FOMRHI Quarterly

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FELLOWSHIP OF MAKERS AND RESEARCHERS OF HISTORICAL INSTRUMENTS

Hon. Sec. J. Montagu, c/o Faculty of Music, St. Aldate's, Oxford OX1 1DE, U.K.
Well, if we had our fingers crossed they must have been double-crossed. July was the worst we've ever been. First Eph's printer broke down (and when I asked him why he hadn't just typed out his bits – only the Bulletin Supplement is essential; the rest could have waited till this Q – he said that he hadn't got a typewriter! The trouble is that his computer, being much older than mine, seems to be coming towards the end of its life, and at the moment he can't afford to replace it. Then one of the machines broke down at our printer. The cumulative effect of the two delays was that the Qs then got caught in the postal strike, and (our luck, of course) Manchester stayed on strike longer than anyone else. I'm almost a week late starting this now, and my July Q arrived yesterday, October 5th.

RENEWAL: If you're willing to go on putting up with us, it's time to renew your subscription. And, please, PLEASE, do so promptly. The reason that you didn't get the List of Members in April (and due to the above, haven't got it till the beginning of October) was that so many people hadn't renewed by then that it simply wasn't worth printing it. It does make our lives (Barbara's, Eph's and mine) very much easier if we have the bulk of renewals in by the end of December. I know it's difficult if this is delayed getting to you by the Christmas posts, and especially if you subscribe from abroad by surface mail, but we'd be grateful if you'd do the best you can.

The subscription is the same as last year:

- Basic Subscription for UK and surface mail to anywhere £8.50
- Supplement for AIRMAIL to EUROPE: £1.50, making a total of £10.00
- Supplement for AIRMAIL OVERSEAS: £3.00, making a total of £11.50
- Supplement for non-sterling cheques: £3.00 (about $5.00 US). Please do remember to add this Supplement if you are sending your own check; otherwise you'll only have paid for just over half the year, because the banks are so greedy.

Subscriptions should be sent to The Honorary Treasurer, Barbara Stanley (her address is 21 Broad Street, Clifton, Beds SG17 5RJ, UK), made out to FoMRHI or The Fellowship... in full. Our GIRO Account number is still the same: 27 316 4406. Do please make sure that your name comes with the payment; every year there are one or two mystery GIROS or Bank Drafts without any name attached and the result is that someone never gets his or her Qs. Again I'd ask you not to send your subscription by registered mail unless it's absolutely necessary; if you're worried about a cheque miscarrying, writing A/C Payee Only across it means that it can only go into the FoMRHI account.

Finally, if you can afford to add on a bit extra for those of our members who are not permitted to send money abroad, as always they and we will be grateful; FoMRHI is read avidly in those countries where foreign communication is difficult. Remember, too, that I'm always interested to hear of more people in any such countries, anywhere in the world, who would like to be helped in this way (a new request arrived yesterday from the Argentine; you'll find him in the Supplement herewith).

EDITORSHIP: Eph added a note to his Bulletin Supplement in the last Q asking whether anyone else wants his job, and he has repeated this to me verbally. It's not so much that he wants to give up (FoMRHI was his idea initially; he thought it up, and asked me to do this aprt of the job) as that he is conscious of the delays. It's not too onerous a job acting as editor, but the package is a big one. At the moment, he puts the stuff together that comes in, cuts and pastes a bit to make up pages, sees that it adds up to a mul-
tiple of 4 pages with the cover, which he types, and paginates it. I'm not sure whether he then reduces it or whether the printer does that. The printer collects it from him, prints it and brings it back. Meanwhile, Eph gets the envelopes ready, checking the mailing list against the update in the Q (I send him a spare copy for this) and printing out the labels, and then sorts them, sorts them into postal classes (UK, Surface, Air Europe, Air Zone A, Air Zone B, Air Zone C), takes them to the post office and gets them sent. The point of all this being one package is that nothing has to be posted except for what I send up to Eph from here, and that terrifies me enough, knowing the post office's ability to lose letters. Posting from here to another editor, the editor posting to the printer, the printer posting the bulk stock back to the editor or to someone else (who?) to deal with the mailing, would be a real worry. So a new editor might mean a new printer at the least. Anyway, think about it.

LOST MEMBER: Gerardo Parrinello's April Q has come back marked Transféré; does anyone know where to?

FURTHER TO: Nobody's really had time to react to the last Q. One member, Geoff Burton, says that he likes this new typeface, so I'll stick with it till I hear to the contrary. Say if you think it too small; it works at this size, too, (ten to the inch) and if this is easier to read, please say so. It also works at this size (twelve to the inch), which is almost the same as what I'm using the rest of the time, save that it's equally spaced letter, whereas I've come to prefer proportional spacing.

ADVERTISEMENTS IN FORMHQ?: Eph has suggested that we should have adverts in the Quarterly; what do you think? I've always felt that the absence of adverts is one of our advantages, but you may not agree. Instead I put anything that might otherwise be an advertisement into the text, using my discrimination as to whether it's something that it might be useful (like Bob's fornicators immediately below) to you to know about (ie censorship). If we were open to adverts, we might get a lot of wasted pages about things that are not really relevant. But that's just my opinion, and you may not feel the same. This is something that the Fellows should decide in the end, but it might well be useful to them to have some reactions from you all, so as you'll all (I hope) be writing to us soon with your renewal, you might like to add an opinion on this while you're at it.

What he has in mind is the usual display adverts (page, half, quarter right across the page, eighth (halfway across a quarter) and sixteenth (an eighth divided longways, about three short lines), and also perhaps a page, or however much there is demand for, for one- or two-liners. We would have to take advice on what to charge. Initial ideas over a cup of coffee in Manchester were £60 a page, £25 a half, £10 a quarter, £5 an eighth, and £2 a sixteenth.

It would also probably mean an advertising manager since quite often when we've agreed to stuff something with the Q we've forgotten to charge for it. So if you think it's a good idea, one of you might also consider whether you'd be willing to do the job. One great advantage is that it would keep the subs down.

TOOLS ON OFFER: Bob Marvin writes "I have a batch of 'fornicators', as per my Comm.532. They're tool steel 1.6x12.5x152mm, with curves 3m radius on one side, 2m on the other. Rubbed in a recorder windway, they guide its longitudinal curvature. I'm selling them for US$20 each." He has sent some muddy xeroxes of them which may or may not appear elsewhere here, depending on whether Eph thinks they'll be visible after printing.
AMIS: The American Musical Instrument Society asks me to say that their 18th annual national meeting will be May 25-28 at the Metropolitan Museum of Art, New York, next year. For further information, contact André P. Larson or Margaret Banks at the Shrine to Music Museum (in our List of Members).

NEMA: The Register of Early Musicians will appear next month (November). This time they cannot afford to send free copies to everyone who is in it, like they did last time, and so it will only go free to members of NEMA. Anybody else who wants it will, they regret, have to pay for it. After publication it will cost £3; pre-publication price (if this reaches you in time; with luck they will be late, too) is £2.00. The address is in our List of Members (in full: National Early Music Association).

THAMES VALLEY EARLY MUSIC FORUM: This new Forum fills the gap in the middle of the country. It is designed to cover London as well as Berks, Bucks, Middlesex, Oxon, etc, but at the inaugural meeting here yesterday (the third yesterday in this Bull?) They're all different yesterdays, but I'm a bit swamped with work and running late, for which my apologies, we only had three Londoners, so to start with at least it will concentrate on the out-of-London area. When more Londoners join, it will spread its area. There were a couple of FoMRHI members present, as well as me, but we hope that more will join.

I hope that every FoMRHI member in this country is a member of the local Early Music Forum. I know that their sessions are more often playing than making in orientation, but we all make for players, and these are our customers; it makes good business sense to join, as well being pleasant occasions when one can meet one's friends and colleagues.

I don't know whether the Forum concept has spread yet to other countries, but if it hasn't perhaps it should. Would one of the experienced Forum people be willing to write us a Comm. on how they function and how to run one? I've only just got involved (they made me President of this one, which I suspect was a mistake on their part) and don't yet know the ropes. It is an organisation which should be useful in any country where there are makers and players, for it is the one opportunity to meet and exchange views and comments. We do have much in common with each other, and opportunities to meet are rare other than in such Fora.

BATE WEEKENDS: We have two Weekends this term, as well as the Arbeau day which it's too late to remind you of. It may be too late for the Weekends, too, but in case it isn't, they are Recorders for Makers and Players with Alec Loretto and Alan Davis on November 12/13, and Passaggi for all instruments and voices (late renaissance and early baroque cadences and ornamentation) with Lewis Jones and whomever else he brings on November 19/20.

Next term, too, we have two: Clarinets with Keith Puddy and Brian Ackerman on February 11/12, and Gamelan on March 11/12.

BATE SUMMER SCHOOLS: This year's were so successful that we will have four next year: Renaissance Recorder with Alan Davis and Lewis Jones on August 7-11; Baroque Recorder with the same tutors, August 13-18 (deliberately put together so that people can come to both, with a day and a half off in between to recover); Transverse Flute from Baroque to Early Romantic with Lisa Beznosiuk and Lewis again, August 20-25; Baroque & Classical Oboe and Bassoon with the same team as this year, Paul Goodwin, Dick Earle and Lorraine Wood for oboe and Andrew Watts and Paul White for bassoon. A brochure covering all four will be ready by the time you get this, I hope, so if you're interested write and ask for one.
I believe that this is something that we should do here, even though it’s a disruption and the wage bill terrifies me (we have no sponsorship for them; they have to pay their own way).

MUSEUM DRAWINGS: Arnold Myers has sent me an impressive new list of the Edinburgh Museum’s measured drawings, which you’ll find here. This, too, is something that I believe that all museums should do. Often it does depend on finding someone competent and willing to do them, so it could always be worth offering if you are willing. I’d certainly like more here.

If any of you know of museums who have such drawings whose lists we have not printed, or not for a long while, ask them to send me an up-to-date list so that we can print them here.

ENVoi: I think that’s about it. Not much has come in because there hasn’t been much time since July reached you. Try to make the next one a bumper Bull by sending odds and ends (and Comms if you can) with your renewals.

DEADLINE FOR NEXT Q: January 3rd, please. There won’t be any posts on 1st or 2nd, but you can always get things in before the end of December – it would be safer to reckon to, as the posts, even when they aren’t on strike, are more chaotic than usual at that time of year. The University does have a fax number now, but I don’t think that they’d welcome much more than single pages. Anything sent that way MUST be addressed to me (NOT to FoMRHI, which they’ve never heard of) and MUST be marked attn Faculty of Music; if it isn’t, it won’t reach me. The number is 0865-270708; 0865 is the Oxford code; if you’re abroad you have to add the UK code and drop the 0 from 0865.

I’ve still not got an electronic mailbox to the computer; cash is the problem and as I’m always costing the Faculty money for bits and pieces for the Collection, I’m holding back on modems etc for the moment.

PS: Remember your renewal!

Jeremy Montagu
Hon.Sec.FoMRHI

BULLETIN SUPPLEMENT

Ephraim Segerman

Additional to Jeremy’s explanation for the lateness of the July Q, since my word processing system is very old (Apple II with Centronics 737 printer), I have duplicate computers and printers. This time both printers were out of action at the same time.

Concerning the Editorship, a part of the job that Jeremy didn’t mention is to get the Q camera-ready. This means taping together pages that will be printed together across the centre fold so that the final package given to the printers, when folded along the taped edges, is in the identical order as it will be in the printed Q. The printers do the reduction from A3 to A4. A subtlety (and great annoyance because authors neglect checking through the Notes for Contributors and so don’t get reminded about a new ribbon) is organizing the sequence of Comms so that greysish weak copy is taped as much as possible to similar copy in the other half of the Q. In this Q, Haynes’s weak copy has forced me to separate Galpin’s Comm and Jeremy’s Comm that should have followed on from it.

As implied in Comm 870, Paul Spriggs informs me that he has been unable to find a record shop in the UK that is willing to import Deutsche Harmonia Mundi recordings. If some reader knows of one who would, please let him know.

The image or outline of Bob Marvin’s “fornicator” is not included because it would end up the wrong size, and the dimensions given in the Bull above say all (except that there are holes to hang it on a nail).
Seven further workshop drawings were published by the Edinburgh University Collection of Historic Musical Instruments in October 1988. They are:


The discount on orders for 2 - 5 drawings is £1.00 per drawing; the discount on orders for 6 or more drawings is £2.00 per drawing.

Photographs are also available: the price for a 203 x 254 black-and-white print of a general view of the any instrument in the Edinburgh University Collection is £4.00. Photographs of particular details can be taken on request.

Orders must be accompanied by remittance. Prices include VAT and surface postage. Please remit by cheque payable to the University of Edinburgh, made out in £ sterling drawn on a U.K. bank.

Further information from, and orders to: Arnold Myers, Honorary Curator, Edinburgh University Collection of Historic Musical Instruments, Reid Concert Hall, Bristo Square, Edinburgh EH8 9AG.

7th October 1988
The Renaissance Flute Circle was formed towards the end of 1987, with the aim of encouraging the playing of the instrument by circulating lists of players, makers and teachers, by producing a thrice-yearly newsletter, and by organising playing days and other events. In its first year, under the chairmanship of Barbara Stanley, it has done all of these things. There were 29 members on the list circulated in January (which can be expected to grow); there have been three playing days (all of which I have been unable to attend); and it is a pleasure here to draw attention to the first two issues of the Newsletter, which is edited by Tony Blishen.

These have run to eight and ten A4 pages respectively, and both have included news and reports of courses, playing days and concerts. This is one of the most valuable services such a newsletter can perform, and if there is a slight whiff of introspection and self-congratulation, it will probably pass as the Circle becomes established.

Some significant articles have already appeared. In No. 1, Derek Lindo discusses the renaissance military fife, and attempts to define how, and at what date, the instrument can be distinguished from the civilian flute. He assembles the available information on the schweizer pfeiff or fife, which seems always to have been a short instrument. It is noteworthy that the fifes depicted by Praetorius can have had the ranges he gives for them only at a pitch above a' = 440 Hz. I am not happy with the idea that before 1550 the three sizes of transverse flute used to play polyphony were identical with the military instrument. No case is made for more than one size of fife having been used simultaneously, or for their having played anything other than monophonic music at that time. The suggestion that 'consorts' of flutes might have played for the troops to dance to does nothing to inspire confidence in the hypothesis. In No. 2, Lindo gives useful transcriptions (with quartered note-values) of Arbeau's two marches for the fife or arigot.

In an article on transposition, Nancy Hadden considers the part-ranges and other technical details of the chansons published by Attaingnant in 1533 as being suitable for flutes. In the light of the nominal pitches ascribed to instruments at the time, she recommends, following Howard Mayer Brown, an upward transposition of a fifth (in addition to the customary octave). This encouragement to amateur players to learn to read at different pitches is most welcome, though sixteenth-century ensemble practice, reflected in the writings of Ganassi, della Viola, Virgiliano and others, was certainly more flexible than is suggested here. 'Transpositions' of a tone, minor third, fourth, fifth and seventh, at least, are all important in accommodating polyphony to flutes.

In the absence of detailed technical accounts of renaissance flute playing, Tony Blishen presents two important Chinese texts in translation. The first is a summary of the sections on
breathing and embouchure in a tutor, apparently of the second quarter of this century, by one Xiao Jianquing. The direction that the breath should vibrate finds a parallel in Agricola’s brief instructions for the flute, and the description of tonguing by ’fluttering the tip of the tongue, making the sound resemble that of pearls rolling across a jade tray’ at least serves to remind us how prosaic our renaissance sources are. I am sceptical, however, if it is really the translator’s intention to suggest that we should transfer ’a kind of remoteness, a serene detachment from the everyday’ to the occidental tradition. No less interesting, and even more evocatively translated, is a vivid account of the playing of Li Mo, an eighth-century flautist.

William Marshall offers a retrospective discography of the renaissance flute, which might be augmented, and two reviews of recent records, and a pseudonymous Frog contributes some ’in’ humour which is largely lost on those who have missed the courses and playing days.

The annual subscription to the Renaissance Flute Circle, which includes the cost of the Newsletter, is £5 (students £2-50), and the treasurer and membership secretary is Brian Woods, 20 Cornbury Road, Edgeware, Middlesex HA8 6RT.


A beautiful book, superbly illustrated, and extraordinarily cheap for its size and the amount of illustration (DM 80 is about £25). It is in 17 sections, Moecck himself starting with a general survey of the early periods and the main instrument-making towns in Germany. Thereafter, there is a section on each type of instrument (Joppig on woodwind, Ahrens on brass, van der Meer on harpsichords, etc), each one covering the historical instruments, the modern instruments, and for woodwind, brass, and harpsichords the revival ’historical’ instruments. The coverage is not confined to ’our’ instruments; zithers, mouthorgans and so forth are treated just as seriously as any others, and there is a good section on the electronics (one of the longest) and on the mechanicals. There is also a section on the study of instrument-making, acoustical research and so forth. Finally there is a list of all known German (including some from the East and a few Austrian) instrument makers today, divided into factories and hand-makers for each type of instrument, with basic addresses (no more than 8000 Munchen 2, to take just one example).

Thus it is a very useful book, as well as a very impressive one. Even if you don’t read German or are not very impressed by some of the authors (the percussion section is very summary and concentrates on jazz and Orff Schulwerk), the illustrations are superb, especially the beautiful full-page colour photograph of a left-handed Silbermann piano of 1776 (I’m being unkind; it’s the only plate out of the 355 that I can find any fault with; all the rest are superb, and in fact this one is excellent, too, if you reverse it mentally). We should be grateful to Dr. Moecck for so excellent a celebration of German instrument-making.
Review of: Royal College of Music Museum of Instruments, set of 13 postcards.
25p each, £3.00 the set, £1.75 for 7 cards of instruments, £1.50 for 6 cards of portraits.

A review of postcards? What next? But why not? A good many of the books I review here are more important for their pictures than for their texts, so why not review such excellent colour postcards as these? I wish we could do as well; we have black and white postcards, but so far we've only been able to afford one colour card (of the gamelan).

The instrument cards include the oldest known string-keyboard instrument, the clavicytherium of c.1480, a Barak Norman division viol, a Cousineau harp, recorders by Jacob Denner and Oberlender with the Scherer Ivory recorder, the Alessandro Trasuntino harpsichord of 1531 (Boalch 1), and a general view. The portraits Grove (Sir George, the creator of the Dictionary), Vaughan Williams, Adrian Boult (all connected with the RCM), Farinelli, Haydn, and Weber. The one card that doesn't seem to fit in either category is a rather ropey, and very sentimental not to say gooey, anonymous (c.1640) painting of St. Cecilia playing a somewhat improbable organ with, at her feet, lute violin and cornett.

The general view is just a souvenir of course; unless you scribble all over it you won't know what you've got a distant view of, though one can dimly see the clavicytherium through a glass, plus its reflection in the next glass, and its modern copy standing out among the other keyboards. The Trasuntino, according to Boalch the earliest he or any other Trasuntino made, is a good clear picture in its case. The Denner recorder is the only ivory one listed in Phil Young's 2500 Historic Woodwind (J.C.Denner has two surviving); the Scherer is, I think, the earliest clarinet in England; the Oberlender is, as so often, over-decorated carved boxwood. All three are straight front view. The Cousineau harp is by both Georges & Jacques-Georges, and looks like a Cousineau harp; the only exceptional thing about it is the townscape painted on the soundboard. The Barak Norman of 1692 is the usual elegant shape with inlay on the belly between fingerboard and bridge and on the fingerboard and tailpiece. The star, of course, is the clavicytherium, decrepit with bits missing here and there, but still a wonderful document. I must have another look through Arnault de Zwolle and see whether there is any mention of such instruments (my memory is that there isn't), for I wonder whether they existed in his time; this instrument is dated to c.1480 and one of the carvings in the Ed Ripin anthology which Edinburgh published and Dover reprinted (in Ed Bowles's article, fig.31) is dated to 1490. Both are South German so they might have been outside his geographical area, and perhaps that's the only area they came from. Perhaps, too, I'm revealing too much of my own ignorance, but has anyone made a study of this type of harpsichord? Russell ignores this instrument, and is only really interested in 18th century ones apart from mentioning those in Virdung and Praetorius.

All in all a nice batch of cards and worth having. The RCM's address is in our List of Members. If you're ordering by post, add 14p for up to 7 cards and 22p for the set for postage in UK, and more (unspecified) for abroad.

A mouth-watering catalogue, listing, describing and illustrating 77 superb oboes and bassoons, plus one crumhorn (Jorg Wier), one racket (Ivory anon), one shawm (anon, and more likely a deutsche Schalmei), two Schalmei (both Richard Haka) a basse de musette (I-IR as usual), and a bass curtal (J.C. Denner). Even so, the price seems on the high side, though Phil says it’s not much over cost; presumably so many photos have to be paid for.

The Catalogue is better than the exhibition was, for as Phil explains in his Introduction, they could not afford to accept the offers of loans from Berlin and The Hague, and as the cancellation of The Hague’s loan was at a very late stage, all their instruments are in the Catalogue but weren’t in Victoria. Another very useful feature of the Catalogue is, at long last, a translation of the very important biographical article on the early Dutch wind instrument makers by Marieke Teutscher and S.A.C. Dudok van Heel. Most of us have struggled to learn Dutch enough to read the original in the Kasteel Ehrenstein, Kerkrade, exhibition catalogue, for it is by far the best description of the Amsterdam makers from Haka onwards. I wouldn’t say that that translation is, alone worth the price, but it would go a long way towards reconciling one to paying it. One of the most important points in the catalogue entries is the identification of the mysterious I-IR. It has been recognised for quite a while that these shawms are Swiss and much later than they look, but at last to have a name, dates, and a place for the maker is wonderful.

As I’ve said above, every instrument is illustrated, bassoons both finger and thumb sides. The illustrations vary from the good to the lousy, and the main reason for the lousiness of some of them is the mania among museums, and often publishers, for a blank background. As a result, the background gets brushed out and, along with it, so does the definition of the edges of the instrument, only too often leaving us with either a fuzzy outline or, worse, an outline that has been inked in. When I produced my own photographs for my Rom & Mod, some of the ones taken in the old Bate premises had my daughter’s toes in a corner because we had to put things on the floor (on a blanket) for lack of space and facilities, so of course they had to be cropped. Here I have a plain hessian background for photographs, and every museum can normally produce some plain background. Instruments show far better against a neutral background than they do on a brushed out white page (ivory, in particular, whether whole instruments or mounts, suffers very badly from a white background) and perhaps we should all start putting pressure on publishers to recognise this. What they don’t like, of course, is the different backgrounds from the different museums, but maybe we can persuade them to put up with them. Phil obviously had no choice; he was sent photographs which had already been made for other books and their own catalogues.

There is a description, always interesting and often entertaining, of each instrument and each maker. One point he makes, which he (and I) hope will be followed up by researchers, is questioning the ubiquity of the duplicated Eb key on early oboes. This is in connexion with the Leipzig Rippert, which has only one, as has the Bate Stanesby Jr, and a number of others which Phil lists. A further point here is how many early oboes have the three keys but no hole under the left-hand Eb key? This is true of the oldest oboe in England, the anonymous ex Galpin instrument here, dated variously to c.1690 and c.1680.
A point that I'd like to query with him is the mark on the Astor from the Han de Vries collection: does it not have a unicorn head? It's not cited as part of the mark, and if it doesn't, can it be dated and give us an idea of when that mysterious mark began to be used? I would suggest, too, a note of caution in the description of the oboe da caccia. Phil says that it is a tenor oboe in F ... but unlike the tenor has a curved body and a very large flared bell of wood or metal. It is our assumption that this indeed was the caccia, but I do not know of any evidence for this. I don't know of any contemporary illustration or description, nor of any instrument with an early 18th century label attached saying Oboe da Caccia. We have four or five surviving types of tenor oboe from this period: one that looks like a large oboe, one with a bulb bell, ancestral to the cor anglais, one curved with a flared bell, maybe one curved with a bulb bell, and one very straight and plain. For these we have four names: vox humana for the last (a peculiarly English instrument unknown elsewhere), tenor oboe, taille, and oboe da caccia. Which was which? We guess and we assume. We're almost certainly right (or anyway so we all think) about the caccia being as Phil describes it, but I like to keep that element of doubt and to avoid excessive certainty in print.

One that I can add is in connexion with the octave bassoon. When the Galpin Society visited the Brighton Museum many years ago, Jim Howarth looked at their Hawkes treble bassoon and said 'I remember making that'. He was immediately asked why he'd done such a thing, and the answer was 'For fun'.

Since this Q looks like being a bit thin, perhaps Eph would allow me to take extra space by reprinting the contents list of this Catalogue. That will tell you how many wonderful instruments are included, and show you that the Catalogue is worth having even at $30 ($25 USA) (or £14 from Tony Bingham).
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51. Johann Christoph Denner: dulcian
52. Richard Haka: bassoon
53. Johannes Scherer, Jr.: bassoon
54. Johannes Scherer, Jr.: octave bassoon
55. Thomas Stanesby Sr. and Jr.: bassoon
56. HKICW: bassoon
57. Johann Poerschman: bassoon
58. Sattler: bassoon
60. Thierriol Prudent (1): bassoon
61. Dominique Anthony Porthaux: bassoon
62. Franitselk Doleisch (1): bassoon
63. August Grenser: bassoon
64. Jakob Friedrich Grundmann: bassoon
65. Heinrich Grenser: bassoon
66. Johann Friedrich Floth: bassoon
67. Richard Millhouse: bassoon
68. George Astor: bassoon
69. Thomas Key: bassoon
70. Kaspar Tauber: bassoon
71. Wolfgang Küß: bassoon
72. Wolfgang Küß: bassoon
73. Jean-Nicolas Savary jeune: bassoon
74. Jean-Nicolas Savary jeune: tenoroon
75. Jean-Nicolas Savary jeune: bassoon
76. Jean-Nicolas Savary jeune: bassoon
77. Triebert/Marzoli: bassoon

Bibliography
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Lamellophone 1. General by R. A. Kauffman

The entry states "the lamellae are not plucked; the free ends are depressed and released by the player". This is the definition of plucking.

Laud by J. M. Schechter

This entry states that the Laud or Ud "was introduced to Spain by Arabs during the 13th century". The Arabs seem to have had lutes since the 6th century. According to Farmer (A History of Arab Music, (1929) p. 98), the favourite singing girl of the Arab ruler of Spain, Abd al-Rahmin I (756-88), sang to the ud.

Lira da braccio by H. M. Brown

It is stated that this instrument "was undoubtedly the principal instrument of Francesco di Viola, Alfonso dalle Viola and the other Italian composer performers similarly named." It is my impression that 'viola' was more likely to refer to gamba, braccio or mano types than to the lira, so I doubt it. At the end of the entry it is stated that both the lira da braccio and lira da gamba (lirone) disappeared from use early in the 17th century. This is not so for the lirone, as is shown in its entry in DoMI. Later in the 17th century, the lirone was just called 'lira', indicating that the da braccio instrument was forgotten, making qualification in the name unnecessary.

Loulie, Etienne by Anon

One of the great faults of this dictionary is that it includes inventors of instruments, no matter how inconsequential, but excludes scholars who are important sources of information on instruments or their playing techniques. Loulie was an inventor of little consequence but an invaluable reporter on musical practices of the day. So while he was in anyway, it would have been good to mention that he was an important source of information on performance practices, especially on the viol.

Lute by K. Wachsmann (1), I. Harwood (3-4), D. Poulton (3-7)

1. The Generic Term: I have previously voiced my objection to the confusion caused by the Hornbostel-Sachs classification system which calls all composite cordophones with the string plane parallel to the soundboard 'lutes', while historically the term has been used only for plucked instruments of this type with relatively short necks carrying the stopped strings and a round-backed body that was relatively large.

3. Structure of the Western Lute: The inner end-clasp was not as consistently of the same wood as the back as the outer end-clasp was. The statement that the bar ends were glued to the adjacent ribs is controversial.

4. History: When the lute spread to non-Moorish Europe is more well defined than implied in the entry; the lute first appeared in French poetry around 1270 (as mentioned in section 7 of this entry). The lowest string was often called G (gamma ut) simply because this was the lowest note normally referred to, and since one described a tuning from low to high, this was a good place to start, from the beginning of notes. Finger playing only helped (not allowed) the playing of several parts at once (the lira da braccio and cittern did this without finger playing). I am not convinced, as the author seems to be, that Page has discovered 14th century French tablature (the only evidence Page offers is that it looks like tablature, but he hasn't shown that it makes musical sense);
my money is still on Fulan in 15th century Spain as the inventor of non-German tablatures. Venelio Venere is not such a shadowy figure since Witten's article (JAMIS 1) appeared. Concerning the English treble lute having the same g' nominal pitch as the mean lute, I think that the explanation of Comm 867 is more likely to be true than the one given (Harwood's fourth-higher pitch standard and a tiny treble lute). The argument that the classical 11-course French baroque lute replaced the two-headed lute because of overspun strings is false; it happened before overspun strings were available, and the evidence of hole sizes in bridges of surviving instruments indicates that all-gut stringing was common. Concerning the treble rider on the pegbox, it might be worth adding that, from the paintings, it seems that it first appeared around 1620.

**Lute-guitar** by Anon

It is described as "a guitar with a lute-shaped body invented by ... about 1850". Such instruments are seen in paintings and drawings since early in the 17th century. Perhaps the mid-19th century invention was doing the same thing with the six-string guitar. This is the modern German folk instrument called 'laute' before the early-music movement confused German terminology.

**Lyra viol** by F. Traficante

The author unfortunately does not respect the distinction made in the 17th century between the lyra viol and the bass viol played lyra-way (see Comm 716). The Ashmolean 1598 Rose instrument illustrated is a tenor viol, not a lyra viol. The explanation for the frequent unisons between a fingered string and an open string misses the considerable likelihood that an acciaccatura or tasto (tast in English) was often if not always implied.
Drum Rhythms for Dance Music in the Renaissance and Middle Ages

The iconography of the Middle Ages and the Renaissance is littered with a plethora of percussion instruments, and yet the first concrete evidence that we have for what was played on them is not found until the publication of the famous dance tutor *Orchésographic* by Thoinot Arbeau, the anagrammatic nom de plume of Jehan Tabourot, which was first published four hundred years ago this year, and the music of much of which was popularized by Peter Warlock in his *Capriol Suite*. The book must have been popular in its own day, for three editions of *Orchésographic* were published by Jehan des Preyz in Langres, the first in 1588, the second in 1589, and the third in 1590.

There have been five modern prints of the work that I know of, the first edited by Laure Fonta and published by Bouillon & Vieweg in Paris in 1888 to celebrate the tercentenary of the first publication, incorporating a reprinted copy, rather than a facsimile, of, rather curiously, the 1589 edition; the second was a translation into English by Cyril Beaumont, with the music transcribed into modern notation, published in 1925, an edition that I've not seen; the third was again a translation into English, by Mary Evans, with a photographic facsimile of the little woodcuts and musical notation of the 1888 Fonta reprint, and I think that it derives from that edition rather than from an original; the fourth is a reprint of this third version, with various corrections (but unfortunately by no means all that should have been made) in supplementary notes by Julia Sutton, published by Dover in New York in 1966, with the addition of Labanotation of all the dances; the fifth is the only modern print that should be taken seriously, and is a facsimile of the 1596 edition with a short introduction by François Lesure, published by Minkoff in Geneva in 1972. It may be more expensive than the others, especially the Dover, but it is the only one which is not bedevilled by misunderstandings of the original text. All the references and quotations in this Comm., including the page numbers which are for rectos unless otherwise stated (only the rectos are numbered), are to and from this last edition, the original spelling of which has been retained with all its idiosyncracies and, particularly, its somewhat eccentric use of accents and punctuation.

The work is written in the familiar style of its period as a conversation between the master, Arbeau, and the ignoramus, Capriol, and it includes not merely descriptions of the dances, but details of the steps (sufficiently detailed for the Dover edition to include Labanotation of the steps, as mentioned above), and notation of the music. In one case this is in four parts but in the others it is only of the melody. Of greater importance, for me and for this Comm., some, at least, of the drum rhythms used for these dances are also written out.

Frustratingly, Arbeau gives full rhythms only for military marching and for the pavane and basse dance; for his other dances such as the allemande and the numerous varieties of branle, he gives only the melody and the steps. He does occasionally refer to percussion instruments in his descriptions of other dances, as with the morisques, presumed by all the translators to have some relationship to the English morris, for which crotales, which Arbeau believed were either tambourines or triangles (not 'triangular metal plates furnished with loops' as Mary Evans translated it) may be used: (p.94): "croirois plus-taist que Crotales fuffent un petit tabourin de balque, garny de clochettes & sonnettes lie with pellet bells as well as the normal singles ... ou bien que ce fuffent ce que nous appelions cymbales & fer triangulaire, garny de boucles, lie the triangle still had its rings, as in the Middle Ages] dont aucun
Arbeau does give two basic rhythms, one for binary dance music (p.29): ... \( \text{vne minime blanche & de deux noires, en cette facon:} \)

![Binary Drum Rhythm](image1)

and the other for such ternary dances as the gaillarde (p.39): ... \( \text{qu'elle consiste de six minimes blanches sonnees par deux mesures ternaires ainsi:} \)

![Ternary Drum Rhythm](image2)

which one steps in the following fashion because the fifth and penultimate note \( \text{est consomnee & perdue en l'air,} \) and which we shall see shortly is the better rhythm for the taborer also:

![Better Rhythm for the Taborer](image3)

However, he does not explain how these are applied, nor whether they are used in all binary and ternary dances, irrespective of their speeds, and it is clear from his description of the basse dance (see ex.2 and 2a) that there is an alternative ternary rhythm. He does, though, give us two basic pieces of information which I regard as being of fundamental importance for all percussion players, and ensemble directors, involved in the performance of dance music of both the Renaissance, Arbeau's own period, and of the Middle Ages before him.

The first comes in his description of the military march. He gives (p.8) a basic drum rhythm:

![Military Drum Rhythm](image4)

describing it as, in my own somewhat loose translation, 'the drum rhythm consists of eight beats of which the first five are played, the first four with a single drum stroke and the fifth with both sticks together (the last stroke what today we would call a flam) and the other three are counted but not played. During these eight beats, five played and three silent, the soldier takes one pace with both feet, his left foot on the first beat and his right on the fifth': La mesure & battement du tambour, contient huit minimes blanches, desquelles les cinq premières font battues & frappées sauf les quatre premières chacune d'un coup de baston, seul & la cinquième des deux battons tout ensemble, & les trois autres sont tenues & retenues, sans être frappées. Pendant le son & battement de ces cinq blanches & trois soupirs le soldat fait une passe, c'est à dire, il passe & tend ses deux jambes tellement que sur la première note, il pose & afflemt son pied gauche, & durant les trois autres nottes, il leve le pied droit, pour le poser & affeoir sur la cinquième note, & durant les trois soupirs qui equiopotent à trois
nottes, il releve son pied gauluche pour recommencer vne autre paffée comme auparavant. This is followed by some discussion of the number of paces and drum beats to the league, evidence which is irrelevant to us in this context that military drummers were expected to keep beating the whole time that the army marched.

Arbeau then explains the names of the various drum strokes, the Tan or Plan for a single stroke of a beater, the Tere for two strokes of, in modern terminology, a crotchet each, and the Fre for four quavers: (p.9): ... le son d'vne minime blanche qui se fait par vn coup de baston appele le dis-le Tan. ou Plan. Et le son de deux minimes noires, qui se fait par deux coups de bastons appele le Tere, & le son de 4 crochues qui se fait par 4 coups de bastons Fre. Arbeau does not say how these are executed, but it seems to me almost certain that at any reasonable march speed, the Fre must have been played by bouncing the sticks, the modern five-stroke roll, the fifth stroke being the following Tan. With the massive side drum that he illustrates and describes (p.7) deux pieds à demy long and deux pieds à demy in diameter, and with sticks heavy enough to sound such a drum, it would be all-but impossible to play a rhythm such as the Fre hand-to-hand at anything faster than a snail's pace. In addition, the word Fre, with a rolled r, is a good onomatopoeic approximation to the sound of a five-stroke roll.

He then goes on to give all, or almost all (my son Simon pointed out to me some years ago, when at school he first had access to a computer, that Arbeau had missed four of the possible permutations, the Tan Tere Fre Fre Tan, the Tan Fre Tere Fre Tan, the Tere Tan Fre Fre Tan, and the Tere Fre Tan Fre Tan), the possible permutations of his basic rhythm by dividing any of the minimes blanches into any of these other strokes, having already stressed that the fifth beat must be left plain and unchanged, and that the last three beats must always and invariably be left silent: (p.9): Oultre ce vous debues penfer que quant les battements du tambour font diversiffes, ils sont plus aggreables, & pour ceste cause ceuls qui le battent mettent quelquefois les cinq minimes blaches & les trois foufpirs comme deffus à esti notte, quelquefois en lieu des blanches, ils mettent deux minimes noires ou quatre crochues, comme il leur vient en phantafie, mais ce pendant il faut que la cinquieme notte soit entiere blanche ... car lors il ne font point les trois foufpirs fors au dernier.

Capriol then asks Arbeau why the three rest beats must be left silent and why the drummer cannot simply play eight strokes on the drum for each full pace, four one the left foot and four on the right: (p.14): Pourquoi y meet on ces foufpirs? Que ne fait le tambour pour chacune paffée les huict minimes blanches? quarte pour le pied gauche, & quarte pour le pied droict. Arbeau replies that if they did that the soldiers would fall into confusion: (ibid): Si le tambour n'usoit point de foufpirs, les marches des foldats pourroient tumher en confusion ... vn soldat pourroit faire les affiettes de ses pieds fur autrux nottes que sur la premiere & cinquieme. Ce qui n'aduivent en v colloquants des repos & foufpirs, car battant ainsi il entend bien ladicte premiere notte, & ladicte cinquieme. The point is that it is only the silence which tells the soldier which foot he should be using; with a steady continuous series of notes, nobody can know where they are in the bar. This is also why, in the examples above of the rhythm for the galliard, I said that the second, with its silent fifth beat, must always be preferable.

Thus this detail is of fundamental importance in playing dance rhythms as well as marches; unless the dancers can tell, without thought or hesitation, which is the first beat of the bar, confusion will be confounded and they will fall over their own feet.
Arbeau's other piece of basic information comes in his transcriptions of the music for the pavane Belle qui tiens ma vie, and the basse dance Jouy/\textit{dance vous donneray}, of both of which I give here only the first and last pages (ex.1 & 2a and ex.2 & 2a). For both Arbeau had already specified the drum rhythm but here he writes it throughout the dance, and what is important is that it never varies. Even though the pavane rhythm is specifically stated to be for side drum (\textit{tambour}) and the basse-dance for side drum or tabor (\textit{tambour ou tabourin}), though also on some pages just tabor, and thus played, on the side drum, with two sticks and not, as on the tabor, only one, nevertheless the rhythm is very plain, very simple, and without any of the flashy elaborations so often heard in early music performance today. I must admit to two alterations in my own performance: with \textit{Musica Reservata} we customarily added two bars of drum introduction to set the tempo, and we always added a bar and a beat to make an ending, everybody holding the final chord for an extra bar and coming off together on the first beat of the next bar. To my mind the latter is almost essential musically, and the former was always a help, but for neither is there any authority in Arbeau.

What is important is the steady and unvarying rhythm, which can still be heard today with taborers in southern France and the Basque country. In western Europe, we are a rhythmically backward culture and, on the whole, before the introduction of Afro-American music in the 1920s, we could not cope with much in the way of syncopation or additive rhythms. I well remember the story of the first performance in Paris of Tchaikovsky's \textit{Sixth Symphony}, told to me by my first conducting teacher, Joseph Lewis, and told to him by his teacher who was the assistant conductor on that occasion. The conductor of the orchestra said: 'What is this, five in a bar? Three I know, four I know, six I know, but what is five?' So his assistant said: 'If you beat four, I will beat one,' and so they did, the main conductor beating four beats and his assistant, who told Joseph Lewis this story, beating the fifth beat in every bar. Other examples are Strauss waltzes, where the drummer plays an almost incessant um-cha-cha on bass drum and side drum. Another is Latin American music for dancers in our culture, where one player at least keeps a rock steady rhythm on claves or maraccas.

One of our major problems in the early music world today is that too few of those playing in or directing ensembles have any experience of other dance musics. Any experienced dance drummer knows that the essential in a dance band is to keep the rhythm steady, plain, and simple, and to elaborate only at the points where the rhythm of other players is most obvious. My contemporaries will remember that one of the most successful dance bands of our time was Victor Sylvester's, and his slogan was strict tempo. We do have to remember when we are playing medieval or renaissance dance music that this is dance music; it is not music based on dance forms, such as we meet in Bach or the composers of the classical period. It is music that was actually played for dancing, and this is how it should still be played today.

Arbeau gives us very direct evidence of what we should do: we should keep the rhythm steady and repetitive; we should always play rhythms that make it crystal clear which is the first beat; we should help dancers, even when, in concert performance, they exist only in imagination. This may make it seem dull, especially for the drummer, but anybody old enough to have heard \textit{Musica Reservata} in performance or on record will agree that it works, and that the steady rhythms which we used added immeasurably to the effect of the performance.

For further and more detailed information on how I believe one should play early percussion instruments, and on how to make them, see James Blades's and my \textit{Early Percussion Instruments} (now out of print) and my \textit{Making Early Per-
Discussion Instruments (copies of the latter are available from the Bate Collection at £5.00; it is also officially out of print, but we have a stock of all the remaining copies), both published by OUP.

I would like to take this opportunity to express my thanks to Michael Morrow for all that I have learned from him in the past thirty years. Without him, I would have done little in early music and certainly would never have initiated the reconstruction of early percussion instruments in the late 1950s and early 1960s. It was Michael's attitude to authenticity of music, of both notes and their sound, that inspired me to be the first to make such reconstructions, and as a result, we were the first early music ensemble to get away from the attitude that any old drum would do.

A version of this Comm. will be given, with practical demonstrations, at the Bate Collection's Quatercentenary Conference, held to celebrate the publication of the first edition of Arbeau's treatise, on October 30th, 1988.
DE THOINOT ARBEAV.

pourue que sachez par cœur ce que je vous en ay donné par écrit cy deffus.

Pauane à quatre parties: avec les mesures & battemens du tambour,

Superius

Contratetnor:

Tenor

Bassus.

BEL LE QUI TIENS MA VI E CAPTIVE DANS TES

yeux, qui m'as l'ame ra ui e d'vn soubz-ryz

Contra tenor.

Tenor

Bassus.

yeux, qui m'as l'ame ra ui e d'vn soubz-ryz

Bassus.

yeux qui m'as l'ame ra ui e d'vn soubz-ryz

ex.1
The beginning of the Pavane
Ou me fauldra mourir.

Contra tenor.

me fauldra mourir, viens tost me secou rir

Tenor.

me fauldra mourir, viens tost me secou rir

Bassus.

me fauldra mourir, viens tost me secou rir

ex. la

The end of the Pavane
ORCHESOGRAPHIE
ces paflages & découpages quant vous lautez les modes & façons diverses de mouvoir les pieds, dont nous parlerons en déclarant la dance de la gaillarde. Cependant je vous donnay ici par escript l'air d'une basse-dance commune, avec la mesure ternaire du tabourin.

Capriol.

Faut-il nécessairement qu'és paunes & basse-dances le tabourin & la flurte y soient employez.

Arbeau.

Non qu'ne veult: Car on les peut joier auche violons, espinettes, flurtes trouves & à neuf trouz, haubois, & toutes sortes d'instruments: Voirez chanter auecles voix: Mais le tabourin ay de merueilleuement par les mesures uniformes à faire les affiettes des pieds selon la disposition requise pour les mouvement.

Basse-dance appellée: Louyssance vous donneray: avec les measures & battemens du tabourin.

Air de la basse-dance.

REFERENCE: ex.2
The beginning of the Basse-dance
ORCHESOGRAPHIE

Battement du tabourin.

Continuation de l'air.

DEVX SIMPLES.

DOUBLE.

DOUBLE.

DOUBLE.

REPRISE.

DE THOINOT ARBEAV.

Battement du tabourin.

Continuation de l'air

DOUBLE.

DOUBLE.

REPRISE.

BRANLE, & congé.

Céprid.

l'eus bien voulu que m'eussliez mis par escript cinq ou fix
pauanes, & autant de baffe dances.

Arbeau.

Vous en trouverez assez grand nombre dedans les liures de
danceries imprimes par feu Attaignant, qui demeuroit pres
er'Eglise Saint-Cosme à Paris, & dedans les liures de feu maistre
Nicolas du Chemin Imprimeur audit Paris, à l'enseigne du
Lion d'argent. Toutefois, il vous fauldra reduire en mesure
ternaire lediettes baffe-dances, lesquelles sont mises en mesu-

ex.2a

The end of the basse-dance
Roman Keyed Tibiae?

In the basement of the Romisch-Germanisches Museum in Koln is a 3rd or 4th Century mosaic depicting Dionysus with various acolytes in separate panels. One of these, a lady, is playing a pair of tibiae, each of which appears to have three keys on it, with a separating projection between each. She appears to be depressing one of these with her left hand. The view of the other instrument is unobstructed, and looks like this.

There can be no possibility of drawing error, since the tesserae depicting the keys are of a totally different colour to the surround. I am told that other similar illustrations exist, though I can find no reference to them in any of the works which I have consulted. Can anybody explain their purpose, and, if they are keys, what scale or mode resulted from using them?
The elephant is an improbable component of our finest musical instruments, as I am sure she would be the first to agree. And unlike timber in the popular harpsichord lid-motto, the elephant is not silent in life. But she risks being silent forever if steps are not quickly taken to protect her from extinction.

I recently read a shocking and depressing report on the present plight of the elephant in Africa. I don't recall seeing anything about this subject in FoMRHIQ's, but it seems to me it should be discussed by makers and players of historical musical instruments, since most of us must come into contact with ivory in one way or another.

It is a tragic irony that the tusks (called " défenses " in French) that were meant to protect the elephant are now the cause of her possible extinction before the end of the century if current practices continue. As the average size of tusks diminishes, more elephants must be killed to meet current demand. When tusks weighing no more than 500 grams are being exported from Sudan, this means that even elephants of 2-3 years old are being exterminated. In a recent aerial survey, a British specialist counted 7,861 dead elephants and only 4,300 living ones in one region of Central Africa. In Japan and Hong Kong alone, the annual importation of tusks varies between 700-1000 tons, which equals 90,000 elephants. It is estimated that 120,000 elephants are being killed each year. Between 1971 and 1979, a reasonable estimate is that 2.3 million elephants have been killed, out of a total African population of 2.5 million. In Africa, an elephant is killed every four minutes. Near-extinction is predictable in 1992 or 1993.

African governments make a distinction between poached and legal (i.e. with hunting permit) ivory but it is difficult to see what can be considered "legal" about this kind of commerce. Ivory has become a commodity worth speculating in. The elephant is effectively without protection. The writers of the article I read make the point that the current slaughter makes no moral or financial sense even from the poachers' point of view, as the supply will soon be exhausted. (They do not mention the possibility that most poachers are probably desperately poor and it is not they who make the most profit from the sale of illegal ivory.) The situation can be turned around; at the last minute alli-

gators were saved some years ago and are now eating children again in Florida.

No doubt the basic problem is money; I can't imagine anyone really wants to poison lakes where elephants drink or shoot them with poisoned arrows. An obvious solution is for First-world countries to offer to pay the African governments an appropriate sum for their losses in ivory revenue and for those governments to employ the people presently involved in ivory production (legal and illegal) as inspectors to enforce a complete ban on ivory exports. But more basically, the world demand for ivory must be counterbalanced by a distaste for using it because of what it means to elephants.

I would like to know what general attitudes exist among the members of FoMRHI on this issue. Among those who still use ivory, what is their justification? What about instrument restoration? What steps can we, or should we, as an organization or as individuals, take concerning this situation? I believe FoMRHI has a moral responsibility to honestly face this issue, and I hope this Comm will provoke considerable response.
Further to the A-415 discussion (Comms. 829-833), I believe many early musicians use the term "415" to mean "approximately a semitone below A-440;" it can represent a range of pitches anywhere from about A-410 to 420.¹

Back in the good old 1960's, using "415" was a radical, "authentic" thing to do. At that time it didn't matter to us whether A-415 was considered in the specific or generic sense (and nobody realized we'd someday have to deal with "392"). I'm sure one reason "415" was accepted had to do with the existence of "transposing" harpsichords (whose keyboards can be shifted down one jack). But it seems obvious to us now that it would be suspiciously neat if a common 18th-century pitch should just happen to have been an exact equal-tempered semitone below an arbitrary twentieth-century one.²

One aspect of the question that hasn't yet been considered are original woodwinds. With the possible exception of the organ, the most inflexible of baroque instruments in terms of pitch are the recorder and the traverso. For this reason, they are also relatively accurate and reliable historical pitch indicators.³

The pitch of an early traverso can vary 10-15 cents (2-4 Hz at A-440), depending on who is blowing it. Physical alterations to original traversos that would raise their pitch are detectable, however. Enlarging an embouchure-hole ruins the tone; a better method of raising pitch is to shorten the (upper) middle joint, but this adversely affects the internal intonation and can be detected (there is normally a short blank section on the tenon beyond the thread grooves that would be missing on a shortened joint). An indication of the comparative inflexibility of flute pitch is the development in about 1720 of the corps de rechange (alternate upper middle joints of different lengths, between them usu-

¹. "392" is also used in this "generic" fashion, though many traversos at this nominal pitch seem to play somewhat higher.
ally producing a range of pitch of a large semitone.) While some flutes may have been raised in pitch, there is no way to lower them, so we are reasonably certain that the present pitch of early specimens cannot have been higher, although it might once have been lower. Flutes can also serve as a control and reference to other instruments, such as recorders, by the same maker.

Of all the woodwinds, recorders are the least flexible in pitch and are therefore the most useful as historical pitch indicators. As with traversos, differences in wind pressure are only possible within a narrow range, and there are no missing parts (such as reeds) to take into account. A recorder whose scale is reasonably in tune cannot have been shortened. An enlarged window will raise a recorder's pitch, but such work is easy for an expert to detect. And from a historical point of view, since the recorder fell into disuse during the course of the 18th century, there would have been no reason to have attempted to raise its pitch. Although it must be taken into account that a recorder's pitch can vary as much as 6-7 Hz depending on temperature, recorders in original playing condition can be considered, as Friedrich von Huene once said, relatively reliable 18th-century "pitchpipes."

Because wood shrinks to a different degree in different directions, original woodwind bores are now oval rather than round, and somewhat smaller overall than when originally made. Attempts have been made to develop formulas to extrapolate original bores from existing ones, but little practical experiment has been done to determine what these dimensional differences mean in practical terms. How much have these dimensional changes affected pitch? The little evidence we have is inconclusive. If anything, woodwinds may have originally played somewhat lower than they do now.

One problem modern makers have in copying old woodwinds is that whatever bore they choose, it will be round rather than (as on the original instrument in its present state) to some degree oval. Fred Morgan has written,

In order to get as close as possible to the likely diameter of the bore when new, I always take the maximum axis size as my dimension when making reamers for copies...Working to the larger axis will cause the instrument to sound at a slightly lower pitch than the original does, with its oval bore, but this lower pitch will be closer to the original's pitch when new than is its present sounding pitch. An example of this from my own experience concerned the beautiful Jacob Denner treble recorder in the Musikhistorisk Museum in Copen-

hagen. This excellent instrument sounds at exactly A415, according to my tuning measurements. I measured it very carefully, made my first trial copy, and it sounded at A410, because of the effectively slightly more capacious bore.\(^5\)

I believe other recorder makers will agree that Fred is not alone in dealing with this question, and that the usual solution is to "adjust" instruments upwards in pitch a little (pace Quantz).\(^5\)

Although oboes are not as reliable as traversos and recorders as pitch indicators, it is my experience and that of a number of other players that our instruments sound and respond better, and function with more satisfaction in internal intonation, if they are played just a bit lower than A-415. For one of my instruments, for instance, I am only able to play up to (specific) 415 by making reeds narrower than I like for tonal purposes.

Cary Karp comments that

The original pitch of a 'shrunken' woodwind cannot be extrapolated solely on the basis of bore-measurement analysis. I suspect despite this that generally accepted historical pitch levels as established on the basis of characteristics of surviving woodwinds may in light of future research need revision downwards.\(^7\)

A short time ago in these pages Rod Cameron commented on the fact that

Looking at many hundreds of original flutes from the eighteenth century, it is apparent that very few of them played at A415...if we wish to be faithful to the sonorities of eighteenth century music for flute, it will not work to play everything at A415. Yes, I know that it is a bother, and it means problems for the harpsichord tuning, etc. Yet if we are going to stick to A415, we should at least be willing to concede that, by choice, the important parameter of sonority is left unexplored.\(^6\)

Rod's comments were concerned with appropriate instruments for Bach's flute music, but (in the spirit of his Comm., which is "...unabashedly a move to loosen up our attitude to pitch, mainly in the first half of the eighteenth century...") they are a challenge also to those of us with the lingering suspicion that "generic A-415" was originally more like specific A-410.

6. Quantz 1752:Ch.XVII/vii/7.
To quote Fred Morgan again,
I believe that this A415 pitch is slightly too high to give the best tonal results with recorders... Most of the old instruments I know play appreciably lower than A415 and they would have been, in my opinion, somewhat lower still when they were new."

Coming as it does from Fred, and concerning as it does an instrument whose historic pitch has something definite to say to us, these words are worthy of careful consideration.

Then there is the question of temperament. Does "A-415" mean that the note a, plays exactly at 415 Hz? Or that the average of all the notes in the scale is a semitone below A-440? These two things are not the same. As I wrote here some time ago (and many others appear to agree to) it seems that the prevalent intonation model in 18th-century concerted playing resembled what keyboard people call 1/6-comma meantone. In any case, we know woodwinds were not in equal temperament, and for any kind of meantone, the distance between C and A is smaller than it would be in equal temperament. Odd as it seems, this means that tuning the note a, to 415 Hz produces a scale in which the average of all the notes is higher than "A-415." Tuning the note a, about 2 Hz lower than 415 Hz therefore produces a 1/6-comma scale that is exactly a semitone lower than A-440 (for whatever it's worth to use 440 as a reference nowadays).

What are the historic indications of a more exact level for "415?" Realistically, the difference between A-415 and A-410 is probably too small to be differentiated with any accuracy using the historic information available to us. Taking temperature changes, questions of temperament, and the tendency to use "415" in an approximate, generic sense also into account, the historic pitches available to us do not provide clear evidence on so specific a question.

There are a number of traversos and recorders that rarely appear to be higher now than A-415 Hz and are sometimes a little lower. There are the extrapolations based on the old German Chorton/Cammerton relationship: since Cammerton instruments usually played a whole step lower than Chorton instruments (mostly organs), and since the surviving Chorton pitches are a little below a semitone above A-440 (A-460;
modern bb₁ is 466 Hz), Cammerton pitches would be a little below a semitone below A-440.¹¹

Then there are the two competing theories for the level of Praetorius's "rechte Thon" or pitch standard. (This pitch is relevant to the pitches of the 18th century because it describes organs that probably did not change between Praetorius's day and Bach's). The two theories put that pitch at either about A-460 or at A-430 +5 Hz.¹² Either of these pitches is somewhat below its closest modern equivalent (466 or 440).

None of this can be said to be conclusive for the relatively small pitch difference we are discussing. On the other hand, the way original woodwinds and copies of them function is worth consideration.

If we were to decide to lower our "generic 415" to about A-410, how could this be accomplished? What would be the problems?

As Jacques Way said in Comm B33, "I try to think for whom the question is important." We woodwind players can tell him: it changes our lives. I think string players in general would not care. Organs would be tricky, as they are hard to tune and are often locked into an A-440 system. But I suspect the main resistance would come from woodwind players and the built-in inertia produced by nearly a generation of reed set-ups and flute "copies" made to play just a little higher than their originals (instrument makers don't operate in a vacuum, as I hardly need add here).

Is it worth the effort? One wonders what might be discovered by this little refinement in our sense of the meaning of "415."

¹¹ In Comm. 683, Eph Segerman includes a graph of Mendel's organ data that shows very clearly three predominant pitches.
   Mendel's model is that the pitches tend towards -1, +1 and +2 semitones away from modern. (p.67)
   Interestingly for the subject at hand, Eph suggests that a model that has the pitches -1, +1 and +2 semitones away from a' = 435 Hz would have an even higher probability.

Eighteenth-Century German and French Pitches?

On page 65 of Comm 683 on 18th-century German and French pitches, Eph Segerman says that
the picture of German pitch standards presented here is complete. It accommodates all of the surviving information. ... (It) is anchored onto absolute pitch at one end by Praetorius's dimensions of pitch pipes and the Halberstadt organ, and on the other end by the association of the range of pitches of 18th century German organs given by J.A. Silbermann with the range of pitches of surviving organs summarized by Mendel.

Unfortunately, neither of these two anchors is entirely secure. The level of Praetorius's "rechte Thon" has not yet been proven convincingly, and Silbermann is ambiguous and in disagreement with the weightier evidence of Quantz and Agricola. Further, Eph's statistical graph of Mendel's organ pitches appears to argue against the pitch he has assigned to Praetorius.

This is not to say that Eph's two pitch Comms are not worth careful attention. They are well thought out and much can be learned from them. I'm grateful to him for having written them, not only for the insights they offer but because they serve as a kind of "devil's advocate" in thinking through the alternate possibilities offered by the original sources.

But they do sometimes present judgments between conflicting evidence as established fact. Unfortunately, judgments are unavoidable in any historical pitch study. (As in the editing of music, judgment is not undesirable in itself, as long as everyone knows when it is being used.) Having studied the surviving information on baroque pitch for some years now, the claim by anyone to accommodate all of it seems to me naive. Nor do I understand why Eph says he does. He based his work on Mendel's 1978 article on pitch, which is a landmark study but is incomplete in several important areas. Eph's study suffers from that incompleteness.

The history of pitch is intimately connected to two types of instrument: the organ and the woodwinds. These were the instruments that tended to influence pitch the most directly,

---

because they were the least flexible at changing it.\footnote{Mendel 1978:22 cites a Dutch statement from 1723 that identified a pitch as "...cammer of haubois thoon" (chamber, or oboe pitch).} This lack of flexibility also makes them now the major source of evidence on absolute historical pitches, since their pitch has tended to change little with time, thus making them relatively reliable indicators. If one understands the context in which they were used, traversos and recorders are convincing historical pitchpipes; they are a major piece of the puzzle we are trying to fit together. Mendel in 1978 attempted to include what information on woodwinds he could gather from others but failed to recognize its reliability and therefore its significance. The studies by Thomas Rhodes and Eph ignored it altogether. In all cases, this information would have affected their conclusions.

A potential red-herring in studying historical pitch is terminology. It is natural to try to relate the terms Chorton and Cammerton from different sources, but Praetorius, for instance, uses the same words to mean different things and different words to mean the same things, sometimes without explanation. In other sources, Chorton and Cornet/Trompetenton are sometimes used synonymously, sometimes as separate concepts. There were two different levels for both Chorton and Cammerton. Pitch terminology is therefore extremely relative. The term Kammerton is used in Germany to this day to mean "standard pitch." The "Cammerton" that developed in the 18th century, however, was a simple expedient to reconcile the old organs to the new woodwinds; it was natural to give it a familiar name but it had no necessary connection with Praetorius's use of the term. Relating pitches that have the same name but were used at different periods or places is clearly an unreliable practice.

\textbf{Praetorius}

Eph's statistical graph of Mendel's organ pitches, presented on page 67, shows three distinct groupings of pitches at about A-488, A-460 and A-410, with a clear blank around A-440. Eph observes

\begin{quote}
It is curious that the lists of German organ pitches given by Ellis and Mendel omit [sic.] organs in the region of modern pitch.
\end{quote}

This is particularly important when we realize that the pitch Eph has assigned to Praetorius's "rechte Thon," which serves as the foundation of his studies, is approximately modern pitch \(\langle A-430 \pm 5\ Hz \rangle\).\footnote{A.J. Ellis (1880), "On the history of musical pitch," Journal of the Society of Arts IR in Studies in the history of musical pitch by Ellis and Mendel, Amsterdam, 19681, p.38 calculated this pitch as a meantone \(a_3\) at 424.2 Hz.} We could reasonably expect to
find at least a few surviving organs at this pitch, which Praetorius describes as the one...nach welchem numehr fast alle unsere Orgeln gestim-
met werden/(p.15)
Eph, who has just been explaining probability theory (p.67), offers the improbable guess that all these organs have since been retuned.

Eph locked horns some time ago with Herbert W. Myers in the pages of Early Music on the question of Praetorius's pitch. Although he claimed to have "demolished" Herb's argument for a "rechte Thon" at G+1S, questions still remain. Essentially, there is a conflict of about a semitone between, (on one side) the apparent pitch of the organ pipes for which Praetorius provided dimensions and (on the other) the pitches of other instruments (including an organ) described and depicted by Praetorius. This conflict is unresolved.

Anne Smith made a compilation of all the references to pitch in the Syntagma. Among other pitches, Praetorius described five standards clustered around his "rechte Thon", which he used as a reference point.

Table A
(Each --- represents a semitone)

--- ...fast die meiste do mahlige Orgeln (p.116)

--- ...nicht wenig [Wercke] auch umb ein Semitonium höher intoniret und gemacht worden. (p.103)

--- [Praetorius's standard]: "rechte Thon;" "deutscher ChorThon;" "CammerThon;" "jetziger Cammerthon;" "jetzige gewöhnlicher Thon;" "unser rechter Cornetten oder Cammerthon" (pp.62,102,116,15,41)

--- [Blank]

--- "'ChorThon' zu Praag und etlichen andern Catholischen Capellen" (p.15)

--- Wiewohl auch in Italia und andern Catholischen Capellen/Deutches Landes/jetzgedachter niedriger Thon in tertia inferiore gahr sehr im gebrauch.
(p.16)

It is interesting that Praetorius makes no mention of a pitch one semitone below his "rechte Thon". This curious blank reminds us of the blank shown in Eph's graph of surviving organ pitches, suggesting the possibility that the missing pitch in Praetorius's descriptions corresponds to about @. This, of course, would put Praetorius's "rechte Thon" up a semitone at @+ls. (The same curious blank -- at the same place, @ -- appears in Quantz's and Agricola's reports of pitches compiled in Table H below.)

Eph connects a pitch one whole step below "rechte Thon" with the pitch of Rome and Paris (@-2s), since Praetorius linked that level with "Praag und etlichen andern Catholischen Capellen." This is an attractive idea, since Rome was the center of the Catholic world and Paris could conceivably have been influenced by it. But Praetorius also describes a pitch yet another semitone lower (see Table A) which could be that of Rome and Paris (@-2s) as well. If this were the case, "rechte Thon" a minor third higher would have to be at about @+ls. This possibility was not considered in Eph's Comms because of his conviction (which I would be glad to share if there was more practical evidence to balance that of contemporary instruments) that Praetorius's "rechte Thon" was close to @.

The absolute level of Praetorius's "rechte Thon" is relevant to the study of 18th-century pitch for two reasons. First, it is unlikely that organ pitches changed much from Praetorius's day to Bach's. Second, there are important implications for the pitch of the new woodwinds that were disseminated from France throughout Europe in the last third of the 17th century.

Muffat in 1698 describes two French pitches a semitone apart:

Le ton, auquel s'accordent les Francois est ordinairement d'un ton, & mème pour les Operas d'une tierce mineure plus bas, que celuy d'Allemagne, dit du Cornet, qu'ils treuvent trop haut, trop piaillant, & trop force. Pour moy s'il m'etoit libre de choisir, lors qu'aucun autre égard n'y mettroit obstacle, je me servirois du premier, qu'on nomme en Allemagne l'ancien

7. As a means of communicating pitches, I use a system based on the modern standard A-440, which is designated with the symbol "@." Pitches will be described in relation to @ in semitones (with a give-or-take of several Hz on either side); thus "@+ls" will be approximately a semitone above A-440, "@-2s" will be approximately two semitones below A-440, etc.
ton du choeur avec des chordes un peu plus épaisse, ne manquant pas de vivacité avec sa douceur.

A limiting factor in fixing these pitches is Muffat’s implication that they were all playable on the violin. Let us hypothetically assume with Eph that Muffat’s "ton d’Allemagne, dit du Cornet" equals Praetorius’s "rechte Thon." If "rechte Thon" was @, Muffat’s French pitches would have been @-2s and @-3s.

If this were so, @-1s (generic "A-415") would not have been a pitch associated with France. This in turn would have a very interesting implication: since the first wave of late-baroque woodwinds came out of France, none of them would have been at @-1s. It is unlikely that the Germans changed the pitch of French woodwinds until sometime in the seventeen-teens, when there is clear evidence of radical innovations to the woodwinds in Germany, probably directly connected to the "introduction" of A-Cammerton there. @-1s would not have come into Germany with the French, and, as we have seen, Praetorius did not know of the existence in Germany of a pitch one semitone below his "rechte Thon."

We could therefore test Eph’s hypothesis by looking for surviving German woodwinds at @-1s made in the late 17th century or earliest years of the eighteenth. A good place to start would be the instruments of Johann Christoph Denner (1655-1707), who was the most famous German woodwind maker of his time and probably the first to begin making the new French instruments. In 1676 he and his colleague Johann Schell applied for an exceptional type of Meisterrecht, namely, permission to make for sale the "...französische Musikalischen Instrumenta, so mainsten in Hautbois und Flandadois bestehen...die ungefahr vor 12 Jahren in Frankreich erfunden worden."

But among Denner’s surviving recorders are a half-dozen instruments at @-1s. His surviving recorders also include

9. W.R. Thomas and J.J.K. Rhodes (1980), "Pitch," The New Grove, 14:780, appear to equate Muffat’s cornet-pitch with a whole tone above @, making his French pitches at @ and @-1s. This seems unlikely, given the French relation to A-Cammerton as explained by Quantz and Agricola. It would also imply that violins played at @+2s.
four at @+ls and even one at @+2s, but none lower than @-ls. Since he died in 1707, he could not have taken part in the design reforms of the following decade. For a maker who consciously set out to copy French instruments during most of his career, it would be remarkable if none of his approximately 50 surviving instruments were at that pitch.

If we look at surviving instruments of French origin, Mendel lists three French organs built between 1627-1674 already at @-ls. And among French recorders at @-ls, thirteen could have been made in the period 1664-1701. 92% of the French organs and 97% of French traversos and recorders made in the 17th and 18th centuries fall within a range of @-ls to @-2s.

Denner did apparently make recorders at "French pitch." In 1694, his only surviving instrument bill lists two frantzenische Fletten, which, on the back of the document, are also called Opera-Floten. These would probably have been recorders in French opera pitch — J.C. Denner apparently made no traversos. Denner appears here to use the terms "French pitch" and "Opera pitch" as synonyms. He is not alone in this practice. J.A. Silbermann (see below) wrote in 1772 that he had built three organs from 1736 to 1750 at "Opera oder französischer Thon." Although ambiguous, Mattheson also wrote in 1713 that Der Chor-Ton...so viel beschwehrlicher vor die Sänger, und ungeschichter vor Hautbois, Flutes, und andere neue Instrumenten, als der niedrige und commode Cammer- und Opern-Thon....

13. Other surviving recorders, however, include five at @. Although recorders were sometimes made "in G" or other unusual keys, the concept of a standard instrument "in F" was usual. All of Bach’s vocal music, for example, can be demonstrated to have been written for the standard traverso, recorder, oboe and bassoon of his day, despite many theories to the contrary. See B. Haynes (1986), "Questions of tonality in Bach’s cantatas: the woodwind perspective," JAMIS 12, p.51; Prinz, Ulrich (1979), Studien zum Instrumentarium Johann Sebastian Bachs mit Besonder Berücksichtigung der Kantaten (Dissertationssdruck). Tübingen, p.109; and Koch, Hans Oskar. 1980. Sonderformen der Blasinstrumenten in der deutschen Musik vom späten 17. bis zur Mitte des 18. Jahrhunderts (Inaugural-Dissertation, Heidelberg).

14. There is one organ at @-3s and as many as three flutes can possibly be interpreted as at the same pitch.

15. Nickel 199.


17. Quoted in Mendel 1978:34.

Jean-Jacques Rousseau wrote in 1768 that both Ton de Chapelle and the Ton d'Opéra were used in concerted instrumental music.

Ce dernier n'a rien de fixe; mais en France, il est ordinairement plus bas que l'autre.¹⁹

In other words, by French standards, opera pitch seems to have been the lowest pitch term in general use. Muffat implied the same thing 70 years earlier. Since the French themselves used different pitches, apparently their own term for their lowest pitch was "opera pitch," and it seems likely that this became known outside of France as "French pitch." Thus, "opera pitch" and "French pitch" are probably synonymous terms. And unless we can find a significant number of surviving instruments lower than @-2s and none at @-1s, this lower French pitch would appear to be @-2s rather than @-3s.

All of this indicates that the higher French pitch to which Muffat refers was @-1s and his "ton d'Allemagne, dit du Cornet" (equivalent to "rechte Thon") a whole tone above it was therefore @+1s. Muffat was writing in Passau for the Hapsburg Emperors; the pitches of a half-dozen Austrian organs from the 17th century have survived, all at @+1s.²⁰

Violins also provide an indication. Eph states that in the 17th and 18th centuries, the highest pitch for the string band was governed by gut first-string breakage on the violin. The smaller sized violin (with string stop of about 30 cm, that was popular in the 17th and less in the 18th century) could go up to about a semitone above modern pitch. The larger size of violin (with string stop of about 33 cm, that was also used then, and is the standard today) could not comfortably go much higher than modern pitch.²¹

Praetorius (15) wrote of his "rechte Thon" that
...weil derselbe [Tono] ohne das nicht allein vor die Vocalisten, sondern auch vor die Instrumentisten bei den Besaiteten Instrumenten, als Violini de Bracio und Violen de Gamba, auch Lauten, Pandoren und dergleichen, zum ofttern zu hoch befunden wird: Denn es aussbändige Saitten seyn müssen, die solche Höhe erleiden können. Daher kömpts dann, wenn man mitten im Gesang ist, da schnappen die Quinten dahin, und ligt im Dr. Darmit nun die Saitten desto besser bestimbt bleiben können,

¹⁹. J.-J. Rousseau (1768), Dictionnaire de musique (Paris), 516.
so müssten solche und dergleichen besaittete Instrumenta gemeinhin umb ein Thon tießer gestimmet, und alsdann nottwendig mit den andern Instrumenten, auch umb ein Secund tieffer musicirt werden.

If Praetorius’s “rechte Thon” was about @ and all the violins of the period played comfortably at that pitch, the smaller ones going even higher, it seems strange that Praetorius would complain of the problems caused by “such a high pitch.” His comments would of course make more sense if his “rechte Thon” was higher than @. Praetorius’s thinking appears to be echoed by Walther in 1732 (almost surely describing a Chorton at @+1ś):

_Cammer-Ton heisset; wenn ein musizisches Stück nicht nach Chor- oder Cornet-Tone sondern hauptsächlich um der erwachsenen Sopranisten, so die Höhe nicht wohl habben können; und so dann, um der Instrumente willen, und damit die Saiten desto besser halten mögen, entweder um einen gantzen Ton oder gar um eine kleine Terz tieffer executiert wird._

It is interesting that Praetorius also recommends downward transpositions of both a major second and a minor third from his “rechte Thon”, since singers and string players may find this pitch too high for sustained liturgical use. It is not likely he was talking about A-440, much less the level suggested by Thomas & Rhodes (about A-427). Praetorius himself would have liked to adopt the practice found in “Prague and some other Catholic chapels,” in which a pitch a major second lower than his (northern-German) “rechte Thon” was known as “ChorThon.” (Considering his location, Muffat was probably using the term in Praetorius’s “Catholic” sense; this was the pitch he also preferred.) As Table H indicates, the use of pitches a second and minor third lower than @+1 was common a century later.

“Chormass” = “rechte Thon”, and is the term Praetorius used for his organ pipes which are claimed to be at A-430 ± 5 Hz. He also called it “rechter Cornetten [cf. “Zincken” below] oder Cammerthon.” But Mendel (1978:20) cites a report by Fock of an organ that was lowered in 1647-49 to “Chormass”, so that “alle best und recht chormässige Instrumenten, also Dulcian, Zincken, Trometen, Fleuten [recorders], Posaunen etc. ohne einen Dissonanz und Zwang mit darein...stimmen können”. And the pitch to which he lowered it seems to have been between 1 1/2 and 2 semitones high.

Although it is tempting to equate Praetorius's pitch terms to those of the 18th century (which used the same names), this can lead to confusion, as Praetorius uses "ChorThon" to mean two different pitches a second apart and considers "CammerThon" equivalent to one of them and higher (sic.) than the other.

As Thomas & Rhodes point out in discussing Praetorius's organ-pipes in the "Sciagraphia," Plate XXXVII, "something is wrong with the graduation of the scale." The artist accidentally gave the 4th Brunswick inch three halves and included only nine inches instead of ten. Thomas & Rhodes's calculations based on this plate give a mean difference of 8 Hz with the other organ ("Chormass") plate. I think this level of obvious error brings into question both Praetorius's own control over the illustrations used in his book and the seriousness with which they are sometimes taken. (The entire argument for a "rechte Thon" at a level near $\mathfrak{a}$ or somewhat below rests on these drawings.)

It is possible to construct two distinct "scenarios" based on a "rechte Thon" at either approximately $\mathfrak{a}$ or $\mathfrak{a}+\frac{1}{2}$. Both have attractive and compelling features but neither, unfortunately, is without internal conflicts. I am unable to explain the obvious discrepancy between the arguments presented here and those by Myers for a "rechte Thon" higher than $\mathfrak{a}$ on one side, and those of Eph and others for a lower one. But as far as I can see, it is much more difficult to make a case for the $\mathfrak{a}$ side than the $\mathfrak{a}+\frac{1}{2}$ side. I would be delighted to be corrected on this point.

Silbermann

Silbermann's evidence (presented in a footnote by Mendel with strong reservations) is, like Praetorius's, a can of worms. To put Silbermann in context, let us first look at the two relatively complete and reliable descriptions of mid-eighteenth century (and earlier) pitches by Quantz (1752) and Agricola (1757). On page 35, Eph implies that Quantz's pitch descriptions could have involved two different Chortons. To my mind, this idea is essential to reconciling the descriptions by the two men, and has important implications for determining the level of their pitches.

First Quantz:

Le ton de Venise est présentement le plus haut, & presque égal à notre vieux ton de Choeur. Le ton de Rome étoit bas, il y a vingt ans passé, & égal à celui

de Paris. Mais à présent on commence à rendre ce dernier presqu'égal à celui de Venise.

Je ne veux pas défendre le parti du ton de la Chambre des Français qui est si considérablement bas, quoiqu'il soit le plus avantageux pour la Flute traversière, l'Hautbois & quelques autres instruments; mais je ne saurais non plus approuver le ton de Venise si considérablement haut, parce que les instruments à vent accordés suivant lui, sont trop désagréables. Je crois donc que ce ton de Chambre, qu'on appelle communément le ton de Chambre Allemand d'A, & qui est une Tierce mineure plus bas que l'ancien ton de Chœur, est le meilleur. Il n'est ni trop haut ni trop bas, tient le milieu entre le ton Français & celui de Venise; & les instruments à cordes & à vent étant accordés suivant lui, peuvent faire l'effet désiré.

And Agricola:
In der Lombardey, und sonderlich in Venedig werden die Clavizimbale und andere Instrumente sehr hoch gesämtmet. Ihr Ton ist fast nur einen halben Ton tiefer als der gewöhnliche Chor- oder Trompetenton. Was also auf der Trompete c ist, das ist bey ihnen ungefähr cis. In Rom ist die Stimmung sehr tief, fast der ehemaligen französischen Stimmung gleich, eine grosse Terz tiefer als der Chorton: so dass das c auf der Trompete mit dem e der andern Instrumente fast überein kommt. Sie ist noch einen halben Ton tiefer als der an vielen Orten Deutschlands eingeführte sogenannte A-Kammerton: bey welchem das a der chortonigen Instrumente mit dem c der Kammertönigen gleich lautet.

Mendel translated the baroque pitch data he assembled into a pitch table, the relationships of which Eph has also accepted. This diagram (in an abridged form) looks like this:

26. J.J. Quantz (1752) Essai d'une méthode pour apprendre à jouer de la Flûte Traversière (Berlin), Ch. XVII/vii/6.
27. Quantz 1752:Ch. XVII/vii/7.
28. "...fast nur einen halben Ton" is ambiguous: it could mean "scarcely a half-tone" or "hardly more than a half-tone." Mendel thought the latter in 1955, but changed to the former in 1978 (which Eph followed). We know in fact from other sources which clearly make the difference between Rome and Venice a large whole step that Agricola meant the latter, which also fits Quantz's description.
Table B

<table>
<thead>
<tr>
<th>Pitch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>@+2s</td>
<td>Chorton</td>
</tr>
<tr>
<td>@+1s</td>
<td>---</td>
</tr>
<tr>
<td>@</td>
<td>high Cammerton</td>
</tr>
<tr>
<td>@-1s</td>
<td>Cammerton (A-Cammerton)</td>
</tr>
<tr>
<td>@-2s</td>
<td>former French pitch</td>
</tr>
</tbody>
</table>

(To judge from p.33, Eph would move all these pitches down about 1/3 semitone.) But this table hardly represents the statements of Quantz and Agricola. As cited above, Quantz wrote that A-Cammerton was "the mean between the French and Venetian" and that "At the present time the Venetian pitch is...almost the same as our old choir pitch." A-Cammerton is therefore a semitone too low in this scheme. And yet Quantz also said that A-Cammerton was "a minor third lower than the old Chorton." If all three statements are true, then French pitch would have to be moved down a whole tone. Taken literally, Quantz's description would look like this:

Table C

<table>
<thead>
<tr>
<th>Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>--- Old Chorton</td>
</tr>
<tr>
<td>Venetian</td>
</tr>
<tr>
<td>Present Parisian</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>German A-Cammerton</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>French/Roman</td>
</tr>
</tbody>
</table>

But if we compare this to Agricola's description, there are serious discrepancies:
### Table D

<table>
<thead>
<tr>
<th>Quantz</th>
<th>Agricola</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Chorton</td>
<td>Ordinary Chorton/Trp pitch</td>
</tr>
<tr>
<td>Venetian</td>
<td></td>
</tr>
<tr>
<td>Present Parisian</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>German A-Cammerton</td>
<td>German A-Cammerton</td>
</tr>
<tr>
<td>Roman</td>
<td></td>
</tr>
<tr>
<td>French</td>
<td></td>
</tr>
</tbody>
</table>

The only two pitches they describe at the same level are Chorton and A-Cammerton. Venetian and French/Roman are both off. But because Quantz and Agricola were writing within five years of each other in the same city, and Agricola considered Quantz one of his teachers, it would be worth our while to try to understand how their two seemingly conflicting accounts of pitch might be reconciled.

There is abundant proof that there were two common levels of Chorton,\(^{30}\) and although Quantz does not distinguish them in the two descriptions above, these citations appear at separate places in his book. If we hypothesize that he was speaking of two different Chortons, one in relation to Venice (Chorton 1) and the other in relation to A-Cammerton (Chorton 2), we would produce the following:

--- French/Roman

Table E

<table>
<thead>
<tr>
<th>Quantz</th>
<th>Agricola</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Chorton 2</td>
<td>Ordinary Chorton/Trp pitch</td>
</tr>
<tr>
<td>Old Chorton 1</td>
<td>Venetian</td>
</tr>
<tr>
<td>Venetian</td>
<td>Present Parisian</td>
</tr>
<tr>
<td>German A-Cammerton</td>
<td>German A-Cammerton</td>
</tr>
<tr>
<td>Roman</td>
<td>French</td>
</tr>
<tr>
<td>French/Roman</td>
<td></td>
</tr>
</tbody>
</table>

This is attractive, as it reconciles all the pitches except French. But we could start at the other end by equating French pitch and place everything in reference to that:

Table F

<table>
<thead>
<tr>
<th>Quantz</th>
<th>Agricola</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Chorton 2</td>
<td>Ordinary Chorton/Trp pitch</td>
</tr>
<tr>
<td>Venetian</td>
<td>Present Parisian</td>
</tr>
<tr>
<td>German A-Cammerton</td>
<td></td>
</tr>
<tr>
<td>Roman</td>
<td>French</td>
</tr>
<tr>
<td>French/Roman</td>
<td></td>
</tr>
</tbody>
</table>

Since German A-Cammerton is a minor 3d below (some form of) Chorton, and is the mean between French and Venetian (the latter being either almost a minor 3d or almost a major 2d above A-Cammerton), it and "old Chorton" will have to be placed as in Tables F or G. But Table F separates German A-Cammerton and Venetian pitch an unacceptable amount.
This last table comes close to reconciling all the pitches. With all the "almosts" and "hardly mores," the remaining discrepancy between the two German A-Cammertons could be a question of semantics. Since Agricola distinguishes Roman and French pitch, if Quantz's French pitch were slightly lower, his German A-Cammerton would be the same as Agricola's. Or alternately, when Quantz calls German A-Cammerton the "mean" between French and Venetian, he may not intend this literally. Thus if we place Quantz's A-Cammerton a minor 3rd below "old Chorton 2" (as he also indicates), it would come into line with Agricola's.

The weakness of this table is of course that it involves interpreting Quantz by assuming two Chortons. There can be no doubt that two Chortons existed and both were well-known. To not assume their existence for Quantz means accepting the highly unlikely spread shown in Table D.

We could now apply absolute pitch values approximating those of modern notes to Table G. There are a number of small indications that they should probably be lowered about 1/3 semitone.  

31. Using a 1/6-comma meantone scale and placing a, at 410.00 Hz produces the following:

<table>
<thead>
<tr>
<th>Note</th>
<th>Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>c₂</td>
<td>489.12 Hz</td>
</tr>
<tr>
<td>b₁</td>
<td>459.24</td>
</tr>
<tr>
<td>a₁</td>
<td>410.00</td>
</tr>
<tr>
<td>ab</td>
<td>389.84</td>
</tr>
</tbody>
</table>

These numbers correspond well with the historic indications of pitches for high Chorton, low Chorton, Cammerton and French pitch suggested in Haynes 1985:94.
In this scheme, unlike Mendel’s or Eph’s, there is no Cammerton at the level of @. I have explained what I believe to be the fallacy in Mendel’s reasoning in my JAMIS pitch article (p.94). Eph arrives at a Cammerton at the level of @ on the authority of J.A. Silbermann’s description of pitches, which, because its range is only four semitones instead of five, matches neither Mendel’s scheme (Table B) nor Quantz and Agricola’s (Table G). As Mendel himself noticed, something is obviously wrong. Silbermann (1772) says:

*dass viererley thöne sind, worin die Òrgeln gestimbt wurden. In ganz Teutschland ist vor diesem der Cornet Thon üblich gewesen...Dieweil aber dieser Thon wegen seiner Höhe dem Gesang beschwerlich war, so machte man denselben einen 1/2 Thon tiefer und nahnte ihn den Chorton. Nach diesem wurde derselbe wieder einen 1/2 Thon herabgesetzt, den man den Kammerthon nante. Dieser Thon scheint allgemein und vollkommen eingeführt zu seyn, denn alle Musikalische Instrumenten sind darin gestimmet. Man nennt ihn auch den Italianischen Thon, weil er in ganz Italien bräuchlich ist. In Frankreich war der Thon noch einen 1/2 Thon tiefer weder der Kammerthon, und hiess der Französischer Kammerthon, wird aber selten mehr gebraucht...*

Silbermann uses the same terminology, but his range from top to bottom is one semitone less than those of Quantz and Agricola. We must therefore make an arbitrary decision as to which two to match. If we start by matching the top pitches as Eph does, we get:
French pitch ends up a semitone higher for Silbermann than the other authors, being now equivalent to A-Cammerton. But Agricola wrote that "...the former French pitch, a major third lower than choir-pitch...is a half-tone lower even than the so-called A chamber-pitch that has been introduced in many places in Germany..." Which of these two sources is correct?

There is reason to think that J.A. Silbermann's French pitch was more like @-2s; his father Andreas built the Cathedral organ at Strasbourg (then -- in 1716 -- a French city33) and was pitched at about @-2s.33 If we accept this and shift all of Silbermann's pitch names down a semitone, most of the problem is cleared up. Silbermann's French pitch would then be the same as Quantz and Agricola's (and his father's), his Cammerton the same as their A-Cammerton, and his Cornett Thon would be the lower variety of Chorton, a pitch in which a number of 18th-century cornets have survived.34

32. Ellis 35.
33. Ellis (59) records it as A-393.2. He also cites Hopkins (1870), who equates the pitch of another Silbermann organ (the Protestant church) with that of the Cathedral organ.
Silbermann agrees with Quantz and Agricola that there are four different pitches in use; he omits the blank in the middle, however. The simplest explanation is that he forgot to insert that blank because there was nothing in it. Whatever the case, this account of pitches by Silbermann in a private letter in 1772 is not completely in accord with those in Quantz's and Agricola's books, suggesting that it should be taken with a grain of salt. It is not clear why Eph opted for the less-likely higher placement of Silbermann's pitches when the lower fits the other evidence more convincingly.35

35. Eph seems to have chosen the higher level partly on the basis of trumpet pitches. This is quicksand, as a look at Mendel's comments on trumpet pitches indicates (1978:23). Because of the element of added crooks, trumpets cannot be said to be in any absolute pitch. Indeed, the addition of a crook on a Nuremberg trombone was one of Eph's stronger arguments against Myers on Praetorius's pitch.
I hope that Brian Galpin won't mind if I add a further note to his Comm. in this Q. It was I who told him that I had seen such things before (and I added that I had carefully avoided thinking about them, simply because I had no idea what they were). One source was the music issue of World Archaeology (Vol.12 no.3, February 1981), but when I checked it this evening, that was the same mosaic that Brian mentions here. I also thought that I'd seen them in Friedrich Behn's Musikleben in Altertum und frühen Mittelalter, but that was poor memory; there aren't any there. Where there are some is in Günter Fleischauer's Musikgeschichte in Bildern volume Etrurien und Rom (Band II, Lieferung 5). I will try photocopying a couple of them, in which case they will accompany this Comm, but if they don't come out well enough, the references are plates 29, 39, and 42, and I think also 24, though that one is more difficult to make out.

Fleischauer describes them as the rings provided on some tibia which, as is generally recognised, can be turned so that they close one hole and open another, and thus change from one mode to another. However, I don't believe this. On the surviving tibia with such rings, they are flat, whereas these project very considerably above the surface of the instrument. I can see that these might work in that way because if, let us say, the hole for B were flat on the surface, turning a ring so that this sort of chimney were superimposed on that hole, the tube would thus be lengthened sufficiently to produce B♭ instead. But since the surviving instruments with rings don't have these chimneys, I'd presume that that was not what they were for.

Thus I adhere to my original attitude, unscholarly as it may be, I don't know what they are and, since I'm not particularly working on ancient Roman music, for the time being I'm ignoring the problem.

One point I would add is that they seem always to be on Phrygian pipes, those which have one straight pipe and one with a curved end à la crumhorn. So it may be that there was some peculiarity in the music played on Phrygian pipes that required whatever they were.

This Comm. isn't very helpful to Brian or anyone else, but it does at least add some further sources for any of you who would like to join in.
The starting point of this paper was a question asked by an organbuilder. This renowned professional was confronted with a problem often encountered in the process of restoring old organ reeds. Wanting to save as many of the original brass tongues as possible, he was very surprised to discover that he could not replicate the sound quality of the original when he substituted the missing tongues with new ones. We assume that this difference could be due to the metal itself or to the manner of manufacturing the new tongues, or to the interaction of both factors.

The results obtained while studying harpsichord wire encouraged me to do similar research on the brass used for organ reeds. I will retrace the steps toward this goal.

General remarks

A unique trend in instrument making in our century has been the "return" to the old masters. This movement, which has also affected organ building, seems to incorporate two opposite points of view.

On the one hand there is a tendency to adore the old masters, sometimes even rather blindly. To these unquestioning worshippers modern material and techniques seem highly suspect.

On the other hand there are those who smile somewhat ironically, believing this to be but a passing folly; they are convinced that progress is leading us towards an even better future and doubt that the old masters can teach us anything.

The historian of technology takes a more moderate position. To him the history of civilisation resembles an enormous tree, of which our western 20th century civilisation is but a branch. The civilisation of other times and places constitute other ramifications. Thus it is of crucial importance to look at these as well.

Many reprints of old papers are in circulation today, and everyone swears by (or against) Dom Bédos. I do not doubt that these papers are studied today - but I do wonder whether they are always well understood.

The historian of technology is aware of the problems that would arise if a person alive today could meet a colleague of times past. Apart from numerous linguistic difficulties there would be considerable differences with respect to their knowledge, their ways of thinking, the technical means at their disposal and the desired results.
Instead of imagining this fictitious encounter in detail, let us consider a concrete example. The most famous paper on organbuilding is beyond doubt that of the author mentioned above: Dom Bédos. On page 658 of the fourth part, published in 1778, we find the definition of brass. We are told that it is "red copper that turns yellow by cementation or by mixing with zinc or its oxide, calamine, or calaminic clay".

Two centuries later our dictionary on the open shelf tells us in somewhat different language that brass is "an alloy of copper and zinc that may contain other metals". The word alloy is defined as a "metal product obtained by blending one or more elements with a metal (by solution or plain combination)". The word alloy already existed in the 16th century, Dom Bédos defines it as "the mixture of a part of tin with lead".

Why did Dom Bédos not use this term when he talked about brass? The history of technology will help us find an answer.

The history of technology

This new scientific discipline offers us exactly what we need in order better to understand the how and why of the ways of thinking and of procedures in different eras. It can be of precious and vital help to modern organology. In order to attain our goal we should pursue three separate paths of study that are sometimes parallel:

a) the detailed study of old technological documents.
If we want to understand the exact meaning of the terms used by Dom Bédos and his contemporaries, we will have to study the metallurgical treatises of his time, of course, and of the eras before and after that.

b) the analysis of ancient objects, in our case the tongues and shallots of past times, in order later to corroborate the results of the documentary studies.

c) finally, when possible, concrete attempts at reconstituting rediscovered old techniques: in our case the "old fashioned" manufacture of brass sheets for organ reeds. Here we have already succeeded: you can listen to and compare two sets of pipes with tongues made of modern brass and, on the other hand, of our copy of "old" brass. (1)

A study along these three paths will enable us to dismiss both of the extreme positions mentioned above. If we know and understand the techniques and, inevitably, the ways of thinking of the ancients, we will be able to compare them with our modern methods. A judgement of the advantages and disadvantages of both will be possible. Thus the history of technology offers us a dialogue with the old masters. We are free to revive whatever seems profitable for us today.
- In Part I we will compare modern and ancient methods of elaborating and shaping (into sheets) the alloy commonly used for organ reeds: brass.

- In Part II we will enumerate some of the results of analysis and present the experiments made with modern and "ancient" brass.

PART I

A. 20th Century Brass

As we have said already, brass is an alloy of copper and zinc. These latter practically do not exist in pure form, as "native metals", in nature. They must be extracted from ores. The techniques used to this purpose influence the properties of the final metal and have changed over the centuries. So we can already sense that modern brass will differ from that produced in former centuries.

A.1 Copper

There are more than 165 different copper ores, roughly classified as sulphuric and oxidized metals. In order to extract "red copper", several very specific procedures are necessary.

Today, different copper qualities are classified and standardized according to their degree of purity or their chemical composition, in France N.F.A. 53-100. The copper with the French standard CU/d, obtained by electrolysis and more than 99.90% pure, is commonly used for alloys, therefore also for brass.

Let us complete with some data that we will compare later on with the results of the analysis of ancient copper. The following copper, for example, refined to 99.96%, contains several foreign elements that can hardly be completely eliminated industrially:

- silver : 0.0007%
- lead : 0.0002%
- tin : 0.0001%
- zinc : 0.00002%
- iron : 0.0004%
- nickel : 0.0003%
- bismuth : 0.00002%

A.2 Zinc

The second metal needed in order to make brass is zinc. In nature zinc is found mainly in sulphur complexes (blends) or in carbon and silica complexes (calamines). As in the case of copper, other metals such as lead, copper and iron are associated with the zinc in these ores. Often we also find silver, cadmium and tin.

In order to extract pure zinc we can then choose one of two procedures:

- the thermic method based on the principle of reducing zinc oxide with carbon at a high temperature. The horizontal melting pot used in
Europe after 1810, the vertical melting pot called New Jersey Oven developed around 1925 and the blast furnace or Imperial Smelting procedure developed in England in 1951 enable us to perform this process. Figure 1 shows us a drawing of the first. The mixture of roasted ore (zinc oxides) and coal is put into a horizontal melting pot heated on its sides.

The zinc vapour escapes to the front and condenses in the central part outside the oven: the condenser. The zinc that is finally taken out of the oven is cast into ingots. Depending on the ores and the procedures involved, the metal thus obtained has purity of up to 99.5%. In order to eliminate further impurities, mainly lead and iron, and also, in smaller quantities, cadmium, arsenic, antimony and copper, a liquation can follow. If a purity of over 99.995% is desired, distillation is necessary:

First the lead is separated from the zinc-cadmium (boiling point of Cd: 767 degrees centigrade). Next cadmium and zinc are separated. The zinc thus obtained is comparable with the zinc extracted with the second method:

- Electrolysis: The zinc oxide contained in the roasted ores is dissolved in sulphuric acid. This solution is purified and then undergoes an electrolysis. Here are the analyses of two examples of metal obtained in this way and described by the French standards A 55-101:

  - Z8: 99.95% with less than 0.02% Pb.
  - Z9: 99.993% with less than 0.00358% Pb.

A.3 Brass

Copper and zinc are melted together to make brass. All alloys made of copper and zinc with 5-45% of the latter are called brass. Small quantities of several other metals may be added to improve certain qualities. The French standards A 53-102 describe the mechanical characteristics that depend on the proportion of zinc and additional elements.

B. Old Brass

Although Dom Bédos did not use this term, old brass was also an "alloy" of copper and zinc. Nevertheless analysis reveals great differences between ancient brass and that produced today, differences that can be explained by the different methods used in both cases.
B.1 Old Copper

In the absence of all the concepts and the methods of analysis and control that modern physics and chemistry offer us, a standard similar to that cited above could not be attained in the past. A different procedure was chosen: that of testing the material using only the five human senses and certain tricks of the trade.

The ancient coppers did not have an N.F.A. number... but they could be distinguished by their place of origin, by their colour, and sometimes by their smell or their sonority.

Only a few of the 165 ores known today were exploited, according to well-kept traditions. Thus, it was possible to make use of procedures that had been developed over centuries for the treatment of a given ore.

B.1.a. Origin:

Each region had its own oven shape and methods of performing the necessary operations that could not simply be employed in another region, with different ores, without significant changes.

In his Dictionnaire Universel du Commerce Jacques Savary des Brulons (2) enumerates and comments upon the coppers available on the market at that time. "There are copper mines in Asia, in America and in Europe. China and Japan are the Asian countries that produce the most; that of Japan appears in small, thin ingots weighing about half a pound; it is very pure and suited for several nice pieces of work. Chinese copper is not as good, as it breaks easily and is almost not ductile. (...) In Peru, especially in the province of Lima, are the most abundant American copper mines. That which is exported to Europe in Spanish ships comes in huge blocks weighing about 150 pounds each. This copper is not very pure and cannot be used until it has been purified by remelting it several times; but then there is none that is better. (...) Europe has several copper mines: the best and most abundant are in Sweden, first of all, and then in Norway, in Hungary and in several places in Germany; others are in Italy, in Savoy, in the Lorraine, in the Tyrol and even in several French provinces.

The copper sold and used the most in France is that from Sweden. It is usually imported over Rouen, like that coming from Hamburg. (...) This copper, called Swedish money, comes in small plates, or square pieces, as thick as three white crowns and weighing 5 1/2 pounds, with a crown engraved in all four corners. This is the best, the softest and the most malleable of all the red coppers; therefore it is commonly used for copper-smith work, where it must be stamped. (...) (The copper) of Norway, which is harder than the other coppers, is also more suitable for casting pieces of artillery: compared with the other European coppers, of which that of Sweden and of Hungary are the best and that of Italy and Lorraine the worst, it is nevertheless only mediocre. That of France, Savoyen and the Tyrol is comparable to that of Norway for normal pieces of work”.

As mentioned above, the place of origin was not the only means for "standardizing" copper; there were also the colours, as well as the sonority.
B.1.b. Colour:

At the beginning of the 17th century, an author tells us clearly (3): "Hungarian copper as well as that from Cottenberg and Sweden has a nice red colour: but that extracted in Meissen is brownish. The good copper is stamped with hammers and also cast. But in some places, especially in Leberthal, the copper that is extracted can be cast, but not stamped".

The situation is still the same 150 years later. In the comments by D.G. Schreber, translator of "The Art of Converting Red Copper... into Brass or Yellow Copper" (4), we find that "there are differences in the colour as well as in the ductility of copper, depending on its place of birth (5). The colour of our copper is quite different from the Japanese : the Tyrolian, Hungarian, and other coppers can be reduced to very fine wire ; (...) but not those from Saxony or the Harz etc..., however pure they may be". This does not contradict Matthias Quade.

These texts very well illustrate a remark made above. They demonstrate that the best use was found for each of the copper varieties produced in the world at that time. Modern metallurgical-chemistry would be perfectly capable of treating each of these coppers so as to make it suitable for any desired purpose. The situation in the past was different : subject to the metallurgical traditions of various regions depending on the type of ore available there, it was often necessary to choose the purpose that corresponded best to the material available.

And yet, within the scientific and technical limits of the time, there were attempts to influence the desired material.

The great Swedish engineer C. Polhem gives us a nice example (6). We have already heard about the extraordinary malleability of Swedish copper. What is advantageous in one case can be inconvenient in another. In such case a solution must be found. "Our Swedish copper is preferred to the Hungarian and Japanese, because it is more malleable and is more easily embossed with a hammer as is necessary for several products; but alone and without adding Japanese copper, it is too soft to make needles, as they would bend easily. The English needles are made of a mixture of Japanese, Swedish or English copper, so that they are stiffer and thinner, which is important for needles; but Swedish copper, because it is more malleable, is better suitable for the eye of the needle".

Of course we cannot give a detailed description or comparison of the various techniques employed in the different regions where copper was produced.

During all these centuries, however, the methods of extracting copper were limited to thermic treatments only, limited by the means available at the time. (We have already mentioned that the electrolytic method was not applicable before the end of the 19th century).

We will close this chapter with some data describing the composition of an ancient copper:
A comparison of these data with those cited above will give us an idea of the changes brought about by the application of refining methods based on principles and sources of energy not yet existing in former times.

B.2 Old Zinc

The definition of brass given by Dom Bédos and cited in our introduction is interesting because it originated at a turning point in the European history of this alloy. In the beginning of the second half of the 18th century zinc attained a new status and was allowed to take its rightful place among the other metals. In the old texts it is often called the "eighth metal", the very old "group of seven" consisting of gold, silver, iron, copper, tin, lead and mercury. Why did zinc arrive so late?

For a long time we encounter this metal, which had been classified by the ancient scholars as belonging to the category of the so-called "half-metals", only in small quantities in the medicine of that era. It was not commonly used by artisans or manufacturers until the very end of the 18th century. This can be explained by the fact that the Occident only then discovered the distillation technique for obtaining pure zinc. This method was in use in China, as it is shown in an engraving taken from a Chinese technical treatise dating from the first half of the 17th century (Figure 2)(7).

This ingenious method enabled the Extreme Orient to obtain a relatively "pure" zinc and, if we are to judge by the time that passed until the Occident also thought of employing this technique, they kept its secret well. Known for a long time as "tin from India", oriental zinc entered the melting works for brass or yellow copper only gradually. First two changes were necessary: the one concerning the European tradition of melting brass, the other consisting in the realization that "tin from India" was actually zinc.

For many centuries brass was called "yellow copper". One did not think of the latter as an "alloy" in the modern sense. Remember that Dom Bédos used this term only to describe the "mixture" of (what he thought of as being) two metals. Since zinc was not considered to be a metal that could be exploited in large quantities, naturally the term alloy was not used in this context in the old metallurgical and chemical language. In the ancient theories, brass is described as the result of
the colouring of red copper, brought about by the contact of plates or granules of the latter with a special earth in a crucible, placed in a suitable oven. This earth, regarded almost as magic because it alone was capable of giving copper a "gold" colour, was the calaminic earth mentioned by Dom Bédos. Today we know - and this knowledge was beginning to spread over in Dom Bédos time - that this calaminic earth is nothing other than zinc ore (see the definition given above).

Old brass was thus obtained by the direct reduction of zinc ore brought into contact with red copper in a crucible. Dom Bédos called this operation "cementation". It was also and most importantly known to the ironsmiths. Iron was cemented to transform it into steel. By letting the iron bars lie for some time in organic matter, highly nitrogenous and carbonic (stag antlers, skin clippings etc...), the metal was significantly hardened. These organic materials contained the "plus" responsible for the transformation of the iron. The same phenomenon was thought to occur in the crucible filled with copper and calaminic earth. This time the latter contained the "plus" that made the copper change its colour. The similarity seen by the ancients between these two processes is the reason for the juxtaposition, in old metallurgical treatises, of two chapters that have nothing to do with each other in our modern minds: the manufacture of steel and that of brass. Chapter 7 of the first book of the great treatise of Biringuccio is devoted to steel. The following chapter is about brass and the author tells us: "In the last chapter I talked about steel. For similar reasons I must now talk about brass, since it is related to copper just as steel is related to iron. (...) As steel is iron artificially transformed almost into another kind of metal, thus brass is copper artificially coloured yellow". (8) The physical-chemical theories of modern metallurgy have quite a different opinion!...

C. The making of brass sheets.

The differences brought to the fore between old and contemporary techniques of brass making also exist for the making of sheets.

Modern lamination:

The modern alloy of copper and zinc, brass, goes through the rolling mill. After each pass the thickness of the original sheet diminishes by a carefully calculated amount: the length increases in proportion whereas the breadth always remains the same.

A metal is not an unstructured body. On the contrary, organ builders know that there are specific crystallizations that are commonly named the "grain of the metal". They also know that this grain greatly influences the mechanical characteristics of a given metal. A laminated sheet of metal can then be imagined as the arrangement of thousands and millions of these sheets lying parallel to each other, their axes always oriented in the direction of lamination. We can best compare this laminated structure, characteristic for the sheets produced by modern industry, to a bundle of parallel lying, flat pressed strips. (Diagramm A).
Old Metal Sheets:

The old sheets were made entirely with the aid of another apparatus that is practically the symbol of ancient metal industry: the forge-hammer.

Figure 3 shows us the installations for the manufacturing of sheets of brass dating from the 18th century. This engraving shows three smiths, one of whom is hammering brass into square plates.

The sheets that left the smithy went to the "scraper" (Messingschaber). This craftsman is shown in Figure 4(10) [next page]. His task is to scrape the sheets of brass that are fastened to a slightly rounded block with a large scraper. These brass sheets were finally traded and went into the hands of the organ builders or the brass instruments makers.

J. Savary des Brulons informs us that "Nuremberg and Aix-la-Chapelle supply us with great quantities of yellow copper in bands or in thin sheets, scraped on one side and black on the other; it
is either folded, then it is called brass in 2, 3, 4, 5, 6, 7 or 8 folds, or rolled, then it is called brass on spools". (11) Dom Bédos also used these terms. He tells us that the tongues "are always made of thin brass that is bought rolled and scraped. Several thicknesses will be chosen. None of the rolled brasses is thick enough for the strong tongues, such as the basses of the Bombarde etc. For this purpose it is necessary to take brass that is not rolled" (12). This is certainly the "brass in \( \ldots x \) folds" that was obviously thicker than the rolled brass.

The number of folds was certainly not arbitrary. In the ancient smithies, the thickness of sheets was not measured with a micrometre; instead, a certain weight of metal had to be hammered until it covered a prescribed surface. The dexterity of the smith was of paramount importance. A band folded two times was twice as thick as a band of the same weight and the same width that was folded four times.

C.3 The Differences...

We have seen that the rolling mill was still missing in ancient metal industry at least until the second half of the 18th century. Since forging is a very specific method of deforming the grain of metal, we must assume that the structure of forged brass differs from that of laminated brass.
We have already demonstrated, using a drawing, that a cubic crystal that goes through the rolling mill ends up as a very long sheet with constant width and diminishing thickness corresponding to the number of passes.

Forging, that is to say the endless strokes relentlessly repeated with a rounded hammer, on the other hand, deform the cubic crystal in two perpendicular directions. Shapes like those in Diagram B, again extremely simplified, ensue. The cubes turn into sheets that more or less retain their original shape.

We will close with a second comparison, a counterpart of the one made above. If laminated metal can be compared to a bundle of parallel lying, flat pressed strips then forged metal, hammered in the old fashion, resembles a pack of flat lying cards.

It is highly probable that their vibratory behaviour will not be the same.

PART II

Experimental Studies

The results obtained in our manufacture of old-fashioned harpsichord wire encouraged us to do similar experiments with the sheets used to make reed tongues.

Of course we could not proceed by guesswork if we wanted to achieve our goal. The analysis of ancient reeds gave us important information; at the beginning of this second part of our paper, we will linger over a series of laboratory results all the more interesting because they corroborate the old sources and vice versa.

1. Measurements of Hardness

The Laboratory of Metal-Archaeology at Nancy-Jarville was so kind as to be interested in our studies and undertook several manipulations, one of which, namely the measurement of hardness, revealed a fact heretofore unknown. The brass used by modern organ builders is extremely stiff, that means it is laminated until it becomes very hard. The laboratory measurements of old and modern tongues revealed a fundamental difference: as indicated in Table B [s. next page], the hardness, measured in Vickers, is the same over all the thickness of modern brass. The values measured on the surfaces (columns 1 and 2) hardly differ from those measured in the heart of the metal.
The items 1 to 9 are old samples of different origins not exactly known (18th - 19th century). No. 7 (19th or early 20th century) showed under the microscope a typical laminated grain.

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We can thus deduce that the old reeds were made of annealed brass. This does not at all contradict the data found in the ancient texts and cited above: the folded and rolled brass could not possibly have taken or retained its shape if it had been very stiff. The black colour so often mentioned constitutes an additional proof that these brass sheets were annealed.

But then how can we explain that the values in columns 1 and 2 correspond so well to those of brass hardened by lamination?

Again, Dom Bédos gives us an answer.
2. Making Reeds in early time:

The extreme hardness of the surfaces certainly cannot be explained by the polishing of the tongue during its making. Let us cite Dom Bédos once again. He tells us the origin of the differences discovered in the laboratory two centuries later (listed in Table B).

"The brass is cut with shears into very straight bands in the width appropriate for the desired reeds. These bands can have a length of up to 18 or 20 feet. They are forged on a smooth anvil with very close hammer strokes. The hammer must be very small. The hammering must be so regular that a band forged in this manner is even and flat in all directions. Some instrument makers hammer the bands first on one side and then on the other, so that they are perfectly stiff. I think it is better to harden them less and that it suffices to hammer them only on one side; then they can be handled more easily. If they are very stiff, it is hard to give them the desired shape, which, when obtained, does not last long. (...) The most experienced instrument makers say that an excessive hardening of tongues makes the organ pipes sound less mellow. I believe they are correct. Others do not harden them at all. It is true that they are easily shaped then; but they lose their shape just as easily. So it seems best to give them a medium hardness, that is to forge them only from one side with a very smooth hammer". (13)

This technique does not corroborate the tendency of the rolling mill engineers of today to give their brass the "spring-hardened" quality.

Even more important, the text gives us evidence of the old masters' habit of directly influencing the physical characteristics of the brass at their disposal. This procedure does not seem to belong to the so-called secrets so jealously guarded by certain organ builders today. If we study the text closely, it seems that the quality, that is the result of several physical characteristics that can be influenced by the artisan, was much more important than the fashion of finally obtaining the "right" shape. Whereas this latter phase, as I was recently able to observe, interests the modern instrument builder most, while he is no longer interested in directly influencing the hardness or the elasticity of his metal, accepting it as it comes from the rolling mill.

The technique described by Dom Bédos attracted our attention.

Encouraged by our practical experience (old strings) and theoretical experience that taught us once again that the old masters always knew what they did and why they did it, we decided to verify the foundation of the old procedure in the laboratory.
3. Attenuation

Among the important values that can be measured in the laboratory, we were interested most in the internal attenuation factor. A brass plate, which is fixed at one end and oscillated, will not return to its idle position until the excitation has stopped for some time. How this happens depends directly on the quality of the material.

The measurements made at the laboratory of the Ecole Nationale Superieure des Arts et Industries at Strasbourg under the supervision of Mr. Fellman showed us once again that the thousand and one observations gathered over generations and turned into trade secrets finally led to unique results. The goal of this experiment was the comparison of the attenuation factors of brass plates, all the same size (200mmx10mmx0.5mm), but made of different alloys and treated differently (modern and "old-fashioned" brass). Here is a description of the 8 samples we studied:

Sample 1: modern brass, annealed
Sample 2: "old-fashioned" brass, annealed
Sample 3: modern brass, annealed and polished
Sample 4: "old-fashioned" brass, annealed and polished
Sample 5: modern brass, treated according to Dom Bédos
Sample 6: "old-fashioned" brass, treated according to Dom Bédos
Sample 7: modern brass, hardened by lamination
Sample 8: "old-fashioned" brass, hardened by lamination.

The plates were fixed in a massive holding-device, equipped with an electromagnetic exciting dynamo and a device for measuring the velocity of vibration. The plates were oscillated by sending electric currents of variable (but known) frequencies through the dynamo. Then the excitation was suddenly stopped and the decrease of the amplitude of vibration as a function of time was measured. The decrease, which is measured in dB/sec = p, is exponential and appears linear on a logarithmic measuring device. At a given frequency the attenuation is faster if p is larger.

The graphic results are shown in Table C [s. next page] the vertical arrows indicating the moment the excitation is suddenly stopped. Of all 8 curves, corresponding to the 8 samples, one stands out among all others: that of sample 6. Expressed in the numbers listed in Table D, its p-value is by far the lowest for all frequencies (see column 3, nr. 6 in Table D). So this sample takes longest to regain its idle position.

Our first conclusion is that the influence of the mechanical treatment that a brass plate has undergone is crucial for its vibratory behaviour. The laboratory results demonstrate that the treatment according to Dom Bédos leads to the lowest structural attenuation.
If we compare the results of samples 5 and 6 we can further deduce that the chemical composition plays an important part. Though treated identically, "old-fashioned" and modern brass react differently, as we have already stated during our work on harpsichord strings.

4. Structure

Let us examine samples 7 and an old tongue more closely. We can easily get an idea of the structure of a metal by observing the surface of a fracture, a technique often applied in former times. It is easily seen today during the tensile tests. Mr. Cornet of the E.N.S.A.I.S. performed these experiments for us. Here also, there are differences between modern and old-fashioned brass. [See the photographs in ISO INFORMATION, op.cit., p.55].
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<td></td>
<td>126</td>
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The old plate shows a structure which is three-layered, with two hard surfaces (stiffened by hammering as described by Dom Bédos) enveloping an annealed layer: a malleable zone corresponding to the central part of the plate and showing the characteristics of a "ductile fracture", and a stiffened zone with attributes typical of a "brittle fracture".

The electron microscope illustrates very well the results of the measurements of hardness mentioned above: the homogeneity of modern brass and the "three-layered" effect in ancient tongues, where the hardness measured in the heart of the plate is less than half that measured on the surfaces (see Table B).
Differences in structure! Differences in the reaction to the same treatment! Differences in the vibratory behaviour! These are, very condensed, the results of the laboratory studies.

These differences were also noticed by organ builders whom we asked to compare. Accustomed to polishing the tongues made of modern brass many times, all the organ builders, while exerting great pressure, were very surprised by the fast reaction of the old-fashioned metal and the ease with which it can be shaped.

Conclusion

The fact that the brass treated according to the old techniques described by Dom Bédos has an attenuation factor distinctly different from the others is certainly no mere coincidence. Our laboratory analysis has opened a window on a forgotten world in which centuries of observation, experimentation and trial and error replaced systematic scientific research using numerous instruments, one even more exact than the other.

This study shows us once again that each era has its own way of thinking, its own intellectual tools and its own techniques. It also proves that it is sometimes useful to go and discover ways of thinking and procedures different from ours.

Organ builders today use a chemically pure and extremely hardened brass with a typical, homogeneous structure obtained by lamination to manufacture their reeds. The old instrument builders used a brass that was less homogeneous chemically and physically and would today be classified as a "special" brass (with quite a few elements added). It was annealed and had a structure typical of forged metal. The point both families of craftsmen have in common is that they use the material of their time. The important difference, however, lies in their manner of handling this material. The former do not exert any influence on the mechanical characteristics of the brass used for their reeds, its size and shape seems to satisfy them. The latter consciously created a three-layered structure in their metal (a sandwich of ductile and hardened metal) with an obviously unique vibratory behaviour. This method was justified, if we are to believe Dom Bédos, by the resulting sonority. This was the ultimate goal. May the acoustic-physicists enter further into the world on which this paper has but cast a glance. Many questions remain to be answered, many others will still arise along the way.

Let us close with music...

Sonority was also our goal; we did not hesitate to manufacture organ reeds, some as are common today, the others with brass reconstructed according to the results of our research.

These two series of reeds with identical dimensions were installed in two series of pipes, also indentical, so that we could compare the ensuing sonority.

The audition of these two "homologous registers" was the final event of the First Biennale of Organology.
The differences in resonance were distinctly perceived by the auditorium. The somewhat shrill and stifled sound of the modern reeds was contrasted by the full and supple sonority of the "old" reeds. Was this the softness Dom Bédos meant?

We do not want to prove that the ancient techniques are in any way superior to those used today, or to try to convince anyone that the old "genius" ought to replace the "bad" modern systematically. We live in a world full of tastes and colours... of sonority! Our results simply make us realize that in this vast palette there will now be still another colour: that which we have searched for and found in the drawers of history!

Acknowledgements

I wish to express my most sincere thanks to many persons who have contributed to the realization of our project.

For the scientific part:

- Mr. Claude Forrières and Mr. Paul Merluzzo of the Laboratoire d'Archéologie des Métaux at Jarville.
- Mr. Fellman and Mr. Cornet of the Ecole Nationale Supérieure des Arts et Industries at Strasbourg.

For the experimental studies:

- Mr. Jürgen Ahrend, organ builder, for having raised the question that led to this study.
- Mr. Hermann Klein, manufacturer of organ pipes in Woerth (Alsace), for his great patience, his friendly advice and the time he so generously gave.
- Mr. Rémy Mahler, organ builder in Pfaffenhofen (Alsace), for his enthusiasm, his competence and his availability.
- Mr. Rudi Piesche, engineer.
- The various organ builders, French and others, who were so kind as to give us their advice in several areas.

The interest of the instrument makers we had contacted in our "old-fashioned" brass, served as a spring board for the manufacture, in the "Workshop for Historical Metals" of these special sheets. I wish to thank the House Laukhuff for taking charge of the commercialization all over the world.

Notes and Bibliography:

1. Of course we cannot add an acoustic sample to this written paper. At the end of this paper, however, we have given information on the manufacture and commercialization of these special sheets, so that anyone interested can repeat our demonstration made on June 28, 1986 at Saint-Maximin for themselves.

3. QUADE, Matthias, Herrlichkeit der Teutschen Nation..., Cölln, 1609, p=456.


5. Here one is easily tempted to translate "place of origin". This would not be correct. Dom Bédos' contemporaries actually believed that the ores grew in the bosom of the earth, just as vegetables grow on its surface. If we want to understand the ways of thinking of people of past times at all, we cannot ignore how they imagined the formation of ores and of beings in general, their great animistic concept of nature, in short their cosmogonies so different from ours.


8. BIRINGUCCIO, Vanoccio, De la Pirotechnia, Libri X, Veneto, 1540. We cite the German translation by Otto Johannsen, Braunschweig, 1925, p.203. This is the most faithful version for all those who speak neither ancient Italian nor Latin. The old French versions are very incomplete and faulty. There is no recent French version.

9. GALON, "L'Art de convertir le cuivre rouge, ou cuivre en rosette, en laiton ou cuivre jaune" Paris, 1764.


11. SAVARY DES BRULONS, op. cit., tome 2, p=1027.


13. ibid.

14. We have used that sold for years by the House Laukhuff without any supplementary treatment.
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* in left-hand margin = change of address or other change

Christopher Allworth, 36 Wilson Avenue, Halifax, Nova Scotia, Canada B3N 2B9, (med.str.instrs; M,P).

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Thomas Glavich, 1979 Skyview Dr, Altadena, CA 91001, USA; (318) 798-2430 (recrdr, trav, perc; M,P).

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J.M.Hamber, 76 Selwyn Street, Onehunga, Auckland, New Zealand (early ww, esp. gemshrn, bagpp).

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Niall MacCoinnich, see Maria Boxall (hpschd; M).

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The Library, Museum of Fine Arts, Boston, MA 02115, USA; (617) 267-9300.
Musikhistorisk Museum & Carl Claudius Samling, Åbenrå 30, DK-1124 Copenhagen K, Denmark; 01/11 27 26.
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Hans Hermann Ziel, caixa postal 398, 89.100 Blumenau - SC, Brazil (ww, recrdr, crottino, gmba; M,P).

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