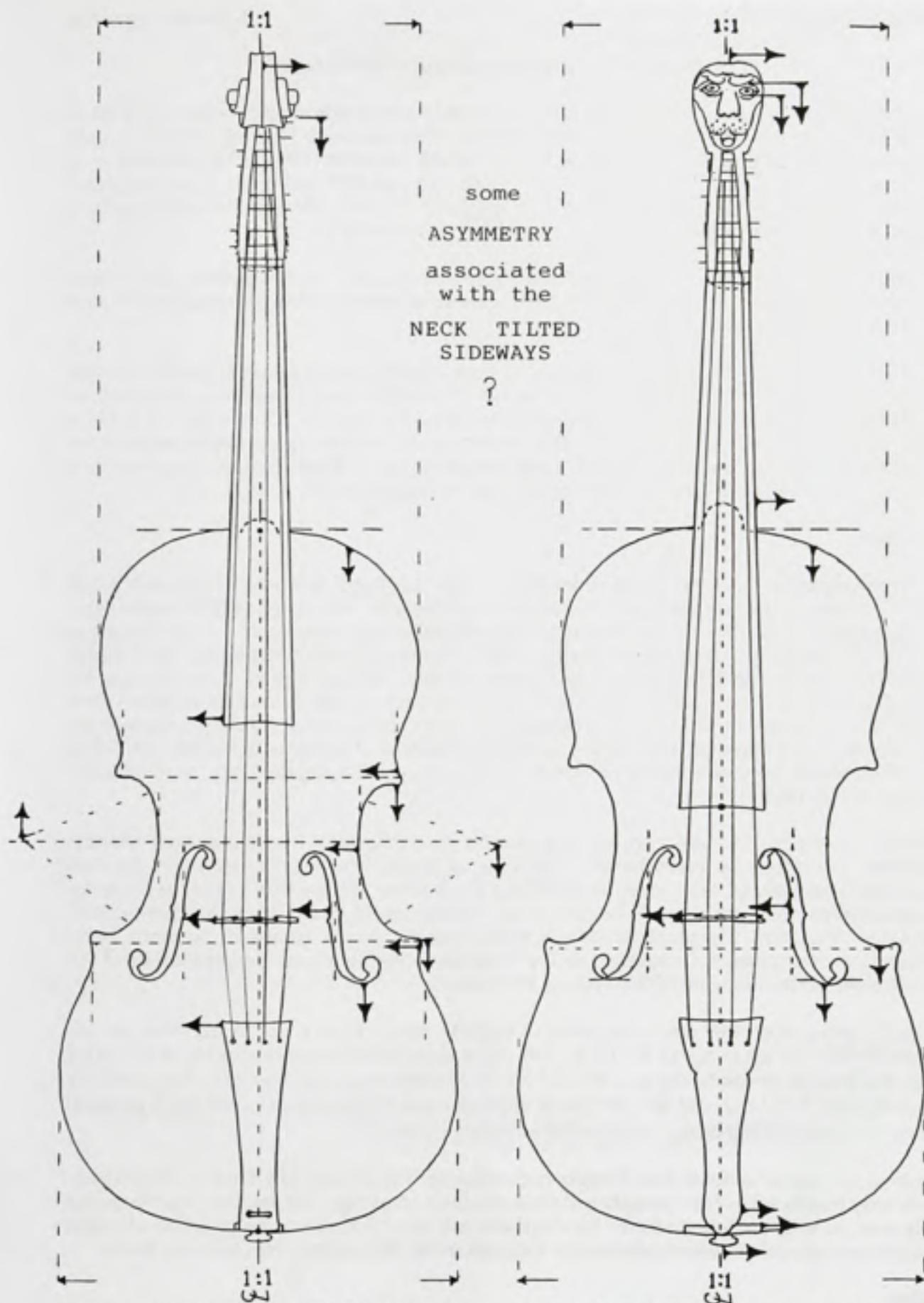
It is not easy to draw accurately a symmetrical violin; to draw an asymmetrical violin is even more problematical. If the back or belly is made of two halves joined together, should one always take this join as the central line? My own method of determining the central line (regardless of this join), is to find the centres of the two widest parts of the body, and then to draw a line through these two centres, as in my drawings in this Comm..

The Apparent Relationship with Unequal String Tension

Judging from published photographs of violins, violas and cellos (which admittedly is somewhat uncertain), when the necks are not upright, most are apparently tilted to the treble side. However, I have found a few photographs in which the neck is apparently tilted the other way; were these necks knocked this way, perhaps helped by an unequal tension of strings? The affect of unbalanced pulling of the strings on the neck, is shown clearly on instruments with bourdon strings to the bass-side of the neck (e.g. the plucked theorbo, and the bowed lira da braccio). In all the photographs I have handy of theorbos, the neck is tilted to the bass-side, undoubtedly pulled by the bourdon strings. One of the lira da braccios, also, appears to have the neck tilted to the bass-side (Linarolo 1577, Leipzig University Museum No. 780). However, two other lira da braccios appear to have the neck tilted to the treble-side, presumably to resist the pull of the bourdon strings (Antonius Brencius, Bologna 1592, Leipzig Uni. Mus. No. 782, and Giovanni Maria of Brescia, Venice, Hill Collection, Oxford).

If some lira da braccios had the neck tilted to the side, to resist an unbalanced pull of the strings, perhaps some early violins (and other instruments) also had the neck tilted, not to resist the pull of bourdon strings, but to resist an unequal tension of the strings, with the increase in the bass, allowing the lower notes to be louder. One way of increasing the tension of the lower strings, is to make the bridge higher on the bass-side than on the treble. Two published examples of old bridges much higher on the bass-side are: (1) the bridge of the Maussiell 'gamba of 1710, shown on p.56 of the Widhalm book referred to earlier, and (2) the apparently original bridge of Stradivari's "Medici" viola of 1690, reported by Charles Beare to be 5mm higher on the bass side (in "Strumenti di Antonio Stradivari", published by Ente Triennale Internazionale degli Strumenti ad Arco, Cremona, 1991). Alternatively, or in addition, the tension in the bass could have been increased by increasing the weight of the lower strings, such as by overspinning with metal.

There seems to be no other obvious reason for tilting the neck sideways. For example, there is no clear advantage to the violinist or cellist, in the holding and playing of their instruments. If necks were tilted to the side because of an unequal tension of the strings, did some of the asymmetry (e.g. in the scroll) have the purpose of signifying (to those who knew) that the instrument was designed for unequal string-tension? Presumably, the introduction around the early 19th century, of stronger methods of attaching the neck, meant that necks no longer needed to be tilted to the side, when unequal-tension was desired, and that side-tilting became forgotten.



J. Stainer violin, 1654 (private possession). Neck original, but angled back further.

Widhalm? violin, 1st-half 19th C. (private pos.). Neck, fingerboard etc. unaltered.

Tensions and diameters of early viol strings

A correspondent wanted to string his viol with a maximum of historical accuracy, and asked about whatever 17th century evidence of heaviness or tensions there is on viol strings. I only know about such information from Mersenne (1636) and Talbot (c.1694). I've published most of my analyses of their evidence before, in Comms 325 and 343, and in my *Strad Magazine* articles (Jan, Mar, Apr 1988) on violin stringing. Newer relevant information is in Comm.1307. It seems appropriate to collect and update the analysis.

A useful version of the Mersenne-Taylor Law for gut strings that I've used in these calculations is: frequency (in Hz) times string stop (in cm) times string diameter (in mm) equals 4809 times the square-root of tension (in Kg).

The line of reasoning used in both cases is to find the string stop, nominal pitch and pitch standard of a viol string that we have diameter information on. Combining the resultant frequency and string stop with the string diameter gives the tension. Then using the balance relationship in a family of instruments (that the tension is proportional to the string stop) we can calculate the tension on a viol with a modern string stop. Then from the frequency and tension on the modern viol, we can calculate the appropriate diameter.

Mersenne

Mersenne wrote that the total length of the bass viol he illustrated was 4 1/2 feet, which is 148 cm. Measuring that illustration gives the ratio of string stop to total length of 0.59, leading to a string stop of 87 cm. He said that the English tuned their viols a tone lower than the French to "render the harmony softer and more charming". Praetorius (1619) wrote that the English achieved "more pleasant, magnificent and majestic harmonies" on their viols by tuning as the Germans did, which was a 4th below the English nominal pitches at his Cammerthon pitch standard (which was $a'=430$ Hz). The French bass viol nominal pitches were the same as the English ones, so it played at 3 semitones below that standard. According to Muffat (1698) this French standard was then called theatrical or opera pitch. At that standard, the bass viol 6th D frequency was 60.3 Hz.

Mersenne wrote that the largest string on a theorbo, the 11th, was 1 line in diameter, which is 2.28 mm. Elsewhere he wrote that the 10th string of the theorbo or the 6th string of the bass viol should be made of 48 or even 50 or 60 guts for they are at least 4 or 5 times as fat as the racquet strings which are made of 12 guts. This implies that these two strings had pretty much the same diameter. Mersenne promoted equal tension, which results in diameter being inversely proportional to frequency, so the 10th string, being a tone higher than the 11th, would have 8/9 the diameter of the 11th, or 2.03 mm.

From the string stop of 87 cm, a frequency of 60.3 Hz and a gut diameter of 2.03 mm, we can calculate that the tension was 4.90 Kg. For the standard modern bass viol of 68 cm string stop, this tension would be reduced to 3.83 Kg (4.90 times 68 divided by 87). At $a'=440$ Hz the D string (73.4 Hz) would be 1.89 mm in diameter, much lighter than the all-gut equivalent diameter of the D string of any modern viol stringing I know of.

There is no reason to doubt that French viol stringing was at such low tension at that time. Viols only played with other viols then in domestic music making. The fashion in performance style was, as with the lute, to strive for exquisite delicacy. There was no tradition of public performance on viols as was established in England in the 16th century by choir-boy bands.

Talbot

Talbot's notes include equality in diameter between the bass viol 1st d' and the treble violin 2nd

a' . Equality is a difference of nought semitone steps (a semitone step is a factor of a 12th root of 2) in diameter. The string stop of the violin was 33 cm (13 inches), and of the bass viol it was 81 cm (32 inches). The difference is -16 semitone steps (violin minus viol). The violin pitch standard was a tone higher than that of the viol, so the pitch difference between the two strings was a major 6th, or a frequency difference of +9 semitone steps. According to the Mersenne-Taylor Law, the tension difference in semitone steps is half the sum of the semitone-step differences of frequency, string stop and diameter, which in this case is -7 semitone steps.

If the two instruments were balanced as if they were members of the same family, the tension would be proportional to the string stop, so the tension difference in semitone steps would be half of the semitone step difference in string stops, or -8 semitone steps. So within one semitone step of tension, (or half a semitone step, 3%, in diameter), they were balanced as if they were in the same family. This is uniquely characteristic of the French baroque violin stringing of the Lully period late in the 17th century (when aristocratic viol players could insist on playing with fiddle bands, and expect to be heard), and that tradition came to England with Charles II. By then, French playing of the bass viol had been influenced by the English players (who were famous throughout Europe) and St. Colombe and Marais had developed it into a soloistic art.

We can estimate the limit on how lightly a violin can be strung. The French preferred to get their treble strings from Rome, and the statutes of the Roman string makers insisted that the thinnest strings were made of 2 or 3 whole guts twisted together. The average diameter of such strings is 0.48 mm in diameter. At equal tension, and allowing for thinning of the violin first on stretching, the violin 2nd was 6 semitone steps thicker than the first. Six semitone steps thicker (that is multiplied by the square-root of 2) than the thinnest string would then be 0.68 mm. This would also be the bass viol 1st. Its pitch standard was about $a' = 383$ Hz, so its frequency for d' is 256 Hz. At this frequency and diameter and 81 cm string stop, the tension is 8.60 Kg. For a modern 68 cm string stop, the tension would be 7.22 Kg. At $a' = 440$ the d' string (294 Hz) would have a diameter of 0.65 mm. This is the minimum, and a bit heavier is perhaps more likely.

This analysis pertains to English bass viol strings in the 1690's. By then, playing viols in sets had gone out of fashion, and the only viols extensively played were bass viols. Smaller bass viols as made by Barak Norman were coming into fashion then, probably because they were easier to play (Talbot's measured instruments did not include such a smaller bass viol). They could have as good projection on the low D string as the large ones by using a D that was overspun with metal. That was the only overspun string. The Talbot ms is the first evidence that such strings, which were invented around 1650, were in use in England (in a note he indicated that the lowest string on a bass viol or bass violin could be wound with metal). We are most interested in early 17th century English viol stringing, when most of the valued repertoire was written. The strings then could not have had any metal windings. I know of no reason to expect that stringing practices on normal English viols changed during the 17th century.

St. Colombe added a 7th overspun string earlier in France. Evidence for other viol strings being overspun there occurs in the next century. It is likely that the stringings used by St. Colombe and Marais had only the 7th string wound with metal. The stringing balance between the violin and the bass viol so that they could play together, that was apparent in the Talbot evidence, should apply to French stringing as well, so the deduction of string heaviness made here could apply as well to French viols.

Stringings of the baroque guitar in the 18th century

Paul Sparks is working with Jim Tyler on a new edition of Jim's guitar history book. He sent me copies of stringing instructions by Corrette (1763) and Baillon (1781), and asked if I had ideas about the stringing changes between the baroque and subsequent 6-string classical guitar. It seems appropriate now to reinterpret the evidence from earlier in the 18th century provided by Stradivari (c.1700) and Castillion (1729) given in Comm. 1256, and try to understand the development of stringing during that century and beyond.

Comparing string diameters is made quite easy by using increments of a semitone step, as in increments of frequency for semitones or increments of vibrating string length for frets. In each step, the ratio of diameters is the 12th root of two, which is 1.06. So if string A is one step heavier than string B, its diameter is the twelfth root of two times the diameter of string B, 6% greater. If it is two step heavier, it is the twelfth root of two times the twelfth root of two (equalling the sixth root of two, or 1.12) times the diameter of string B, or 12% greater. Three steps is the fourth root of two or 1.19, and the diameter is 19% greater. Four steps is the third root of two or 1.26, and the diameter is 26% greater. Twelve steps is two, and the diameter is twice that of string B. The steps-difference version of the Mersenne-Taylor Law is: frequency steps (semitones) + length steps (fret lengths) + diameter steps = tension half steps.

All of the 18th century tunings had the same relative tunings. The second and third courses were unison pairs a major third apart. The first course was either a unison pair or a single string tuned a fourth above the second. The fourth and fifth courses were octave pairs a fourth apart, with the bourdon (low octave) of the fourth course tuned a fourth below the third course.

Stradivari (c.1700)

The Stradivari specifications, for the fingerboard strings of a theorboed guitar were:

- first course - guitar firsts (the plural implies a pair)
- second course - guitar seconds
- third course - large violin firsts
- fourth bourdon - violin second
- fourth octave - guitar second
- fifth bourdon - the thickest possible violin second
- fifth octave - violin first.

In analysing the Stradivari evidence, we need to cut down the possibilities by making reasonable assumptions. To ensure similar sound qualities on the two octaved courses, the number of steps difference between the bourdon and octave string on the 4th course is assumed to be the same as on the fifth course.

Violin stringing in Italy in Stradivari's time was in equal tension, so the number of diameter steps between adjacent strings tuned a 5th apart was 7, except that it is likely that it was 6 between the first and second because the first string, which stretches much more than the others, would be one step heavier to start with. The number of steps between the second and third would be 7, so the heaviest possible second string that still remains closer to a second than a third would be 3 steps heavier than a normal second string.

Musicians can usually just about tell the difference in sound and feel of one step, but there is no question about 2 steps. By looking, 2 steps is more obvious. If a large violin first string was 2 steps heavier than an ordinary violin first, the guitar third course would have higher tension than the second course. This is unlikely since elsewhere in the guitar stringing, relative tension does not go counter to relative pitch, so we assume that the large violin first is one step heavier than a normal one. We do not have any criterion to chose between whether the guitar first string is 3 or 4 steps lighter than the guitar second. So the final result, in number of steps thinner (-) or thicker (+) than a violin first, for Stradivari's stringing is: first course -6 or -7, second course -3, third course +1, fourth bourdon +6, fourth octave -3, fifth bourdon +9, and

second course -3, third course +1, fourth bourdon +6, fourth octave -3, fifth bourdon +9, and fifth octave 0.

In previous work (*The Strad*, Vol 99 No 1175 (March 1988), pp 195-201), we have estimated that Stradivari's violin second string had a diameter of about 1.16 mm.

Castillion (1729)

Castillion's bourdons were heavier strings, either of gut or preferably open-wound (by himself) with metal. Of the thinner strings, he said that a first course string was thinner, and the third course string a little thicker than the rest. For a little thicker, 2 steps is a reasonable estimate, and for thicker, at least 3 steps. In this case, 3 is chosen. This is because the first string stretches to about a step thinner, and one needs greater thickness on the first because it is single, and has to somehow balance with a pair on the second course. If we call the difference within octave pairs n steps, the resulting stringing, compared to a second course string is: first course -3, second course 0, third course +2, fourth bourdon + n , fourth octave 0, fifth bourdon + n , and fifth octave 0.

We can assume $n=9$ as in the Stradivari stringing to compare them. For this, we state the Stradivari tuning in terms of the thickness steps relative to the second course, which is respectively -3 or -4, 0, +4, +9, 0, +12 and +3. The Castillion stringing differs in that the third course strings and both strings of the 5th course are 3 steps thinner. I've previously suggested that the Stradivari stringing might be less typical than the Castillion stringing for early in the 17th century because it was for a theorboed guitar, and he could have made the 5th course heavier than for a normal guitar to balance better with the bass strings on the second neck.

Corrette (1763)

Corrette specified that the strings of the third course and the fifth octave were the same and not as strong as violin firsts, the second course strings were thinner, and thinner yet were the first single string, which was equal to the fourth octave. The fourth bourdon was half wound on silk (like Chinese strings), 'stronger' than the third course strings, and the fifth bourdon was wound even stronger (not necessarily half-wound, but probably so).

The English guitar had recently been developed. It was the first use in European music of silk as the core of a wound string generally being preferred to gut. A silk core gives the sound a projecting metallic 'zing', which apparently was copied on the baroque guitar.

In Comm.713, it was deduced that the equivalent diameter of a French violin fourth string around 1775 was about 2.2 mm. Assuming equal tension (for which there is earlier and later evidence), the first would be about 0.65 mm stretched, or 0.69 mm when chosen. This is 6 steps in diameter thicker than the thinnest strings made (0.48 mm diameter).

In Castillion's stringing, the thirds were slightly thicker than the seconds, which were thicker than the first. Corrette's stringing differs here by the thirds being (not slightly) thicker than the seconds, leading us to expect the steps different from the first to the thirds to be greater than Castillion's 5. Since it cannot be greater than 6, it can only be 6, with the first string being the thinnest made. We again assume equal steps difference between the bourdon and octave strings in the fourth and fifth courses. For balance between the single first and second course pair, plus the fact that the first string stretches much more than the others, as with the Castillion stringing, we assume that there are 3 steps between the first and a second string.

There remains then only the choice of how heavy the bourdons should be, which can be measured by the number of steps difference there is within each octave pair. If we call this difference n steps, the stringing, relative to a second course string becomes: first course -3, second course 0, third course +3, fourth bourdon + $n-3$, fourth octave 0, fifth bourdon + $n+3$ and fifth octave +3.

Baillon (1781)

According to Baillon, guitars played at standard orchestral pitch. The fourth course octave was a little thicker than the first string. Strings of the second course were thicker than the first string. The fifth course octave was a little thicker than the second course. The two bourdons were close-wound on silk, the fifth heavier than the fourth. Within each octave course the thumb hits the octave string before the bourdon (as had always been on the baroque guitar).

We can follow the previous assumptions that 'little thicker' means 2 steps, 'thicker' means 3 or more steps, and a second string was 3 steps heavier than the first string. The last relationship makes the fifth bourdon and octave 3 steps heavier than the corresponding strings of the fourth course. A third course string must be 3 or more steps heavier than a second course string. If it were 5 steps or more, the tension on a third course string would be greater than that on a second course string, and since that is not observed on any other of the stringings, that is unlikely, so the choice is between 3 and 4 steps.

Relative to a second string, Baillon's stringing then was: first -3, second course 0, third course +3 or +4, fourth bourdon $n-1$, fourth octave -1, fifth bourdon $n+2$, and fifth octave +2.

We have found that using the thinnest winding wire that we can handle (0.08 mm), to avoid the string breaking at any workable guitar tension on a close-wound string, the silk core has to be thick enough that the gut equivalent diameter of the string must be at least 1.20 mm. That is then the minimum gut equivalent diameter of the fourth bourdon. In Stradivari's stringing, the fourth bourdon was a standard violin second string. In a previous study, it was estimated that Stradivari's violin second string had a diameter of about 1.16 mm, about half a step less than the above minimum. So Baillon's fourth bourdon was heavier than Stradivari's, but not necessarily by much.

The minimum gut equivalent diameter of 1.20 mm is 16 steps heavier than the thinnest string made, so if the fourth bourdon is less than 16 steps heavier than the first string, then the first string is thicker than the minimum, and therefore thicker than Corrette's first string. If this were not the case, since the fourth bourdon has an equivalent gut diameter that is $n+4$ steps thicker than the first, n would have to be at least 12. This would mean that the bourdon had at least the same tension as the octave string in each octave pair. That would be a major change from early in the century in the kind of sound desired of octave courses. The number of steps between the fourth bourdon and the first string in the Stradivari stringing is 12 or 13 steps, and the fourth bourdon is 15 or 16 steps heavier than the thinnest string made. So in this stringing, the first string is thicker than the thinnest made. Then if any stringing is anomalous in this respect, it seems to be the Corrette one.

Summary and Conclusion

In summary, the four stringings discussed, in diameter and tension half steps (in parenthesis) relative to strings of the second course, are as follows:

	Stradivari c.1700	Castillon 1729	Corrette 1763	Baillon 1781
first string or course	-3 or -4 (+1 or 0)	-3 (+1)	-3 (+1)	-3 (+1)
second course	0 (0)	0 (0)	0 (0)	0 (0)
third course	+4 (0)	+2 (-2)	+3 (-1)	+3 or +4 (-1 or 0)
fourth bourdon	+9 (0)	n ($n-9$)	$n-3$ ($n-12$)	$n-1$ ($n-10$)
fourth octave	0 (+3)	0 (+3)	-3 (0)	-1 (+2)
fifth bourdon	+12 (-2)	n ($n-14$)	$n+3$ ($n-11$)	$n+2$ ($n-12$)
fifth octave	+3 (+1)	0 (-2)	+3 (+1)	+2 (0)

The diameter steps difference with a second-course string minus the tension half-steps difference equals the number of semitones in pitch below the second course that the string is tuned to.

As can be seen in the above summary table, representing all of the reasonable information that can be derived from the evidence, there are no obvious trends as one progresses through the 18th century. The possible trends that this evidence would allow include the possibility that the tension difference between the fourth and fifth course was greater early in the century if Castillion's stringing was more typical than the Stradivari stringing (which was atypical because it was for a theorboed guitar), and that tension difference reduced to a more Stradivari-like value later in the century.

Also possible is that bourdons got heavier during the century, reducing the tension difference between the bourdon and octave in each octave pair. We know that later 18th century guitars tended to have more bars under the soundboard, and that should increase treble response. The octave strings would then sound brighter, and heavier bourdons would restore the previously appreciated mix of sound in the octave pairs.

The Classical 6-string Guitar

A major use of the guitar late in the 18th century was to play arpeggiated accompaniments for the voice or a melody instrument such as the violin. The 6-string guitar was a new development to perform that musical function. One advantage over the baroque guitar was a fourth greater in total range (some baroque guitars, particularly in Spain, had six courses from about 1760 to 1830). Another advantage was smoother arpeggios because there were no transitions between octave and unison pairs, and because the strings had equal tension. Transitional practices in stringing the fourth and fifth courses of normal baroque guitar without the octave strings (leaving single bourdons) or with two bourdons, as mentioned by Baillon, furthered this purpose. Baillon reported that some complained about the metallic quality that octave stringing produced. A third was that the strings were much thicker and so at higher tension (see Comm. 1096). Louder playing was possible with stronger plucking, so balance with a violin could be over a greater range of dynamics. Thicker strings had less brightness but greater warmth, and this was attractive since current fashion around 1800 tended towards more seriousness and less frivolity.

Another factor favouring the 6-string guitar was that orchestral pitch standards tended to rise to close to modern early in the 19th century, especially so in France and Italy. So a guitar with a string stop greater than about 65 cm, as most baroque guitars were, broke first strings too often at the new higher pitch needed to play with an orchestral instrument. The 6-string guitar, being new and therefore more flexible, easily had its string stop short enough to play at 19th century pitch standards. The shorter string stop also made the 6-string guitar easier for women, often with shorter fingers, to play.

From a stringing point of view, there were not any technical differences in string construction between the baroque guitar and the classical guitar. Gut treble strings had been used since Homer, and metal close-wound on silk bass strings had already been used on Baillon's baroque guitar. Nevertheless there may have been a difference in the quality of metal close-wound strings available in the 18th and 19th centuries. In the 18th century, metal winding was a local activity done by players (e.g. Castillion) or instrument makers (e.g. in the instrument maker's workshop discussed in Diderot's *l'Encyclopedie*), and not made by string makers. Their quality was probably quite variable. Baillon complained that double bourdons were unsatisfactory because they mutually interfere with each other in their vibrations. In the 19th century, metal-wound strings were made and traded by professional makers who could maintain a quality that was only previously available from the best of the local metal winders. Core diameter uniformity and smoothness of its surface is more critical than with other strings.

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- # Odd Aanstad, Boda Åsen, SE-67195, Klässbol, Sweden; +46-570 51184; fx +46-570 51194.
- # Peter Armitage, code: KT18 5JU; 01372-811107.
Christophe, 6 boulevard Talabot, F-30000 Nîmes, France; t/fx 04-66.29.14.32.
Civica Scuola di Liuteria del Commune di Milano, La Biblioteca, I-20141 Milano, Via Noto 4, Italy; 02/5740 9945.
- # Robert Cronin, t/fx: 1 (650) 323-3436.
Peter Crossley, Klyveaasen 5 (1002), N-3738 Skien, Norway; +47-3559-4063; (plckd/bowd str instrs; M).
William D Hendry, Ancroft, 4 Veiwbank Rd, Bonnyrigg, Scotland EH19 2HB, UK; 0131-663-1785 (keybds; M).
Henning Hoel, 8 rue du Bessay, F-69800 St Priest, France; 04-78.21.18.04 (lute; P).
Hélène La Rue, Bate Collection of Musical Instruments, Faculty of Music, St Aldate's, Oxford OX1 1DB, UK; 01865-274721; bate.collection@music.oxford.ac.uk (all instrs; curator).
- # David Lasocki, 1201 E 3rd St (not 201 – apologies)
Jonathan Little, 4 Woodyatt Court, Court Road, Malvern, Worcs WR14 3EG, UK; t/fx 01684-893967; jonathan.little@buckscol.ac.uk (timp and perc; res, P, M).
E W Morse, 7 Village Street, Moulsoford, Wallingford, Oxon OX10 9JE, UK; 01491-651509 (brass; repair, R).
- # Mimmo Peruffo, Via Manasse 4/a, Arcugnano (Vicenza), Italy; aquila@protec.it
- # Ekkehard Schulze-Kurz, Nebelhornstr. 90, D-71083 Herrenberg, Germany; 07032/329909.
John & Linda Shortridge, 725 #1 Tramway La. NE, Albuquerque, NM 87122, USA (hpschd etc, clavchd, gmba, bows, chamb orgn; M,R).
- # Martin Turner, The Old Post Office, Chapel Road, East Ruston, Norwich, Norfolk NR12 9AA, UK; 01692-651410.
- # Andrew Wooderson, 5 Bourne Road, Bexley, Kent DA5 1LG, UK; 01322-558326, t/fx 01322-525558 (hpschd; M).
Tom Zajac, 734 S. 17th St #401, Philadelphia, PA 19146, USA; (215) 545-2359; tomzajac@aol.com

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