The Psychology of Music

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12 Rhythm: tonality's poor relation

If certain experiences result whenever a human being, regardless of race, creed, or colour, encounters particular musical sounds, we might expect music from very different cultures to have certain things in common. In an interesting account, Revesz (1953) attempts to explore the origins of music, and tries to identify the basic core of music by finding common elements within the music of different cultures. He concludes that every form of music, from so-called primitive music through to the complex polyphony of the West, is characterized by three common elements. These are (a) fixed intervals, (b) transposition of intervals to different pitches, and (c) the use of such intervals in heterogeneous, rhythmically articulated tone combinations. More specifically, the use of tonal rows containing some intervals which are readily recognizable, such as seconds, seems almost universal. According to Revesz, the octave relationship is found everywhere, and some other 'framework tones' are fairly widespread. Indian music, for example, with its quarter tones, is remarkable more for the similarities it has with Western tonality than for the differences. The observer is able to hear tonic and dominant notes and may even notice that the quarter tones themselves sound more in the nature of artistic deviations, rather than an incomprehensible scale. The fact that tones occurring in 'our scale' are also to be found in the scales of other cultures is also made by Mersenne (1957), in the work *Harmonie universelle*, cited by Pikler (1966). Again, the manner in which many African and South American peoples sing chants in octaves attests to the inevitability of the octave relationship. After all, when men and women wish to sing together, and find that their voices have different ranges, the conditions are created in which the octave must naturally emerge.

It is not, surely, just a matter of chance that there are such widely distributed similarities in terms of certain framework tones. Differences between musical cultures are likely to concern particular conventions, or differences in the emphasis placed on different aspects; such differences should not lead us to overlook the fact that there are often similarities in terms of certain very basic musical events. If we return again to Revesz's definition of musical fundamentals, however, we can see that his is the type of definition likely to be offered by someone from our own musical culture. The emphasis is placed upon the tonal aspects of music, whilst the rhythmic element manifests itself almost accidentally through the organization of the tonal elements themselves. According to his definition, rhythm has no independent existence. Revesz's definition, therefore,

whilst of value in highlighting certain tonal similarities, is deficient in the role it assigns to rhythm. Such a deficiency is to be expected when the basis used is our own Western classical tradition, which is tonally extremely sophisticated, but rhythmically naïve. Stravinsky's magnificent 'Rite of spring', for example, is often felt to be the height of rhythmic sophistication. Compared to much other Western classical music, this might be the case; compared to some so-called primitive music, the use of rhythmic devices is unsubtle. The author recalls a brief exchange with a tuba player, at that time playing with a well-known London symphony orchestra, and also with the Mike Gibbs orchestra which is an advanced modern jazz band. After finishing a concert with the jazz band, the player replied, in answer to a question, 'We're doing the "Rites" tomorrow. After this lot, it's like "Polly put the kettle on".'

The role assigned to rhythm, as one of the corner stones of music, therefore, needs more emphasis than we tend to give it. To begin with, we need to define what is meant by 'rhythm', in music. Many notable workers in the field of musical abilities (e.g. Bentley 1966a, Thackray 1969) have proceeded on the assumption that a rhythm is, in essence, rather like that which is left if we remove all tonality from a tune, i.e. we are left with elements which differ in intensity (accent), which have variable time intervals between them, and which themselves are of variable duration. Again we see the notion that rhythm is inextricably bound up with tonality, and has no independent existence. It is just the stuff which is left over when we take out the tonal component. Certain of the tests of rhythm which have been produced actually incorporate rhythm into a tonal framework (i.e. Thackray, Wing, Bentley). The problem centres around the idea that a rhythm is specified by intensity, time intervals, and duration. It is the opinion of this writer that the last of these three parameters, duration, is a characteristic of tones, and from a psychological point of view has nothing to do with rhythm. Rhythm is seen instead as an order which the listener imposes upon sequences of events, solely on the basis of their relative intensities, and their relative times of onset. It is argued that changing the duration of elements affects the rhythm in no way, provided accent and relative onset times do not change. After all, if we play a short tune to someone, and then ask him to clap the rhythm (when he claps, of course, all the durations become very short, and the same), provided he indicates that he has correctly perceived the relative onset times, and the accents, we say that he has produced the rhythm correctly. Rhythm, from the listeners' point of view, is thus (in part, at least) a system of temporal anticipations. It involves the ability to infer that particular events will take place, or commence, at certain specific points in time. Whether they actually do or not is another matter. On the whole, in Western classical music, they do. In jazz, and in some 'primitive' music, they frequently do not, so that the listener has to know where they ought to come.

Music in the Western classical tradition, although tonally very complex, is usually rhythmically simple. There are two possible reasons for this. Firstly, as stated earlier, the rhythm of a piece tends to be carried by the notes themselves,

whereas, in rhythmically more complex music, the rhythm is to a greater extent expressed independently of any tune, perhaps by way of drums, gongs, whistles or pipes. (Indeed, a study by Vidor (see Mursell 1937a, p. 151), in which rhythms carried by tones, and rhythms carried purely by a series of taps, were compared appeared to show that the ability of subjects to reproduce the one was only marginally related to their ability to reproduce the other. In other words, if this is the case, the rhythmic abilities demanded by Western classical music might have little to do with those demanded by African music or jazz. On the other hand, the difference might be one of degree, rather than type.) Secondly, Western music has confined itself largely to the use of metres involving units of two, three, or four beats. (The term 'metre' is used here to describe the basic, underlying pulse of a piece of music, around which the different rhythms are fitted.) Even the distinction between two and four time is in a sense artificial, since what can be grouped in fours can also be grouped in twos. Pieces involving an underlying metre of five, such as Holst's 'Mars', from the well-known 'Planets' suite, are the exception rather than the rule. Until recently, the tyranny of twos and threes has also dominated jazz. Dave Brubeck, the much maligned jazz pianist, was one of the first well-known performers to try experiments with 'new times'; in fact, the Western audiences were so amazed to hear attempts at five-four time that the very moderate little tune 'Take five' became a top seller. So successful was this, that Brubeck was tempted to explore the unknown reaches of seven-four ('Unsquare dance') and nine-four ('Blue rondo à la Turk'), all of which involved an invariant underlying, repetitive riff (or repeated tonal sequence), whose only virtue was that it fitted the time sequence in question, and probably served as an anchor to prevent the musicians getting lost. The early attempts to improvise over these time sequences were rather moribund, and, in the case of 'Blue rondo', the sequence lapses into an easy four-four swing for the solos, on account of the difficulties involved in *feeling* these unaccustomed metres.

There, in a nutshell, is the problem. Fed an unvarying diet of metres involving twos or threes, the Western listener is unable to feel anything else. There is no intrinsic reason why five should be impossible to feel, but for most of us this is the case. Imagine the chaos that would be caused on the dance floor by a Boston Five-step, or by Tea-for-Seven-cha-cha-cha-cha-cha-cha-cha-cha. Put one of the crudest examples of complex time, such as 'Take five', on your record-player and ask a friend to tap his feet to the music. More than likely he will say something like, 'It's got no rhythm.' Compare now the Western preoccupation with twos and threes, and the occasional foray into the realms of five and seven, with other forms of music, in which the basic metre might be twenty-four, with different subdivisions for the rhythm and the tune as in an Indian piece described by Meyer (1956); or an African piece described by the same author, in which rhythms of three-eight, two-four, three-sixteen and twelve-eight occur simultaneously, with the different patterns commencing from different points of the basic metre (whatever that is); or a recent composition by guitarist John McLaughlin entitled 'Binky's beam', in which improvisation takes place in a completely natural-sounding fashion over a basic metre of nineteen-eight.

When we describe music as 'primitive', therefore, we should beware. In tonal terms, the description is to some extent justifiable, perhaps, but in rhythmic terms our own music is largely primitive compared with many other cultures. Some authors have not always made this distinction. Revesz, for example, writes of some music from the Vedda tribe of Ceylon, with charming naïvety. 'The rhythm is very simple,' he writes, and, almost in the next sentence, 'the frequent change in time-outline makes it very difficult to determine the beat.' In fact, without a grasp of the basic metre, or 'time-outline', it is impossible to see the function of the rhythms which occur. Revesz's statement (p. 221) that the rhythm was very simple should thus be interpreted in the light of the later statement that he found it difficult to tell where the beat was. (It is interesting to see how transcriptions of primitive music, by Western observers, often involve the forcing of the phrases into Western-style bars of three or four beats, occasionally five; this sometimes does great violence to the piece in question.) By way of contrast, we can look at some early research by C. S. Myers (1904), carried out in Borneo. Through careful observation, Myers to a very large extent avoided the pitfalls which appear to have snared Revesz. He studied the rhythmic playing of a Sarawak Malay, who was beating a large gong-type instrument called the tawak, in the context of a normal group music-making session. Initial observation led him to believe that the tawak was not beaten in any regular or systematic fashion, but apparently randomly. To examine this impression, he substituted a Morse key for the tawak, and analysed the time intervals between strokes. The subjective impression, that the gong was beaten in no regular fashion, was confirmed; but Myers did not conclude that the apparently random irregularities stemmed from the performer's lack of rhythmic sense. It is clear from the report that initially Myers was to some extent befogged with the Western notion that if a metre is present it will manifest itself in the form of a series of equidistant, and regular, sounds or groups of sounds. This is not the case, and his final conclusion is very perceptive, more so when one considers that the research was carried out in 1904. He concluded that the musicians he heard were capable of remembering, using, and improvising upon rhythmic structures in which the main pulses were separated by different, and varying time intervals. Myers wrote, 'The faculty [i.e. the one described above] they carry to a degree which lies so far beyond the power of civilized musicians, that the latter may reasonably be sceptical as to the possibility of its occurrence among less advanced people.' Indeed, this scepticism still exists today, some seventy years later.

It is the intention later to give some example of complex rhythms, taken from tape-recordings of Bantu and pygmy music, in the possession of the author. Unfortunately, the ones given are by no means the most complex, since these latter elude the author's skill. Examples will also be given from some modern

jazz. Before producing the evidence, however, there is one more topic to consider, namely 'syncopation'. There seems to be a fairly widespread belief that the major difference between jazz and classical rhythm lies in the heavy-handed use of syncopation in the former. In fact, there are two sources of error here. Firstly, syncopation is only one aspect of jazz rhythms, and possibly not the most important; and secondly, the classical view of what syncopation entails tends to be rather simplified. In addition, many musicians who do not play jazz regularly have the impression that the notes, in jazz, are made to 'swing' by the simple expedient of alternating long ones with short ones, to give a rhythmic pattern of a daa-di-daa-di-daa-di-daa or 'trochee' type. Far from adding the magic ingredient of swing, such a stilted rendition has a completely stultifying effect on the music, and has very little to do with sounding 'jazzy'. Furthermore, jazz music has its origins in the songs of the American Negro, which are in turn to a great extent influenced by musical, and particularly rhythmic, traditions coming from Africa. On the whole, syncopation is not a characteristic of African music, but merely a device given great prominence by the big bands of the swing era, like Glen Miller, Artie Shaw and Benny Goodman. Meyer (1956, p. 239) is very perceptive on this point. He writes, 'The very essence of African music is to *cross the rhythms*. This does not mean syncopation. On the whole African music is *not* based on syncopation.' This same point applies as much to jazz as it does to the culture in which jazz has its roots. Simple cross-rhythms do occur in classical music also, usually involving crossing two beats against three.

What makes the rhythmic aspects of much primitive music so difficult to comprehend, when compared with our own Western tradition? The answer lies in the deliberate crossing of metres to produce either ambiguity or apparent confusion. Suppose we take as a basic component the sound of a drum struck regularly at equal time intervals, and use this as our basic metre. We might represent this visually in terms of a number of black pegs stuck into the ground at equal intervals, thus:

Fig. 34. Sample 'metre'

So far so good. We can readily appreciate the simple recurrence of an event at regular intervals, both in the auditory and in the visual mode. The only slight hint of uneasiness might stem from the fact that we cannot tell how they are grouped. Are they in pairs, threes, fours or what? To add to the confusion, we might suppose that the first, third and sixth strokes (or pegs) are accentuated, offering us two alternative hypotheses about grouping.

At this point a second sound joins in, again perfectly equally spaced; we

might represent this sound by white pegs stuck in the ground, in the following manner:

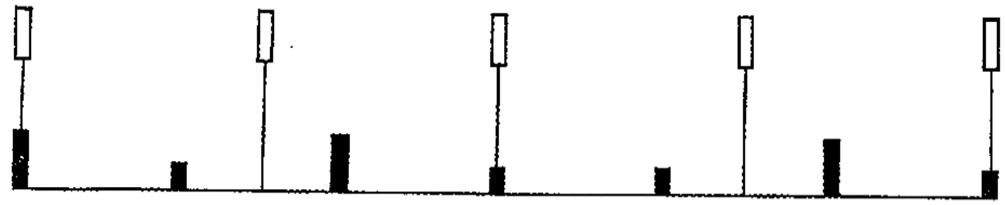

Fig. 35. Two conflicting metres

Because of the way they are spaced, the white pegs coincide with every fourth black peg. This creates an ambiguous state of affairs, in which the beat appears to alternate between a 'two feel', as indicated by the white pegs, and a more rapid three to the bar created by the accents occurring on the first, fourth and seventh beats where the pegs coincide. The ambiguity is heightened by the perverse accents on the black pegs, which offer us no help at all. This very simple two-across-three rhythm is fairly straightforward, and is often encountered in the music of Latin American countries. Our perception of it seems to alternate between twos and threes.

The two possible ways of hearing a two-across-three rhythm are given in normal notation, in fig. 36. Arrows indicate accents. In a similar way, Deutsch (1974) has made an analogy between particular auditory phenomena and the figure-ground illusion, though in a more experimental context. Apart from their

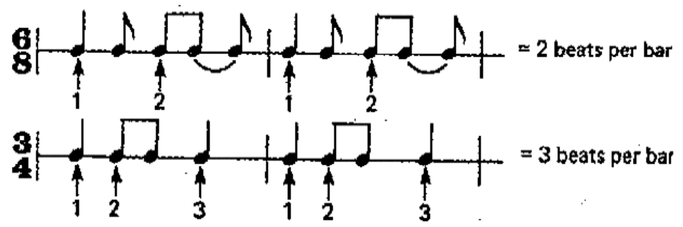

Fig. 36. Alternative ways of perceiving fig. 35. Do the black pegs or the white pegs provide the basic metre?

value as illustrations, it is not clear how good such analogies are. Exactly this device is used by Leonard Bernstein in the piece, 'I wanna be in America', from *West Side Story*. In terms of notation, the two possible ways of hearing the theme are given in fig. 37.

Again arrows are used to indicate accents. However, these accents may be subjective rather than real. Depending on how we group the notes (i.e. the way in which we dispose our subjective accents) we hear the rhythmic groups in one fashion or the other. It is almost as though, when presented with an ambiguous rhythm, we assign some type of psychological accent to particular notes, to find out how the stimuli are grouped. Unfortunately, in this case, there are two

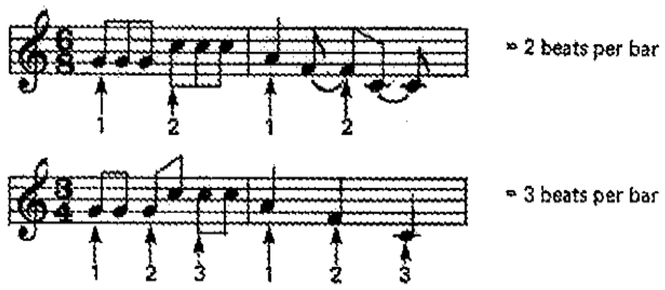

Fig. 37. Alternating perception. Example from West Side Story

ways to do this, and so we are unable to come up with any conclusion as to how the elements are grouped.

Up to now, we have coped fairly well, and we understand the nature of the ambiguity. But now another percussion instrument joins in, again with equally spaced strokes, but starting, apparently, from a completely different point. The strokes are alternately heavy and light, and are represented by circular pegs

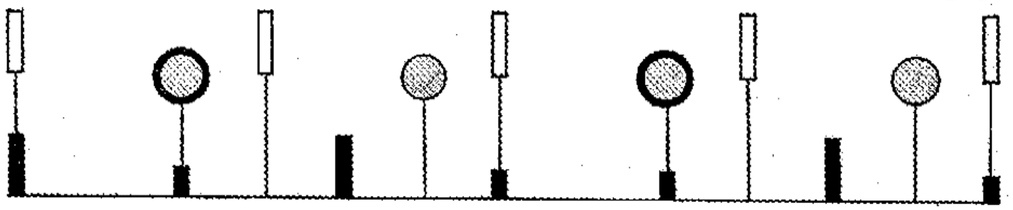

Fig. 38. Ambiguous metre with three instruments

below. The circular pegs appear to be stating a pulse of two, like the white pegs, but starting from a different point. On the other hand, they also imply a further subdivision of the white pegs into triplets, by falling at a point two thirds the distance between each white peg.

The next instrument to join in plays not equidistant strokes, but in groups of

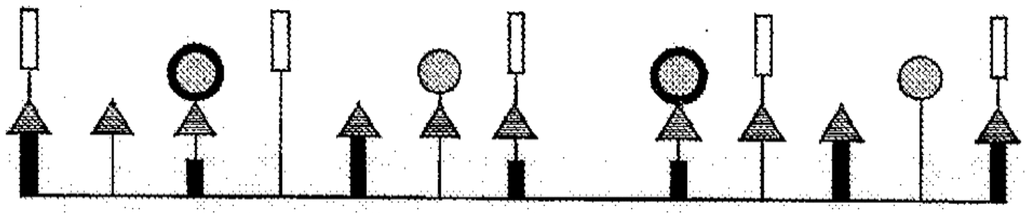

Fig. 39. Ambiguous metre with four instruments

three, as indicated by triangular pegs. This now is a statement of a fast four, with the last stroke missing but played at a speed which does not fit with anything else in any obvious way. For example, the white pegs accentuate respectively the first beat in the first group of three, then the gap between groups, then the last of the third group, and the second of the last group. We

can just see, from the coincidence of white pegs and triangular pegs, that this cycle is about to repeat itself, thereby threatening to make the whole thing into just one bar. Or is it really three bars of four-four? Or four bars of three-four? And just which four and which three are we talking about?

The crossing of metres, as illustrated in the above simple example, can be carried to extreme lengths, with each additional instrument implying a different grouping, some of which are barely recognizable. In addition, it is quite possible for a player to play his instrument in a purely aesthetic manner, using rhythms which accentuate first one metre, then another, so that there is in fact no underlying regularity in the strokes. (It is apparent that the distinction conventionally made in the musical literature between 'rhythm' and 'metre', in which rhythm is seen as a pattern or group superimposed on top of a basic beat or metre, is difficult to make in rhythmically advanced music. The basic metre is not always easy to find, and the superimposed rhythms may in fact serve to introduce a new, crossed metre. In addition, two metres may combine to produce rhythmic patterns not related to either. The distinction between rhythm and metre which seems so obvious when there are three beats in every bar, and a tune that fits over the top, is probably less useful when music is rhythmically more sophisticated.) In addition, particular groupings can be accentuated either in a conventional way, by playing louder, or by actual omission. To appreciate this, it is of course necessary for the listener to realize that an omission has taken place, if he is not to be deceived and lose his bearings.

So far, the argument has been illustrated with home-spun examples, and it is fitting now to turn to some instances of complex crossed rhythms taken from actual performances. The first example comes from a recording of a live concert by Miles Davis, the modern jazz trumpeter, and his band, of a tune called 'Seven steps to heaven'. The tune, transcribed below in four-four time, starts off with a fairly simple opening phrase of seven notes, presumably as a reflection of the title. This is followed by a full bar's rest, with a final repetition of the last three notes of the opening phrase. This should be apparent even to those who do not

Fig. 40. Notation, not precisely representing musical events

Fig. 41. 'Viennese waltz'

read music. The only thing of interest, with regard to these notes, concerns the encircled G. Although, in strictly temporal terms, this is part of the second beat, its real function is to accentuate the third beat of the bar. It is not part of the second beat, but the third beat brought forwards by a small amount. It is

impossible to write down in notation the exact way in which this is played, without venturing into absurd fractions of a beat, but the above is as nearly correct as one can write it. The situation is analogous to the problem of the 'Viennese waltz', in which the first beat of each bar is shortened, and the second extended by a fraction. Written thus, and played in a precise fashion, the end result has none of the essential lift of the 'Viennese waltz', which is ultimately a matter of *feeling*. In a similar fashion, the jazz example above is also a matter of feeling, which cannot be precisely communicated via notation, but relies on the performer to understand the effect which is required.

However, the interest in the Miles Davis tune lies, not in the tune, but in a drum break inserted into the silent space in the middle, by drummer Tony Williams. For those who are willing to try and work it out, it would be written as follows:

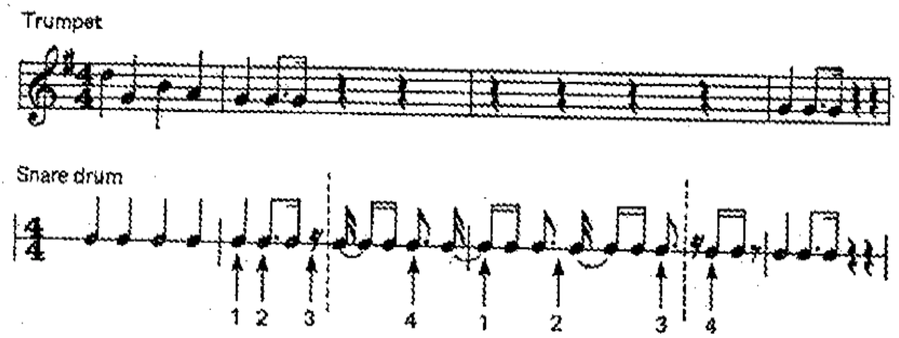

Fig. 42. Improvised drum break from 'Seven steps to heaven'

We can describe what Williams does, intuitively, in terms of a mathematical transformation. The drum break, enclosed between the dotted lines in the above transcription, has a duration of eighteen semiquavers, equivalent to one bar and one quaver at the stated tempo. Williams transforms this time interval into three bars of two-four time, making each crotchet of the two-four equal to three semiquavers of the original time. We might thus write it in two ways:

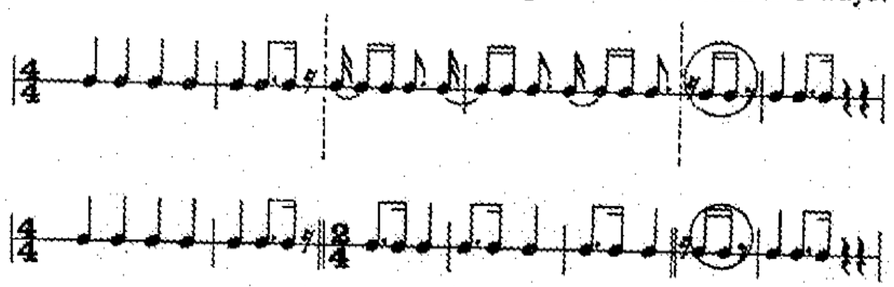

Fig. 43. Alternative ways of perceiving snare drum solo

In each version, the two circled notes are unambiguous, and clearly serve as an introduction to the last three notes. The intention behind the break, however, is clearly to confuse the existing rhythm by introducing a completely new one,

intact in itself, but only very obliquely related to the main metre, and which occupies exactly the same amount of time as the space between the two phrases. In order to come back with the ensemble at the correct time, the other instrumentalists have to preserve in memory the main metre through the drummer's attempts to destroy it. Characteristically, in this kind of situation, a sly grin may pass across the face of the drummer if the other musicians fail to grasp instantly what he is doing, and make an incorrect or ragged entry. In a sense, the drummer may be testing the rhythmic abilities of his comrades, and may well be filled with glee if he can lead them astray. In other words, it is fun.

Meyer describes an exactly similar example from Hindu music, taken from Sargeant and Lahiri (1931); interestingly, Meyer describes the situation as a contest. He writes (quoting from Sargeant), 'It often happens that a *vina* player and a drummer will engage in a friendly contest to see which can confuse the other into losing track of the *sam* (the structural beat).' And later, 'The *vina* player uses all sorts of ruses to disguise the *sam* . . . The drummer will meanwhile seek to confuse his opponent by insisting on his cross rhythms as though they were the true basic metre, playing metres of seven, or five, against the latter's four or three and so on.' This kind of rhythmic competition which takes place in Hindu music is clearly very similar to what sometimes happens in jazz, though there may well be differences in the lengths to which this is taken. By contrast, this kind of thing is most unusual in Western classical music; in fairness it must be added that the scope for this type of melodic/rhythmic interplay is necessarily greater where the performers can improvise, rather than having to adhere strictly to a written score.

The second example comes from an anthology of music prepared by Arom and Taurelle (1965), collected from amongst the Ba-Benzele pygmies. The actual piece depicted is one used as a celebration after returning from the hunt, and involves a rhythmic structure known as Djoboko. Men, women and children all participate, indicating that, in this culture, a sophisticated sense of rhythm is a norm. The piece involves flutes, percussion of various kinds, chanting and something very like yodelling. Because of the cross-rhythms used, it is impossible to specify a definite time signature for the piece, though a regular series of accents (what Mursell refers to as a takt, or regular beat) is detectable. Similarly, whilst there is a very strong sense of key, in the sense that the notes are modally and tonally consistent, the actual key is ambiguous.

The piece starts with a single performer playing a flute which produces only one note. The flute is played in a series of short non-equidistant bursts, and the player sings in between puffs. In this way, the one player produces a basic takt or beat as well as a polyrhythm, simultaneously. (Interested readers might like to try maintaining a rhythmic pattern on a child's recorder, and improvising sung passages in the gaps without any change in the pattern played on the recorder.) This introductory pattern is written below, and given a time signature of six-four. It is arbitrarily written out in the key of F. The voice part is sung in a pleasant treble voice, and the motif is shown in the top line. Simultaneously,

the singer interjects a basic metre into this motif on the flute, which plays the note C′. The flute pattern is shown in the lower line.

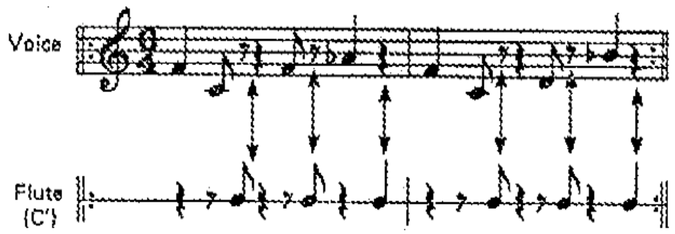

Fig. 44. Flute/voice motifs of Ba-Benzele pygmies

The arrows indicate where the flute notes come, relative to the voice. The voice motif also changes from time to time, but the flute rhythm remains fixed. The effects of the interplay between voice and flute are interesting. At times, the flute seems to stand out from the voice (see an investigation of this phenomenon in Dowling 1973) and at such times creates a rather complicated counter-rhythm; at other times it becomes perceptually absorbed into the voice line, whereupon it becomes simply part of a tune. Perception seems to alternate between these two extremes. The first performer is very quickly joined by a second flute, whose instrument plays the note D′, that is, one tone away from the first flute. As nearly as possible, the pattern played by this second flute is represented in fig. 45(a). In itself, this pattern looks very rudimentary. There is one small catch. Written in the above manner, we need to synchronize the second flute with the first by making the first beat of every bar for the second player coincide with the last quaver of every bar for the first player. In other words, viewed through Western eyes, the two rhythms do not start from the same point.

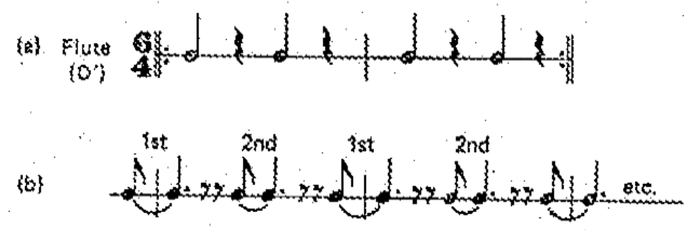

Fig. 45. Timing of D′ flute relative to C′ flute

We might write it as shown in fig. 45(b). The effect of this rhythm is to imply a slow duplex metre over the existing one. However, notice where each of the D′ notes falls with respect to the C′ of the first player. The first D′ is preceded by a C′, just one quaver before. The second D′ is preceded by a C′, which occurs one crotchet before. Since the two flutes are only one tone apart, the effect is similar to one flute playing an ascending two-note motif, and perceptually it is almost impossible to see these tones as separate. Note that, although the cycle repeats itself, it has a peculiar lop-sided feel since the ascending two-note motif is alternately fast and slow.

As the piece continues, more patterns and voices join in; to describe the effect of each new arrival individually would take several pages. A transcription of some of the parts involved, however, is given below, up to the point where the solo singer commences; the whole thing up to this point is simply a 'backing'. The transcription should merely be taken as a sample of some of the things which are going on.

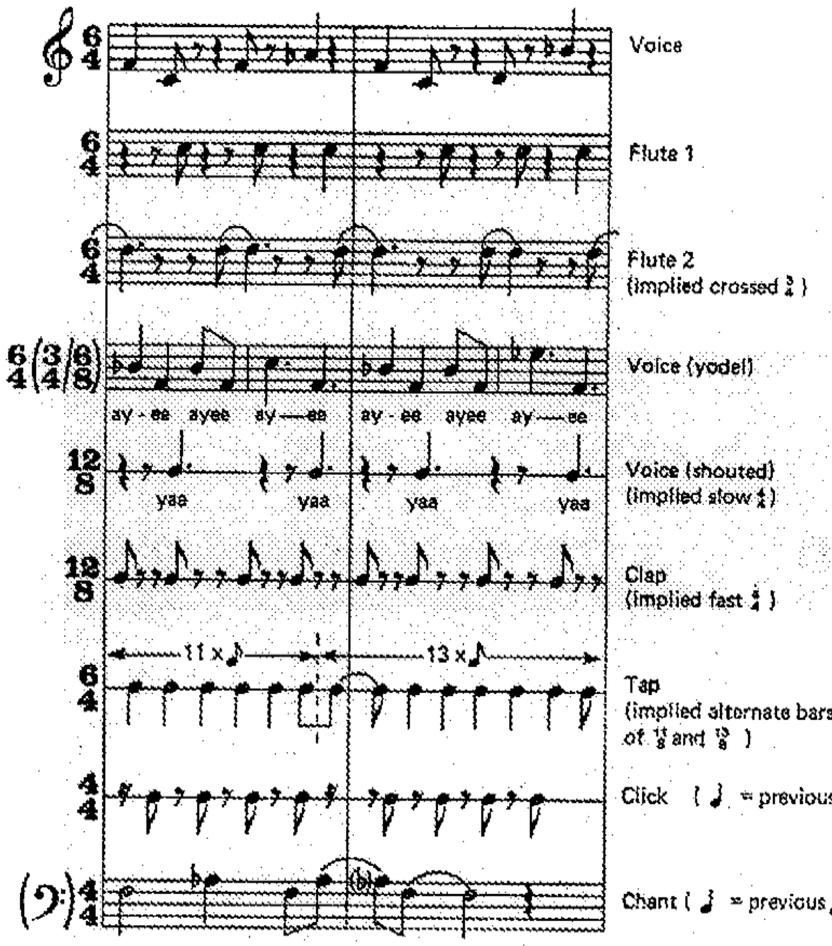

Fig. 46. Sample of pygmy Djoboko

In the above transcription, certain parts have been written out in four-four time for clarity. These implied quadruple rhythms, however, are based on a beat which is equivalent to a dotted crotchet in the six-four rhythms. Note the tapping noise, which, in alternate bars, accentuates an on-beat, then an off-beat. Also, the clicking sound, which is displaced by a semi-quaver in alternate bars. Finally, the chant, whilst preserving its temporal form, appears to start from different points in the bar on different occasions, so that the first note is not always the first beat of a bar in terms of the way we have construed the rhythms. (The way

we have construed the rhythms, in terms of Western notation, may well have nothing in common with the way a pygmy construes them.)

If one were asked to crystallize the essence of the rhythmic ability which underlies high level rhythmic performance, one might say that it consists of the capacity to mentally impose different groupings upon temporally spaced events. There can be little doubt that the ability of primitive musicians to create alternative groupings is in excess, possibly greatly in excess, of that normally displayed by Western musicians. This leads us to a very interesting point. It is extremely difficult, and for the author frequently impossible, to give a precise transcription of certain rhythmic patterns, or particular cross-rhythms, in terms of standard musical notation; and yet the whole of Western music relies on this form of notation. In other words, the system we use is inadequate for the portrayal of complex rhythms without becoming unintelligible. The bar lines operate in a tyrannical manner, insisting that the first beat always comes in the same place, and making any event which crosses a bar line into some sort of exception, to be represented by a clumsy 'tie' line, identical to that used to indicate phrasing. The basic units presuppose that any subdivision of a note is going to be made in terms of halves or quarters, so that even a simple triplet involves writing in the number 3, accompanied by the same curved line we also use for ties, and for phrasing. If, for example, one wishes to subdivide a note into five, it is again necessary to resort to numbers, as the notation alone cannot represent this event. No matter how much we divide or multiply a single beat by multiples of two, there is no way we can produce five. In other words, the notation system, which is so elegant for the representation of tunes and chords, imposes very real restrictions upon the rhythms we can employ, since it can only represent certain rhythmic events in a very clumsy and unsatisfactory manner. Although the case cannot be proved, it is not an unreasonable hypothesis that the lack of rhythmic sophistication which characterizes much of our own music stems from our adherence to written music, and the concomitant use of a system which represents notes far better than it represents rhythms. Several workers have suggested alternative notation systems, e.g. Edwards (1940). This author writes, 'Our existing system of musical notation seems like the English system of weights and measures, to have "just growed". In fact, it seems to have grown into about as needless complication as the latter.' (See also the Klavar-System, a new type of music notation.)

There are possibly other reasons why rhythmic abilities tend to be viewed rather differently from tonal abilities. As mentioned earlier, in chapter 7, studies of musical abilities tend to reveal that a separate factor exists for rhythmic, as distinct from tonal, abilities, i.e. rhythmic abilities do not appear to be closely related to abilities involving the tonal aspects of music. This finding perhaps serves to accentuate the isolation of the rhythmic aspects from those tonal attributes which receive more attention in Western music. It should be remembered, however, that the notion that tonal abilities form a single, or unitary, entity, is simply a theory. Other workers have concluded that, in fact, musical

abilities are best viewed as unrelated, including the different tonal abilities. One consequence of the unitary theory has been to provide evidence for a view of rhythmic abilities as both separate and inferior. If rhythmic abilities are unrelated to tonal abilities (which together form a group), it is possible to have a high degree of rhythmic sense, and yet still be inept in those areas which form the main component of Western music. (By contrast, the atomistic theory renders such a view untenable, since all abilities are seen as basically independent, whether rhythmic or tonal.) Lundin (1967), for example, asks the question, 'Can we have individuals seriously defective in tonal appreciation who are still able to make good musical responses because of a refined perception of rhythmic groups?' He quotes Mursell, in answer to his question, by referring to the hypothetical case of a 'drummer with a jazz orchestra who is rhythmically effective but tonally inept'. The question, and its answer, have the tone of an employment agency urging potential employers to consider employing the handicapped, on grounds that they can still make a useful, if limited, contribution. The unfounded preconceptions implicit in the argument are clear. However, the notion that a drummer might pursue his occupation because he does not have the abilities which would enable him to aspire to the tonal aspects of music should apply just as much to 'drummers' in symphony orchestras as to 'drummers' in jazz bands; it is equally false in both cases. More importantly, however, the inverse of the argument can also be considered from the point of view of the unitary theory. We can ask, 'Are there individuals seriously defective in rhythmic appreciation who are still able to make good musical responses because of a refined perception of tonality?' In answer to this question, we might refer to the hypothetical example of 'the violinist in a symphony orchestra who is tonally effective but rhythmically inept'. When we turn the illustration around in this way, the real injustice of this condescending view becomes apparent. The violinist in a professional symphony orchestra, who is 'tonally effective but rhythmically inept' simply does not exist, since both kinds of abilities are demanded for the performance of his job. Similarly, the drummer, to do his job properly, also needs both kinds of abilities. It is inconceivable that he could perform in any kind of meaningful or artistic manner if the tonal aspects of the music were meaningless to him. At this level then our hypothetical 'rhythmically inept' violinist, and our 'tonally inept' drummer, are mythical creatures. True there are probably a great many bad amateur jazz bands with tonally inept drummers. There are also a great many bad amateur symphony orchestras with tonally inept violinists. The conclusion must be that, in all areas of musical performance, a serious deficit in any one musical capacity makes the achievement of a high overall standard of performance all but impossible.

The finding of a separate factor for rhythmic, as distinct from tonal, abilities, which has emerged from a great many studies, is also underscored by the different theories of rhythmic ability which have been put forward. On the whole, these theories have little to do with the tonal aspects of music, so that the distinction between rhythm and everything else is again, unfortunately, accen-

tuated. Mursell (1937a, chapter 4) gives a good coverage of the best known theories of rhythm. Firstly, he gives an account of those theories which see rhythm as an 'instinct'; secondly, he describes those theories that view rhythm as a natural concomitant of various regularly recurring bodily processes. Basically, the instinct theory of rhythm postulates the existence of an innate rhythmic response. In other words, people respond to rhythms because such a response is inherent in their nature. The instinct notion, used as an explanation, is unsatisfactory, because instinct is a non-explanatory concept. It does, however, serve as an adequate label for particular kinds of innate (i.e. unlearned) behaviour. Unfortunately, the evidence from studies of rhythm seems to indicate that the existence of an innate 'rhythm instinct' is unlikely. Studies of the rhythmic abilities of children appear to show that they are rather poor at simple tasks such as 'keeping time'. Mursell points out that many adult observers would probably disagree with this assertion, arguing instead that children make many and varied rhythmic responses to music. Mursell insists, however, that such observers are deceived by what they see, and are too easily seduced into interpreting the actions they see as 'keeping time', when in fact nothing of the kind is happening. The movements which children appear to make spontaneously as a response to particular types of music are, according to Mursell, much more likely to be a result of the generally stimulating effect of tone; this in no way implies a true rhythmic response of any kind. The most often quoted study in this area is one carried out by Heinlein (1929) in which children 'marched in time' to music, whilst their responses were monitored by electrical contacts embedded in the walkway on which they marched. The results showed that, out of eight subjects, only one displayed any proper synchronization between his marching and the music. This finding, however, does not totally dispose of the instinct theory, since it rests on the assumption that, if a piece of behaviour is instinctive, children will automatically manifest it. This assumption is simplistic, since it overlooks the fact that many behaviours which have been regarded as instinctive (in animal studies) do not emerge until the organism has reached a particular developmental stage. Perhaps the kindergarten-aged children in this study had not yet reached the necessary stage? In an unpublished, but detailed, study of a sample of children ranging in age from five years to eight years, Pomfret (1969) found increases in the accuracy with which a 'marching' task was performed (in this example, children were asked to 'march on the table with both hands' in time to the music) as a function of increasing age; not surprisingly, a developmental effect of some kind appears to be present. She also noted that the testing situation appeared to be rather overwhelming for some of the younger subjects, and suggested that this may have prevented them from performing as well as they might have done. In evaluating Heinlein's finding, therefore, we should note both that there is a developmental aspect to rhythmic abilities, and that young children do not always do themselves justice in experimental situations.

Perhaps the main deficiency of the instinct theory, however, concerns the

oversimplified view which often inheres in the very notion of instinct itself. The postulation of an instinct for rhythm, of which Seashore is a major proponent, is perhaps a carry-over from the golden era of instinct which came at the start of the century. At this time, the term 'instinct' became an all-purpose panacea for the 'explanation' of types of behaviour which were widespread but for which no obvious learning process was apparent. A survey of 500 books was performed by Bernard (1924) from which he abstracted a list of no fewer than 5,648 instincts which had been postulated by different writers. Among these were the instinct to sit in a chair (an amazing piece of luck, since we presumably inherited this trait from our distant ancestors who didn't have any chairs to sit on), and the instinct not to pick apples from your own orchard (from an evolutionary point of view, this would seem to be a strangely maladaptive behaviour pattern). The problem in using the word 'instinct' in this kind of way is that we tend to think we have explained something when we have done no such thing. Instead, we have coined a particular word to *describe* an observed pattern of behaviour; at a later point in time we use this arbitrary label as though it *explained* the behaviour. In other words, we say that a particular behaviour is caused by the presence within the organism of 'an instinct', and we infer the presence of the instinct from the behaviour. The course of the argument is thus circular, and lacks an external referent, and therefore is unhelpful. Further, it is probably incorrect to conceive of the actions of genes as taking place in a vacuum. The precise way in which they are expressed depends both on interactions between genes, and between genes and the environment. To say that a particular individual's rhythmic behaviour is the result of an instinct is therefore oversimplified, as is the attribution of differences in rhythmic abilities between individuals to different degrees of instinct. Similar caution must be observed when speaking of racial differences. A currently widespread belief, stemming no doubt from the observation that African music is rhythmically very complex, is that Negroes have a 'natural' (i.e. instinctive) sense of rhythm supposedly lacking in whites. The findings on this issue are not satisfactory, since, in the main, the only Negro groups who can, with any semblance of fairness, be tested with standardized test batteries, are those domiciled in the USA, so that most findings come from this group rather than from an African group and we have no way of knowing how far the US Negro is like his African counterpart. Mursell gives a summary of findings on this issue, and the results are contradictory. Sometimes whites do better than Negroes, and sometimes the Negroes are better than the whites; on other occasions there are no reliable differences between the groups. Mursell also outlines the problems inherent in using culturally biased tests to examine supposed differences between ethnic groups, and the objections here are well known. There may be differences between racial groups in their capacities for rhythmic response, or there may not. It should be clear, however, that, even if there are, we cannot naïvely ascribe differences in rhythmic performance to instinct. As Lundin concludes, '. . . the explanation may just as easily lie in culturalization as in inherent tendencies'.

A second theory of rhythm is based on the periodicity of bodily processes, such as heart-rate, or respiration. Thus music which proceeds at a speed below the limits of the normal pulse sounds sluggish, whilst music above this limit sounds hurried. Music which approximately coincides with heart rate is supposed to sound 'just right', and one latter-day folk myth has it that the popularity of pop music is due to such coincidence between heart-beat and tempo, which is supposed to give the music some irresistible, compulsive quality. Whilst the evidence on these more general claims is largely to be taken with a pinch of salt, the 'bodily processes' theory cannot be entirely discounted, since interesting results have been obtained in studies with children. By and large, these do *not* show rhythmical responses in children, but they do appear to show that children respond to particular kinds of rhythmic stimuli (the distinction is important). In particular, certain kinds of periodic events, such as rocking or swinging, appear to have a calming effect on babies. Mothers have probably known this for a long time, but it is nice to have it on a scientific footing. An interesting study by Korner and Thoman (1972) compared the efficacy of various soothing techniques in causing crying four-day-old children to be quiet. Of the different methods they used, the one which led to the shortest continuation of crying afterwards was one in which the baby was moved to and fro as if in a pram. None of the other methods described involved such repetitive type of stimulation, though lifting the baby and cradling it in the arms was similar in some respects, although it was not repetitive (or, as the authors describe it, '. . . . during intervention 5 the infant was given continuous linear acceleration over the thirty-second period and during intervention 2 only momentary linear acceleration was provided'). Thus, if your baby cries too much, you might try giving it some continuous linear acceleration or pushing it to and fro for a while. (Although the notion of a linearly accelerated baby might appear rather hilarious, it should be stated, in fairness to the authors, that it is often difficult to find ways of expressing such things succinctly yet with precision. Even so, the appropriation of this terminology from physics is not entirely apt since the baby was not continuously accelerated, as the authors suggest, but repeatedly accelerated. On second thoughts, therefore, mothers are strongly advised *not* to apply continuous linear acceleration as baby will thereby attain a theoretically infinite terminal velocity.) These authors refer to other studies of an equally interesting nature; for example, there is evidence to suggest that rocking at a rate of sixty to seventy oscillations per minute might be the most effective rate in stopping crying in very young babies. According to Ayres (1973) this is the speed at which women are likely to walk during the later stages of pregnancy. Also, up-and-down motion may be more effective than side-to-side. One more general conclusion, however, is of special interest here. The authors write (p. 450), 'It seems likely that the most effective soothers involve rhythms and types of motions experienced in utero.' It is possible, for example, that the regular sound of the mother's heart-beat might have a soothing effect (or alternatively, that its removal produces a change in stimulation which is disturbing). Owners of dogs may be familiar

with the practice of putting a clock in the basket of a new puppy to reduce its crying at night.

Recently a fascinating hypothesis has been advanced by Barbara Ayres (1973), namely, that cross-cultural variations in the use of rhythm in music might be related to variations in the manner in which parents carry their children. The notion is that rhythm serves a major psychological function in promoting feelings of security and satisfaction, and in reducing anxiety and tension, through association with early experiences when similar rhythmic events occurred. Consequently, it is argued that children coming from cultures where they are customarily carried by the mother will associate feelings of security with the regular rhythms of the mother walking, grinding or performing other regular tasks. Such cultures should thus demonstrate regular rhythms in their music. On the other hand, it is argued, cultures in which the infants are not carried but are kept in cradles, hammocks or on cradleboards, will not be characterized by regular rhythms in their music. This hypothesis is supported when data on carrying practices from a number of different cultures are related to a preference for regular or irregular rhythm in the music of those cultures. Unfortunately, whilst the hypothesis is a most attractive one, the paper is rather speculative in several of its aspects. In the first instance, the classification of rhythms into 'regular' and 'irregular' involves some rather naïve assumptions about rhythm (as we have seen previously, whether a rhythm sounds regular or not depends very much on who is listening to it). Secondly, there are some important exceptions to the results, and the explanations of these amount to little more than guesswork. For example, it is suggested that African polyrhythms come about in tribes where the infant is carried about by different women at different times. In fact, this would, at most, subject the infant to rhythms of different speeds. To meet the psychological requirements for polyrhythmic perception, it seems more likely that the infant would have to be carried about by several women at the same time. Other exceptions to the rule are explained in similar speculative terms. Lastly, there is reason for supposing that rhythms which sound irregular, or even 'free', to Western ears, represent a more highly developed rhythm sense than the simple repetitive or regular rhythms of the West. In the Ayres paper, it is implied that a good rhythmic sense is a product of a 'carrying' environment, where the infant has more rhythmic stimulation; but it is also, at two points, implied that a good sense of rhythm means good sense of regular rhythm, i.e. 'individuals who have been carried extensively in infancy and early childhood have a *better sense of rhythm* [author's italics] and stronger preference for regular rhythm . . .', and also, 'Since the Yaghan wear little clothing their *low rhythm score* [author's italics] cannot be explained by the absence of body contact. . . .' In other words, there are two hypotheses operating, which are slightly confused. If the hypothesis is that regular rhythms are preferred in cultures where infants are carried, Ayres's data support such a conclusion. However, if, as implied later, it is the belief that carrying leads not merely to a preference for regular rhythm, but to the development of a 'better sense of

rhythm', one might expect the results to be precisely opposite to those found. Although Ayres suggests that carrying infants while walking, kneading, grinding and so on leads to preferences for regular rhythms in elementary times like 2/4, 3/4, or 6/8, it is difficult to see why one should assume *a priori* that such events should be psychologically grouped in twos and threes, rather than fives or sevens or thirteens.

Despite these differences of opinion, the paper remains very interesting. In summary, one might say that the hypothesis that specific aspects of child-rearing practices affect rhythmic development remains entirely plausible, but that the specific relationship suggested by Ayres remains speculative. It is unlikely, however, that anyone would disagree with the observation that testing such hypotheses remains very difficult in the presence of the influence of other more general cultural factors upon rhythmic development.

Recent research into the influence of 'musical acculturation' upon rhythmic development has been performed by Zenatti (1976). In experiments with French children, Zenatti concludes that one manifestation of their musical acculturation is a marked preference for regular (*bien marqué*) rhythms, presumably of the type normally heard in Western music. Zenatti stresses the developmental aspects, especially the development of perceptual abilities, and also specifically musical learning (from songs and dances which the children hear) as both being important in rhythmic development. Her results also show that when rhythms are 'carried' by a tonal sequence, children's judgements are affected by the tonal nature of the material; a fact probably related to the predominantly tonal nature of 'musical acculturation' in the West. In particular, only 30 per cent of six-year-old children differentiated between two tonally identical sequences, one of which was presented with a simple rhythm (*cellules isorythmique*) and one with a syncopated (*syncopé*) rhythm (*cellules rhythmiquement hétérogènes*). (Unfortunately, in the written example of this stimulus material, the second version is not merely syncopated; the elements used add up to five beats, whereas the first version is in 4:4 time. Since the metre is thus different in the two renditions, it is not certain that the difference can be simply described as one of rhythmic syncopation.) However, this task was successfully performed by seven-year-olds (71 per cent successful), suggesting a developmental difference. By contrast, melody differentiation was performed much better by both these age groups (72 per cent and 83 per cent respectively), so that results cannot be simply attributed to failure to understand the task on the part of the younger children. It is possible, however, that rhythm was simply less salient for the younger children than melody. It thus appears that Ayres and Zenatti stress different processes in the acquisition of rhythmic abilities. Ayres stresses the importance of bodily stimulation through movement, whilst Zenatti's results suggest the importance of later perceptual development, and also of a more cognitive type of learning through exposure to music occurring within the culture. The two sets of results are not comparable, however, since Zenatti's data come from a society where children are not habitually carried by the mother,

and where a preference for regular rhythm would consequently have to be learned in a way different from that suggested by Ayres. Thus, unless Zenatti's findings can be shown to hold true in a 'carrying' society, there is no reason to view the two positions as contradictory.

Related to the bodily processes theory are certain studies involving the phenomenon of 'photic drive'. In photic drive, bursts of neural discharge (manifesting themselves as brain waves which can be measured) can be made to 'lock on' to a regularly flashing light. When this occurs, the electrical discharges of the brain are synchronized with the flashes of the light (Livanov and Poliakov 1945). The earliest work in this area involved rabbits, but more recent work has demonstrated similar results with human beings. In particular, some persons, particularly epileptics, have been found to be more susceptible to photic driving than others. In one form of epilepsy, attacks are accompanied by a characteristic brain-wave pattern known as the 'spike-and-wave', which commences at the start of the attack, and finishes when the attack terminates. The attacks are characterized by varying degrees of inattentiveness, and in some cases by jerks of the limbs. There is by no means always loss of consciousness during these attacks (this form of epilepsy is sometimes known as *petit-mal*, as opposed to the more striking *grand-mal*), and, in some cases, subjects are not even aware that such an attack has taken place. Furthermore, subjects are still able to discriminate sounds whilst the attack is in progress, and even able to continue making automatic rhythmic movements which they were instructed to make before the 'spike-and-wave' attack was induced (Cornil, Gastaud and Corriol 1951). There are many other studies demonstrating, amongst other things, the phenomenon of synchrony between brain waves and external regularly occuring events, and a full review of these is not necessary here.

Given findings like those above, it is very tempting to draw speculative analogies with certain aspects of pop music. For example, at a superficial level, the things which take place in photic drive experiments seem very similar to the things which go on in a discotheque, where very loud repetitive sounds occur in conjunction with stroboscopic (i.e. flashing) lighting. Furthermore, it appears that many of the dancers are apparently oblivious of anything going on around them (inattentiveness), their movements might loosely be construed as of an epileptic type (jerky), they do not totally lose consciousness, they are apparently still able to discriminate sounds, and they are able to continue making automatic rhythmic responses throughout the duration of the 'attack'. In truth, the flashing lights and incredible volume levels sometimes present in the disco can become very headachy and oppressive. However, the inference that all present are undergoing the paroxysms of some type of epilepsy, as a result of photic drive, or its auditory equivalent (or a combination of both) does not bear close examination as an explanation for the behaviour of groups of teenagers. The precise control and monitoring necessary to produce photic drive are not available in the disco, nor are all the teenagers of the highly susceptible type. The findings concerning photic drive are important, not for these simply speculative reasons, but because

they demonstrate that synchrony between internal and external events takes place. This is a long way from the notion that respiration, or heart-rate, are crucial internal variables with respect to the rhythmic response, but not all that different from MacDougall's claim that feeling for rhythm is due to a basic rate of nervous discharge (MacDougall 1902). We are not here attributing the whole of the rhythmic response to a rate of nervous discharge, but simply saying that the structure of the nervous system, and the speed at which it operates are likely to have some bearing upon the perception of periodic events, and whether such events seem fast or slow. Furthermore, the fact that particular repetitive stimuli can induce a synchronous pattern of brain waves means that the possibility of a relationship between regular musical events (metre) and similar patterns of nervous discharge cannot be entirely dismissed. Finally, it is of interest to note that, in certain recent studies, particular rates of brain waves have been found to be associated with particular experiential and mood states, suggesting that particular brain-wave patterns have particular types of experiential correlates (e.g. Brown 1970, Fermi 1969, Wortz 1969, Green 1969).

However, the rhythmic response goes far beyond simple repetitive events. Such events have been defined earlier as 'metre', and rhythm is something imposed on top of the basic metre, not necessarily of a simple repetitive nature. The basic rhythmic response would seem to involve not the perception of simple regularity, but the formation of perceptual units. Any theory of rhythm which is based on voluntary bodily movements, or which assigns paramount importance to movement, would therefore seem to place the cart before the horse, or, at least, by its side. For example, Ruckmick (1913) carried out experiments in the perception of rhythm, and found that 'awareness of rhythm' was accompanied by muscular movement. The conclusion was that rhythmical forms must initiate the factor of movement in order that the impression of rhythm shall arise. This does not mean, however, that muscular movement is a cause of rhythmic perception. It could be either a concomitant, or a consequence. Indeed, it is difficult to imagine how one could, for example, tap one's foot to a rhythm that one had not perceived. On the other hand, no one can doubt that movement and rhythm are closely related. People tap their feet, shake their heads, and move in a variety of ways in response to rhythm, and sometimes these movements are probably of real value in helping to 'keep the beat'. At the heart of the matter, however, lies a purely mental process involving the subjective grouping of temporally spaced events into groups. Our own movements might be intimately related to this process, and for many people they may enhance the pleasure of the rhythmic experience, but they are not themselves the process.

What is the nature of this grouping process? Interesting experiments performed by Vos (1973) cast some light on this subject. (Vos was impressed initially by the fact that most of the empirical work on rhythmic abilities was either descriptive or historical in nature, or else highly speculative. Much of the evidence in the area comes from studies performed many years ago.) Vos

presented subjects with sequences of tones which were constant in both pitch and intensity. The temporal arrangement of tones was manipulated, however, in accordance with particular statistical rules. In general terms, Vos found that metrical (or periodically structured) sequences gave rise to the subjective perception of 'measure' and of 'accent'. In other words, groups of tones were perceptually formed into units or measures, probably as a consequence of the Gestalt laws of proximity and similarity; there also arose a perceived difference in the stimulus strength of the different elements (accents) where none existed in physical terms. To put this another way, people heard accents where there were none in actuality. According to Vos, the phenomenon of rhythmic perception which he describes is not confined to music alone, but is allied to the perception of speech rhythms also.

So far as music is concerned, we need to take care about how we define 'rhythmic groups' and 'accents', since they are not to be thought of solely as properties of music. Vos clearly demonstrates that they are properties of people, as well as of musical sounds. If this is true, then logically we go even further with this analysis. Accent, or that quality of a tone which makes it sound louder than other tones, can arise due to either the perceptual phenomenon which Vos describes, or due to the manipulation of 'objective loudness' so that the difference in the intensity of tones impresses itself upon perception, i.e. accents can be purely perceptual, or can be physical. There is experimental evidence on the influence of changes in physical parameters (i.e. intensity) upon pattern perception. Using pulses of white noise (a broad band noise containing all audible frequencies), Ptacek and Pinheiro (1971) showed that an attenuation of at least 10 dB was necessary to make a 50 dB pattern 'stand out', even though the threshold for actual discrimination is only about 0·5 dB at this level. These authors, again, make a comparison with the visual figure-ground phenomenon, and also note the occurrence of spontaneous pattern reversals, mentioned in an earlier chapter. On the other hand, grouping is always a purely psychological phenomenon, and no matter how we manipulate the tones themselves, they are never grouped until they are perceived as such. There are thus two ways we can perceive accents (namely, we can perceive accents which are subjectively created, and accents which are objectively created), but only one way in which we can perceive groupings (namely, when we can impose a grouping on the stimulus elements). What appears to happen in much music is that accents are presented as parts of the music, and serve as cues which the listener uses to form perceptual groupings. We should remember, however, that accents are not essential to this process, since the rhythmic listener will generate his own accents if none are objectively present in the music, as demonstrated by Vos with tones, and, in analogous terms, by many other workers in the field of pattern perception in general. Moreover, because we have two kinds of accents (those contained in the music and subsequently perceived, and those generated solely by the listener), there is no reason to suppose that the subjective accents and the objective accents will of necessity coincide, and no basis for thinking that they

ought to. One can envisage a situation in which accents are objectively placed so as to accentuate grouping cues like proximity or similarity, and also situations where the objective accents are so placed as to be at variance with the grouping cues, or even in conflict with them.

If we now consider once again the nature of largely improvised primitive music, and formally written-down music in the Western tradition, we might speculate as to how the rhythmic superiority of the former has come about. In brief, the former involves a dialectic process which is largely absent in the latter. Consider what happens when a man starts to play some sort of elementary rhythm, or rudimentary pattern of regularly recurring tones or drum beats. Regardless of his playing, subjective accents (possible alternatives to those he is playing) will arise. These accents, at first entirely internal to himself, can be made external by the simple expedient of starting to play them objectively. He is not constrained to play a part exactly as written, and thus can suggest an alternative rhythmic organization. Once this new state has been arrived at, an alternative set of internal accents may arise, and once again the possibility of making public this new rhythmic insight is possible, so that once again the level of complexity of the rhythms is changed. This process, in which an objective state of affairs spontaneously generates new internal possibilities to an individual performer, who then makes these new subjective types of organization public, is a characteristic of most rhythmically complex music systems, but is largely absent from classical music where the composer's original conception is adhered to rather more closely. Indeed, whilst minor deviations are characteristics of musical performance (Small 1937) the major evolution of totally new rhythmic patterns would be regarded as sacrilege, and would certainly alter the whole character of a piece.

The principle underlying the spontaneous organization of sounds into definite patterns appears to be similar to pattern perception in other areas, and seems to resemble what is known as the 'figure-ground' relationship. Basically, this refers to the relationship between an object and the background on which it appears. People learn from their past experience that particular visual stimuli are normally used as objects or 'figures', which occur against some sort of background. For example, in fig. 47 below, there is a tendency to see the shapes as figures, occurring against the background of the page, since this is the normal state of affairs. In fact, if a ruler is laid along the top and bottom edges of the figure, we can observe that our interpretation of what is figure, and what ground, is erroneously juxtaposed, since it is really the background which forms the figure. We are in a sense perceptually accentuating the wrong thing.

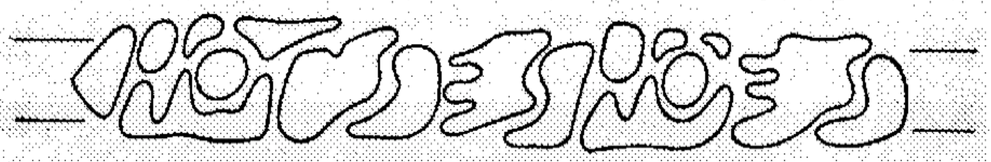

*Fig. 47. Figure-ground illusion. What is it?**

* horseshoes

The classic illustration of the figure-ground phenomenon is contained in fig. 48 and shows the ways in which a figure and ground can be ambiguous. At one point in time we tend to see a white vase in front of a black background, whilst at another the figures seem to reverse, and we see two faces in front of a

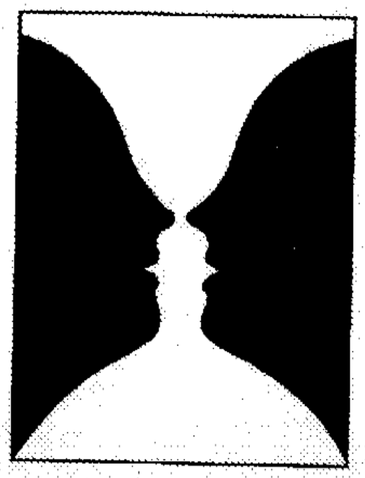

Fig. 48. Figure-ground illusion. Two faces or a vase?

white background (Rubin 1921). If we in some way perceptually accentuate the white section, then the two 'faces' merge into, and become, the background. The reverse also happens. Now, according to Vos, the processes involved in the above figure are similar to those involved in the perception of auditory rhythm. Thus, he suggests that the Gestalt terms we have been using here, namely 'figure' and 'ground', can be identified with the accented and unaccented tones in a sequence, respectively. In other words, accents are the figures which stand out, whilst the ground comprises those tones in the sequence which do not stand out.

As we can see from the previous figure, however, the parts that stand out, and the parts that form the background, are produced as much by the listener as by the performer. It is this ability to differentiate between figure and ground which is at the heart of rhythmic ability; the person with a high degree of this faculty may be able to form a number of different possible groupings of figure and ground in a situation where others may see none at all. Given a particular metrical sequence to perform, the skilled performer has an almost limitless number of devices he can use. A basic number of beats may be subdivided into groups containing any number (of elements) which is a common factor of the first number. Thus, a sequence of thirty-six beats may be subdivided into nine units of four, four units of nine, twelve units of three, six units of six, and so forth. This is still fairly simple. It might also be divided into units of unequal length, such as five units of seven, plus one unit of one, or any other combination. In addition, the performer may choose to deliberately accentuate elements which he knows will not be accentuated perceptually by the listener, thereby presenting

him with a dilemma as to who is 'right'. In other words, the performer presents rhythms which conflict with the obvious ones that the listener is probably using, and thereby shows him new ways of grouping. If the listener is not careful, he may even be seduced into a blind alley if he interprets the objective (played) accents as 'the beat' when they in fact are not. This kind of rhythmic approach is baffling to those who cannot perceive the relationship of the new groupings to the ongoing, or underlying, metrical form. The rhythm never seems to be constant, but is perpetually changing course, apparently in a purely whimsical fashion. ('The trouble with modern jazz is it's got no rhythm,' remarked one frustrated listener at a jazz concert, after his strenuous efforts to tap his foot had been foiled by his failure to locate the first beat of the bar.)

From the above, it should be apparent that rhythm and rhythmic perception can be developed to extreme levels of complexity which go far beyond simply 'keeping time'. Furthermore, whilst rhythm is highly effective when it occurs in a reciprocal complementary relationship with tonal sequences, it is in no way subservient to the tonal aspects of music unless we choose to make it so. There are musical cultures in which the rhythmic aspects have much the greatest priority, with a minor role being assigned to the tonal aspects. If we have a view of rhythm as being of secondary importance to tonality, this is only because our own musical culture often implies such a distinction by failing to exploit the possibilities of rhythm to any great extent.

13 Musicians and instruments

In the main, this book has been concerned with treating the musical person in terms of processes. In the course of this treatment, occasional anecdotes of a non-scientific nature have been included, chiefly to enliven the scene. This last chapter is different, however, and concerns itself rather more with anecdote and speculation, and rather less with scientifically respectable findings. Most of the anecdotes and speculations, however, come from musicians themselves. This makes a fitting conclusion, since much has been said about the musical person 'as machine', but very little has been said about musicians as people.

One topic which seems to interest many musicians is personality, both their own, and those of other musicians. There is little doubt in the mind of the author that there exists among musicians a number of stable beliefs or stereotypes about the personality characteristics of other musicians. They often seem willing, even eager, to describe various aspects of other musicians' personalities at great length, and the subject is clearly one that fascinates many of them. To try to put these impressions on a slightly more secure footing, a series of group discussions was held in the psychology laboratory, to which musicians from a Glasgow-based symphony orchestra were invited, on a voluntary basis. Alcoholic refreshment was provided for those who wished. The comments made were confidential, in the sense that the people making them would not be named; since not all participants were happy, or at ease, when the conversations were tape-recorded (there were some fairly indelicate speculations from time to time), the substance of the meetings was written down by a research assistant. The meetings were unstructured, other than encouraging individuals to talk about the various sections of the orchestra.

Before proceeding to the contents of the interviews, it is interesting that psychologists have so far paid relatively little attention to the topic of the personality of musicians. Books on the psychology of music deal with aspects of the 'musical mind' largely in terms of musical ability, its assessment, and its relation to other abilities; or the nature of, and propensity for, affective and aesthetic responses; or various aspects of the development of musical abilities. Information about personality types of musicians must normally be gleaned from biographical accounts of famous composers long since dead, often with extracts from their letters. Other information comes from light-hearted accounts of the musician's life, such as Malcolm Tillis's *Chords and Discords* (1960), or the accounts of events in the jazz world revealed in books by authors like