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“Metric Modulation” or Drum Tempo Contrasts in Hopi Traditional Dance

The term “metric modulation” is used cautiously in this work to describe a rhythmic phenomenon that occurs in Hopi dance. I use it at the risk of offending contemporary ethnomusicologists and more traditional musicologists alike. Modern ethnomusicology rightfully advises against the unnecessary and oftentimes misleading application of concepts from Western classical music to non-Western music. On the other hand, more traditional musicologists might mistakenly believe that such abstract concepts apply only to the European classical tradition. One of the aims of this paper is to dispel the latter solipsistic view by demonstrating the complexity and sophistication of drum tempo contrasts in Hopi traditional ceremonies. The term metric modulation is not used by the Hopis themselves; yet it is the best term in use among music theorists, that I am aware of, to describe what is actually taking place in Hopi dance.

It is not my intention to fully elucidate the context or meaning of Hopi music. Such an attempt would violate the strong views of the Hopis concerning their right to religious privacy. In recent years the Hopis have banned non-Indians from being present at all ceremonial dances and at many social dances, mostly because of what they perceive as the misunderstanding and misrepresentation of their culture and religion by outsiders. This paper is a musical analysis of a specific rhythmic phenomenon found on commercially available recordings of Hopi music. It is undertaken with the intention of illuminating and honoring the considerable skill of the Hopi drummer,¹ while dispelling commonly held views about the simplicity of Native American music.

Metric Modulation: A Definition and Critique

The Hopi musician does not necessarily think in terms of meter, which in the West implies a hierarchy of strong and weak beats in identical and recurring units. Regular accent patterns are largely absent in the Hopi drum beat. The concept of metric modulation does not, however, require the presence of meter. The term *metric* is therefore a bit misleading and unfortunate, resulting in considerable confusion on the part of contemporary theorists.

Many attempts at defining metric modulation are either incomplete or misleading, often confusing the idea of simple meter change with modulation or describing the result of the procedure without clarifying the means. A brief survey of definitions found in contemporary music dictionaries will help

illustrate some of the common misunderstandings of this concept. Philip Morehead, in *The New American Dictionary of Music*, defines metric modulation as follows:

A 20th century compositional technique which expedites the change from one meter to another by means of ambiguous rhythmic situations roughly analogous to modulation from one harmony to another by means of a pivot chord.²

This is misleading on nearly every count. First of all, as Elliott Carter has been quick to point out, this rhythmic phenomenon is not merely a twentieth-century technique—for instance, it occurs in fourteenth-century French music and in the classical music of India.³ Secondly and essentially, it does not result in a change from one meter to another, but rather from one tempo to another. That the meter usually also changes in metric music is a byproduct rather than a defining characteristic.⁴ Finally, Morehead’s statement that the metric shift occurs “by means of ambiguous rhythmic situations” is clearly not helpful. Any sense of ambiguity is simply a result of ignorance of the specifics of the procedure.

The following definition, found in the *New Oxford Companion to Music*, is no better:

Technique introduced by Elliott Carter, by which changing time signatures effect a transition from one metre to another, just as a series of chords can effect a harmonic modulation from one key to another.⁵

The idea of changing time signatures is synonymous with transition from one meter to another. One idea does not define the other, and neither defines the concept of metric modulation.

Kennedy’s definition is a small improvement:

Term and technique introduced by American composer Elliott Carter for changing the rhythm (not necessarily the metre) from one section to another.⁶

Again, this describes a result of the procedure without clarifying how it takes place. Fink and Ricci offer some insight into the procedure itself:

A transition from one meter or tempo to another through common note values or pulses that remain constant.⁷

Though this is incomplete, it does explain the analogy with the “pivot chord” of harmonic modulation that Morehead and others mention. A secondary pulse (other than what is perceived as the basic pulse) acts as a pivot upon which the tempo of the basic pulse changes. The secondary pulse is a constant in the original and determines the new tempo. It exists in both, though it has a different relationship to the first than it has to the second, and may therefore be

notated with different time values in each. The example offered by Morehead involves a transition from 6/8, where the basic dotted quarter pulse is 60, to 2/4, where the quarter pulse is 90. The tempo of the basic pulse has accelerated, but the tempo of the eighth note value has remained constant, acting in an analogous fashion to a “common chord” in harmonic modulation. The basic pulse unit has changed in a ratio of 2:3 (60 to 90), made possible by the common secondary pulse of $\text{♩} = 180$, acting as a pivot. In this case, the secondary eighth-note pulse is notated in the same way in each tempo, but its relationship to the basic pulse is different. In the first, an eighth note is one third of the beat, and in the second it is one half.

Fink and Ricci’s example (duplicated in Figure 1) involves a transition from 4/4, where a quarter note pulse is 84, to 4/4 where the quarter note pulse accelerates to 126. In this case, the secondary pulse which acts as the pivot is notated as half-notes in the original tempo and dotted halves in the succeeding tempo. What were quarter-note triplets in the original tempo become the basic pulse of the new tempo, while the slower secondary pulse remains a constant in both, relating one to the other.

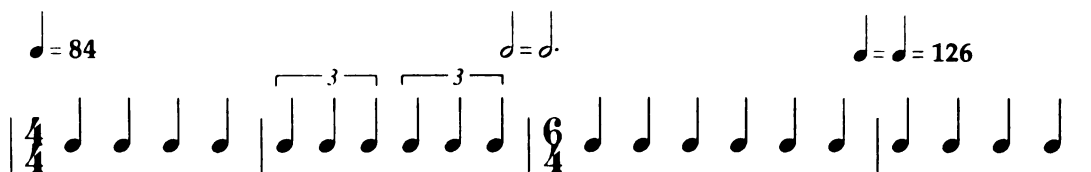


Figure 1. Example of metric modulation from Fink and Ricci

Fink and Ricci mistakenly write $\text{♩} = \text{♩}$ at the transition from 4/4 to 6/4 where it should be $\text{♩} = \text{♩}$. The point that they intend to make, in support of their definition, is that the slow secondary pulse remains constant while the quarter-note pulse modulates to a new tempo. This notational confusion would be avoided if the metric designations were omitted. Essentially what is happening can be seen in the second measure prior to the change to 6/4. The basic pulse unit has accelerated in a ratio of 2:3, while the slower secondary pulse has remained constant. The slower pulse has simply been subdivided differently with the new subdivisions becoming the new basic pulse, unlike Morehead’s example where the subdivisions remain constant while the additive values change (i.e. quarters vs. dotted quarters). In both cases, the direct proportional relationship between the initial and subsequent pulse is guaranteed by the existence of the common pulse and its pivotal relationship to each.

Griffiths’ definition is much better, though it omits the idea of the common pivotal pulse.⁸ He defines metric modulation as follows:

Term introduced by Carter for a technique changing the pulse from one passage to the next, and usually changing the metre too, by introducing the new rhythmic character as a cross-rhythm within the old.⁹

There are several defining characteristics of metric modulation. Firstly, the result is a change of tempo from one pulse to another. Secondly, this change turns or pivots on a common pulse, resulting in a cross-rhythmic or proportional relationship between the two pulses.¹⁰

Rhythmic Structure of the Hopi Eagle Dance

The transcription of a Hopi Eagle Dance in Appendix A was made from the field recordings of Jesse Fewkes, recorded in the 1920s and released on Folkways Records in 1964. The proportional relationships between tempi clearly play a structural role in the music and, undoubtedly, are integral to the dance, if not dictated by it.¹¹ There are three distinct pulses utilized. What is designated as Section A in Figure 2 is characterized by a pulse rate of approximately 180 beats per minute. A brief eight beat introduction, which accelerates to this tempo, is followed by a repeated phrase, nine and one-half beats in length. The beat is displaced on the second half of beat four by a brief rest, accounting for the fractional length of the phrase.¹² Six unbroken beats act as a brief interlude before two more repetitions of phrase a recur. Phrase b, which follows, consists of eighteen unbroken beats.

<u>Section/phrase</u>	<u># of beats</u>	<u>Tempo</u>	<u>Ratio of modulation</u>
Intro	8	180	none
A/a	9.5	180	none
a	9.5	180	none
b	6	180	none
a	9.5	180	none
a	9.5	180	none
b	18	180	none

Figure 2. Rhythmic Structure of Hopi Eagle Dance, Section A

A new section, B, clearly begins with an abrupt change in tempo. Four beat units now take the place of three in the former pulse, i.e., a dotted quarter is now equal to a half-note. The tempo has accelerated in a ratio of 3:4,¹³ increasing from 180 beats per minute to 240. Even though there is no regular accent pattern, the lengths of the phrases suggest that the drummer perceives the 180 pulse in three-beat units and the new 240 pulse in four-beat units (i.e., he perceives the common pulse of 60 beats per minute which relates the two tempi together¹⁴). The two b phrases in section A are divisible by three—a six-beat phrase, and an eighteen-beat phrase. The four repetitions of the a phrase would also be divisible by three if it were not for the insertion of the half-beat break in each. Three of the four times the 180 beat per minute tempo recurs in section B (labelled as b phrase variations) the phrase length is again divisible

by three, except in the final phrase of the section where one beat is added. That the b phrases are successively reduced in length by increments in multiples of three (from 24 to 12 to 6) also supports the conclusion that the Hopi drummer perceives triple groupings of the pulse.¹⁵

<u>Section/phrase</u>	<u># of beats</u>	<u>Tempo</u>	<u>Ratio of modulation</u>
B/a	35	240	3:4
b	24	180	4:3
a	35	240	3:4
b'	12	180	4:3
c	6	120	3:2
a'	9	240	2:4
b''	6	180	4:3
c	6	120	3:2
a''	9	240	2:4
b'''	13	180	4:3

Figure 3. Rhythmic Structure of Hopi Eagle Dance, Section B

Following the first b phrase in 180 is a shift back to 240 and an exact repetition of phrase a, followed again by a return to a shortened phrase in 180 (labelled b'). Following b' is a brief modulation in a ratio of 3:2 in 120 (c). The tempo then doubles, returning to 240 for a shortened phrase a followed again by a modulation back to 180 for a six-beat phrase (b''). Phrase c then returns, followed by another phrase a variation. The section ends with a final modulation back to 180 (b'''). The sequence of metric modulations in section B can be represented by the following ratios: 4:3, 3:4, 4:3, 3:2, 2:4, 4:3, 3:2, 2:4, and 4:3.

Section C is much freer in character, without the clear sense of phrase distinction and proportional rhythmic shifts of the earlier sections. This section begins with apparent compound subdivisions of a beat moving at approximately 180 beats per minute, though several seemingly random cases of beat displacement occur, in which a fourth subdivision of equal value to the other three is added to a given beat. There are two points that could be called brief modulations in a ratio of 3:2, from 180 to 120 beats per minute. The slower tempo lasts for only two beats in each case, however, and therefore is probably conceived as a slow duplet against the underlying pulse rather than an actual modulation. Section D begins in the tempo of Section C (approximately 180) but changes from triple to duple subdivisions of this pulse. It then modulates in a ratio of 3:4 to a tempo of 240 without subdivisions and over 67 beats accelerates from there to the end of the piece.

Rhythmic Structure of a Hopi Snake Dance Song


The transcription of the Hopi Snake Dance Song (Appendix B) was also made from the Fewkes recording found on Folkways Records. Although this example does not have the number or the variety of modulations found in the Eagle Dance, it does contain two distinct pulses, again in a ratio of 4:3, and several clear modulations between them.

This example opens with an introductory series of irregularly subdivided beats; beginning with quintuplets and moving to septuple and occasional sextuple divisions of the beat. This opening sequence appears to be somewhat random, giving the impression that the drummer is warming up, merely letting his stick bounce on the head of the drum for varying unspecified durations. After eighteen such irregular beats, the pulse stabilizes into a regular sextuplet pattern for twenty-one beats, followed by ten more undivided beats announcing the opening to the song.

<u>Section/phrase</u>	<u># of beats</u>	<u>Tempo</u>	<u>Ratio of modulation</u>
Intro/a	18	irregular	none
b	21	240	none
c	10	240	none
A/a	16	240	none
a	16	240	none
b	12	240	none
c	18	240	none
Transition	9.5	180/120/180	4:3:2:3
B/a	14	180	none
a	14	180	none
b	13.5	180	none
Repeat of B			
A'	56	240	3:4
Ending	3	180	4:3

Figure 4. Rhythmic Structure of Hopi Snake Dance Song

At Section A, the song begins with a sixteen-beat repeated phrase (phrase a) at a tempo of 240 beats per minute. This tempo continues through two more phrases (labelled b and c) before modulating in a ratio of 4:3 to 180. The transition to section B is particularly interesting. It can be analyzed in two ways: either as a single modulation to 180 with the beat displaced by three dotted values (the third, fourth, and fifth drum strokes) thereby constituting a phrase nine and one-half beats in length; or it could also be heard as three rapid modulations—the first to 180 for only two beats, the second in a ratio of 3:2 to 120 for only three beats, followed by a return to 180.

Section B continues with a repeated a-phrase fourteen beats long, with two beats displaced by an interesting syncopated figure . The following phrase (b) begins with the same figure but lasts for only six and one-half beats before repeating. The two halves of b are identical except for the addition of a half-beat at the end. This is followed by an exact repetition of section B in its entirety.

The next section (labelled A') returns to the opening melody and tempo. After 56 beats at 240, there is a brief and final modulation back to 180 to conclude the piece.

Conclusions

Hopi drum music, on the surface, may seem to the casual listener to consist primarily of uncomplicated steady pulses with occasional breaks and random changes in tempo. Upon more careful listening, however, it becomes increasingly clear that very subtle and sophisticated rhythmic ideas are involved. We can perceive the proportional relationships among tempi and the way they help define the overall structure of the piece, whether or not we understand them in numeric terms. These changes are clearly not random. All one has to do to comprehend the very specific relationship between one tempo and another is to clap the common pulse that connects them and listen as the tempo shifts. Such an exact proportional shift could not take place unless the drummer also perceived that connecting pulse.

Other interesting rhythmic phenomena which occur in Hopi drumming merit further study: the frequent breaks and the resulting beat displacements, the way these serve a structural role, and the way they connect with the dance. It is an open question as to whether these practices have been maintained since the time of Fewkes's recordings.¹⁶ The few available modern recordings of Hopi drum music do not contain as many clear examples of metric modulation as the two pieces transcribed from Fewkes. This could mean that these skills have been lost or that they occur more often in these specific types of dances, of which there are no other recorded examples.¹⁷ The scarcity of recordings and the reticence on the part of the Hopis to approve any further field research make it difficult to arrive at further conclusions at this time.

NOTES

1. The Hopi drummer is so-called in this paper because he plays the drum, but drum music *per se* does not exist as a category separate from song.

2. Philip P. Morehead, *The New American Dictionary of Music* (New York: Dutton, 1991), 340.

3. David I.H. Harvey, *The Later Music of Elliott Carter: A Study in Music Theory and Analysis* (New York: Garland Publishing, 1989), 25.

4. Schiff argues that even the music of Elliott Carter (to which the term is most often applied) is not intended to be perceived as metric, even though it is notated as such for the convenience of the performers. David Schiff, *The Music of Elliott Carter* (London: Eulenberg Books, 1983), 28.

5. Denis Arnold, ed., *The New Oxford Companion to Music* (Oxford: Oxford University Press, 1983), 1168.

6. Michael Kennedy, *The Concise Oxford Dictionary of Music*, 3rd ed. (Oxford: Oxford University Press, 1988), 415.

7. Robert Fink and Robert Ricci, *The Language of Twentieth Century Music* (New York: Schirmer Books, 1975), 51.

8. It could be argued that this idea is implicit in the idea of cross-rhythm.

9. Paul Griffiths, *The Thames and Hudson Encyclopaedia of Twentieth Century Music* (London: Thames and Hudson, 1986), 119-120.

10. The last two points could be reversed, i.e., because there is a cross-rhythmic relationship between the two pulses, there must be a common pulse at some rhythmic level by which they are related. Given the above definition, an alternative terminology that avoids the confusing implications of the word “metric” may be called for. One possible alternative that I would propose is “cross-rhythmic tempo modulation.”

11. Proportion and balance are strong Hopi values. The main purpose of Hopi ceremony, for instance, is the maintenance of proper proportional relationships within society which includes ancestral spirits, animal and plant spirits, the spirits of natural phenomenon, and human beings.

12. Breaks in the pulse such as this are common in Pueblo music. The Rio Grande Tewas refer to them as *Tu's* (meaning “pause”), though I am unaware of what term the Hopis use for this phenomenon.

13. This ratio is of particular significance to the Hopis. Hopi origin myths usually refer to the successive creation of four worlds (with the current world being the fourth). Many ceremonies reenact the emergence from the third into the fourth worlds (a ratio of 3:4). In many myths, the eagle facilitates the emergence into the fourth world from the third; while highly speculative, this deep structure is in keeping with the significance of the Eagle Dance.

14. I use the masculine pronoun because Hopi eagle-dance drummers are male.

15. The phrases in the 240 pulse tempo are not divisible by four as might be expected. However, at the beginning of this section there is a perceptible accent on the first and fifth beats, followed by a rest on beat 9, supporting the idea that the drummer is perceiving the secondary pulse of 60 beats per minute, at least at the point of modulation.

16. In general, the Hopis have maintained their traditions more than most other native American groups, in part due to their geographical isolation, and in part because of the structure of their society. Many of the important cultural symbols and practices (including much of the traditional music) are preserved because they belong exclusively to specific religious societies, and are protected by members who have access to them. This very exclusivity, on the other hand, has also resulted in the disappearance of certain ceremonial practices; for when the last member of a given society dies, the ceremonies which belong to that society also die. (The Yayatu, Pobostu, and Mamchit ceremonies for example have died out completely, and the Snake Dance is now conducted in only two of the original five villages where it traditionally took place.)

17. One Butterfly Dance example from the *Hopi Butterfly* recording released on Canyon Records (Phoenix), recorded in 1970 (side 2, example 2) contains several metric modulations, although they are not as precise as the examples found on the Fewkes recording. The piece opens with a tempo in the neighborhood of 245 beats per minute, slows gradually to around 230, then

modulates abruptly to around 175 (roughly a 4:3 ratio), then slows again to around 137 (again very nearly a 4:3 ratio). It repeats these three tempo ranges, but tends to gradually accelerate or decelerate while in each of them. Further examples can be found on *Hopi Social Dance Songs*, vol. 2, also issued by Canyon in 1976.

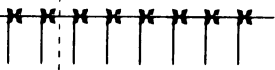
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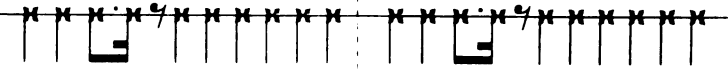
APPENDIX A

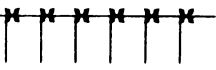
Transcription of Hopi Eagle Dance Song, Drum Part

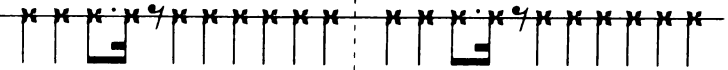
$\bullet = 180$


Intro 

Section A *accelerando*


Phrase a  Phrase a

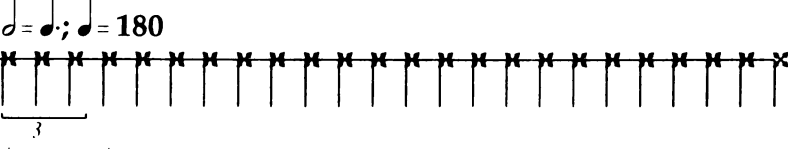
Phrase b 

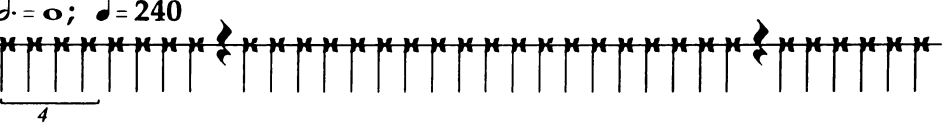
Phrase a  Phrase a

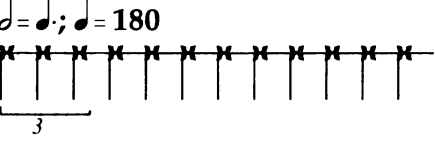
Phrase b' 

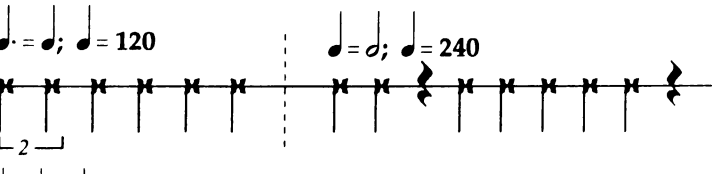
Section B $\bullet = \circ; \bullet = 240$

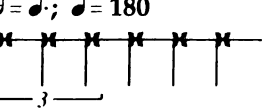
Phrase a 

Phrase b $\bullet = \bullet; \bullet = 180$ 

Phrase a $\bullet = \circ; \bullet = 240$ 

Phrase b' $\bullet = \bullet; \bullet = 180$ 

Phrase a' $\bullet = \bullet; \bullet = 120$ $\bullet = \bullet; \bullet = 240$ 

Phrase b'' $\bullet = \bullet; \bullet = 180$ 

Phrase a"

Phrase c

Phrase b'''

Section C

Section D

Part One

Part Two

accelerando

The musical score is written on a single staff. It begins with a tempo marking of 120 beats per minute (♩ = 120). The first section, Phrase a'', consists of a series of eighth notes. This is followed by Phrase c, which includes a triplet of eighth notes. Phrase b''' is a triplet of eighth notes. Section C is marked with a tempo of 180 beats per minute (♩ = 180) and features a series of eighth notes. Section D is marked with a tempo of 180 beats per minute (♩ = 180) and features a series of eighth notes. Part One is marked with a tempo of 180 beats per minute (♩ = 180) and features a series of eighth notes. Part Two is marked with a tempo of 240 beats per minute (♩ = 240) and features a series of eighth notes. The score concludes with a final measure marked with a tempo of 240 beats per minute (♩ = 240).

APPENDIX B

Transcription of Hopi Snake Dance Song, Drum Part

Intro

Phrase a

Phrase b

Phrase c

Section A ♩ = 240

Phrase a

Phrase b

Phrase c

Transition $\text{♩} = \text{♩} \cdot$ $\text{♩} = 180$

Section B $\text{♩} = 180$

Phrase a

Phrase b

Section A' $\text{♩} \cdot = \text{♩}$; $\text{♩} = 240$

(Coda)

Ending $\text{♩} = \text{♩} \cdot$

Note: In the appendices all *dotted* verticle lines indicate rhythmic groupings as explained in the text. All *undotted* verticle lines indicate groupings of ten notes of equal length irrespective of the rhythmic significance.

