THE POLYRHYTHMIC FOUNDATION OF TSWANA PIPE MELODY

by

CHRISTOPHER BALLANTINE

This paper proposes the theory that Tswana pipe melody is not initially conceived as melody at all, but is the result of the application of polyrhythms to the fixed pitches of the pipes of the ensemble in accordance with the norms of Tswana "harmony".

Some remarks of an introductory nature, as well as a few notes on Tswana "harmony", are necessary before I formulate this theory more fully and advance evidence to support it.

The Pipe Ensemble

The members of the Tswana pipe ensemble on which this study is based worked as miners for the Luipaardsvlei Estate and Gold Mining Company near Krugersdorp. The recordings were made at the mine, and the transcriptions of these in full score are given in the Appendix at the end of this paper.

The ensemble had a range of five octaves. On each of the occasions on which I recorded there were twenty-one pipes (*ditlhaka*) in the ensemble. Since each pipe (*letlhaka*) produces only one note and the internal length of each pipe is different, the entire ensemble had twenty-one different notes at its disposal. The pipes are numbered from highest to lowest. The highest pipe is the exception: instead of having a number it is called *motenyane*, while the next highest pipe is called *letlhaka la bobedi* (second pipe), the next *letlhaka la boraro* (third pipe), and so on.

There are five musical groups within the ensemble, each group consisting of four pipes (except the lowest, which has five), and each doubling at the octave the notes of the group immediately above or below it. The Tswana pipes use a tetratonic scale, and every group is a complete musical unit in the sense that each note of the scale is represented in it. The names of the groups, in descending order of pitch, are: *metenyane*, *dinokwane*, *dinokwane tse ditona*, *meporo emennye*, *meporo emetona* (or *meporo emetelele*). The entire range of the ensemble, with its divisions into groups, then is:

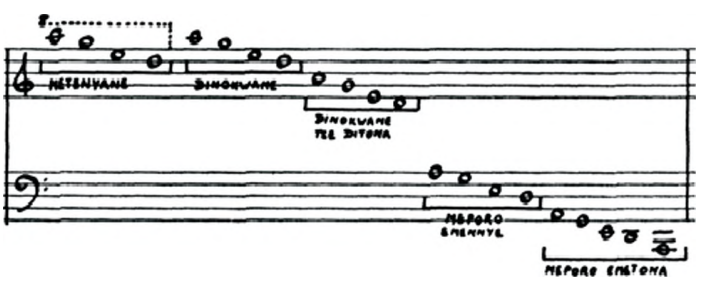

Fig. 1

I did not consider it necessary to make stroboscopic measurements of the pitch of each pipe. While each pipe can technically produce only one note, in practice it is possible, depending on the way a player blows, to alter its pitch by as much as a semitone; and Blacking has pointed out the invalidity of making pitch measurements upon

people to whom the concept of an isolated tone is foreign.[1] The Tswana, like the Venda, conceive of music as total patterns of sound rather than as aggregations of isolated tones. Evidence of this is that the Tswana tune their pipes *during performance only* — they have a standard piece, *Motseo*, which is used exclusively for this purpose — and that some of the players, when asked to blow their pipes solo, immediately turned the experiment into a miniature performance by singing the notes of the other pipes softly to themselves between their "blows", and by stamping their feet rhythmically. For the Tswana, intonation can only be judged during performance, and discrepancies here are relatively slight. I am satisfied that Fig. 1 represents the relative pitches of the pipes, based on a synthesis of all the variations in the tunes I recorded. In some of the recordings the entire ensemble was a semitone or two sharper than indicated in Fig. 1, owing possibly to changes in the heat of the pipes or the excitement of the performance; the point, however, is that the relative pitches of the pipes always remained the same. For the sake of easy comparison all the transcriptions presented in this study will use the pitch-notation of Fig. 1. I have furthermore observed the principle of using bar-lines only to indicate what sounded to me like acousticallystressed notes.

The pipes vary in length from about six inches to more than five feet. They are end-stopped and are made from lengths of metal piping obviously found somewhere on the mine.

"Harmonic" Criteria

The problem of deciding what, for the Tswana, is essential or acceptable "harmony" and what is unessential or incidental, is made extremely difficult by the extent of the elaboration that exists in any of the pipe tunes. Were we to accept the "harmonies" produced by, say, the first eight pipes (the *metenyane* and *dinokwane* groups) as the norms, we would have to admit that Tswana pipe "harmony" had developed to the ultimate of its possibilities, for here any and every possible combination of the notes A-G-E-D seems to be possible. However, the "harmonies" produced by the rest of the ensemble indicate that this view cannot be correct, for here the most predominant intervals are octaves, and fourths or fifths; less frequent are thirds or sixths, and, still less frequent, seconds or sevenths, which disappear almost entirely in the lowest two groups of pipes (*the meporo emennye* and the *meporo emetona* groups). My suggestion is that the only fully accepted "harmonies" are octaves and fourths or fifths; thirds or sixths are then still in the evolutionary stage, and any other "harmonies" are unessential and can be explained as the result of embellishment, or, as we shall see later, of what we may call "rhythmic" line. Thirds (and sixths) occur when the note E is used, instead of the more conventional D, against a G in the melody; but it is interesting that when E is the melodic note, G is never used as a replacement for A. Evidence in favour of considering thirds or sixths as still in the evolutionary stage, is the apparent lack of agreement among the players about when E, instead of D may be played against G: often the alternatives occur together.

Using the above criteria I was able to find the "harmonic" frameworks of all the tunes, and Fig. 2 shows the "harmonic" *fluctuations* and demonstrates the similarity that exists between some of the tunes on the basis of these fluctuations. As I consider that sixths (or thirds) are not yet established "harmonic" intervals, I have, for the purpose of this chart, written then in their "correct' form (i.e. as fifths), and have indicated the alternative note in brackets.

[1] Blacking, John: "Problems of Pitch, Pattern, and Harmony in the Ocarina Music of the Venda", in *African Music*, Vo. 2, No. 2, 1959.

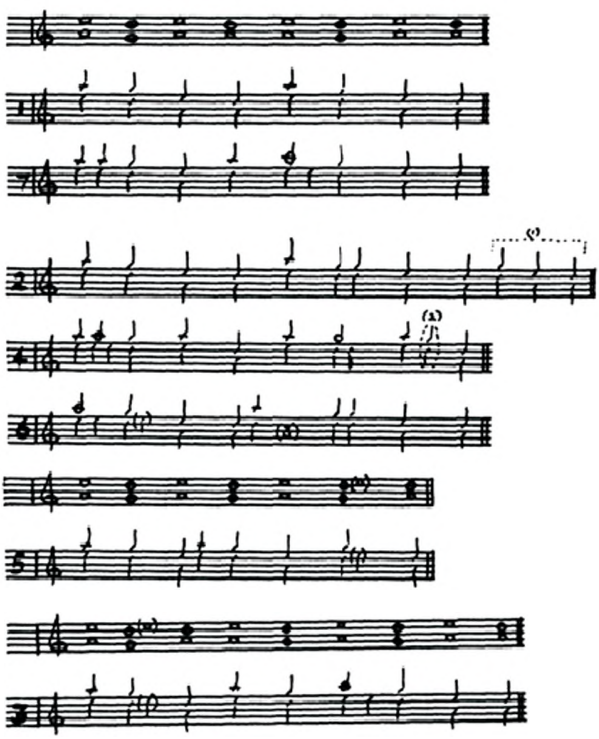

Fig. 2

The Structural Foundations of the Melody

There has been a tendency among some ethnomusicologists (Hornbostel and Herzog are two instances[2]) to maintain that melodies outside the Western tradition are conceived as pure melody, unrelated to any underlying structural factors such as harmonic frameworks or scales. Hornbostel argues that these melodies are to a certain extent "natural, i.e. rooted in the psychophysical constitution of man".[3] Blacking has raised objections to this theory, pointing out, in a discussion of Venda music, that

> "even the 'simplest' music is a product of man's culture: Venda music is not 'natural' but highly artificial, and it has to be learnt by aural experience and physical participation. When a Venda sings, he is expressing cultural particulars, rather than psychophysical universals. Although the Venda cannot explain the theoretical framework upon which they build their performances, they know very well, by training and not by instinct, what is right and what is wrong, and what is acceptable or unacceptable according to the canons of Venda music."[4]

The Tswana, too, are unable to explain the theoretical framework underlying their music. But the business of the ethnomusicologist is to find precisely what these theoretical foundations are, and to establish the canons by which a people creates its music and deems it to be acceptable.

There are two ways in which the structures of Tswana pipe music may be explained. The first — and from our knowledge of other African musics, the more typical — is that it may be based on vocal melody. Kirby subscribed to this view, and after a study of Tswana pipe music during a tour of southern Bechuanaland in 1932 wrote:

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[2] Von Hornbostel, E. M.; "African Negro Music", in *Africa*, Vo. 1, No. 1, 1928, pp. 34-35.
Herzog, G.; "A Comparison of Pueblo and Pima Musical Styles", in *Journal of American Folklore*, Vol. 49, No. 194, p. 286.

[3] Von Hornbostel, E. M.; *op. cit.*, p. 34.

[4] Blacking, John: *The Cultural Foundations of the Music of the Venda, with Special Reference to their Children's Songs*, Ph. D. thesis in the Library of the University of the Witwatersrand, 1964, p. 304.

"The song-maker makes his song for the voice in the first place, and sings it to his fellows, usually the reed-blowers. These join in with their voices, and if the song is found to be suitable for the reed-band, it is put into practice and learned. The harmonies are fitted as the song is learned."[5]

The other possibility is that the pipe music may be founded on abstract patterns or principles—as is some Nsenga *kalimba* music, and, to a lesser extent, Venda ocarina music, where the melodies are generated by the physicl properties of the instruments.[6]

I believe that this latter possibility is the correct explanation — at least for the tunes I recorded. My theory is that these tunes are produced by the *application of polyrhythmic techniques* to the pipe ensemble. Stated differently, this means that the Tswana, in the creation of at least some of their pipe pieces, do not proceed from melodic considerations — do not first think of a melody and then play it, with the addition of a few "harmonies" on their pipes—but begin with one, or in some cases, two rhythmic schemes, which are then played by the pipes in a polyrhythmic way: but their interrelation and points of coincidence are such that, apart from occasional exceptions, the canons of "harmonic" acceptability are not offended.

Polyrhythmic Technique

I have abstracted the polyrhythms from the pieces, and they are shown in Fig. 3. A comparison of Fig. 3 with the transcriptions of the pipe pieces in full score in the Appendix will reveal that the process of isolating the polyrhythms was not a straightforward one: the relationship between the basic polyrhythmic structure and the total sound of a piece is too subtle and too complex to have allowed for a simple transposition from the full score. In order to find these structural bases, I had, for example, sometimes to regard melodically important notes as unessential to the basic polyrhythmic pattern. I could not rely too much on the highest or the lowest pipes, for in the former the elaboration of the basic pattern was so great as to render it practically indiscernable, and in the latter the basic pattern appeared in skeleton form with many essential notes omitted. Nor could the middle range of pipes always be taken at face value, for the basic pattern here was often complicated by "secondary" elements, such as will be discussed later. In Fig. 3 no rests are given, and there is no indication as to how long any of the essential polyrhythmic notes were "held" by the players. The note-values simply show the distance between the essential notes.

It will be seen from Fig. 3 that the Tswana use two different kinds of polyrhythmic technique: the one is to give the same rhythmic pattern to all the pipes, the other to have two rhythmic patterns; in this latter case the first pattern is played by the pipes in A and G, and the second by the pipes in E and D. Tune No. 3 seems to be the exception; however, once it is realized that the non-conforming G pipes play a pattern (𝅗𝅥. 𝅗𝅥 𝅝) which is exactly double the pattern played by the other pipes, (𝅗𝅥. 𝅗𝅥) then it must be regarded as a variation rathern than an exception. When there are two patterns, one of them always consists simply of one constant, unchanging note-value. Four of the seven pieces use, to a greater or lesser degree, the pattern 𝅗𝅥. 𝅗𝅥 and two of the three non-conforming pieces (Nos. 2 and 6) show a relationship to this pattern by their use of 𝅝—𝅗𝅥, which could also have been notated 𝅗𝅥.—𝅗𝅥. Other favourites appear to be the value 𝅝 for the basic pattern, and various combinations of 𝅗𝅥. 𝅗𝅥 and 𝅝.

If Tswana instrumental melodies are not *conceived* as melodies at all, but are the results of polyrhythms added to pitch, we must not ignore the possibility that we may be wrong in assuming that, for the Tswana, they have either a definite beginning or a definite end; the players of the A pipes may feel that the point at which they start playing

[5] Kirby, P. R.; "The Reed-Flute Ensembles of South Africa: a Study in South African Native Music", in *Journal of the Royal Anthropological Institute*, Vol. LXIII, p. 374.

[6] Blacking, John; "Patterns of Nsenga Kalimba Music", in *African Music*, Vol. 2, No. 4, 1961.

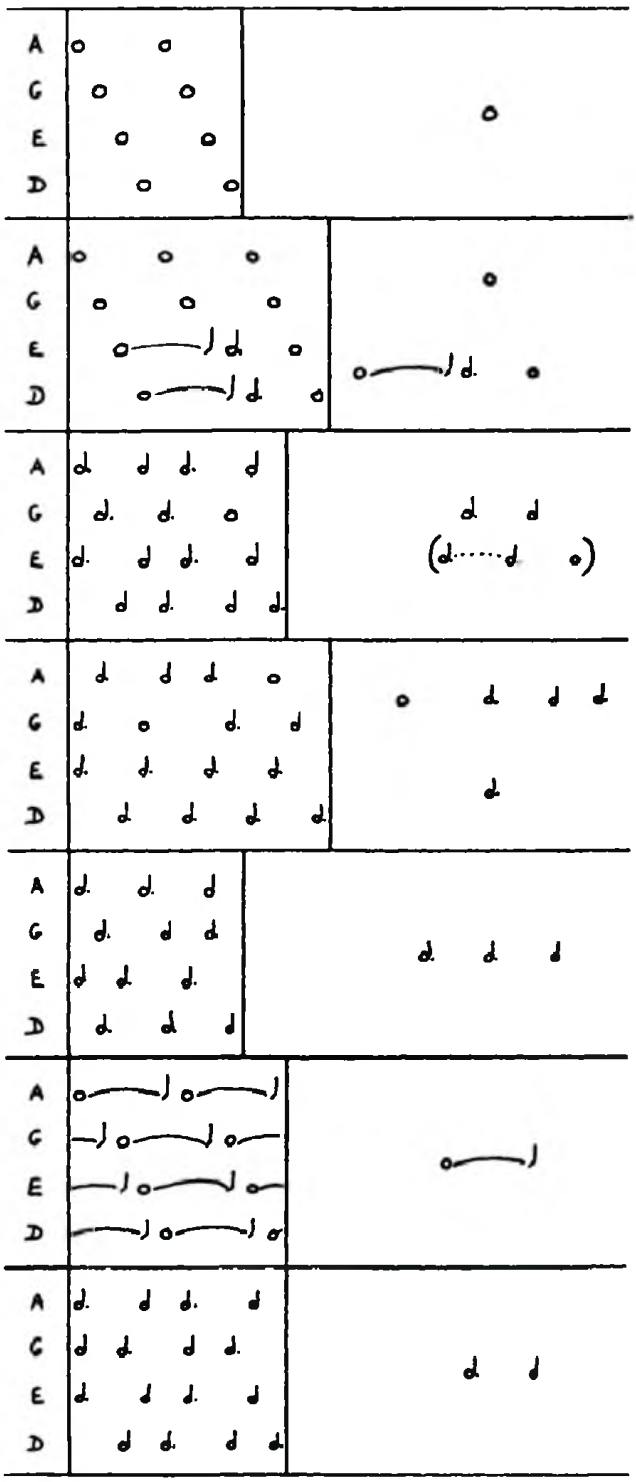

Fig. 3

their rhythmic pattern is the beginning, the players of the A pipes may feel the same about the moment they start, and so on. Hence any one melody may have multiple beginnings depending upon which pipes one is listening to or playing.

I personally do not find this argument convincing. The extent to which the basic rhythmic patterns are consciously deviated from for purely melodic consideration seems to be adequate proof that the melodies, though they may be the result of polyrhythms, exist as fixed entities in the minds of the players, each with a fixed beginning and end.

It should now be clear why a "weighted" scale based on the instrumental melodies, though such a scale would be considered "sound" ethnomusicological method, is in fact misleading: where two or more essential polyrhythmic notes in any piece coincide, the factor governing which of the notes will be heard as part of the melody is usually *acoustical* rather than *intentional*, namely that the highest note will be the most easily audible. We shall see that the Tswana are themselves aware of this, and sometimes omit an essential polyrhythmic note for the sake of the melody. It should be understood that whenever I speak of a note as being "essential" to the polyrhythmic structure, I mean "essential" on the basis of my abstraction of the polyrhythms as set out in Fig. 3.

Polyrhythm and Melody

It was mentioned at the beginning of this discussion on structure, that the relationship between the total sound of a piece and the underlying polyrhythmic structure was complex, and that the task of abstracting the polyrhythms was made difficult by the extent to which the players embellished and varied the rhythmic units. We must now work from the other end; i.e. given the rhythmic structures, we must see how they lead to the melodies and establish the principles governing their interaction.

BASIC RHYTHMIC PATTERN

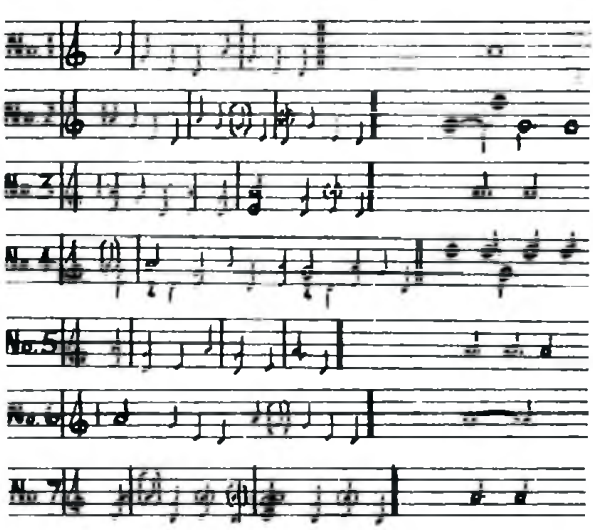

Fig. 4

The melodies and their basic rhythmic patterns are set out in Fig. 4. In order to make this chart as readable as possible I have had to restrict myself to notating, apart from the "heard" melodies, only the first note of each unit of the polyrhythmic patterns. I have thus been able to write each tune on one stave, but have had to neglect the principles of part-writing, and have not been able to give any idea of the total "harmonic" sound

of each piece. However, some of the essential "harmonic" conventions become apparent, as do some of the discords which are brought about as a result of polyrhythm. The top notes are the melody notes except where indicated to the contrary by round brackets; square brackets are used to point out notes which are not essential to the polyrhythmic structure.

Tune No. 1 needs no comment, but No. 2, like No. 6, has two consecutive G's, both of which are important melodically, but only one of which is important (i.e. essential) from a polyrhythmic point of view. In No. 2 it is the first G which is the essential polyrhythmic note, and the second G is just a subdivision to fill in the "gap" before the next entry of an essential polyrhythmic note — the E. In No. 6, however, the second G is essential; the first is merely the last crotchet of the 𝅗𝅥⁀♩ unit. The reason for the slight elaboration here is obvious: without it the two descending phrases of the melody would sound identical owing to the nature and relative positions of the polyrhythmic patterns. The beginning of No. 4 is particularly interesting. The most prominent note melodically, the A (indicated by the square brackets), which acts as a weak upbeat to the next A, is quite unessential to basic polyrhythmic structure: it is the last crotchet of the basic 𝅗𝅥 unit, and is consciously given preference over the "esential" notes, E and G. Attention must be drawn to the discord which results, and which may sound to Western ears like a clash brought about through the use of an anticipatory note, the A. Other discords will be found in Nos. 5 and 7, but these are all the result of a different cause; i.e. the fortuitous coincidence of essential polyrhythmic notes. Hence notes that are essential polyrhythmically must sometimes be regarded as unessential harmonically. In a chord like A-G-E (which is fairly often the result of the polyrhythmic structure) and where the A is the most important melodic note, the G can be called unessential from a harmonical point of view; it can be explained as a "horizontal" moment, much as accented passing notes and other unessential notes are accounted for in classical counterpoint. There, however, they are explained through melodic line, while here an harmonically unessential note is explained through what we may call "rhythmic" line. These apparent discords brought about through polyrhythmic coincidence, sometimes, but not always, occur at moments of obvious acoustical stress.

To return to tune No. 7, we find that it begins with two consecutive A's, the first of which is a light up-beat despite the fact that it is an essential note in the polyrhythmic scheme. The second A, the unessential note, is given the acoustical emphasis and as such becomes the more important note melodically. Again, the prolongation of the A sound (here subdivided into ♩ ♩) is an expedient to fill the "gap" before the next essential polyrhythmic entry. Two more A's occur consecutively in the middle of the melody. Here it is the second which is seen to be essential if we regard its role in the polyrhythmic structure. The first A is merely the second of the two crotchets which make up the ♩ unit. It is interesting to notice the way this ♩ unit is treated here: the first half is practically silent, while it is the second that is made audible, is intended to be melodically more important than the "essential" D with which it sounds simultaneously.

The principles governing the interrelation between the basic polyrhythmic structures and the melodies as they finally sound, may now be summarized as follows:

1. Notes which are *not* essential to the polyrhythmic structure sometimes assume melodic importance. These notes always occur immediately *before* or *after* the essential note and on the same pipe.

(a) A note that occurs *after* the essential note is usually an expedient — a prolongation of the essential note before the entry of the next essential note on another pipe. (These prolongations are not always subdivided, but often occur as minims.)

(b) A note that occurs before an essential polyrhythmic note acts as an "anticipation", sometimes clashing with essential notes on other pipes. The reason for the use of these "anticipations" seems to be purely melodic.

2. Notes which *are* essential to the polyrhythmic structure are sometimes given no melodic importance. However they always occur simultaneously with at least one other essential note on another pipe; this other note then becomes the melodically important note.

Other Factors

The above account obviously does not include all the ways in which a basic rhythmic structure may be varied; it has been confined to discussing the interrelation merely between that structure and the melody of any piece. But there is a great deal of elaboration upon the basic structure which seems to derive from other considerations in the minds of the players. One of these considerations is to give "harmonic" fullness to the melody. Fig. 4 should have made it clear that the polyrhythmic technique which generates a melody does not also automatically supply the rudimentary "harmonic" sounds which accompany the melody. If I am a player of, say, a D pipe and the leader decides that we should play *Tlasikwe* (No. 7), then I will know that the basic rhythmic pattern of the piece is , and I will have learnt when to start playing that pattern in relation to the other pipes. However, this dotted-minim-plus-minim pattern is only an indication of the *distance* between my essential "blows"; it does not mean that I must sustain the first of these "blows" for the value of three crotchets, and the second for the value of two, but refers only to the precise moment at which I must play. What I do after that moment, and before my next essential "blow", is for the most part my own affair. But what I do will be affected by the size of the instrument I am playing, and my knowledge of the norms of Tswana "harmony".

Owing to the physical properties of the instruments, the higher the pipe the less effort is required to produce a sound on it, and the more frequently can these sounds be produced. Conversely, the lower — and therefore bigger — the pipe, the more effort is required to produce a sound, and the less frequently can this sound be repeated. An examination of the transcriptions of the Tswana pieces in the Appendix will show this principle in operation. What this means with regard to the underlying rhythmic structures and the norms of Tswana "harmony" is that highest pipes all elaborate greatly upon the basic patterns, apparently without regard for the resultant "harmonies", that the middle pipes are the main carriers of the melody and the main suppliers of acceptable Tswana "harmony", and that the lowest pipes simply produce skeletons of the rhythmic foundations of the piece and very little "harmony".

This is the matter put very simply; but if we look more closely we will sometimes find other factors interacting with these principles. These are what I have called "secondary" melodies and rhythms, which grow out of the variations of the basic pattern, are superimposed upon it, and assume a new individuality. Secondary melodies frequently develop between the E and D pipes in the *metenyane* and *dinokwane* groups and an example of one of these melodies, from No. 2, is given below. It is interesting to note that this melody runs *over* the main melody phrase, such that what sounds like its beginning corresponds approximately with the middle of the main melody.

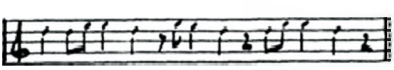

Fig. 5

The most audible secondary melodies obviously occur in the higher pipes and are sometimes doubled by the pipes an octave higher or lower. This is what happened with the above melody — it was doubled by the pipes an octave higher and for a while it achieved remarkable prominence. Secondary melodies appear to grow spontaneously out of elaboration, and seem to be dropped as soon as the players become tired of them.

Secondary rhythms are less noticeable and less important than secondary melodies, and are often interrelated, as may be imagined. The type to which I wish to draw attention is that found mainly in the lower pipes, where an essential polyrhythmic note may occur constantly just "off" its beat; i.e. a crotchet earlier or later than the moment when, in terms of the polyrhythmic structure, it "should" sound. In No. 5, for example, the lowest A pipe consistently plays one crotchet later than we should expect it to, so that when it does sound it "clashes" with the predominant G in the melody. A possible explanation for this is that the G is the first stressed note of the melody and the player may have felt that it needed more reinforcement. In tunes Nos. 1 and 2, the player of the bottom A pipe consistently plays a crotchet "too soon"; whatever the reason for this, the point is that, as in No. 5, our expectation is frustrated and a secondary rhythm is established. A clear instance of a secondary melody and rhythm working together is to be found in No. 4, where the basic pattern is slightly varied for the sake of both the secondary melody and rhythm. I have indicated this by means of dotted lines in my transcription of the piece in the Appendix.

CONCLUSION

I cannot assume that *all* Tswana pipe melodies are made according to my polyrhythmic theory, any more than I could assume on the basis of, say, the Chopin *Etudes*, where physical movements generate the music, that all Western piano music therefore grows out of physical movement. It is indeed possible that some Tswana pipe melodies may be founded on song, as Kirby argued, but the proportion of vocally inspired pipe melodies to those based on polyrhythm can be established only by further investigation. I am satisfied, however, that all the tunes I recorded are founded on the more abstract structural principle.

ACKNOWLEDGEMENTS

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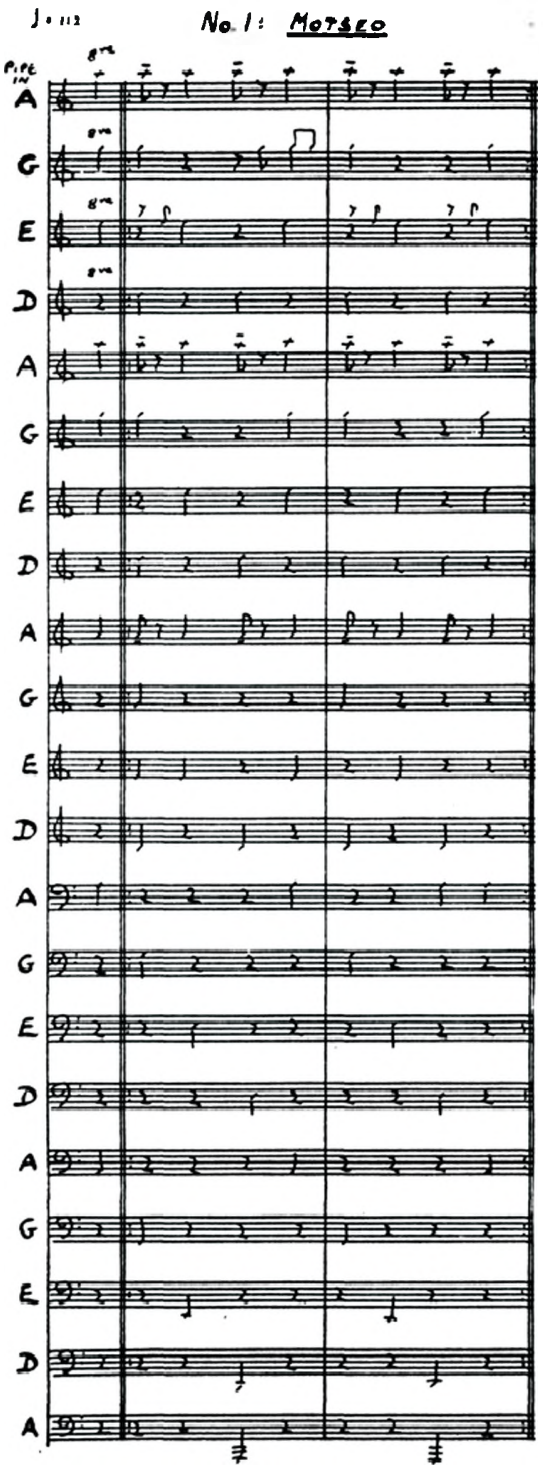
I wish also to thank Professor John Blacking for his help with the recordings and for his advice and criticism during the various stages of the work, and Dr. Hugh Tracey for his preliminary suggestions about its scope and direction.

Transcriptions of the pipe pieces are here printed in full score in which some of the characteristic variations are indicated.


No. 1: Motsco
Pipe in
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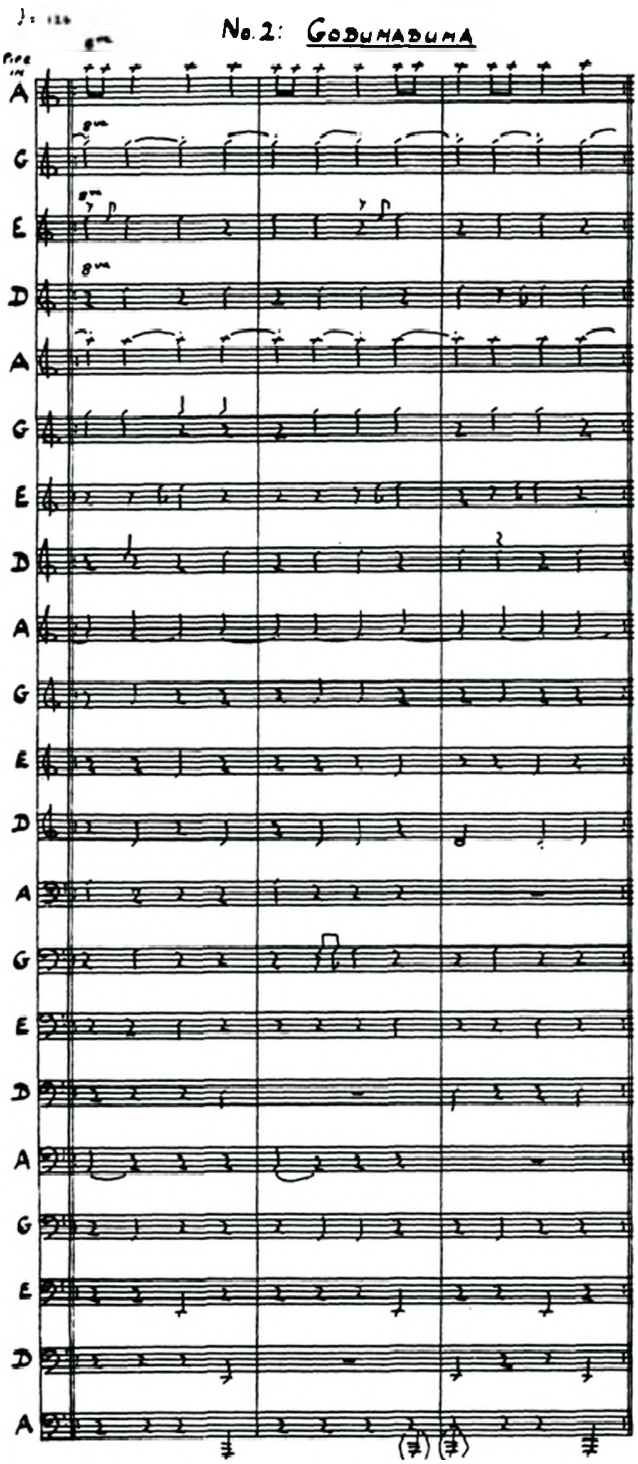
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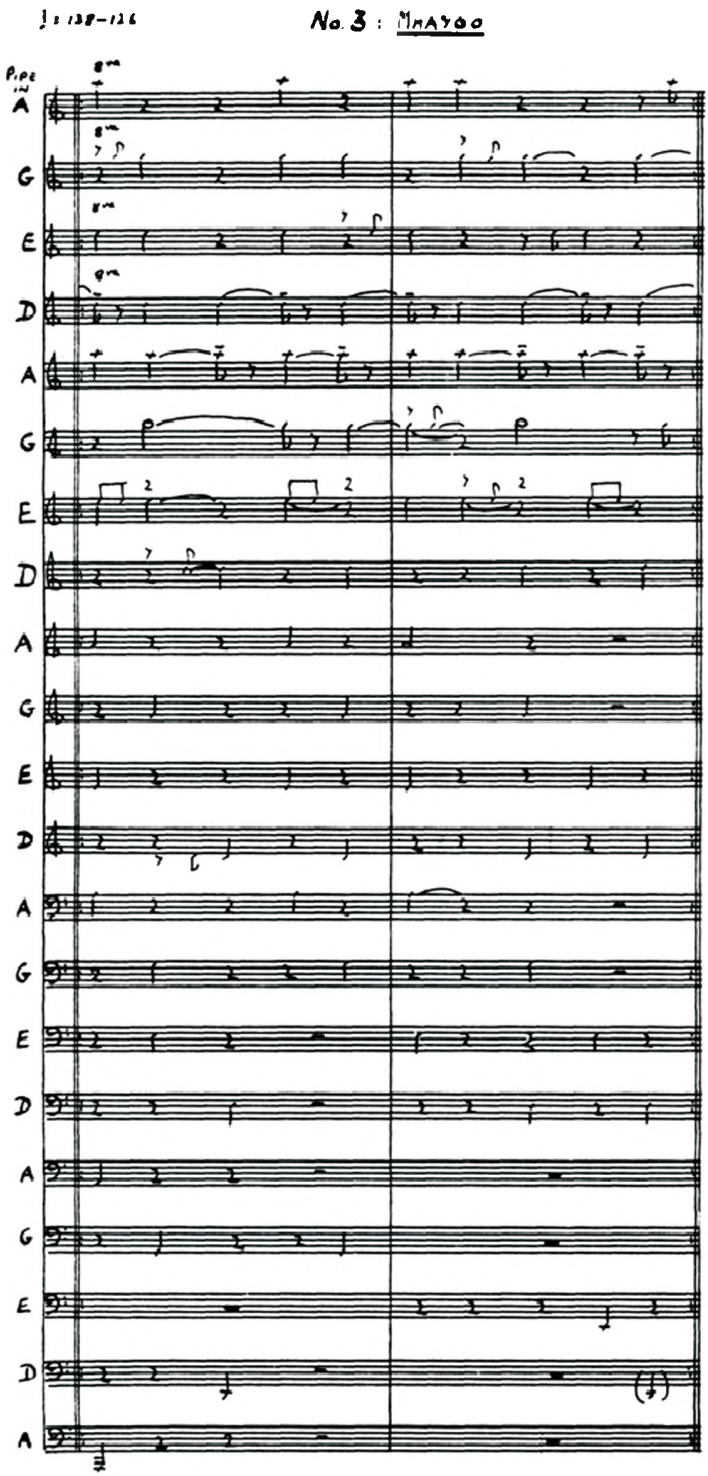
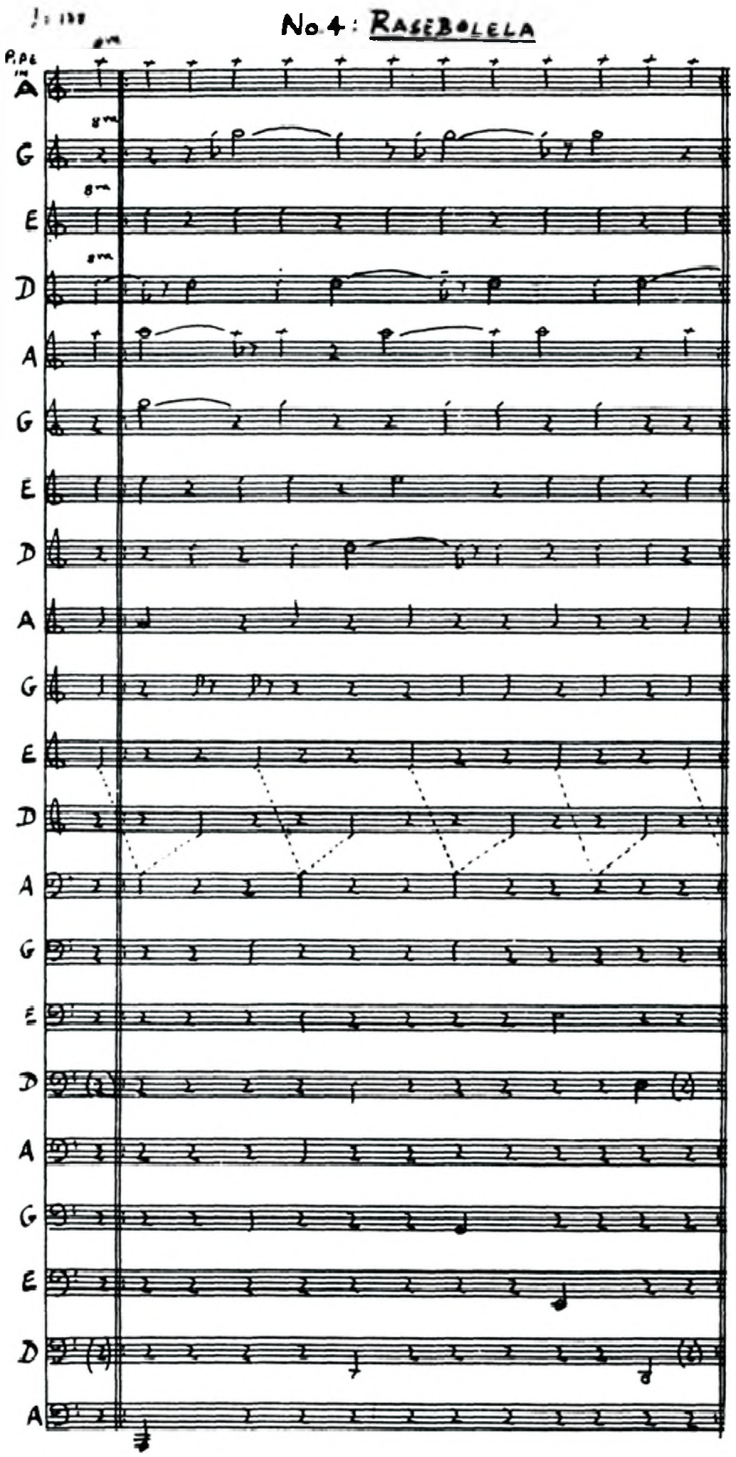
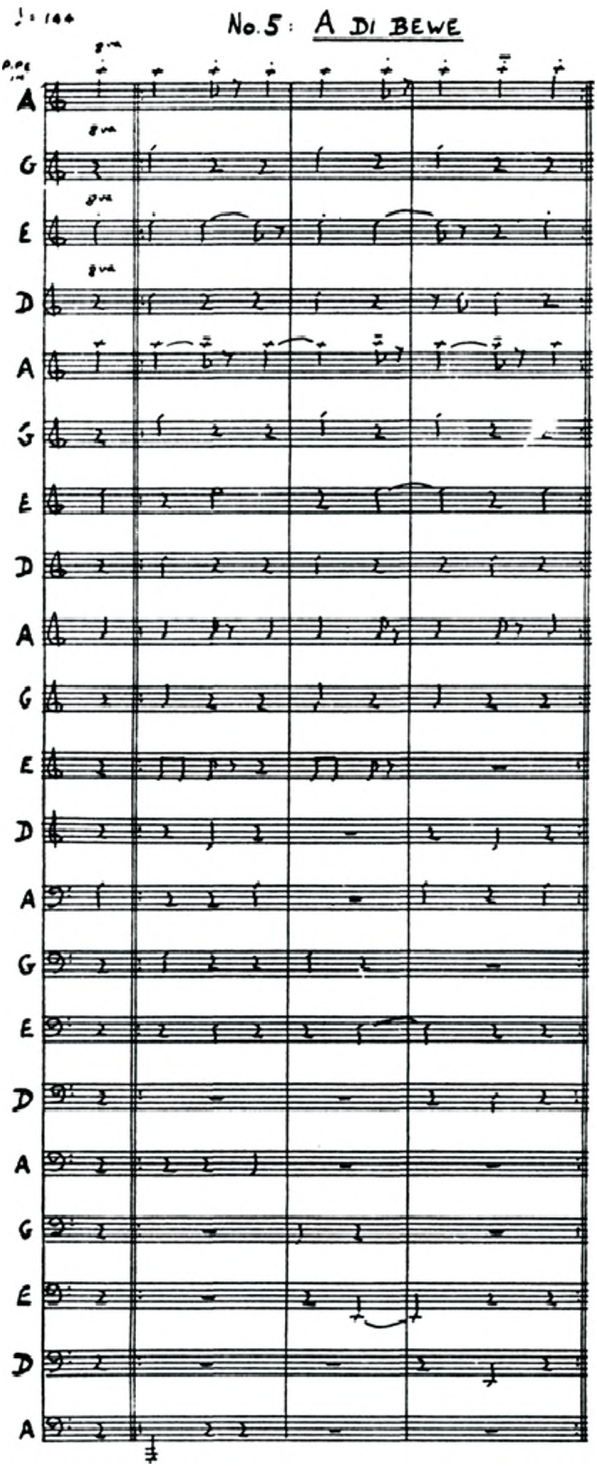

No. 3 : MMAYOO


No 4 : RASEBOLELA


♩= 144
No. 5: A DI BEWE
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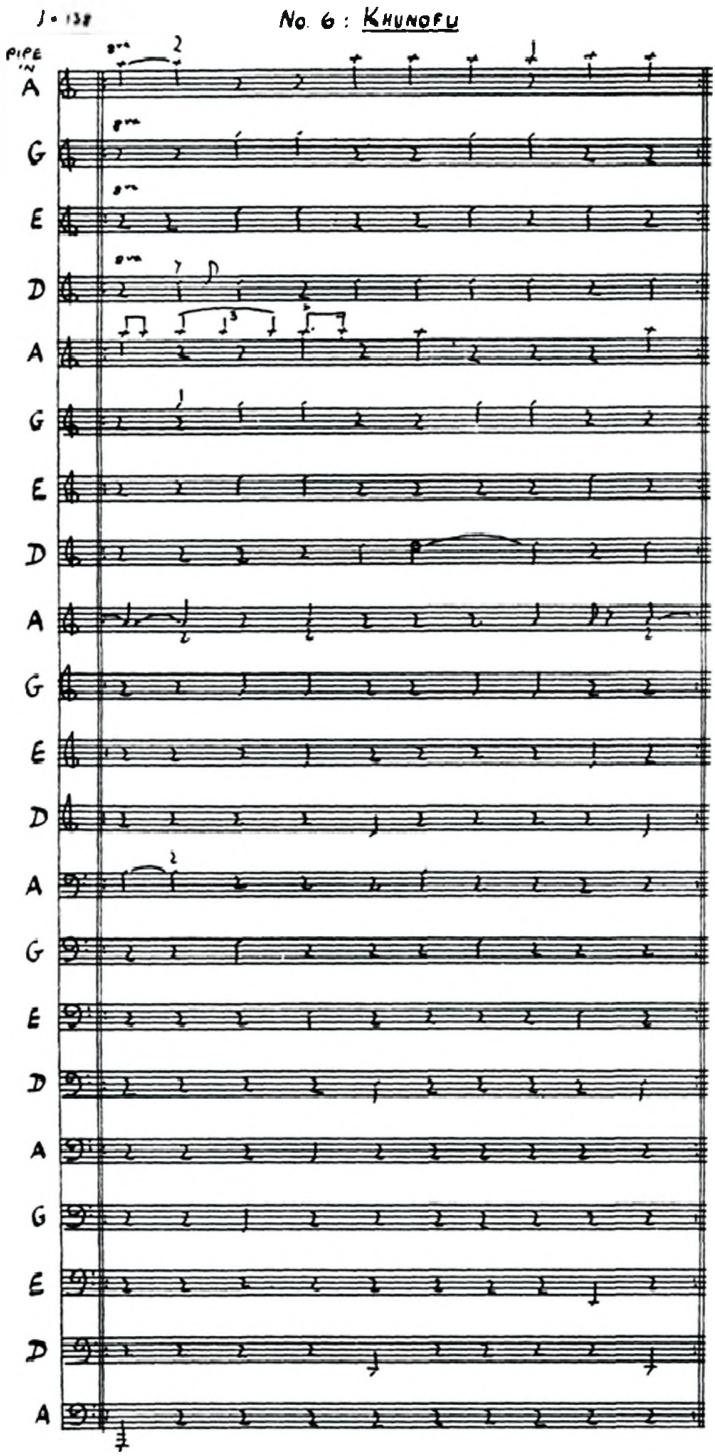
No. 6 : KHUNOFU
PIPE IN
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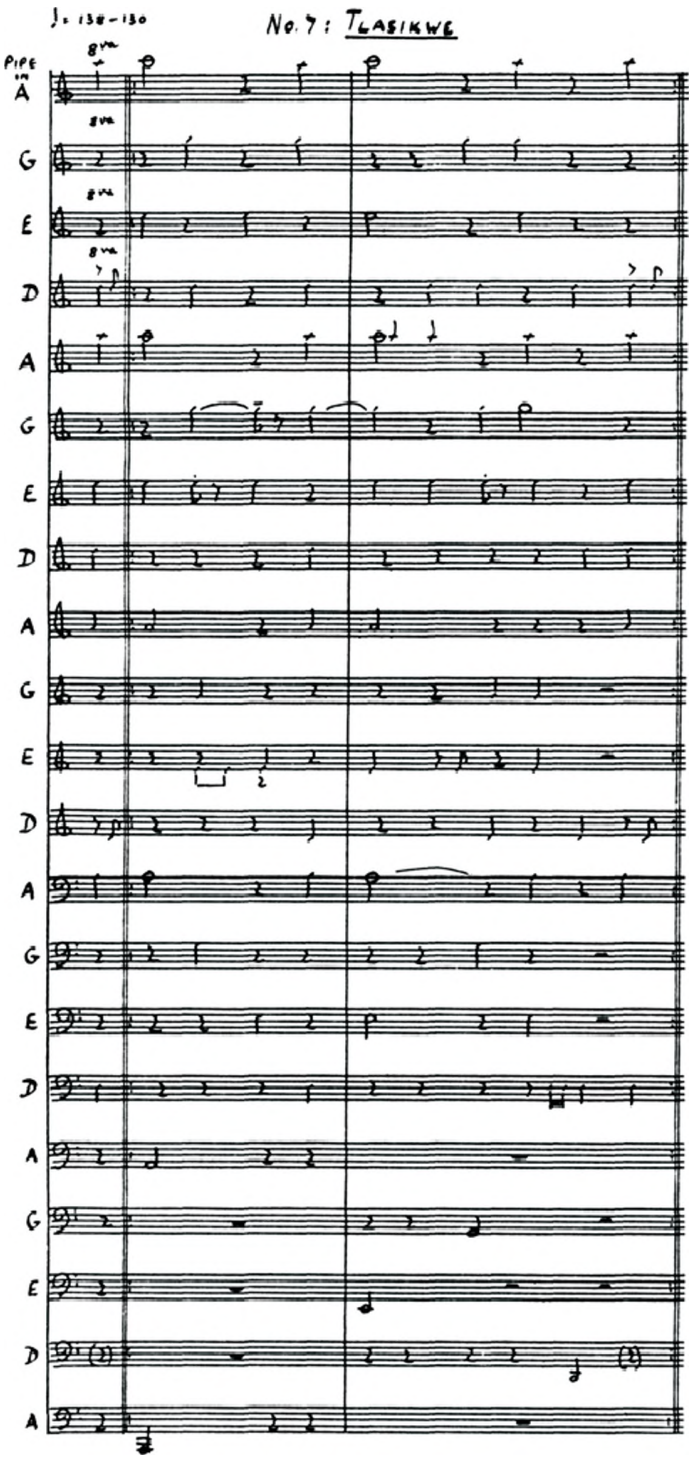
♩= 138-130
No. 7: TLASIKWE
PIPE IN A
8va
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