The Flute in a mixed consort: detail from the title page of Orlando di Lasso's *Missæ aliquot quinque vocum* (1589), by Hans Nell.

THE RENAISSANCE FLUTE

BY

JOSCELYN GODWIN

The extent of information available on the transverse flute before the innovations associated with Hotteterre is surprisingly small, considering the wealth of iconographical evidence testifying to its widespread use throughout the Middle Ages and the Renaissance. One turns to the theorists in search of advice on specification, technique and repertoire, and finds here and there a hint, sometimes helpful and sometimes contradictory. This article attempts to assemble these hints into a basis for further researches.

The most obvious sources of information on early instruments of any kind are Sebastian Virdung (*Musica Getuscht . . .*, 1511), Martin Agricola (*Musica Instrumentalis Deutsch*, 1528, 1532, 1542, 1545), Michael Praetorius (*Syntagma Musicum*, 1615–19) and Marin Mersenne (*Harmonie Universelle*, 1636–37). Equal to these in importance, for our purposes, are the works of Philibert Jambe de Fer (*Epitome Musical . . .*, 1556) and Pierre Trichet (*Traité des Instruments de Musique*, ca. 1640). Naturally these authors do not all fall within the period usually thought of as the "Renaissance", but, besides being all that we have available, they do at least treat of the same instrument as had been current during the 15th and 16th centuries: a flute of cylindrical bore with six finger holes[1] and no keys.

Of the other sources, the following are of some slight use: Tinctoris (*De Inventione et Usu Musicae*, ca. 1487), Hercole Bottrigari (*Il Desiderio*, 1554) and Athanasius Kircher (*Musurgia Universalis*, 1650). Quotations will be made from all the authors mentioned so far, available in modern editions as detailed below.[2] It may also be useful to list here some other authors whose works might be thought to contain worthwhile information on the flute, but which do not: Bartolomeo Ramis de Pareja (*Musica Practica*, 1482) goes only so far as to mention the fact that the "calamus" is operated by opening and closing the finger holes; Ottomar Luscinius (*Musurgia seu Praxis Musicae*, 1536) is largely a translation of Virdung, with the same woodblock illustrations. The same author's *Musicae Institutiones* (1515), together with Zacconi's *Prattica di musica* (1592, 1596) and Cerone's *El Melopeo* (1613), contains nothing apposite. Neither is there anything on our subject in the encylopaedic works of Robert Fludd (*Utriusque Cosmi . . . Historia*, 1617–21) and Gaspar Schott (*Magia Universalis Naturae et Artis*, 1659), books which are otherwise most interesting on the subject of music and on certain instruments. This somewhat discouraging list may save others from fruitless searches.

Pitch and Range

The earliest account of ranges, in Agricola's first edition,[3] gives three octaves: a span unexceeded by any subsequent writer. In this tabulation the ranges appear as Bass: *D–d″*; Tenor/Alto: *A–a″*; Discant: *e–e‴*. These pitches naturally require transposition, being chosen for reasons associated with the church modes,[4] as do those given in the fourth edition where there are two alternative tables.[5] The first of these gives Bass: *C–d′*; Tenor/Alto: *G–a′*; Discant: *A–f″*. In these latter tables, Agricola has modified his somewhat sanguine expectations of a three-octave range, having doubtless experienced the highest notes as

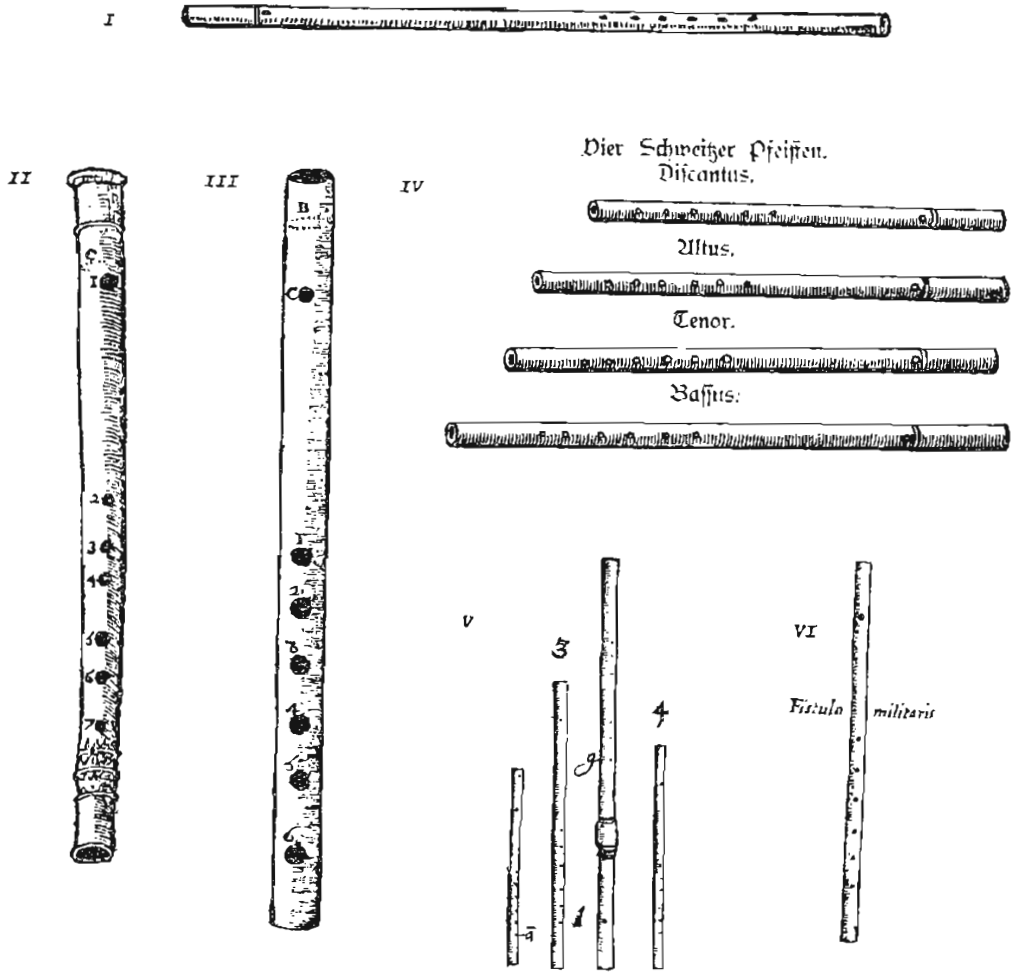
Jambe de Fer describes them: ". . . ilz sont fort cruz, & rudes, pour la vehemence du vent qui y est necessaire, & pour ceste cause sont peu vsitez . . . l'experience vous en rendra plus certain."[6] And Jambe de Fer is speaking here of the notes from the fifteenth to the nineteenth diatonic step; of Agricola's very highest tetrachord he makes no mention at all.

Jambe de Fer gives the ranges of two flutes, at their actual pitch: from "G sol re vt premier" to "G sol re vt troiziesme"[7] (*g*–*g*″), and from "D la sol re, le premier" to "A la mi re, le quatriesme" (*d*–*d*‴)—"mais c'est auec grand peyne, aussi ne le trouue lon guyere en Musique . . ."[8] He does not, apparently, expect more than two octaves from the bass, for which he gives a fingering chart (unpaged).

Praetorius, although writing considerably later than the preceding authorities, is fundamentally in agreement with them. He gives Bass: *g*–[*g*″]; Tenor/Alto: *d*′–*d*‴, with the additional tetrachord *e*‴–*a*‴; "Cant.": *a*′–*a*‴.[9] We may take these three sizes and pitches as standard for the period. But although there is no mention by our writers of a piccolo-sized instrument this does not necessarily mean that such did not exist; the cylindrical flutes shown at the Royal Military Exhibition in 1890 include one pitched, according to the catalogue, in b′.[10] Throughout the Renaissance, as the theorists bear ample witness, instruments were made in experimental sizes and specifications. Agricola, for example, devotes a chapter to a small four-holed recorder of which one stops the end as well as the holes.[11] And lest we should think that there were, as the standard instruments, only six-holed flutes on the one hand and nine-holed recorders on the other, a word from Trichet should serve as a warning: "Quant aux flustes de sept et de huict trous, elles sont si fréquentes et communes qu'il n'est pas besoing de s'y arrester."[12]

Agricola's engraving[13] of a quartet of flutes shows the "Altus" and "Tenor" of slightly different sizes, so that there appear to be four sizes in all. But then his "Discantus" is fully three quarters the size of his "Bassus", whereas for acoustical reasons it should be no more than half as long, which nullifies any accurate conclusions one might hope to draw from this engraving.

"One of the best flutes in the world", the curious curved object depicted in Mersenne,[14] is according to Grove (*loc. cit.*) 23.45 inches long ("13½ lines"); "This flute serves as treble in the parts, and consequently the others ought to be longer and thicker as they descend lower. For example, the one which descends by an octave, or a fifteenth ought to be twice or four times this one."[15] At this point, imagining a flute nearly eight feet long, one may well wonder how large the early flute could be. In the *Air de Cour* by Henry le Jeune which Mersenne gives as suitable for flutes,[16] the bass part descends to *c*, theoretically requiring a flute of some four feet in sounding length — if it could be held and fingered. Now Praetorius suggests that a four-part choir be made up of three flutes with a bassoon, or a quiet bombard, or a trombone, in cases where the bass part lies too low for a flute[17] (this presupposes that the flutes play at sounding pitch, not an octave higher). Perhaps this is what should be done in Mersenne's example; it is curious, if so, that he does not mention it, but perhaps if everyone knew that no flute could possibly reach *c* (and the lower of Mersenne's two flutes descends only to *g*) there would be no need for comment.



The Flute and Fife as shown in Treatises, 1511-1650.

I. "Zwerchpfeiff" from Sebastian Virdung's *Musica Getuscht*. 1511.

II. "One of the best flutes in the world . . ." from Marin Mersenne's *Harmonie Universelle*, 1636-37.

III. "Fifre" from Mersenne.

IV. Consort of flutes from Martin Agricola's *Musica Instrumentalis Deutsch*, 1528.

V. Consort of three flutes (3) and fife (4) from Michael Praetorius' *Syntagma Musicum*, 1615-19.

VI. Fife from Athanasius Kircher's *Musurgia Universalis*, 1650.

Bass flutes do exist which descend below modern *g*: the three bass instruments in the Verona Collection measure from the stoppers 32.4″, 34.5″ and 38.4″, with the bottom notes *f-sharp*, *f* and *e-flat* respectively.[18] Eric Halfpenny's bass flute also sounds about *f-sharp*[19] with a sounding length of 32.4″. But these are not so low as to constitute a class below the *g* bass.

Technique

The only writers to attempt any advice in the matter of the embouchure (of whose difficulty, in comparison with that of the recorder, Mersenne speaks)[20] are Jambe de Fer and Trichet. The former writes:

> Quand à l'emboucheure de cesdicte fleute d'Alleman, il est bien difficile d'en donner bonne & suffisante raison, toutesfois ie vous en diray mon opinion en deux petitz motz, à celle fin que ne m'accusiez de paresse. Il faut donc prendre l'adresse, & l'ardiesse de mettre ladicte fleuste iustement au milieu de la leure dessoubz, auec vn vent doux, & moderé, l'augmentant en force, petit à petit pour monter, & pour descendre il la faut faindre de peu à peu selon l'assiete de la Musique sans crainte de faire la moue. En aprés ie vous aduerty que ceux qui n'ont point de langue, ce ieu leur est deffendu comme le parler, car a toutes notes que prononceres, il faut que la langue soit conducteresse, & pour ce donc vous, qui à ce ieu prenez plaisir, gardez vos langues de moysir, c'est a dire beuues souuent.[21]

Charming as this advice may be, it would be of very little use to one who sought to teach himself the flute. But perhaps no-one did so in those days: certainly none of the early books gives sufficiently lucid instructions. The books seem to be written more for the sake of containing a little information and rather more speculation under each of several headings; surely they were designed to enhance the prestige of those who wrote them and to increase the learning of those who displayed them on their shelves (and the contents in their conversations). They were not "home-tutors"; for anyone who could afford books could presumably afford personal instruction on an instrument.

For this reason we should not expect anything really enlightening, especially on the present subject: for there is hardly anything less easy to put into words than the embouchure of the transverse flute. Agricola restricts himself to telling us how hard to blow for various notes. In the fingering charts of his first edition he gives directions for "Vento": for the first octave one is to blow "messig/mediocri", for the second "schnelle/veloci", for the next four notes "nochshneller/velociori", and for the top three "auffs schnelst/velocissimo". The same advice is given in rhyme on f. xii, after which he tells us, more interestingly (our italics):

> Auch wiltu haben den grund und bodem
> So lern pfeiffen *mit zitterndem odem* [=Atem]
> Denn es den gesang gantz sere zyret
> Auff allen pfeiffen wie man hofiret.
> Ich wils ytzund also lassen bleiben
> Du magsts selber mit der ubung treiben.

The last couplet could serve as a motto for all these instructions.

Jambe de Fer gives only, on his fingering chart, the words "Vent bien doux" for the low notes and also for the high C and E (equivalent to *g″* and *b″* on our chart), the former to be played with "Vent doux & bien couuert". Trichet is even less informative, but he does mention an interesting fact with reference to the bass flute (our italics):

> Il faut pour les entonner les tenir de travers joignant la bouche, et mettre la levre inférieure sur le bord de l'emboucheure en poussant le vent fort doucement, comme on faict au fifre, *sauf la basse qui s'entonne quelquefois par derriere et se tient pres de la poitrine.*[22]

and, in the chapter on the fife:

> Or, parce qu'il faut une basse fort longue pour descendre assés bas, aucuns font son emboucheure par derriere et la tiennnent joignant la poitrine pour l'entonner, et non de travers comme les autres flustes d'aleman, afin que par ce moyen les mains puissent plus aisément s'estendre jusques aux derniers trous tandis qu'on l'embouche.[23]

I can only suppose that this indicates a diagonal position for the instrument, to ease the strain on the arms. It cannot truly be played "par derriere", but it is possible to blow slightly out of the side of one's mouth so that the wind impinges more on what is normally the side of the mouth hole. Eric Halfpenny mentions that the mouth hole of his bass flute is "set with its major axis *across* the instrument so that it favours the oblique playing position which is so often depicted . . ."[24]

Tonguing is mentioned by Agricola, who devotes an entire chapter to the matter in his fourth edition.[25] From a great deal of verbiage we learn that fingers and tongue have to be co-ordinated, and little else. But the examples he gives do at least show that (1) every note is expected to be tongued, even in fast passages,[26] and (2) single tonguing is used for slower notes ("de de de") and double tonguing for faster ones ("Di ri di ri"). Finally there is a kind of flutter-tonguing: "Etzliche brauchen im Colorirn diese art/ und nennen es die flitter zunge/ wie volget . . . tellellelellellellele/le."[27] This is of course not the rolled "r" of modern flutter-tonguing, but the familiar "doodling".

Hercole Bottrigari, in *Il Desiderio*, writing about instruments which are variously stable and unstable in intonation, places the flutes, with the cornetts, in the "stable but alterable" category: "Even though they may have a certain stability because of their holes, the accomplished player can nonetheless use a little less, or a little more breath and can open the vents a little more or a little less, bringing them closer to good accord."[28] No contemporary writer, to our knowledge, mentions rolling the flute relative to the lips as a means of altering intonation; yet this is one of the fundamentals of flute technique, and certainly more reliable than shading or half covering the holes.

Repertory

We cannot expect to find the use of the flute specified in mediaeval and renaissance music, any more than the other instruments are named. Such examples as we have of the definite use of flutes belong mainly to the seventeenth century. In an article on "Sixteenth-Century Instrumentation",[29] Robert L. Weaver makes very little mention of flutes, beyond saying that in the instrument symbolism of the period they were associated with seascapes. He cites the intermedii of Cosimo de Medici's wedding in 1539, in which Francesco Corteccia's music for the second feast included a piece "*Chi ne l'altolt'oime* a sei voce cantata . . . da tre sirene, et da tre monstri marini sonata con tre traverse, et da tre Ninfe marine con tre liuti tutti insieme."[30] In addition to this, Weaver mentions Bardi's intermedii to *L'Amico Fido* of 1585, in which there were flutes (as well as trombones, lutes and harps) in the sea scene; but the gods and "I Beni" also descended to the sound of flutes, so the instruments were not exclusively maritime. The evidence is tantalisingly slim; but if it should lead us to suppose that flutes were little used, the contrary is suggested by inventories of the period. The following numbers of flutes, as compared to recorders, are given for various royal collections by Anthony Baines:[31]

	flutes	recorders
Marie of Hungary	more than 50	ca. 10
Philip II	54	13
Henry VIII	74 (72?)	74 (76?)
Stuttgart Hof	220	48

Further use of the flute, specifically in unbroken consorts, is evidenced by Attaingnant's two publications of 1553, *Chansons musicales a quatre parties* . . . and *Vingt et sept chansons musicales a quatre parties* . . . Here the pieces suitable for flutes are marked "a", those suitable for recorders "b", and those which are appropriate for both species "ab". The only "a" chanson which I have found in a modern edition[32] has the ranges *f'–f''*, *g–b'–flat*, *f–g'*, *c–d'*, with treble, mezzo-soprano, alto and baritone clefs. I am unable to reconcile this with a consort of three flutes and a bass instrument, but an examination of the ranges of the whole collection might reveal the necessity of some system of transposition. The "ab" chanson, Jacotin's *Voyant souffrir* from the same book, has the ranges *c'–b'–flat*, *f–f'*, *e–d'*, *F–g*, which fit the modern quartet of recorders but not those described in contemporary theoretical works, nor do they fit flutes.

A commonly cited example of early "orchestration" is the so-called "Ritornello for three flutes" in Peri's *Eurydice* (1600). On examination, this turns out to be a mistaken attribution. The passage in question, on pp. 11–12 of the original score, has three instrumental parts all in soprano clefs, with ranges *f'–sharp–e''*, *e'–e''*, and *d'–d''*. They are thus suitable for tenor flutes. But the rubric says nothing about "traverse"; it reads only: "Tirsi viene in scena sonando la presente Zinfonia con un Triflauto, e canta la seguente stanza; salutando Orfeo di poi s'accompagna con gli altri del Coro, e con tale strumento fu sonata." It is wrong to state, therefore, that flutes are specified. Peri does not tell us what to use to represent Tirsi's "Triflauto", or triple flute; recorders have just as much claim as transverse flutes.

Later uses of the flute, in Monteverdi's *Vespers* (1610), Schütz's *Psalm 150* (1619) and Schein's *Geistliche Konzerte* (1626), seem to suggest by their vary scarcity and lack of any features in common that the flute was simply another tone colour available to the performers of the early Baroque, to be used like any other when the range and the mood of a part suited it. The Schein works, incidentally, seem to be a rare example of the bass flute used soloistically: the parts are of low range,[33] and the flute is evidently supposed to balance the violin part written at the same pitch. The "flute" in the English consort music such as Morley's *Consort Lessons* (1599), Rosseter's *Lessons for Consorts* (1609) and Leighton's *Teares and Lamentations* (1614) is sometimes thought to be a bass flute, sometimes a bass recorder — the latter since the parts habitually descend to *f*. In the celebrated picture of Sir Henry Unton's wedding in the National Portrait Gallery, a consort is shown with the same instruments as in these pieces, but with a transverse flute. Allowing that one picture is not sufficient evidence, it may still be that the "flute" concerned was indeed a transverse one, but that the tenor instrument was used, playing the part an octave higher than written.

It seems to have been accepted in the period that both flutes and recorders could play parts which should actually sound an octave lower without doing violence to the ensemble. Thus Praetorius:

> Diese Flötte [sc. recorder]/ so wol auch die Querpfeiffe in diesem Thon/ kan nicht allein zum *Discant*, wie ich es alhier eingesetzet/ sondern auch zum *Tenor* ein *Octav* drunter/ gebraucht werden.[34]

Fife and Drum: design for a dagger-sheath, ca. 1510, by Urs Graf (Basle, Offentliche Kunstsammlung).

He goes on to say that some instrumentalists actually believe that they are playing at the real tenor pitch, when they are in fact sounding the octave above; and that he himself might almost have believed it.

The Fife

The differences between the fife and the flute are that the fife is on the whole shorter, of narrower bore, not made in the larger size, and not used in homogenous consorts. All the later writers testify to these points. The "Schweizerpfeiff" or "Feldtpfeiff", according to Praetorius, "hat ihre absonderliche Griffe/ welche mit der Querflöten ganz nicht uberein kommet: Uund allein bey der Soldaten Trummeln gebraucht wird."[35] There are two sizes, with the ranges *d'–a''* and *g'–c'''*.[36] The association of fifes with drums, soldiers, and more particularly with the Swiss militia, is borne out by Kircher:

> Fistule militaris genus refert, quo Germani passim uti, & tympano coniungere solent, quo & Helvetii custodi[bus] Summi Pontif[icis] deputati utuntur.[37]

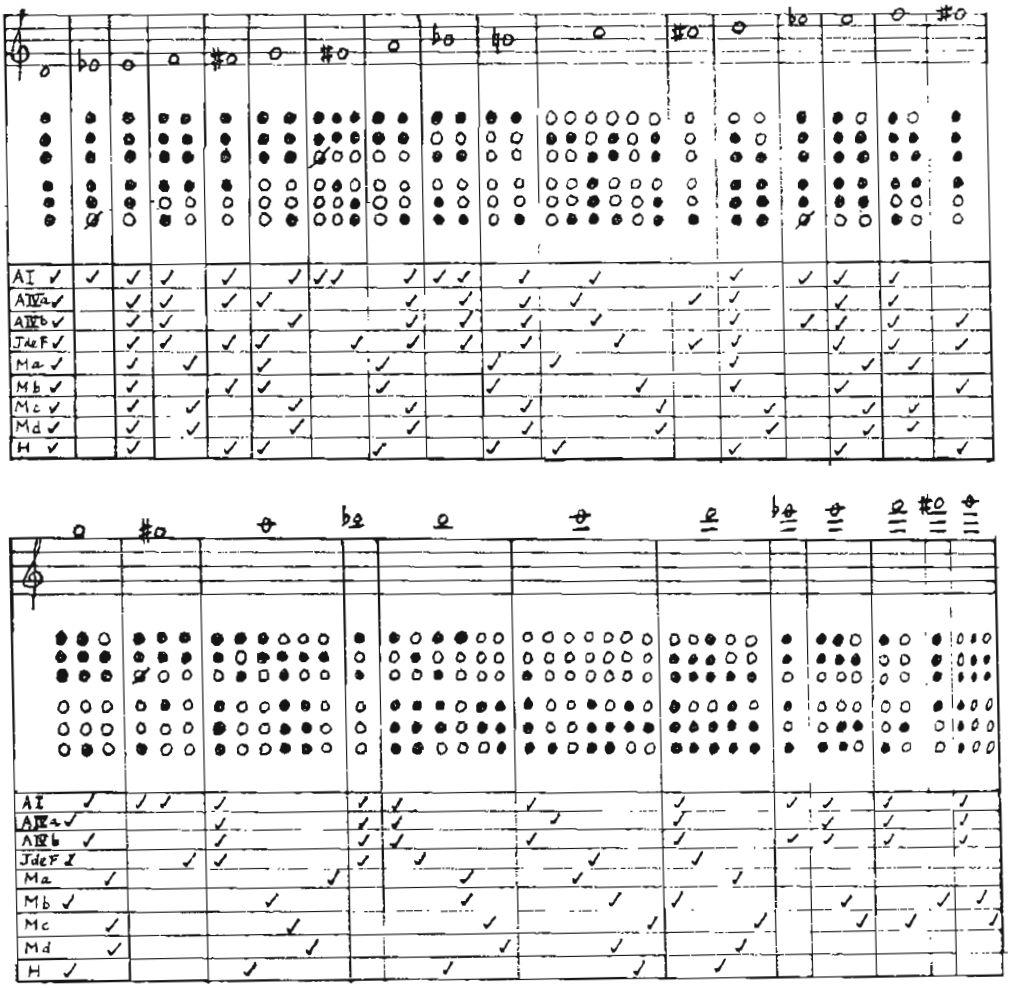
He gives an illustration of a "Fistula militaris" — the only instrument of the flute type shown by him — and refers us to Mersenne for the fingering.[38] A more informative writer is Trichet:

> . . . il suffira de dire en ce endroit que j'açoit que le fifre aye mesme nombre de trous rangés de mesme sorte, et qu'il aye mesme forme que la fluste d'aleman. Toutesfois puisqu'aux concerts qui se font de flustes d'aleman, toutes diverses en grandeur l'une de l'autre selon la partie qu'elles doivent soubstenir, on y admet point le fifre pour faire le dessus, y ayant une fluste propre pour cela différente du fifre, pourquoi est-ce qu'on ne croira que le fifre est un instrument différant de la fluste d'aleman?[39]
>
> . . . le fifre differe d'avec la fluste d'aleman en ce qu'il parle plus fort, que les sons sont beaucoup plus vifs et plus esclatans et qu'il est plus court et plus estroit. D'ailleurs l'on ne faict pas ordinairement toutes les parties de musique avec les fifres, comme avec les flustes d'aleman, que l'on met au ton de chapelle pour faire des concerts . . . Davantage l'estendue du fifre n'est pas si grande que celle de la fluste d'aleman, car le fifre n'a qu'une quinzieme et la fluste d'aleman s'estend jusques à une dix-neufieme.[40]

That there was not always such certainty in distinguishing the two sub-species is shown by the fact that Virdung shows only one side-blown instrument and calls it "Zwerchpfeiff",[41] while Agricola similarly calls all the flutes "Schweizer Pfeiffen", or simply "Pfeiffen", as opposed to his "Flöten" which are recorders. And a drawing by Virdung's contemporary, Urs Graf,[42] shows four Swiss *Landsknechte,* armed with swords, playing a quartet of flutes of assorted sizes (for which one of the players has a case hanging by his side). These are surely the kind of people whom one would expect, from reading Praetorius and Mersenne, to be playing fifes and drums. Evidently the species divided during the sixteenth century, a slimmer, shriller model being preferred for military use, in conjunction with drums, and a wider-bored model, in the three standard sizes, for civilian purposes.

Fingering Charts

Our chart is a composite of the few available:[43] the three of Agricola, Jambe de Fer's, Mersenne's, and a modern diatonic table given by Eric Halfpenny for his bass flute as the result of practical experience. Since the fingering does not differ for the various sizes of flute, we have given it for the tenor, beginning on *d'*, adapting fingerings given for different sizes to their equivalents at this pitch. This is necessary in particular if any composite table is to be made from Agricola, who gives various accidentals only as they occur in his various diatonic charts; he gives, for example, no fingering for *c''-sharp,* but it can be deduced because the note occurs in the same relative position in his second chart for the bass, there called B-natural.



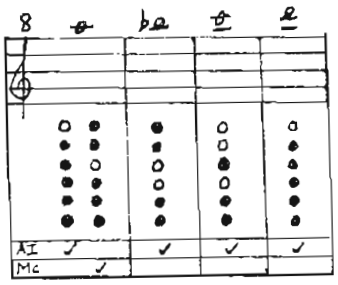
AI = Agricola's first edition, 1528

AIVa = First chart in Agricola's fourth edition, 1545

AIVb second chart in same edition

Idel = Jambe de Fer

Ma = Mersenne's first chart, for "Flûte à six trous"



Mb = Mersenne's first chart for the German flute

Mc = Mersenne's second chart for the German flute

Md = Mersenne's chart for the fife

H = Eric Halfpenny's chart for his bass flute

Of these fingerings, some are more logical than others. As far as *g″* we have placed first, in cases of preference, those fingerings which we find workable with our Körber reproductions of renaissance flutes; but we have in no way attempted to give a chart of our own, which would be full of further variants peculiar to ourselves and our instruments. For notes above *g″*, as can be seen from the chart, there are many choices. As far as our various sources are concerned, Halfpenny is of course the most reliable, since he depends on experience with an actual instrument. Agricola and Jambe de Fer also seem to be founded on practice, but Mersenne leads one to doubt whether he ever picked up a flute at all. He does not tell us the relationship of his chart for the six-holed flute[44] to those for the German flute (the same instrument, exactly). The charts called here "Mc" and "Md" are, like the former one and the chart for the recorder, notated in a system which leaves something to be desired in logic: uncovered holes are shown indifferently by blanks and "o"s. One wonders, moreover, whether he does not expect certain accidentals to be understood in his strictly diatonic charts (we have F-sharps simply because "Mb" begins on *g′*, therefore giving B's, equivalent on our chart to F-sharps): see, in this context, his fingerings for *f′* and *c″*, which would sound a semitone higher.

Most of the other differences are due to simple matters such as the adding of the bottom finger to steady the flute (compare the modern flautist's use of the E-flat key), and the differences between individual flutes when it comes to the higher notes. Obviously there would be a need for different fingering on a flute which had the finger holes evenly spaced from that which would work on a flute with the finger holes in two groups of three, with a larger gap between the middle holes. The latter spacing seems to be more common, to judge from surviving specimens,[45] although Mersenne's annotations to his own copy of the *Harmonie Universelle*[46] include a page of drawings of instruments in which the six-holed flute is shown marked off into 27 equal divisions between the foot and the mouth hole. The finger holes occur at nos. 5, 7, 9, 11, 13, 15; i.e. they are evenly spaced. But this is a matter of acoustics and instrument manufacture, and as such requires separate and more thorough treatment.

FOOTNOTES

1 Excepting the cases in which the holes for the fourth fingers are doubled and offset (only necessary on the bass instrument) to accommodate left-handed players. The notes to some drawings of eight-holed (!) transverse flutes by Jacques Cellier, ca. 1585, also state that the "sacqueboute" customarily serves as a bass to the flutes. See *Galpin Society Journal* x (1957) p.88 and pl. VII (c).

2 Virdung: facsimile edited by L. Schrade, Kassel, Bärenreiter, 1931: Agricola: pseudo-facsimile in *Publikationen Aelterer Praktischer und Theoretischer Musikwerke*, vol. xx, New York, Broude, 1966: Praetorius: facsimile edited by W. Gurlitt, Kassel, Bärenreiter, 1929; Mersenne: English translation of *The Books on Instruments* by Roger E. Chapman, Hague, Nijhoff, 1957; Jambe de Fer: facsimile edited by F. Lesure in *Annales Musicologiques* VI (1958–63), p. 341ff.; Trichet: extracts edited by F. Lesure in *Ibid.* III (1955), p. 283ff., and IV (1956), p. 175ff.; reissued in book form by Société de Musique d'Autrefois, Neuilly-sur-Seine, 1957; Tinctoris: extracts edited and translated by Anthony Baines in *The Galpin Society Journal* III (1950), p. 19ff.; Bottrigari: English translation by C. MacClintock, Rome, American Institute of Musicology, 1962 (MSD 9); Kircher: facsimile edition published by G. Olms, Hildesheim, 1970.

3 Agricola, *op. cit.*, 1528, f. xiii′–xiv′.

4 For a cursory explanation see the article "Flute" in *Grove's Dictionary of Music and Musicians*, 5th edition.

5 Agricola, *op. cit.*, 1545, f. 26′, 27′, 28 and 30′–31′.

6 Jambe de Fer, *op. cit.*, p. 47.

7 *Ibid.*, p. 50.

8 *Ibid.*, p. 49.

9 Praetorius, *op. cit.*, vol. II, p. 22.

10 Both Friedrich von Huene of Boston and Günter Körber of Berlin, in manufacturing replicas of ancient instruments, have constructed a quartet of flutes with the lowest notes *g, d', g', d''*; but this specification is evidently designed more for the convenience of modern players than for complete historical accuracy.

11 Agricola, *op. cit.*, 1528, f. xv–xv'; 1545, f. 22'–23.

12 Trichet, *ed. cit.*, p. 72.

13 Agricola, *op. cit.*, 1528, f. xiii; 1545, f. 25'.

14 Mersenne, *ed. cit.*, p. 312.

15 *Ibid.*, p. 310.

16 *Ibid.*, p. 314.

17 Praetorius, *op. cit.*, vol. III, p. 156–7. The same idea is to be found much earlier in Tinctoris' *De Inventione et Usu Musicae* (ed. cit., p. 20–21): he says that there are various sizes of "tibia", called "suprema", "tenor", or "bombarde", and "contratenor", but that "tubicines" are used for low parts with them.

18 Specifications given as in Philip Bate, *The Flute*, London and New York, 1969, p. 76.

19 Eric Halfpenny, "Two Rare Transverse Flutes" in *The Galpin Society Journal*, XIII (1960), p. 38ff. ". . . the pitch is *g*, about a semitone below the norm" (p. 39). Sounding length calculated from data on p. 40: center of mouth hole to bottom end 764mm., tenon shoulder to center of mouth hole 150mm., tenon shoulder to plug 210mm. For an addition to this article, see same author and journal, vol. XXIII (1970), p. 116ff.

20 Mersenne, *ed. cit.*, p. 312.

21 Jambe de Fer, *op. cit.*, p. 51.

22 Trichet, *ed. cit.*, p. 72.

23 *Ibid.*, p. 77.

24 *Op. cit.*, p. 38.

25 Agricola, *op. cit.*, 1545, f. 32–35.

26 Cf. Mersenne: ". . . there must be given at each tone a blow of the tongue and a little of the lip, so that all the notes may be articulated . . ." *ed. cit.*, p. 313.

27 Agricola, *op. cit.*, 1545, f. 34'–35.

28 Bourigari, *ed. cit.*, p. 15.

29 In *The Musical Quarterly*, XLVII (1961), p. 363ff.

30 Details from Howard M. Brown, *Instrumental Music Printed Before 1600*, Harvard University Press, 1965, p. 63.

31 "Two Cassel Inventories", in *The Galpin Society Journal*, IV (1951), p. 30ff.

32 François Lesure, *Anthologie de la Chanson Parisienne au XVIe Siècle*, Monaco, Oiseau-Lyre, 1953; the chanson is Passereau's *Pour quoy donc*, from the "27".

33 E.g. nos. 16, *Also heilig ist der Tag* for tenor and five instruments with "Traversa" *d'–f''*; 27, *O Maria, c'–f''*; 1, *Siehe das ist mein Knecht, b-flat–f''*.

34 Praetorius, *op. cit.*, vol. II, p. 21. See also vol. III, p. 73, where playing parts even two octaves higher is countenanced.

35 Praetorius, *op. cit.*, vol. II, p. 35.

36 *Ibid.*, p. 22.

37 Kircher, *op. cit.*, p. 500. The illustration is on a plate opposite this page.

38 Mersenne, *ed. cit.*, p. 314.

39 Trichet, *ed. cit.*, p. 76.

40 *Ibid.*, p. 77. The first part of this extract is taken (with acknowledgement) from Mersenne, *ed. cit.*, p. 312.

41 Virdung, *op. cit.*, p. [14].

42 Reproduced in Bate, *op. cit.*, Plate I.

43 A book by Simon Gorlier, *Livre de Tabulature de flûtes d'Allemand*, is listed as having been published in Lyons in 1558, but now lost; see H. M. Brown, *op. cit.*

44 Mersenne, *ed. cit.*, p. 305.

45 For a partial list, with illustrations, see Anthony Baines, *European and American Musical Instruments*, p. 86f. (London, Batsford, 1966).

46 Facsimile edited by F. Lesure, Paris, Editions du Centre National de la Recherche Scientifique, 1963. The drawing is opposite p. 232 of vol. III.