**PROJECT 2.1**

**DEVELOPING RHYTHMS**

**THE DRUMMER ENVIRONMENT**

Now that you have some ideas about beat and it's multiple forms and functions, check out the Drummer environment in a bit more detail. As you have already seen, the Drummer environment differs in several ways from the Tuneblocks environment:

The BLOCKS area includes two kinds of blocks--the familiar *tuneblocks* and also ***drumblocks***.

Tuneblocks, as always, play tunes such as Anya; drumblocks play percussion instruments.

The meaning of the numbers on Drumblocks will become clearer in a moment.

Now look in more detail at the Drummer Playroom:


Voice 1

Voice 2

Voice 3

Voice 4

**Playing the numbers: how much; how many?**

The four separate "strips" in the Drummer Playroom correspond to the four separate ***voices*** that you will be working with. While you could work with only one instrument in one *voice* in the Tuneblocks Playroom, you can work with four instruments in four voices in the Drummer Playroom.

Voice 1: A melody voice (such as HOT) played by pitch-playing instruments--clarinet, vibes, piano, etc..

Voices 2, 3, and 4: Percussion voices for drumblocks played by

percussion instruments, such as conga, bongo, or snare.

Repeat box (at the left of each voice): Tells Impromptu how many times to repeat the drumblock(s) in that Voice The 8 in the Repeat box for Voice 2 tells Impromptu to repeat the 12-block in that voice 8 times. The 8 vertical lines in the graphics notation shows the 8 repetitions in that voice

Repetitions of the same block mark off time into regularly *recurring time units thus creating a beat.*

• Larger numbers represent longer durations, smaller numbers represent shorter durations. The smaller the number on a drumblock, the faster events will follow one another.

• The numbers on drumblocks represent durations that are proportional to one another: e.g., the 2-blocks will go twice as fast as 4-blocks; 6-block wills goes twice as slow as a 3-blocks.

**From Action to Symbolic Description**

**Graphic Representations of Time Relations**

Hearing, feeling, and making sense of temporal relations is a major goal of Project 2.1. However, time is always going by: events happening in the present disappear into the remembered past and into the becoming future. Recall Leonardo's spatial grid where past and future are both in the present view. music's temporal grid is different since it is constantly re-emerging as past and present disappear. Click on PLAY again and this time carefully follow the graphics at the bottom of the screen.

Impromptu's rhythm bars graphic notation represents time relations through analogous spatial relations. As you can see, the unequally spaced vertical lines in the top row of the graphics window represent the varied durations of the rhythm of Anya. Focusing your attention just on Anya while watching the graphics, you notice that the rhythm of events that take up more time (go slower), also take up more space. Similarly, events that take up less time (go faster) take up less space.

In contrast to the unequally spaced lines representing the rhythm of ANYA, the other

three rows of vertical lines are all equally spaced. The equal spaces between these lines represent the equal durations played by the percussion instruments in each voice—that is, each percussion instrument is playing a steady beat.

Turn off Anya in the melody voice (Voice 1) so you can listen more closely just to the percussion instruments. Click on PLAY and focus your attention on the slowest beat represented by the lines at the top level of the percussion (Voice 2). Listen again and clap along with the slowest beat. Now listen for and clap along with the fastest beat shown by the lines at the bottom level (Voice 4). Notice that these lines are closer together than those at the top level. Notice, too, that your hands also move less distance from one another in clapping a faster beat.

Finally, focus your attention on the mid-level beats. This is the beat that usually feels most natural--the beat that you probably clapped when you were first "keeping time" to ANYA. The midlevel beat is called the *tactus* (Italian for "touch"). The tactus is the beat that usually serves as the temporal reference in relation to which beats at the other levels of the hierarchy are measured.

## TWO BASIC PRINCIPLES

### Duration numbers are Proportional

### Duple and Triple Meter

In working on the next experiments, you will be moving back and forth between sounds, your actions, and descriptions in several media. These experiences will help develop your intuitive sense of a pulse, your feel for temporal organization, and the ways in which organizing time becomes a creative medium for composers.

### Building Duple Meter

To focus your attention on the relationships that characterize duple meter, turn off Voice 4, the fastest beat, and listen to just the relations between the slowest beat in Voice 2 and the tactus beat in Voice 3**.** As you listen, watch the continuously moving pointer in the graphics window. The pointer represents the continuous flow of time, while the static vertical lines represent the marking off of that flow by the regularly recurring drum sounds--the beats.. Can you hear that two beats in Voice 3, the tactus, are going by for each beat in Voice 2? This 2:1 temporal relationship is represented by the numbers on the blocks (16:8) and by the two beats going by at the middle (tactus) level against each beat at the grouper level.

The 16-block has the effect of grouping the 8-block beats in two's. To reflect this grouping function, wel call the slower beat the ***grouper beat***. You may have had a somewhat different impression as you listened. Instead of hearing two sets of steady beats going along with a 2:1 relationship between the 8 and the 16 grouper beat, you may have heard a "tick-toc" effect-- a kind of "on-off," or an alternation:

Tic toc tic toc- - - - - -

What creates this effect? When the tactus beat and the grouper beat arrive together, they sound like one stronger beat (tic); the lone tactus beat (toc) falls in between.

Grouper tactus

At these moments when tactus and grouper beats occur simultaneously, they reinforce one another to generate a ***regularly occurring accent.*** If you focus your attention just on the tactus beat, you can hear that tactus beats alternate between accented and unaccented beats. This is usually described as an alternation between strong and weak beats. Try clapping along with the tactus marking this alternation between strong and weak beats. This regular alternation is the central characteristic of what we call ***duple meter***. The term, "duple" refers to the "two-ness" of this metric structure.

Experiment with the instrumentation to make the grouper and tactus beats more distinct.

Now **turn off VOICE 2,** the slowest beat**, and turn on VOICE 4, the** fastest beat**.** Listening just to the relations between the beats in Voices 3 and 4, you hear that the fastest beat at level 4 is moving along twice as fast as the tactus--again a 2:1 relationship.

8 8 8 8

tactus

**divider**

4 4 4 4 4 4 4 4

Taking the tactus as point of reference, the fastest beat **divides** the duration of the tactus in half. We will call this fastest beat the divider beat. Turn VOICE 1 and VOICE 2 on again and listen once more to ANYA accompanied by all three percussion instruments.


As you listen, shift your listening focus from one level to another. Using both hands, try to tap out the beats at two different levels simultaneously. Can you hear and feel the 2:1 proportional relationship? It is this grouping of the tactus beats in twos that characterizes ANYA as being in duple meter . You can see this duple structure represented in several ways: in numbers (12-6-3), in space-for-time graphics, and by following the continuously moving pointer. And most of all you can hear the duple meter structure and feel it by clapping the beats and by listening carefully.

**Re-visiting Sousa and Lanner**

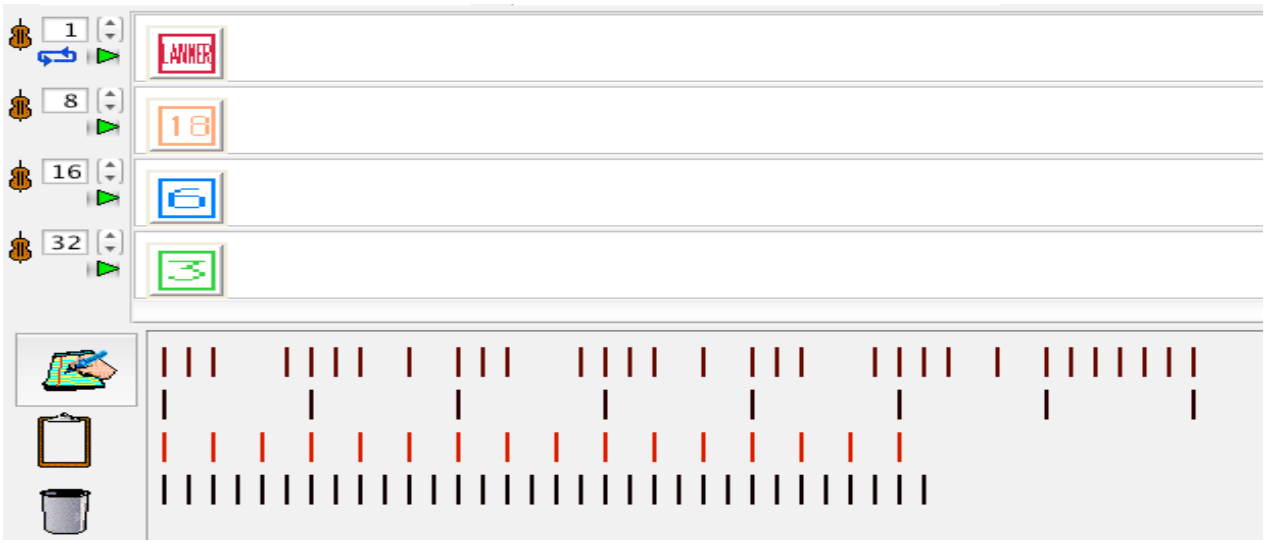
Go back, now, and listen to Sousa's *Stars and Stripes* and Lanner's *Styrian Dance*.(Examples 2.4 and 2.5). Listen several times to *Stars and Stripes* and try to clap and tap two levels of beats at the same time. Can you hear that there is a 2:1 relationship between each of the levels so, your clapping "tells" you that Stars and Stripes, like Anya, is in duple meter.

Now listen several times to the Lanner dance. Listen and try to clap and tap the tactus and the grouper beat at the same time. Can you hear that, unlike Stars and Stripes and Anya there is a **3:1 relationship** between grouper beat and tactus in Lanner's dance? This 3:1 relationship between tactus and grouper beats makes the difference between duple and triple meter. And this difference between the duple meter of Sousa's march and the triple meter of Lanner's dance also exemplifies the **fundamental difference between a march and a waltz**: marches are organized in duple meter, waltzes in triple meter. The next experiments will give you an opportunity to explore this difference.

## Building Triple Meter

The triple meter hierarchy differs from the duple meter hierarchy only in the relation between the grouper beat and the tactus. In triple meter, there are three tactus beats for each grouper beat-- a ratio of 3:1 instead of 2:1. Thus, the slowest beat groups the tactus beat in three's instead of two's. But notice that the fastest beat still divides the tactus in two's, just as in duple meter.

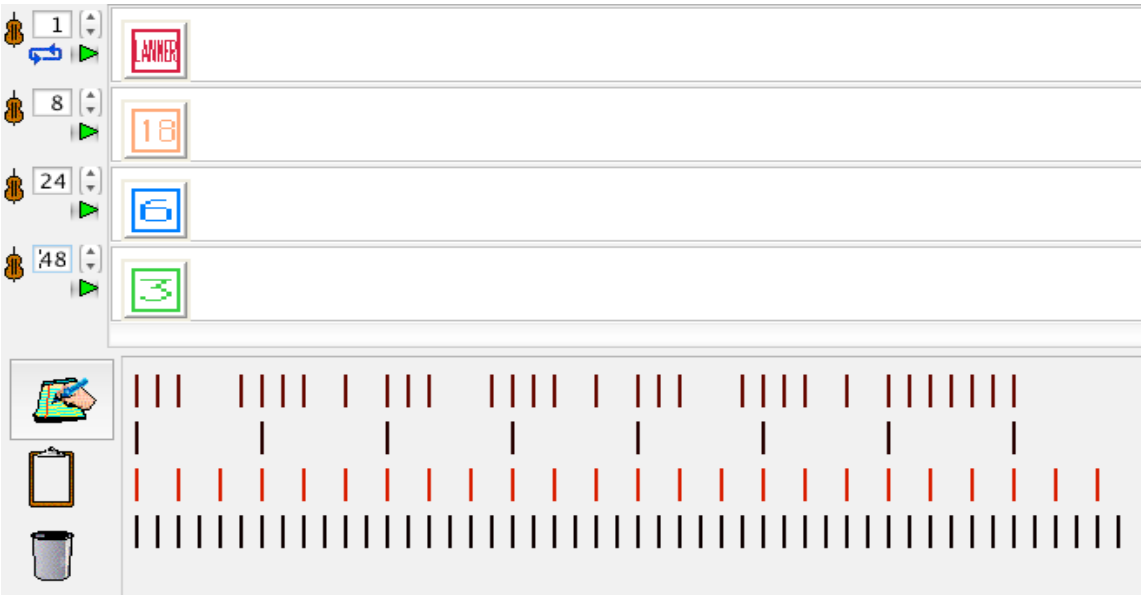
To experiment with triple meter: drag the Anya tuneblock in Voice 1 into the trash and replace it with the Lanner tuneblock. Drag the 12-block in Voice 2 into the trash and replace it with an 18 drum block: . Click on PLAY.




LANNER in Voice 1; 18-block in Voice 2

Notice first of all how stilted the computer instruments sound as compared with the more flexible, musical performance by the Viennese live performers. However, listening to the metrically "exact" computer synthesized version, you can

more easily shift your listening focus from one level of the hierarchy to another and clap each level in turn. Notice, too, that there are not enough beats in the percussion parts to accompany all of the Lanner melody. Make the necessary changes in the Repeat boxes so that the percussion instruments "fill up" the whole tune.




Turn off VOICES 1 and 4. Listen to the relations between the tactus and grouper beats. Can you hear that 3 tactus beats go by for each grouper beat--18:6 = 3:1? The three-ness of triple meter has an interesting effect: instead of hearing a symmetrical alternation between strong and weak tactus beats as in duple meter, you hear a strong beat always followed by two weak beats--an oom-pah-pah effect.

oom-pah-pah

**Duple Meter vs Triple Meter**

This difference between duple and triple meters is reflected in the differences between marching (in duple meter) and waltzing (in triple meter). Being two-legged creatures, we march well to the duple meter alternation of strong and weak beats--LEFT-right; LEFT-right.

Dancing to a waltz, the feeling is more like smoothly gliding. Why? Probably because in waltzing we are always moving through two weak beats for every strong beat. And maybe more important, we must alternate between our two feet on the accent or downbeat: LEFT right-left; RIGHT-left-right; LEFT right left. Imagine marching to a waltz!

**Turn off VOICE 2, turn on VOICE 4 and click on PLAY**

As mentioned before, there is the new 3:1 relation between the tactus and the grouper beat, but there is still a 2:1 relation between the tactus and the divider beat. Thus, the three-ness of triple meter refers only to the grouping of the tactus, not to the division of the tactus. Of course, the tactus beat could be divided in other ways and we will return to that in a bit.

**Change the grouper beat to make the meter duple.**

Turn all the Voices back on. Trash the 18-block in VOICE 2 and replace it with the 12-block making the meter again duple. Does this duple meter accompaniment change the effect/structure of Lanner's melody? Can you describe the difference?

**Experiment with making a triple meter hierarchy using other durations.**

For example, use a 4-block as the tactus again and change the grouper beat to make triple meter. Try the new triple meter accompaniment with Lanner. What is the difference between this conflict and the conflict when you tried a duple meter accompaniment?

**Experiment with different percussion instruments to make the beat levels more distinct.**

To change the percussion instruments that are playing, pull down the instrument menu for any Voice, select an instrument, and listen to how the effect changes..

## EXPLORATIONS 1

### Intuitions and Notations: Can you say what you can do?

It is eminently clear from all of the above that the metric hierarchy is an embodiment of temporal ratios--duple meter as fundamentally 2:1; triple meter as fundamentally 3:1. But to be able to say that is really to start backwards. The remarkable thing is that everyone can intuitively make these proportional relations in action--we can do them quite well without being able to say what it is we know how to do. And we can differentiate and recognize these temporal ratios in action when they are embodied in a melody. Moreover, composers can creatively elaborate these ratios through the varied durations they give to pitches or

non-pitch percussion sounds.

For instance, given some reasonable beat (going, let's say, about as fast as we normally walk), most of us can clap another beat that goes twice as fast or twice as slow. That ability seems to be a natural development from the innate capacity to make a single beat, to "pulse," which babies are born with. But to describe the result of what we are able to do in action, requires a major shift. We must move outside of ourselves-- look at the results of our actions and grasp their relations. In short, we need to *quantify*, to invoke numbers. But as soon as we quantify, we get a *particular* proportional relationship--6:3; 12:6. We know how to enact simple ratios; we can make them in all different sizes while keeping the internal proportions the same. We can start with any beat and intuitively clap a beat that goes twice as fast or twice as slow; three times as fast or three times as slow. But this seems rather far removed from quantifying relations.

Descriptions of actions are fated to de-form our experience of them. So why should you try to say what you know how to do? There are at least 3 reasons:

1) What we do in sound/action instantly disappears; if we can *say what we do*, we can hold action and time still to be looked at, thought about.

2) If we have a notation to describe what we can do, we can use that notation to learn-- to build, develop, elaborate on, and understand in new ways what we know how to do in action.

3) And if we can describe our actions, we can tell/teach another person (and even a machine) how to do what we did.

## Mini-Experiments

### From action to description

Can you get a synthesizer drum to do what you can do in action? Try the following:

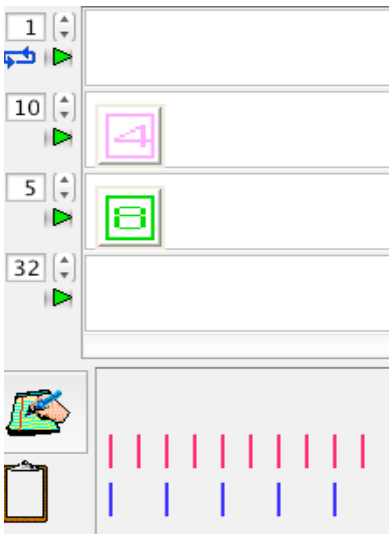
With the Drummer Playroom active on your computer, select METER and set the tempo to about 100.

Now let the synthesizer drum be like a person giving you a starting beat.

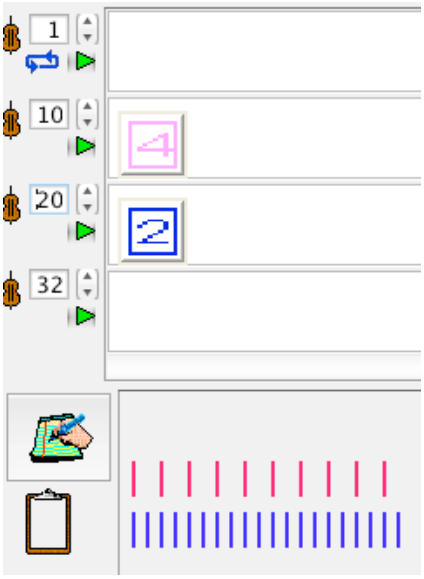
- Clear voices. (Pull down the Edit menu and select "Clear Voices.")
- Put a 4-block in Voice 2 and a 10 in the REPEAT box.
- Click on PLAY and listen to the beat while you clap another beat **that goes twice as fast.**

• Click on PLAY again (or press the space bar} and this time clap a beat **that goes twice as slow.**

• Make the synthesizer drum play each of the beats that you just clapped.




Twice as slow




Twice as fast

Try another!

- Use a 6-block as your starting beat.
- **Clap a beat that goes two times slower**. That's easy because you just clap on every other 6-beat.
- How about **3 times faster?** That's harder. Why?
- Listen to the 6-beat and **clap the slower and then the faster beats**?
- **Get the synthesizer drums to play both of the beats that you just clapped.**
- Listen to the results carefully.

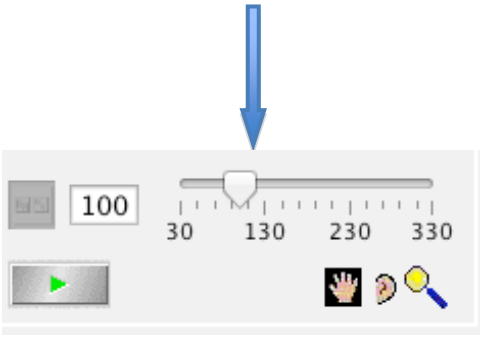
**Compound Duple Meter**

The basic beat you just started with (6-beat) is grouped in twos by the 12-beat. But The 6-beat can also be divided into threes by the 2-beat. This is a relationship you probably wouldn't make so spontaneously. It's called "compound duple" meter because of the combination of duple meter, twos, at the grouper level, and threes at the divider level. Compound duple meter turns out to have interesting possibilities that composers have exploited in various ways from the 16th century until right now. You will hear some examples when you work on Project 2.3

**EXPLORATIONS 3:**

**Fast and Slow**

The easy feeling we have for music moving faster or moving slower is actually created by a fascinating and varied mix of musical relations and dimensions. Most literally, fast and slow have to do with tempo. Tempo refers to the rate of the underlying beat.
For instance, play your example of triple meter in the Playroom while you move the slider at the top of the screen slowly to the right--that is, speed up the tempo.




As you listen, watch the rolling ball (representing time moving) at the bottom of the graphics. Now slow down the tempo—move the slider to the left, listen and watch the rolling ball. What stays the same? What changes?

Another sense of getting faster or slower has to do with the particular durations of events that are being performed. Specifically, a piece "gets faster" if there are more notes played in the same period of time--or more notes per beat. For instance, in "Hot Cross Buns," the middle part "goes faster" than the beginning and ending parts because there are more notes per beat, but the tempo stays the same.

**Hot Cross Buns**

The difference between these two senses of "faster" can be heard quite easily by making the following little experiment: If you Increase the tempo you see the rolling ball go faster and

hear the percussion instruments playing faster. But at the same time, the spatial relations in the graphics stay the same. And so do the relative durations among the three levels of the metric hierarchy. This comparison reflects the difference between "tempo" (rate of the underlying beat), and the relative "duration" of events (the number of events per beat).

P.S. Did you notice that the rhythm of Hot Cross Buns is exactly the same as the rhythm of Anya?

**Fast and Slow Structures:**
**Revisiting Beethoven, Vivaldi, Haydn**

How do composers use our intuitive experience of fast and slow? For instance, listen again to the Beethoven's 9th Symphony excerpt (Example 1.2). Focus on the change from the Theme to Variation 1. Recall that in moving from the Theme to Variation 1, the number of instruments participating increases and the texture becomes *more active*. The bassoon plays a "counter melody" that weaves in and around the melody of the Theme played by the violas and cellos. We have the experience of "getting faster" for two reasons: First, the bassoon plays "faster"--more notes per beat (shorter durations) as compared with the cellos and basses in the Theme. Second, the texture changes from unison in the Theme, to the increased inner activity created by the bassoon's rhythmically independent and competing counter melody. And all of this happens while the tempo remains the same.

For a somewhat more complex example of "getting faster," listen again to the beginning of the Minuet movement from Haydn's Symphony 99 (Example 1.4). Recall the opening antecedent-consequent phrases with their internal contrasts in pitch- movement and texture. Within each of these phrases, there is contrast between conjunct and disjunct movement, and contrast between thin, unison texture, and thicker rhythmic unison texture. As the piece continues, notice again how Haydn fragments these opening phrases. Using only the beginning fragment of each phrase, Haydn makes two new phrases, each of which is half as long as the initial ones. In the process, the internal contrasts in pitch motion and texture are maintained, **but the rate of change increases**. As the phrases are fragmented, so the time between these contrasts becomes half as long so twice as fast. Thus, even though the tempo and the durations of performed events stay just the same, the result is a feeling of

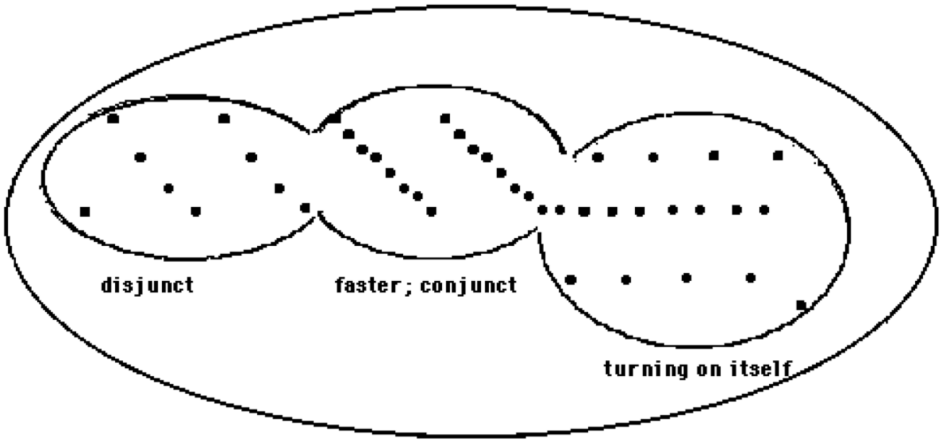
"speeding up."

**Opening Phrases: "Speeding up"**

This structural sense of speeding up is wonderfully illustrated by Vivaldi. Listening again to the opening of "Winter," (Example 1.6), you can hear that Vivaldi establishes a clear beat by asking the instruments simply to play that steady beat altogether. The first contrast occurs when the solo violin enters. The violinist creates the feeling of "getting faster" as he plays "faster notes"--that is, he plays more notes in relation to the steady beat.

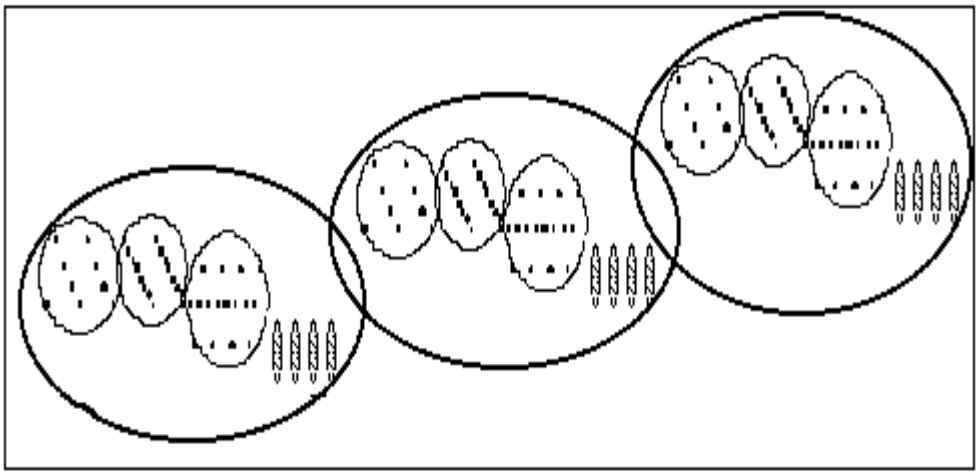
With the return of the full orchestra and the opening steady beat, the tempo stays just the same but the piece seems to slow down again, helping to mark the boundary at the end of this first solo, sequential passage. In the next solo passage Vivaldi plays with our sense of getting faster through new structural means. The violinist is playing "more notes" (the quick, repeated notes), but there is a more subtle difference as well: can you hear that this sequentially repeated figure is much shorter than the previous one? The result is that the moves from one iteration of the sequential figure to the next happen much faster.

This whole passage is a perfect example of how a composer can use change in structural rhythm to create contrast and excitement. A given sequential figure creates a "structural beat" that is equal to the time-span of that figure. In the Vivaldi example, the first sequential figure is relatively long, including three inner figures plus a reminder of the orchestra's steady beat pattern--12 beats in all.




**First sequence: Three inner figures**

This whole three-part figure is repeated three times going up. It is followed by an orchestral interlude.



Repeated 3 times going up

The total time-span of the next sequential figure is exactly half of the first--6 beats in all. Thus we have the feeling of the piece speeding up not only because of the faster notes played by the violin soloist, but also because the structural rhythm is faster--that is, the beats implicitly generated by the sequential repetitions of the second, shorter figure, creates a feeling of speeding up.

Listen to the Vivaldi excerpt several times, shifting your focus of attention among all these dimensions. As these dimensions interact with one another, they form a complex network of inner relationships and it is these which contribute to the almost magical experience of changes in the rate of motion even though the tempo remains the same throughout.