

FELLOWSHIP of MAKERS and RESTORERS of HISTORICAL INSTRUMENTS
BULLETIN and COMMUNICATIONS. JANUARY 1977

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RENAISSANCE TRANSPOSING KEYBOARD INSTRUMENTS

Nicolas Meeùs

It is a well-known fact that, in the Renaissance, several pitch-standards coexisted, at times even within one single instrument. Although the particulars of the construction of Ruckers' 'transposing' double manual harpsichords are now well known, the role that such instruments played in the contemporary musical life is not yet enough understood. The problem posed by different instruments at different pitches is in fact the same, even if it is less obvious. The distance between the pitches often is a 4th or a 5th so that, in the hypothesis that these instruments served transposition purposes, the transpositions implied are the easiest among the few ones which 16th- or 17th-century musicians had to perform. Another possible hypothesis is that instruments at different pitches corresponded to varying usages; but it would then be very surprising that these pitches should be an integral number of semitones apart. Or else, they corresponded to the usual vocal or instrumental ranges, treble, alto, tenor and bass.

None of these explanations is entirely satisfactory; the fact that they do not necessarily exclude each other is interesting, but not very enlightening. In my opinion, the difficulty arises from the fact that our modern concepts of pitch and transposition are not more adapted to these ancient instruments. The mental processes of the Renaissance musicians were probably not much different from ours but the difference, tiny as it is, produces enough distortion of the image to make it difficult to understand. Our modern theoretical concepts are misleading because they cannot readily adapt to Renaissance times. The conception of pitch and transposition has known a constant evolution since the origins of the Occidental music theory in the Carolingian era. The Renaissance conception is one step of this evolution, ours is another. It may well be that Renaissance musicians considered their conception as the ultimate one, much as we do today. This, of course, was and remains untrue.

In order to fully understand the problem, we should be able to recover the viewpoint of Ruckers' time, abandoning any preconceived idea. It would not be possible to describe in a few pages an evolution of centuries. I will try to give enough below to make my opinion more or less clear; for the rest, I can only refer the reader to the study I am preparing on the subject. The problem is of musicological rather than technical nature; it involves various aspects of the music theory, but I will try to avoid any excessive technicality. In order to set the scene, let us start with the medieval conception, from which the Renaissance one is derived.

1. Diatonic medieval keyboards and modal transpositions

Medieval and Renaissance keyboards often lacked raised keys in the low octave. Edwin Ripin has been able to reconstruct the appearance of the organ keyboard in the 'Mystic Lamb' before its repainting by van Eyck: it began on G with no raised key before f \sharp . As Ripin further showed, the pedalboard of the Norrlanda organ in Stockholm, beginning on C with B \flat as its first chromatic key, is a precise analogy to the bass end of the keyboard in van Eyck's original version¹. Any regular short octave shows the same succession of tones and semitones, TTSTTSSS, in the bass octave. The medieval and Renaissance music made little use of complex tonalities: even if chromatic degrees were often demanded in the upper parts of keyboard compositions by the laws of counterpoint, they usually remained unneeded in the bass part.

This explanation is generally thought sufficient. However, it does not take account of the transpositions that may often have been needed when keyboard instruments, the organ in particular, accompanied voices. One may assume that the earliest medieval organs, which often included no other chromatic degree than a b-flat and at times covered no more than an octave, were utilized for playing Gregorian melodies. Later, in the 14th century, it became usual to add counterpoints above the plainsong melody utilized as cantus firmus; the keyboard ranges were extended chromatically toward the treble, but the function of the low octave remained the same as before: it served for the playing of Gregorian melodies.

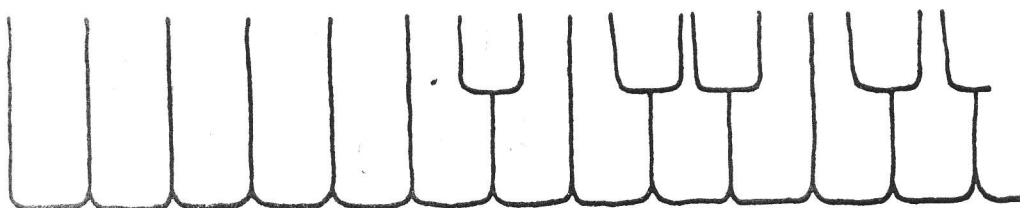
Thus, the bass part of keyboard compositions usually was given: it normally included no chromatic degree but, in notation at least, its pitch-level was predetermined. The bass part, the cantus firmus, also was the part sung by the choir, either accompanied at the organ or following an organ prelude which gave the pitch and recollected the tune. In any case, it was essential that the pitch at which the cantus was played corresponded to that at which it was sung. Of course, organ builders chose a pitch-standard which, in most cases, equated the notated pitch-level with that convenient to the voices, but the best chosen pitch-standard could not have afforded a complete solution: the plainsong, if notated at its theoretical pitch-level, without alterations, covered a range of about two octaves, too wide for unison singing. The singers themselves would have been unable to sing the whole repertory without transposition.

Even at the time when keyboard ranges were not wider than an octave, the organist's problem was not so much of confining the plainsong within the keyboard range — fragments of the melody could have been omitted — than of giving the correct pitch to start from. Actually, there existed a simple

¹ Cf. E. M. Ripin, 'The Norrlanda Organ and the Ghent Altarpiece', in *Festschrift to Ernst Emsheimer* (Musikhistoriska museets skrifter 5), Stockholm, 1974, 193-196. The following section of my communication is an adapted version of a letter sent to Ed when he was preparing this article in 1973.

trick, documented in medieval treatises², permitting the choir to intone any chant at any pitch: the singers merely had to transpose at the octave the notes which fell outside the range they could sing. Yet, one could hardly believe that this ever was more than an expedient. Surely, singers and organists knew more satisfactory transposition procedures.

What I want to show is rather obvious: transpositions at the 4th or 5th, the only ones performable on a diatonic keyboard with one chromatic degree per octave, sufficed to solve all problems of pitch. The corollary of this thesis is that transpositions to the 4th or 5th must have been performed much more often than any other and, possibly, knew a special status in the period concerned. For the sake of the argument, let us envisage a somewhat oversimplified case. Since, before the mid 15th century at least, the cantus firmus regularly was confined in the bass part of the keyboard compositions, one may assume that medieval organs often were built at such a pitch-standard that the lowest notes of the keyboard or pedal corresponded with the lowest pitches that the choir could sing. Therefore, the organist's problem reduced to playing the cantus firmus as low as the keyboard permitted. Let us examine the case of a c-keyboard without chromatic key before b_b . The table hereunder shows under a sketch of the keyboard the lowest possible position of an average range for each of the eight modes³. The finals are underlined.



Mode 1:	c	<u>d</u>	e	f	g	a	b_b	b	c'	d'
Mode 2:	G	A	B	c	<u>d</u>	e	f	g	a	b_b b
Mode 3:		d	<u>e</u>	f	g	a	b_b b	c'	d'	e'
Mode 4:		A	B	c	d	<u>e</u>	f	g	a	b_b b c'
Mode 5:			e	<u>f</u>	g	a	b_b b	c'	d'	e' f'
Mode 6:	c	d	e	<u>f</u>	g	a	b_b b	c'	d'	
Mode 7:				f	<u>g</u>	a	b_b b	c'	d'	e' f' g'
or	<u>G</u>	a	b	c'	d'	e'	f'	g'	a'	
Mode 8:	c	d	e	f	<u>g</u>	a	b_b b	c'	d'	e'

² Cf. for instance Notker Labeo, in Gerbert, Scriptores de musica (henceforth GS), I, 100; Berno of Reichenau, GS II, 76a; Joannes de Muris, GS III, 212b f.; Engelbert of Admont, GS II, 327b f.

³ The ranges considered are those described in Oddo's Dialogus, GS I, 259 ff., as tabulated in W. Apel, Gregorian Chant, Bloomington, 1958, 135.

Modes 1, 3, 5, 6 and 8 are untransposed; modes 2 and 4 are transposed to the high 4th; mode 7 is the most troublesome, being either too high or too low. The transposition to the low 5th, with the final on the first key, does not permit the b_b — which would rarely be needed in mode 7, however — nor the subfinal. The organist would probably have transposed the melodies of rather high range, leaving the others untransposed. The overall range of the plainsong in the table covers an 11 th or a 12th between c and f' or g'. In order to further reduce this range, mode 4 should be transposed to the high minor 3rd instead of the 4th, with three flats; mode 5 should be transposed to the low 2nd, with two flats, and mode 7 to the low major 3rd, with four flats. A fully chromatic low octave would be needed but, even so, the overall range could not be less than a 10th since modes 2, 4 and 8 each cover it alone.

Let us briefly envisage the case of the G-keyboard, supposing that here too the lowest notes correspond with the lowest pitches that the choir could sing — that is, that the G-key of the G-keyboard sounds the same pitch as the c-key of the c-keyboard, or that the pitch-standard of the G-keyboard is a 4th higher than that of the c-one. Obviously, since the succession of tones and semitones remains the same, the modes can be played in the same arrangement as in the table above, where the sketch of the c-keyboard could be replaced by one of a G-keyboard. Modes 2 and 4 would then appear untransposed, modes 1, 3, 5, 6 and 8 transposed to the low 4th and mode 7 to the low 4th or low 8ve. The advantages of the c-keyboard are obvious: the transpositions are much less numerous and they involve a flat rather than a sharp, which seems to have been preferred in the Middle Ages. And indeed, c-keyboards appear to have been much more frequent than G-ones.

2. Transposition and solmization

In our modern conception, it is possible to transpose following the cycle of fifths toward the sharp or the flat side to the infinite without that the theoretical complexity of the procedure increases as one departs from the starting point. Any remote transposition can be described as resulting from several transpositions to the 4th or 5th. In the Middle Ages and the Renaissance, on the contrary, transpositions to more than one 4th or 5th away from the starting point may at times have seemed to be of a different nature than those involving one step only in the cycle of fifths. In that sense, transpositions to the 4th or 5th which, as we have seen, could meet all needs in the Middle Ages, may have known a special status in that period.

Most medieval organists probably received their first training in music as singers; in addition, when improvising counterpoints on a cantus firmus, they probably used to read the cantus firmus in vocal notation. These are reasons to believe that they thought in terms of solmization. The solmization system, in the Middle Ages at least, included two terminologies. The first one described the position of the notes within the Gamut or, more practically, within its materialization on a keyboard or a monochord. According to this terminology, the final of mode 1 would have been described as dsolre on the c-keyboard, as Are on the G-one: it closely corresponded to our modern terminology. The second solmization terminology described the

function of the note considered, saying for instance that the final of mode 1 was re⁴. This implied that there was a semitone between the 2nd and 3rd degrees above this note. The first terminology was utilized in theoretical discussions and appears more often in treatises. The second was practiced by singers and probably by instrumentalists — although the latter often were confronted with the duality of solmization since the notes they played, when viewed as degrees of an instrumental range, were named according to the first terminology.

However, if one can admit that some medieval organists at least dubbed re the final of mode 1, and the other notes accordingly, then one must admit that the difference between transposed and untransposed modes, or between the c- and G-keyboards, must have been much less obvious to them than it is to us. Both keyboards began with an ut and, if the pitch-standards were exactly a 4th apart, both ut's sounded the same pitch. The only obvious difference between the two keyboards was that the first had its second fa (b_b), the second its second mi (f[#]) as first raised key — the fact that the Norrlanda organ has both b_b and b_n, that is both fa and mi, as lower keys takes here its full significance. Unless the organist, having developed some insight into the theory of the Gamut, realized that the ut of the c-keyboard was a cfaut, that of the G-keyboard a Gammaut, he may not have been fully aware that one keyboard was 'transposing' with respect to the other.

The relation between the two solmization terminologies is clear: each name in the first terminology includes all syllables that can be utilized for that degree in the second terminology: thus, dsolre means that the degree d can either have the function of a sol or that of a re in a melody. Inversely, each melodic function, each syllable of the second terminology can be found in several names of the first terminology. For instance, re appears in Are (or its octave alamire), in dsolre (or its octave dasore) and in gsolreut. In general, each syllable is found in three different names per octave and can thus be played on three different degrees per octave in the Gamut, on three different keys per octave on the keyboard. The 'natural' position of re, for instance, is on dsolre; it can be transposed to the low 4th on Are ('hard' position, involving the b_n since the degree above re must be a tone above it) or to the high 4th on gsolreut ('soft' position, involving the b_b since the degree a 3rd above re must be a minor 3rd above it). Any other transposition is outside the possibilities of the system and involves musica ficta.

Apparently, the transpositions possible within the solmization system would be to the high or low 4th — or, of course, to their octave⁵. Things were somewhat more complex in practice, however. The melodic function of a note was deduced mainly from its proximity to a semitone. The notes bounding a semitone were called mi and fa; sol and la respectively meant 'a tone' and 'two tones above the semitone'; re and ut meant 'a tone' and 'two tones below the semitone'. There was no need to imagine names for notes farther

⁴ Several medieval treatises describe the finals of the modes as re, mi, fa and sol rather than as D, E, F and G, e.g. Hieronymus of Moravia in Coussemaker, Scriptorum de musica ..., I, 77a f.

⁵ Unlike our theoretical musical scale, the Gamut has limits and a rather narrow range, so that strictly speaking octave transpositions are not always possible within the system.

from the semitone since, provided the music was diatonic, these notes farther away always would be closer to another semitone and be called with respect to it⁶. Thus, the syllables attributed to the degrees of a melody in mode 1 without b_b would have been the following:

c	<u>d</u>	e f	g	a	b c'	d'
ut	re	mi fa	sol	re	mi fa	sol

Such a melody was not readily transposable to the low 4th or high 5th: the lower re was transposable from d (dsolre) to A (Are) or a (alamire), but the higher re could not have been transposed from a (alamire) to e or e' (both called elami) without 'placing on this degree a syllable which is not naturally there', which is one of the definitions of *musica ficta*.

To some extent, medieval musicians utilizing the solmization system would have considered that the higher re in mode 1 untransposed, placed in 'hard' position on alamire, was placed there by virtue of some kind of transposition. Transposing mode 1 to the high 4th, as this:

f	g	a b_b	c'	d'	e' f'	g'
ut	re	mi fa	sol	re	mi fa	sol

not only implied transposing the lower re from its 'natural' position on d to its 'soft' position on g, but also 'detransposing' the higher re from its 'hard' position on a to its 'natural' one on d'. Mode 1 was not theoretically more complex when transposed to the high 4th than when untransposed: rather, half of the melody was viewed as transposed in both cases — what varied was which half was transposed.

If the melody included a b_b instead of a b_\natural when untransposed — it must be kept in mind that the b_b was an intrinsic part of the Gamut and that its presence in a Gregorian melody does not necessarily result from a transposition — it was not readily transposable to the high 4th or low 5th:

c	<u>d</u>	e f	g	a b_b	c'	d'
ut	re	mi fa	re	mi fa	sol	la

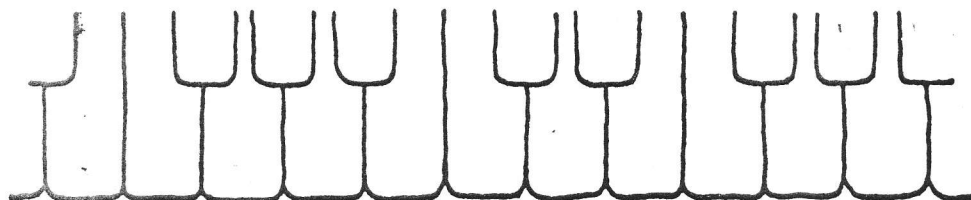
The lower re is transposable to its 'soft' position on g but the higher one, already in 'soft' position, cannot be further transposed in that direction without *musica ficta*. This makes it clear that the only transpositions performable in the solmization system had the effect either of adding a flat in melodies having none or of removing it from melodies including it when untransposed. The Gregorian repertory also includes melodies having both b_b and b_\natural , which were wholly untransposable without recourse to *musica ficta*. I cannot enter here a discussion of *musica ficta*: for the present purpose, it will suffice to know that it was quite a complex procedure, one to which, as Schlick said, 'not everyone is used'.

To sum up: in the solmization system, transpositions to the high or low 4th and their octaves were in some cases so trivial that organists — and musicians in general — might not have been aware of performing them. All other transpositions involved such complex processes that not everyone was able to perform them.

⁶ This is the obvious reason why the solmization system is based on hexachords. In the diatonic system, semitones never are separated by less than two tones nor by more than three.

3. The transpositions according to Schlick

Schlick's Spiegel is the earliest treatise known today that provides detailed information on the performance of transpositions. His discussion confirms that the foregoing description of the medieval transposition procedures is in general correct and shows that things were not yet much different in 1511. Schlick describes two pitch-standards, recommending one of them for the facilities it affords when accompanying singers. At his recommended pitch, he shows how to play modes 1, 3, 5, 6 and 7. The table hereafter, which adapts Schlick's indications to the same modal ranges as in the table above, has an overall range of an 11th between e and a'.



Mode 1:	c	<u>d</u>	e	^f	g	a	^b b	b	c'	d'	
Mode 3:		d	<u>e</u>	^f	g	a	^b b	b	c'	d'	e'
Mode 5:	e	<u>f</u>	g	a	^b b	b	c'	d'	e'	f'	
Mode 6:	c	d	e	<u>f</u>	g	a	^b b	b	c'	d'	
Mode 7:	f	g	a	^b b	b	c'	d'	e'	f'	g'	a'

Although Schlick does not discuss mode 8, it could easily be added to the table: transposed to the high 4th, its range is f-a'. Adding modes 2 and 4, on the other hand, necessarily would extend the range to a 12th or 13th; whether this must be done on the high or the low side raises the controversial question of Schlick's pitch, which I will avoid here⁷.

Although Schlick's keyboard is fully chromatic, no transposition other than to the high 4th is envisaged as a regular procedure at his recommended pitch. The indications concerning the other pitch are too incomplete to permit drawing a table as for the recommended pitch, but the important point is that all transpositions envisaged there are to the low 5th. The whole discussion of the pitches in the Spiegel is in fact to the effect of avoiding ficta transpositions. If none of his two pitches is utilized, Schlick says, 'persons are often forced to sing too high or too low, unless the organist plays the semitones, which is not convenient for everyone'⁸.

⁷ The choice of Oddo's modal ranges for the table above would need a justification in the case of a discussion of Schlick's pitch. The repertory includes melodies of much wider range than these.

⁸ Spiegel, ij r°. Mendel's translation as in MQ XXXIV (1948), 33.

The medieval idea that the b_b could at times be a lower key was still in existence in Schlick's time. He recommends a pedalboard covering a 12th from F to c', which is two keys more than many early-16th-century pedal ranges. Therefore, special care was needed for the appearance of the two top keys which may have seemed unusual to some organists. Schlick writes: 'The b_b at the top of the pedal keyboard, just under the c', should not be a long key, like the B, an octave lower, but short and high, like the other semitones. Then the b_b will remain below, as was customary among our forefathers, and is more practical for everyone even today, since until now few organs have had any keys above b_b in the pedal'⁹.

Schlick's descriptions of transpositions to the high 4th or low 5th are rather laconic. He says for instance that 'mode 7 will have to be played on cfaut' or that 'mode 3 will be played on alamire' — 'mode 7' and 'mode 3' meaning of course 'the final of mode 7' and 'of mode 3'. These transpositions clearly needed no explanation. In view of this, it is particularly enlightening to note how detailed the descriptions of other transpositions are. They always include considerations of the solmization procedure involved and always warn against the difficulties. Here follow a few examples.

One advantage that Schlick cites in favor of his recommended pitch is that the finals of modes 1 and 7 fall on the same key, g, while at the other pitch the final of mode 7 is on c, that of mode 1 on d. Since in both cases the final of mode 3 falls a tone higher still, the other pitch has three different finals for these three modes 'unless the organist plays in *musica ficta*, mi on d, which is good to do, but not familiar to everyone'¹⁰. Mi is the final of the third mode¹¹, of which the natural position is on e; the transposition implied is to the low tone.

Schlick discusses melodies involving both b_b and b which, as we have seen, cannot be transposed without *musica ficta*. He mentions one in mode 7 as much easier to play at his recommended pitch — where indeed it would not be transposed —, 'for otherwise the organist would have to play it on c, where mi and fa would fall on e, or play it on d, with mi and fa on f. He may be fluent in playing chromatics, as is necessary and agreeable for a master organist, but not everyone has practised this'¹². That is, the final must be placed on c through a transposition to the low 5th, the chromatic semitone (mi and fa) falling on e_b and e, or on d through a transposition to the low 4th, with the chromatic semitone on f and $f\sharp$.

He also mentions the hypothetical case of two masses based on the same cantus firmus — a Magnificat in mode 6 — where the bass counterpoint¹³ would descend to c in the first, to B_b or A in the second. Although the two masses be written 'on the same lines and spaces' — that is, at the same notated pitch-level — the second will have to be played with the modal final on d', a tone higher than the first where the final would be on c', in order that the low notes of the bass remain within the singable range. In the second mass, 'fa will be on d', mi on the semitone above c', or $c\sharp$ ', re on b_b and ut on a, which however is difficult and impossible for some organists, who did not exercise themselves at that'¹⁴. Use will indeed be made of the ficta hexachord on a.

⁹ Spiegel, vij r°; Mendel, 39.

¹⁰ Spiegel, iij v°; Mendel, 35.

¹¹ Cf. note 4 above.

¹² Spiegel, iij r°; Mendel, 36.

¹³ Bass counterpoints were usual in Schlick's time, which is the reason why his plainsong range is not confined at the bottom of the keyboard.

¹⁴ Spiegel, iij v°.

These examples show clearly enough, I hope, that Schlick's conception was closer to that of the Middle Ages than to our modern one. Transpositions were still performed through the solmisation system, with the result that transpositions other than to the high 4th or low 5th remained extremely difficult. Such transpositions were 'necessary and agreeable for a master organist', but Schlick apparently did not expect the normal organist to be fluent at them.

(To be continued)

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with the upper surface of the body a film of some sort has to be applied between the probe and the body. Grease and oil are commonly used on metals, water has been used, so has wallpaper paste. For a musical instrument, almond oil might be acceptable, but it would be worth trying various devices - double sided adhesive tape - cork or rubber sheet if oil were unacceptable.

RENAISSANCE TRANSPOSING KEYBOARD INSTRUMENTS (II)

Nicolas Meeùs

In the first part of this study (FoMRHI Com. 45, in Bull./Com.6), I tried to show how transpositions to the 4th or 5th afforded satisfying solutions to most of the problems of pitch encountered by medieval and early-Renaissance organists. Transpositions to the 4th or 5th were the only ones performable on keyboards with no more than one chromatic key per octave, as sometimes was the case in the Middle Ages. Up to the 17th century, many keyboards had no more than one chromatic key in the low octave, when they had a short octave. Here too, no other transposition than to the 4th or 5th would have been performable if the music to be performed made use of the low octave. So long as the problem was restricted to accompanying singers in church at a convenient pitch, however, no other transposition was really needed.

Transpositions to the 4th or 5th were rather trivial in the solmization system, while all others were quite complex procedures involving the technicalities of musica ficta. The medieval Gamut ranged the b-flat among the 'diatonic' degrees. Therefore, any transposition involving the b-flat only was performable without 'chromatics'. Pieces without b-flat as written were transposable up a 4th or down a 5th within the Gamut. Several Gregorian melodies included a b-flat when untransposed: these, and the pieces based on them, were transposable up a 5th or down a 4th if they had no b-natural when untransposed, the effect of the transposition being here of removing the b-flat rather than adding it. In short, every diatonic melody had two 'natural' positions a 4th or a 5th apart in the Gamut — and on the keyboard, where the b-flat key at times was ranged among the lower keys. To take an anachronistic comparison: on such a keyboard, both c- and f-major are playable on the white keys.

We must now see how and to what extent the situation changed during the Renaissance, when the solmization system and the medieval Gamut lost much of their significance. Of course, I could not review here all Renaissance treatises, although many of them have something to say about transposition. Since the present study is primarily concerned with Ruckers instruments, it may suffice to examine the opinion of one of Ruckers' most famous contemporaries, Praetorius. As will appear soon, his conception is still based to a large extent on the medieval theory.

4. Praetorius and the transposed modes

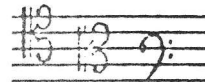
Chapter IX of the Syntagma's 3rd volume provides important information on the performance of transpositions. Here follows a commented translation of the most important passages of this chapter.

"Chapter IX.

Of the Transposition of Melodies.

How and to What Extent Some Chants must be Transposed in Transcription.

"Although every piece that is written in high clefs, i.e. in which the bass is written in the C-clef on the 2nd or 3rd line counting from the top or in the F-clef on the 3rd line, as this:



must be transposed when it is put into tablature or score for players of the organ, the lute and any other foundation instruments, as follows: if it is in bmol, down a 4th into durum; if it is in bdur, down a 5th into mollem, yet in some modes, e.g. Mixolydian, Aeolian and Hypoionian, when they are transposed down a 5th, the sound produced by the resulting low pitches is dull and poor. Hence it is much better, and the singing becomes much fresher and more spirited to listen to, when these modes are transposed down a 4th, from duro into durum"¹.

The terms bmol and bdur, molle and durum, have been explained in part I of this communication (Bull./Com. 6, pp. 21-23). In short, they can be understood as follows: most melodies were written within at least two hexachords, the 'natural' and the 'soft' (or molle, including the b-flat or bmol) or the 'natural' and the 'hard' (or durum, including the b-natural or bdur). What Praetorius means is that pieces written in the 'natural-soft' group of hexachords, with a flat in the signature (but see below), must be transposed down a 4th into the 'hard-natural' group and that, inversely, pieces in the 'hard-natural' group must be transposed down a 5th into the 'natural-soft' one.

Thus, this first paragraph states that if a piece is notated at a high pitch-level it must be played a 4th or a 5th lower on polyphonic instruments. The reason why foundation instruments only are mentioned obviously is that the chapter deals with the writing out of transpositions in transcription. It is clear that melodic instruments also had to transpose, but they could do it *ex tempore* from their part. One may wonder why the piece had been written high if this did not correspond to the composer's intention. It cannot be that the high notation involved less accidentals, since the transposition down a 4th appears to have the effect of removing a flat from the signature. Neither can it be that the high notation involved less ledger lines since two notations a 5th apart in pitch could always be put in the same position in the staff if the proper clefs are chosen. The only reasonable explanation is that the piece was in a given mode, or based on a modal cantus firmus, which it seemed better to notate untransposed.

Praetorius goes on stressing the difficulty of the transposition from duro into durum mentioned at the end of the first paragraph:

"This however is not only difficult and inconvenient for the organists, but also causes an unagreeable harmony at some places, namely when b-natural and f-sharp must be played together with the major 3rd d-sharp in between, which is somewhat too sharp and too high and therefore false"².

¹ Termini musici, 80 f.; cf. A. Mendel, 'Pitch...', MO XXXIV (1948), 347 f.

² Termini musici, 81.

The problem referred to is that keyboard instruments in meantone temperament usually have an e-flat, too high to serve as the major 3rd above b. It is striking that if a d-sharp was needed after the transposition down a 4th, it must be that the piece included a g-sharp when untransposed. The difficulty of this transposition, as of any ficta transposition, was not merely that it implied playing black keys: even untransposed pieces included accidentals.

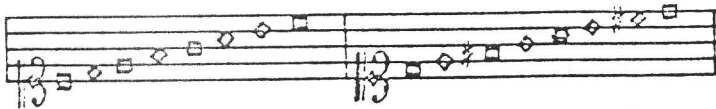
The matter is somewhat too complex to be fully discussed here, but it appears that a distinction must be made between 'contrapuntal' accidentals, which were not always included in the signature, and 'transpositional' ones. It must be remembered that the Renaissance musicians had rules determining where unwritten accidentals were needed: these rules were perhaps not fitted for discovering where 'transpositional' accidentals were needed. Another point is that Praetorius's expressions 'in b^{mol}' and 'in b^{dur}' cannot be understood as meaning that the pieces would either have a b-flat or no accidentals: here, a piece 'in b^{dur}' had a g-sharp when untransposed. It may be that the cantus firmus had no accidental and so truly belonged to the natural-hard group of hexachords.

Praetorius explains how the d-sharp can be omitted, or replaced by a d-natural, or hidden in a shake. He stresses the usefulness of keyboards with split e_b/d[#] keys and discusses the advisability of providing the organ with a device for transposition down a tone or a minor 3rd, less useful, he adds, in the case of stringed keyboard instruments where the retuning of e_b into d[#] is practicable. Apparently, Praetorius implies that the transposition down a 4th could be replaced by one down a 3rd or even down a tone: he does not seem to have been much concerned with the exactness of the resulting pitch.

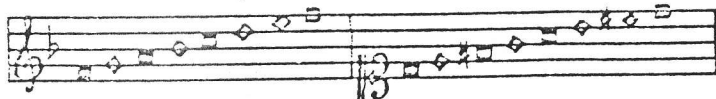
After a discussion of some cases where transpositions up or down a tone could be useful, Praetorius goes on:

"It is necessary to remember here that the Ionian mode, if it is too low and dull when untransposed, but too high and uneasy for the singers when transposed, can be played a tone higher if it is in the Natural and Regular System, or a 3rd lower if it is in the Transposed System, on d, as can be seen in the following examples:

"Ionicus regularis Per tonum minorem elevatus



"Ionicus transpositus Per tertiam depressus"³



It will become clearer below that the Regular and Transposed Systems correspond to the two keys in which a given mode could normally be written. In the example above, the Ionian mode in the Regular System is c-major, in the Transposed System it is f-major and the example merely shows how to make it d-major. Praetorius merely shows how the mode can be brought to a convenient pitch, starting from either of the two notations. But let us first shortly review the end of chapter IX.

³ Termini musici, 82 f.

"However, it is not always necessary to transpose a chant to the 4th or 5th in the partition or in the general ~~bass~~, but (it may suffice) to transcribe it as it has been found in the notation: indeed the transposition, especially to the 5th, is much easier to observe and to understand in the notes than in the German alphabetical tablature. One can easily imagine another clef at the beginning and direct oneself by it. If however someone is not used to this and does not find his way through it from the beginning, he can write the proper clef on a little piece of paper and paste it with wax on the lines, so that he has it under the eyes as he wants it to be. Similarly, I have inscribed two clefs at the outset of some Courantes in my Terpsichore, for the sake of the transpositions on the instruments"⁴.

That is: it may not be necessary to write out the transposition (but well to perform it) if the original is in staff notation. The case of Praetorius's own Courantes is particularly interesting in that it shows that the transpositions were not always needed: otherwise, it would have been useless to provide two clefs. It is clear, of course, that the need for a transposition depended on the pitch of the instrument. The chapter closes with examples of the clefs to be utilized for transpositions up or down a 5th; as Praetorius explains, transpositions up a 5th must be read an octave lower than written: they correspond to transpositions down a 4th.

5. Praetorius's Regular and Transposed Systems

In 1547, Glareanus had extended the number of the modes from eight to twelve. The four new modes were authentic and plagal equivalents to the modern major and minor. These 'new' modes were perhaps not as new as some Renaissance or modern theorists may have thought. Indeed, in the Middle Ages, each ecclesiastical mode had known two forms, one with b-natural and the other with b-flat. What Glareanus did was merely to give a new status to two of the modes with b-flat: the former d-mode with b-flat became the new a-mode (Aeolian), corresponding to our minor, and the former f-mode with b-flat became the new c-mode (Ionian), corresponding to our major.

Praetorius gives a short description of the modes in chapter VI of the Termini musici, where he provides tables of the twelve modes, first in staff notation, then in score — that is, on a staff of twelve lines —, then in German organ tablature. Each mode appears first in the Regular, then in the Transposed System, the second being either a 4th higher or a 5th lower than the first. The Ionian mode, for instance, is first tabulated as a c-scale, then as an f-scale with b-flat. In this case, the purpose of the Transposed System is obvious: it presents the Ionian mode in its ancient ecclesiastical form.

In other cases, the purpose of the Transposed System is less clear since, at first sight, it is the Regular System that appears to correspond to the ancient form. The authentic e-mode, for instance, becomes the Phrygian Regular, of which the Transposed System is nothing else than a mere transposition. The table below will make the present discussion easier. The left column summarizes the information provided in chapter VI: it lists the names given by Praetorius to the twelve modes and describes the scale to which they correspond; the sign * marks the modes which are written in high clefs. The right column establishes the correspondance with the medieval modes.

⁴ Termini musici, 83 f.

Dorius regularis (d-scale with $b\frac{7}{4}$, final d) ⁵	Auth. d-mode with $b\frac{7}{4}$
*Dorius transpositus (g-scale with b_b , final g)	Auth. g-mode with b_b
*Hypodorius regularis (a-scale with $b\frac{7}{4}$, final d)	Plag. d-mode with $b\frac{7}{4}$
Hypodorius transpositus (d-scale with b_b , final g)	Plag. g-mode with b_b
Phrygius regularis (e-scale with $b\frac{7}{4}$, final e)	Auth. e-mode with $b\frac{7}{4}$
*Phrygius transpositus (a-scale with b_b , final a)	—
*Hypophrygius regularis ($b\frac{7}{4}$ -scale, final e)	Plag. e-mode with $b\frac{7}{4}$
Hypophrygius transpositus (e-scale with b_b , final a)	—
*Lydius regularis (f-scale with $b\frac{7}{4}$, final f)	Auth. f-mode with $b\frac{7}{4}$
Lydius transpositus (b_b -scale, final b_b)	—
Hypolydius regularis (c-scale with $b\frac{7}{4}$, final f)	Plag. f-mode with $b\frac{7}{4}$
*Hypolydius transpositus (f-scale with b_b , final b_b)	—
*Mixolydius regularis (g-scale with $b\frac{7}{4}$, final g)	Auth. g-mode with $b\frac{7}{4}$
Mixolydius transpositus (c-scale with b_b , final c)	—
Hypomixolydius regularis (d-scale with $b\frac{7}{4}$, final g)	Plag. g-mode with $b\frac{7}{4}$
*Hypomixolydius transp. (g-scale with b_b , final c)	—
*Aeolius regularis (a-scale with $b\frac{7}{4}$, final a)	—
Aeolius transpositus (d-scale with b_b , final d)	Auth. d-mode with b_b
Hypoeolius regularis (e-scale with $b\frac{7}{4}$, final a)	—
*Hypoeolius transpositus (a-scale with b_b , final d)	Plag. d-mode with b_b
Ionicus regularis (c-scale with $b\frac{7}{4}$, final c)	—
*Ionicus transpositus (f-scale with b_b , final f)	Auth. f-mode with b_b
*Hypoionicus regularis (g-scale with $b\frac{7}{4}$, final c)	—
Hypoionicus transpositus (c-scale with b_b , final f)	Plag. f-mode with b_b

One reason why this table shows each mode in both Systems is an obvious desire for systematization and symmetry: the Regular System is justified by the existence of a medieval equivalent in eight cases on twelve, the Transposed one in six cases on twelve. The ultimate justification of Praetorius's doctrine, however, must be found in a puzzling aspect of the modal theory to be discussed presently. No mode has b as final; the well-known reason is that its medieval equivalent, the e-mode with b_b , was quite rare in plainsong and even more sporadic in modal polyphony. Yet, Praetorius does tabulate the g-modes with b_b , as Dorian and Hypodorian Transposed, while this mode was even less frequent than the e-one with b_b .

Actually, melodies with g as final and a b_b do exist, but they are not classified as belonging to the g-mode. Indeed, the intervals of their scale are identical to those of the d-mode with $b\frac{7}{4}$, so that they are usually classified as belonging to modes 1 or 2 transposed. This classification, which already was in use in the Middle Ages, is to some extent conventional. But the important point is that, in the Middle Ages already, it had been admitted that the d-mode could be found transposed in notation.

⁵ Praetorius does not actually tabulate his modes as scales: he merely gives the notes bounding the modal octave and the final. He shows these three notes for the Discant and the Bass, adding that the Tenor is identical to the Discant, the Alt to the Bass. I reproduce the information concerning the Discant. The Bass has plagal octaves in authentic modes and authentic octaves in plagal modes. In polyphony, the distinction between authentic and plagal modes is in any case rather academic.

This, moreover, is not true of the d-mode exclusively. Several melodies, belonging to various modes, appear transposed in medieval manuscripts. The purpose of these transpositions, which often are up a 4th or a 5th, has not yet been fully elucidated⁶. For the present discussion, however, it will suffice to acknowledge the fact that a device similar to Praetorius's two Systems already existed in the Middle Ages. Although the modern tendency has been of rewriting these melodies in their theoretical key, modern chant books still include instances of transpositions up a 4th or more often a 5th. Thus, it appears that what Praetorius showed with his two Systems were the two possible writings for each mode, the two keys in which each was likely to be found in notation.

In each case, one of the two Systems was written in high clefs (see the *). As Praetorius stated in chapter IX, this writing was not at a convenient pitch and had to be transposed in playing. Chapters VI and IX together turn out to imply a set of rules for transpositions similar to those illustrated in the tables of Part I of this communication. The early-17th-century composers had to make a choice between the two possible writings for each of their compositions. Pitch cannot have been their main criterion, since there was no necessary relation between the key in which a piece was written and the pitch at which it would be played. The mode, or the writing in which they knew the cantus firmus on which their music was based, must have been more determinant. The players, on the other hand, had no means of knowing the pitch intended by the composer — who was unable to specify his intention even if he had any precise one. Their aim, when they decided to transpose or not, must have been merely of bringing the piece within a convenient range.

6. Renaissance pitches -

The transposing harpsichord

It is clear that Praetorius's set of rules for transpositions could have been valid at one pitch only, probably his Chamber Pitch. Any other pitch would have implied other rules⁷. It would be particularly interesting to know

⁶ G. Reese, Music in the Middle Ages, London 1941, 157 ff., discusses some of the possible purposes of the transposition as 1) to conceal chromatic alterations which the untransposed melody would include, 2) to conceal modulations within portions of the melody. If, for instance, a melody in mode 2 included an e_b at some places, transposing it up a 5th would change the e_b into b_b ; it may then appear that the portions with b_b are in mode 2 transposed up a 5th, those with b_b in mode 4 transposed up a 4th. However, instances can be found of transposed melodies which could be written without any trouble in their theoretical key. My own conviction is that this device must be somehow linked with the medieval practices of transposition described in Part I of this communication. This will be one of the topics of the study from which the present communication is derived.

⁷ Praetorius's 'rule of the high clefs' became quite general in the 17th century: it is the well-known chiavette doctrine (cf. Mendel, op. cit., 336 ff.). This does not necessarily mean that Praetorius's pitch gained general acceptance: it is possible, through octave transpositions, to choose which System will be written in high clefs. Praetorius himself writes some modes an octave higher or lower than their theoretical place in the scale; even more, he presents some of them in two notations an octave apart, so implying the doctrine of the low chiavette.

whether some pitches — and the corresponding set of transpositions — were considered better than others. The factors involved are of such complexity, however, that the matter remains highly conjectural and that any result arrived at should be considered with utmost caution. After all, the most important point is that the Renaissance notation cannot be taken as a precise indication of the pitch at which the music was played and that that pitch may have varied with places, times and circumstances.

The overall range of the modal octaves which Praetorius describes as being at a convenient pitch is F-b for the Bass (and f-b' for the Alt), b_b-e'' for the Discant (and B_b-e' for the Tenor). This roughly corresponds to the vocal ranges he describes elsewhere⁸ and it seems therefore that the convenient range was the same on polyphonic instruments as in vocal music. From this premise, it would be possible to speculate on Praetorius's pitch, but the result would remain quite uncertain⁹.

Some modes must have been utilized much more often than others in the Renaissance. About 60 % of the Gregorian repertory is in mode 1, 7 or 8 and one may suppose that the proportion remained similar in modal polyphony. The new major mode must also have been quite frequent. One may conclude that a good majority of the polyphonic pieces were written in one of the following six modes: Dorian (mode 1), Mixolydian (mode 7), Hypomixolydian (mode 8), Aeolian (mode 1 with b_b), Ionian or Hypoionian (both major).

At Praetorius's pitch, following the indications of the table above, the modal octaves utilized in the Discant for these six modes were c'-c'' (Ionian regular, Hypoionian and Mixolydian transposed) and d'-d'' (Dorian and Hypomixolydian regular, Aeolian transposed). The overall range for the six modes is c'-d'', which falls exactly in the middle of the Discant range b_b-e''. Thus, the six modes most frequently utilized were the easiest to sing and to play, which was to be expected.

A similar result could have been reached by choosing the other System for each of the six modes. The modal octaves utilized would then be f'-f'' (Ionian transposed), g'-g'' (Mixolydian and Hypoionian regular, Dorian and Hypomixolydian transposed) and a'-a'' (Aeolian regular). The overall range for the six modes would become f'-a'' and the corresponding overall Discant range e'-b''_b. This would correspond to a pitch roughly three tones lower than Praetorius's (or, if the modal octaves are taken an octave lower, to a pitch roughly three tones higher than Praetorius's). This pitch would have about the same advantages as that advocated by Praetorius. In general, one could say that pitches about three tones apart must have been for many purposes equivalent¹⁰. This, it must be stressed, remains valid independently of the

⁸ *De orranographia*, 20. The ranges there described as easy to sing are C-b_b for the Bass (which must account for exceptional low voices), B-e' for the Tenor, f-a' for the Alt and c'-e'' for the Discant.

⁹ For instance, one could say that the 21th which human voices could most easily sing is about G-f''[#] at modern pitch, to be compared with Praetorius's F-e''. Praetorius's pitch would thus be a tone higher than modern. This is close to the result arrived at by Mendel (*op. cit.*) but it may be wrong by a tone or a 3rd because human voices easily cover more than a 21th. See also Thomas and Rhodes in *The Organ Yearbook* II, 1971.

¹⁰ It would seem that Renaissance makers found the distance of a 4th or a 5th between the two pitches more convenient than that of a tritone. The argument could be furthered to justify pitches a tone apart, as between the pitches respectively a 4th and a 5th higher or lower than any reference.

actual frequency level of any of the two pitches. But let us leave the domain of conjecture and shortly examine the case of the transposing harpsichord, the purpose of which should now be quite obvious.

The transpositions most often practised in the early 17th century were up or down a 4th or a 5th. On the transposing harpsichord, passing from the upper keyboard to the lower effected a transposition down a 4th (or up a 5th). The aim of the transposition practices of the time was not of reaching a precise predetermined level, but merely of bringing the music within a convenient range: not much precision was needed. Therefore, the transposition down a 4th on the transposing harpsichord could replace the transpositions down a 4th or a 5th that would have been practised on other instruments.

For the sake of the argument, let us suppose a transposing harpsichord of which the upper keyboard would be at Praetorius's pitch¹¹. In order to transpose pieces written in high clefs, the harpsichordist would only have to play them on the lower keyboard. In short, the transposing harpsichord permitted to play the whole keyboard repertory within a convenient range without ever having to perform a transposition. In a way, the two keyboards correspond to the two Systems for each mode. The distance of a 4th between the two keyboards is an arbitrary choice of the Ruckers, intended to replace the distance of at times a 4th, at times a 5th, between the two Systems: they could as well have made instruments with the two keyboards a 5th apart.

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It is time to conclude. I have spent much time trying to prove that the preference for transpositions to the 4th or 5th in the 16th and early 17th centuries was a survivance of a medieval practice. Even so, some readers may not be convinced and consider it naïve to explain the transposing harpsichord by the fact that Ruckers's contemporaries transposed to the 4th only. I can add a last argument, which I will leave everyone free to develop: keyboard instruments tuned in unequal temperament permit playing in a limited number of keys only; for the same reason, they permit a limited number of transpositions. Of the transpositions performable, the ones to the 4th or 5th are the most frequent. For instance, a piece in c major including modulations to f-major, g-major and d-major could only be transposed up or down a 4th or a 5th on an instrument in meantone temperament ...

On the other hand, my conclusions should not be taken for more than what they are intended to mean. It is clear that many early-17th-century keyboardists were able to perform complex transpositions, even at times involving retunings of their instrument¹². The transposing harpsichord certainly was not progressive in its time; the Ruckers were traditionalists. The later evolution

¹¹ The Ruckers transposing harpsichord must have been somewhat lower than that, actually.

¹² Keyboard instruments with split keys must have been quite useful for transposition purposes. It must be noted in this respect that the transposing harpsichord, with its double string for $e_b/g\sharp$, permits one key more than a normal instrument, as if one of its keys, either e_b on the upper keyboard or $g\sharp$ on the lower one, was split.

could be summarized as follows: as the modes were progressively made to all resemble either the major or the minor, the key in which a piece was written lost its modal significance and was more often understood as an indication of the pitch at which to play. The trend toward equal temperament contributed in making all keys identical to each other, but for pitch, and made remote transpositions possible. Pitches were progressively standardized and their number lessened. The apparition of the standard pitch is directly linked with the coming into practice of equal temperament and the replacement of the modal system by the major/minor tonal one.

At the same time, pitch was more and more considered to be essential for the correct rendering of a piece. To a large extent, the modern concern of players of early music with the 'authentic' pitch is a heritage of the Romantic period and their suspicion against $a' = 440$ at times resembles snobbery. The Renaissance musicians must not have considered pitch to be of much more importance than, say, the instrumentation which often was left to the players' discretion.

JEROME OF MORAVIA

FoMRHI Com. 58

Anthony Baines

Now that Jerome of Moravia's tunings are coming to the fore in your always interesting and constructive Bulletin, may I, though not a fiddinist myself, offer a few comments.

(1) Jerome's tunings are given on p.34 (Jan.1977 issue) presumably following the placing order of the strings on the instrument, so that from this aspect the 2nd arrangement matches the 1st save in the tuning of the near-side string up to g'. So far as I know, this is a new interpretation. Hitherto, from Panum to Bachmann (presumably competent Latinists), interpreters have picked out the phrase "arranged, however, according to the sounds" as indicating the order G d etc. (as against d G etc. in the 1st tuning). Yet the text, plus marginal additions, do seem to permit Segerman & Abbott's reading. So important is this unique source, borduni and all, that it is imperative that some very expert Latinist be now called upon to try to clear the matter up, stating which reading may be considered correct, or whether either could be.