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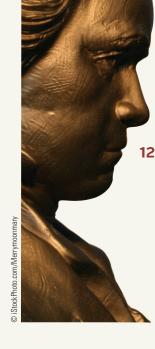
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Elements of Music: Dynamics, Instrumentation, and Rhythm



LEARNING OUTCOMES

After studying this chapter, you will be able to do the following:

- Describe and recognize the basic properties of musical sound, relating them to the elements of music.
- 1-2 Define dynamics in detail.
- 1-3 In the context of understanding timbre and instrumentation, compare the tone color of a piano with that of an orchestra.
- 1-4 Learn the musical meanings of rhythm, beat, tempo, and meter.

n August 29, 1952, pianist David Tudor walked onstage at the Maverick Concert Hall in Woodstock, New York, sat down at a grand piano, placed a musical score on the piano rack, and pulled out a stopwatch. He started the watch, then closed the lid to cover the piano keys. After thirty seconds, he raised the lid. He closed it again and then lifted it two minutes and twenty-three seconds later. He closed the lid a third time and lifted it for the last time after one minute and forty seconds. During the intervals between lowering and raising the lid, Tudor sat quietly, moving only to shift pages in the music. After lifting the lid over the keys for the third time, Tudor stopped the watch, then stood up to signal the end of the work.

Most of the audience were outraged. Some left before the end of the performance. For them, Tudor had violated the most basic assumption about musical composition and performance: that musicians actually do something with sound in performance—that they make sounds with intention. To the audience, it must have seemed like a musical emperor's new clothes.

Tudor's performance was the premiere of 4'33", a composition by the American composer and thinker John Cage (1912-1992). Cage called it his "silent piece," but he composed 4'33" to demonstrate that no environment is truly silent. In this respect, Woodstock's Maverick Concert Hall, the back of which was open to the forest, was an ideal venue. The audience at the first performance could have heard wind rustling through the trees and rain splattering on the roof if they hadn't been so irritated at Cage's seeming violation of musical sensibility. They missed the point. Cage's composition 4'33" was and is—an invitation to tune in to the surrounding sound world with heightened awareness and without judgment.

Music is about structuring sound and silence in particular ways. The traditional definition of **music** is the organization of sound in time. The composition 4'33" represents one extreme of the musical experience—unstructured ambient sound within Cage's temporal frame. We will hear music at the other extreme—music that is completely unvarying—toward the end of our survey. However, most of the music that we will encounter lies in a more familiar middle ground such as that occupied by Beethoven's Fifth Symphony.

By 1807, the year that he began work on his Fifth Symphony, Ludwig van Beethoven (1770–1827) had accepted that his deafness was irreversible. We don't know exactly when the deterioration of his hearing began, but we have correspondence from 1801 and 1802 in which he describes his symptoms and bemoans his fate. He contemplates suicide, but elects to live and to compose.

For a musician, there is no more devastating affliction than deafness. For Beethoven, it meant the end of his career as a performer. He would hear the music that he created only inside his head. He turned inward professionally and socially; visitors used notebooks to communicate with him. That Beethoven was one of the truly great composers of any era puts him in select company. That he not only continued to compose but also created his greatest works after losing his hearing makes his achievement unique.

Beethoven's Fifth Symphony is his most autobiographical work: it is the story of his triumph over adversity. The evidence is in the music; it gives some credence to an apparently fabricated anecdote that Beethoven told his secretary Anton Schindler that the famous opening motive is "fate knocking at the door." Among the most compelling moments in Beethoven's musical account is the passage that connects the third and fourth major sections of the work, or movements (see Music Concept Check: Musical Expression). This passage depicts Beethoven's deafness and his determination to triumph over it.



Listen to Beethoven, Symphony No. 5, third and fourth movements, in CourseMate or your eBook. ●

The excerpt begins with the oboe and the plucked (pizzicato) violins reprising a modified version of the melody heard earlier in the movement, at that time blared out by horns. Here, the dramatic drop in volume is Beethoven's way of communicating that he can no longer hear. As the movement draws to a close, the music continues to disintegrate, until we are left with only a sustained chord and the soft tap on a kettledrum. After

a few seconds, the violins begin to noodle in a seemingly aimless way with a fragment of melody. The music gradually grows louder as the full orchestra joins in. Suddenly, the orchestra blasts out a stirring melody, with the trumpets leading the charge. Within seconds, we have our bearings: music we don't have to strain to hear, the blare of brass instruments, a steady beat, and a tune we can easily remember. With these familiar sounds, Beethoven completes his journey from darkness to light: he refuses to let deafness stifle his creative spirit.

This excerpt highlights our most familiar ways of responding to a musical experience: hearing how loud it is, recognizing the sounds we hear, locating the beat, memorizing the tune. It also demonstrates how great musicians can shape these most fundamental musical qualities to convey deep feeling with enormous power. The beginning of the fourth movement of this symphony is stirring enough on its own, but it gains even more impact because it contrasts so dramatically with what preceded it: from soft to loud, from unusual (plucked strings, drums playing a "melody") to familiar sounds, from ambiguous rhythms to a strong pulse, from seemingly tuneless tones to tuneful melody.

LEARNING OUTCOME 1-1

Describe and recognize the basic properties of musical sound, relating them to the elements of music.

1-1 Properties of Musical Sound

The four entry points just listed—volume, sounds, beat, and tune—grow out of the properties of musical sound. They are the most accessible manifestations of the four properties of musical sound:

- 1. How loud the sound is
- 2. How long it lasts
- 3. How high or low it is
- 4. Its distinctive tonal quality

1-1A Dynamics

We use the word dynamics to refer to the relative loudness or softness of musical sound. We measure the vol-

ume of sound in decibels (dB), units that range from 0 dB (the minimum that you can hear) to 60 dB (the ordinary speaking voice),

music Organization of sound in time

dynamics Relative loudness or softness of musical sound decibel (dB) Unit that measures the volume of sound



A tuning fork that vibrates at 440 cycles per second produces a definite pitch in the midrange of a woman's voice.

to 110 dB (heard at the front rows at a rock concert), to 130 dB (the pain threshold), to 160 dB (resulting in a perforated eardrum). However, in musical contexts we typically describe dynamics in more general terms: very loud, very soft, or somewhere in between.

1-1B Duration

We use the word duration to refer to the length of time that a musical sound or silence lasts. In many instances,

duration The length of time that a musical sound or silence lasts **pitch** The relative highness or low-

ness of a sound **timbre** The distinctive tonal properties of a sound

elements of music Dynamics, rhythm, timbre, melody, harmony, texture, and form

we measure the duration of a sound or intended silence simply by noting when it begins and when it ends. However, when we encounter a series of sounds separated

by silence, such as the audible space between strokes in a drum solo, we tend to measure the duration of the sound as the length of time between one impact and the next rather than the actual duration of the sound, which dies away quickly.

1-1C Pitch

We use the word pitch to refer to the relative highness or lowness of a sound. The pitch of a sound is determined by its frequency, which is measured as the number of vibrations or cycles per second. The highest-pitched string of a conventionally tuned guitar vibrates at 330 cycles per second, whereas the lowest-pitched string vibrates at onefourth of that speed, 82.5 cycles per second. We typically use words like high and low to describe the speed of the vibration: for example, we would say that the top string of the guitar (the one closest to the performer's leg) produces a higher pitch than the bottom string does. We also distinguish between sounds with definite pitch, because they have a consistent frequency, and sounds with indefinite pitch, which do not. Many percussion sounds, including those made on a drum set, convey only a general sense of high and low. Sounds such as the crash of a cymbal or the white noise (the complete range of audible frequencies heard at the same time) heard between radio stations may have duration, but because they have no consistent frequency, they lack definite pitch.

1-1D Timbre

We use the word timbre (TAM-ber) to refer to the distinctive tonal properties of a sound. When we distinguish the sound of your voice from the sound of a friend's and, in music, the sound of an electric guitar from the sound of a violin, we are responding to differences in timbre. Timbre is the only property of musical sound that does not fall on a continuum. Differences in dynamics, duration, and pitch do, because they involve matters of degree: louder or softer, longer or shorter, higher or lower. By contrast, distinctions in timbre are not measurable by degree but by the shapes and frequencies of the sound waves produced by a voice or instrument. A single instrument playing a single tone creates a complex and distinctive waveform. Why? Because almost all musical sounds contain several frequencies sounding simultaneously. When you hear a tone, one frequency dominates, but the tone also contains other frequencies vibrating faster, and sometimes slower, in varying strengths. The resulting waveform—a synthesis of these various frequencies—produces the distinctive timbre of a musical sound. The timbre of a piano is different from the timbre of a flute or a violin because the combinations of frequencies represented by their waveforms are different.

1-1E The Elements of Music

The properties of sound are the four qualities from which the elements of music emerge. Dynamics

4 | CHAPTER 1 : elements of music: dynamics, instrumentation, and rhythm

describes levels and fluctuations in loudness. Timbre is at the heart of *instrumentation*—the selection and combination of instruments and voices used and the manner in which they are performed. *Rhythm* is the product of the durational patterns created by voices and instruments. Successions and combinations of pitches become *melody* and *harmony*. From timbre, rhythm, melody, and harmony comes *texture*, the fabric of sound created by the interaction of all the parts of a musical performance. From the sequence of events, as shaped by all of these elements, comes *form*—the organization of music in time. We discuss each element in turn in this and the next chapter.

LEARNING OUTCOME 1-2
Define dynamics in detail

1-2 Dynamics

On our recording of Beethoven's symphony by the Cleveland Symphony Orchestra (see Music Concept Check: Musical Expression), more than sixty string players sound out the stirring melody that begins the fourth movement and the harmony that supports it. At the same time, only seven members of the orchestra's brass section play the same melody and harmony. Despite their disadvantage in numbers, the brass instruments dominate, while the other instruments remain in the background.

This stunning discrepancy between sheer numbers and power demonstrates that how an instrument is designed and the manner in which it is played are linked to how loud it sounds. Accordingly, in this chapter we consider dynamics and timbre together and experience them as well in a contrast between the sounds of the solo piano and the full symphony orchestra.

Terms associated with dynamics (see The Language of Music: Dynamics) describe either a level of loudness or a change in loudness. Dynamics is the easiest element to discern: no specialized musical training is needed to hear contrasts between loud and soft or even to hear loud gradually becoming soft or vice versa.

Dynamics, more immediately than any other element, can help communicate the character of a musical work or of a section within a work. Before we process anything else in a piece of music—the shape of the melody, the rhythm, the instruments—we respond to its dynamic level. We are most responsive to dynamics when the dynamic levels approach the extreme in either direction or when there are strong contrasts, either sudden or gradual. The ear-splitting loudness of heavymetal groups is a big part of their musical message; conversely, the gentle synthesizer sounds of New Age music are integral to its message.



LEARNING OUTCOME 1-3

In the context of understanding timbre and instrumentation, compare the tone color of a piano with that of an orchestra.

1-3 Timbre and Instrumentation

Timbre is most fundamentally realized in instrumentation, the selection and combination of instruments and voices used in the performance of a musical work. A performance may require only singers, only instruments, or singers and instruments together. It may require only a single musician, such as a pianist—even no musician at all, as is the case in purely electronic compositions—or it may require the massed resources of a 100-member orchestra and a 200-voice choir.

In the course of our survey, you will hear instruments from many times and places, from medieval rebecs and recorders to the rhythm instruments of rock bands. In this chapter, we introduce the symphony orchestra to present many of the instruments that you will hear in the musical examples and to explore the expressive potential of tone color.

1-3A The Symphony Orchestra

The most established and iconic instrumental ensemble in Western culture is the symphony orchestra (see Fig. 1.1). Many major cities in the world have a resident symphony orchestra. Enjoying more widespread support than any other musical group, orchestras perform the most familiar instrumental music in the classical tradition, accompany operas and musicals, and have become a popular medium for film scores, such as John Williams's music for the *Star Wars* series. A large symphony orchestra, such as the Chicago Symphony Orchestra or the New York Philharmonic, has a roster of about a hundred musicians. Among common large instrumental ensembles, only a university marching band is likely to be larger than a modern symphony orchestra.

Today's orchestra is built around four major sections, or families, of instruments: bowed strings, woodwinds, brass, and percussion.

1-3B String Instruments

The bowed string family, or strings, is the core of the orchestra. There are four orchestral string instruments: the

violin, the viola, the violoncello (or simply cello), and the double bass. The violin is the highest-pitched member of the string family, and it has the most brilliant sound. The viola is slightly larger and proportionally wider than the violin.

instrumentation Selection and combination of instruments and voices used in the performance of a musical work

symphony orchestra Large (often 100 musicians or more) musical ensemble containing strings, woodwinds, brass, and percussion

strings Musical instruments that produce sound when the musician draws a bow across or plucks the strings

THE language OF MUSIC

Dynamics

In part because the composer's practice of indicating dynamics in a musical score began in Italy, the terms commonly used for dynamics are Italian. The two basic terms for indicating dynamic levels are the Italian words for loud and soft: *forte* (FOR-tay) means "loud," and *piano* (pee-AH-noh) means "soft." By attaching the superlative suffix *-issimo* (EE-see-moh) or adding the word *mezzo* (MEHD-soh), which means "middle" or "medium," composers could easily indicate six levels of dynamics. Here are the terms for the six most commonly used dynamic levels, from loudest to softest, along with their abbreviations:

fortissimo, ff (for-TEE-see-moh)	the superlative of forte: very loud
forte, f (FOR-tay)	loud
mezzo forte, mf (MEHD-soh FOR-tay)	medium loud: softer than forte but louder than mezzo piano
mezzo piano, mp (MEHD-soh pee-AH-noh)	medium soft: louder than piano but softer than mezzo forte
piano, p (pee-AH-noh)	soft
pianissimo, pp (pee-ah-NEE-see-moh)	very soft

Just as the ups and downs of inflection are intrinsic to speech, dynamic change—raising or lowering the level of sound—occurs in music making. Here, too, musicians use Italian words to describe dynamic change. Here are the most common:

crescendo, ← (creh-SHEN-doh)	growing louder
decrescendo or diminuendo, > (dih-min-yoo-EN-doh)	growing softer
sforzando , sf (ssfort-SAHN-doh)	a strong accent on a single note or chord

Dynamic indications like the abbreviations shown here began to appear in musical scores around 1600. However, it wasn't until the late eighteenth century that dynamic indications appeared routinely in composers' scores and that the markings indicated both dynamic level and dynamic change.

It is somewhat lower in range and has a richer, mellower sound. In orchestral playing, both the violin and the viola

fortissimo, ff Very loud forte, f Loud mezzo forte, mf Medium loud mezzo piano, mp Medium soft piano, p Soft pianissimo, pp Very soft crescendo, Growing louder decrescendo (diminuendo), Growing softer sforzando, sf Strong accent on a single note or chord

are played by placing the instrument under the chin so that the left hand is free to move up and down the neck of the instrument and the right hand can draw the bow across the strings.

The cello is significantly larger than the viola and is tuned lower. The double bass, or simply bass, is the largest and lowest pitched of the four orchestral strings.

In a modern major symphony orchestra, the strings comprise almost two-thirds of the entire roster (see Music Concept Check: Strings). Even though there are four different string instruments that make up the string section of the symphony orchestra, as described above, there are five string sections, each with multiple players. The violins are divided into two sections: first violins and second violins. Usually there are sixteen to nineteen first violins, thirteen to

CHAPTER 1: elements of music: dynamics, instrumentation, and rhythm

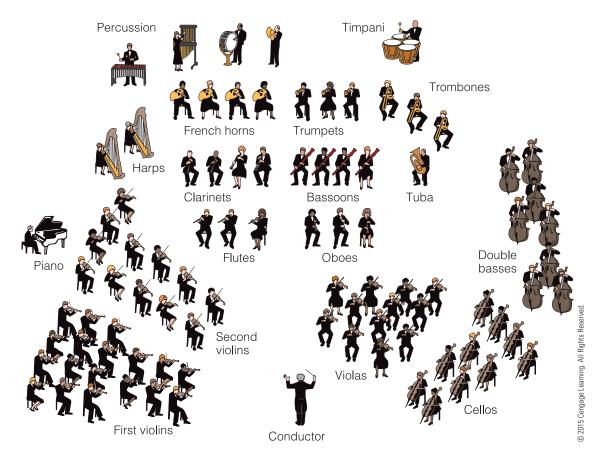


Figure 1.1 Layout of a symphony orchestra



The family of string instruments. These musicians represent the relative sizes of some of the string sections of the orchestra. From left to right: viola, first and second violins, and cello. Note the pronounced difference in size between the cello and the other three instruments, and that the viola is slightly larger and wider than the violin.

sixteen second violins, eleven or twelve violas, ten or eleven cellos, and eight or nine basses. Typically, all of the players within a section play the same part: the first violinists play the first violin part; the second violinists, the second violin part; and so on. The most common exception to this is the bass part, which often doubles (plays the same part as) the cello part, an octave lower. Multiple performers on each string part are necessary in most of the orchestral repertoire to create a rich string sound and to balance the power and brilliance of the rest of the orchestra, particularly the brass and percussion instruments.

Music Concept Check: Strings

In your eBook, hear the orchestral strings enter in Beethoven's Fifth Symphony, third movement, from low to high: first low strings, with the basses doubling the cellos, and then violas, second violins, and first violins.

In orchestral music, the most common way of producing sound on a string instrument is to draw a bow across a string, which is stretched over the *bridge*, a small piece of wood held in place on the instrument's body by the tension of the strings themselves. Skilled performers can use the bow to produce a remarkable range of sounds, from melo-

dies that flow smoothly to sharp, clipped notes. A common alternative

double Having the same line of music played by more than one instrument simultaneously

playing technique is pizzicato, in which the performer plucks the string instead of bowing it (Music Concept Check: Pizzicato). In both cases, the resulting vibrations are transmitted to a resonating cavity, then out through sound holes carved in the front of the instrument.

Music Concept Check: Pizzicato

In your eBook, hear pizzicato violins (and bassoon) in the third movement of Beethoven's Symphony No. 5. ●

1-3C Woodwind Instruments

There are four woodwind sections in all major orchestras: flutes (piccolo, flute); oboes (oboe, English horn); clarinets (clarinet, bass clarinet); and bassoons (bassoon, contrabassoon) (see Music Concept Check: Woodwinds). Each group of instruments has a distinctive shape and method of tone production. Indeed, the flute is no longer made of wood, although it once was; today it is usually made from precious metals. However, it is still considered a woodwind instrument.

Flutists (sometimes referred to as flautists) produce sound by blowing across a mouth hole; they hold the instrument horizontally. Oboists blow into a double reed, two slightly curved pieces of cane that have been bound together and scraped to almost nothing at the tip. Oboists hold the instrument out from their body. Clarinetists attach a reed made from a single piece of cane to a mouth-piece that connects to the body of the instrument. They

also hold the instrument out from their body. Bassoonists also use a double reed attached to a long, thin tube, which connects to the body of the instrument. They usually play sitting down. Due to the length of the bassoon, performers must hold the instrument out to the right side of their body.

The other instruments in each section, such as the piccolo and English horn, are similar enough in shape and playing technique that performers can move between them much more easily than they could move between instruments in different groups. A flutist playing the piccolo need only adapt her basic technique to a smaller instrument; a flutist attempting to play the oboe would have to learn an entirely new instrument.

Not surprisingly, these instruments have quite distinct timbres, which nineteenth-century French composer Hector Berlioz described vividly in *Grand Traité d'Instrumentation et d'Orchestration Modernes*, his landmark treatise on orchestration.

The flute: The sonority of this instrument is gentle in the middle range, fairly penetrating in the upper range.

The oboe: The oboe is principally a melodic instrument; it has a rustic character, full of tenderness, I would say even of shyness.

The clarinet: The clarinet is . . . an epic instrument. . . . It is the voice of heroic love.



The woodwind quintet, the most established woodwind chamber ensemble, includes the four main orchestral woodwinds and the French horn. From left to right: flute, clarinet, French horn, bassoon, and oboe. Performers: the Camerata Woodwind Quintet of Western Illinois University.

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CHAPTER 1: elements of music: dynamics, instrumentation, and rhythm



The brass quintet, the major brass-only chamber group, features the four main orchestral brass instruments. From left to right: trumpets, French horn, tuba, and trombone. Performers: the Lamoine Brass Quintet of Western Illinois University.

The bassoon: The bassoon . . . has a propensity towards the grotesque . . . [its] upper notes have a somewhat painful and suffering character, I might call it almost pitiful.

If you listen to the woodwinds one after the other, you will hear sharp timbral contrasts; by contrast, the members of the string family provide a relatively smooth timbral continuum.



Music Concept Check: Woodwinds 🤝

In your eBook, hear a pair of flutes, in Dvořák's Slavonic Dance in G minor.

Listen to an oboe solo in the first movement of Beethoven's Symphony No. 5.

Hear the clarinet, in Berlioz's Symphonie fantastique, fifth

Listen to the bassoon, at first alone and then joined by clarinets, at the beginning of Stravinsky's ballet The Rite of Spring. •

1-3D Brass Instruments

Brass instruments (see Music Concept Check: Brass Section) produce sound when musicians' lips vibrate against a mouthpiece that has been inserted into a coiled metal tube ending in a flared bell. The most widely used brass instruments in a modern symphony orchestra are, from highest to lowest pitched, the trumpet, horn (also called the French horn), trombone, and tuba. All four descend from ancient trumpets, which were also long, conical metal tubes with a mouthpiece at one end and a bell at the other.

Like the modern-day bugle, these early instruments were limited to only a few notes due to the fixed length of the tube. So, instrument makers later developed mechanisms that enabled brass instruments to play all of the available pitches over the range of the instrument. The trombone was the first to assume its modern form. The slide, which enables trombonists to change pitch by temporarily lengthening the tubing, first appeared in the fifteenth century in the sackbut, an antecedent of the modern trombone. Valves and pistons first appeared around 1800 on trumpets and horns. The tuba is a much more modern instrument, invented during the 1830s.

The most characteristic sound of brass instruments is produced with an open bell. However, brass players occasionally change the timbre of their instruments by inserting a mute in the bell. A mute for brass instruments is any device placed in the bell of the brass instrument that alters the character of the sound produced. It is

pizzicato Technique of plucking a string instead of bowing it woodwind Musical instrument that produces sound by blowing air through a reed or across an open hole causing air to vibrate within a tube

brass Musical instrument that produces sound when the musician's lips vibrate against a mouthpiece that has been inserted into a coiled tube ending in a flared bell mute Device that can change the timbre of an instrument when it is inserted in or applied to the instrument; instruments that most frequently use mutes are those of the brass and string families