Music

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Music	
 A painting on an Ancient Greek vase depicts a music lesson (ca. 510 BC).	
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Originating era	Paleolithic

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Music is an art form whose medium is sound and silence. Common elements of music are pitch (which governs melody and harmony), rhythm (and its associated concepts tempo, meter, and articulation), dynamics, and the sonic qualities of timbre and texture. The word derives from Greek *μουσική* (*mousike*; "art of the Muses").[1]

The creation, performance, significance, and even the definition of music vary according to culture and social context. Music ranges from strictly organized compositions (and their recreation in performance), through improvisational music to aleatoric forms. Music can be divided into genres and subgenres, although the dividing lines and relationships between music genres are often subtle, sometimes open to individual interpretation, and occasionally controversial. Within "the arts," music may be classified as a performing art, a fine art, and auditory art. There is also a strong connection between music and mathematics.

To many people in many cultures, music is an important part of their way of life. Greek philosophers and ancient Indian philosophers defined music as tones ordered horizontally as melodies and vertically as harmonies. Common sayings such as "the harmony of the spheres" and "it is music to my ears" point to the notion that music is often ordered and pleasant to listen to. However, 20th-century composer John Cage thought that any sound can be music, saying, for example, "There is no noise, only sound."[2] Musicologist Jean-Jacques Nattiez summarizes the relativist, post-modern viewpoint: "The border between music and noise is always culturally defined—which implies that, even within a single society, this border does not always pass through the same place; in short, there is rarely a

consensus ... By all accounts there is no *single* and *intercultural* universal concept defining what music might be."[3]

History

Prehistoric eras

Prehistoric music can only be theorized based on findings from paleolithic archaeology sites. Flutes are often discovered, carved from bones in which lateral holes have been pierced; these are thought to have been blown at one end like the Japanese shakuhachi. The Divje Babe flute, carved from a cave bear femur, is thought to be at least 40,000 years old. Instruments, such as the seven-holed flute and various types of stringed instruments have been recovered from the Indus Valley Civilization archaeological sites.[4] India has one of the oldest musical traditions in the world—references to Indian classical music (*marga*) can be found in the ancient scriptures of the Hindu tradition, the Vedas.[5] The earliest and largest collection of prehistoric musical instruments was found in China and dates back to between 7000 and 6600 BC.[6] The Hurrian song, found on clay tablets that date back to the approximately 1400 BC, is the oldest surviving notated work of music.

References in the Bible

Music and theatre scholars studying the history and anthropology of Semitic and early Judeo-Christian culture, have also discovered common links between theatrical and musical activity in the classical cultures of the Hebrews with those of the later cultures of the Greeks and Romans. The common area of performance is found in a "social phenomenon called litany," a form of prayer consisting of a series of invocations or supplications. *The Journal of Religion and Theatre* notes that among the earliest forms of litany, "Hebrew litany was accompanied by a rich musical tradition:"[7]

"David with his harp" Paris Psalter, c. 960, Constantinople

> "While Genesis 4.21 identifies Jubal as the “father of all such as handle the harp and pipe,” the Pentateuch is nearly silent about the practice and instruction of music in the early life of Israel. Then, in I Samuel 10 and the texts that follow, a curious thing happens. “One finds in the biblical text,” writes Alfred Sendrey, “a sudden and unexplained upsurge of large choirs and orchestras, consisting of thoroughly organized and trained musical groups, which would be virtually inconceivable without lengthy, methodical preparation.” This has led some scholars to believe that the prophet Samuel was the patriarch of a school, which taught not only prophets and holy men, but also sacred-rite musicians. This public music school, perhaps the earliest in recorded history, was not restricted to a priestly class—which is how the shepherd boy David appears on the scene as a minstrel to King Saul."[7]

Antiquity

Music was an important part of cultural and social life in Ancient Greece: mixed-gender choruses performed for entertainment, celebration and spiritual ceremonies; musicians and singers had a prominent role in ancient Greek theater.[8]

Western cultures

The music of Greece was a major part of ancient Greek theater. In Ancient Greece, mixed-gender choruses performed for entertainment, celebration and spiritual reasons. Instruments included the double-reed aulos and the plucked string instrument, the lyre, especially the special kind called a kithara. Music was an important part of education in ancient Greece, and boys were taught music starting at age six. Greek musical literacy created a flowering of development; Greek music theory included the Greek musical modes, eventually became the basis for Western religious music and classical music. Later, influences from the Roman Empire, Eastern Europe and the Byzantine Empire changed Greek music.

During the Medieval music era (500–1400), the only European repertory that survives from before about 800 is the monophonic liturgical plainsong of the Roman Catholic Church, the central tradition of which was called Gregorian chant. Alongside these traditions of sacred and church music there existed a vibrant tradition of secular song. Examples of composers from this period are Léonin, Pérotin and Guillaume de Machaut. From the Renaissance music era (1400–1600), much of the surviving music of 14th century Europe is secular. By the middle of the 15th century, composers and singers used a smooth polyphony for sacred musical compositions. The introduction of commercial printing helped to disseminate musical styles more quickly and across a larger area. Prominent composers from this era are Giovanni Pierluigi da Palestrina, Thomas Morley and Orlande de Lassus.

Allegory of Music, by Filippino Lippi

The era of Baroque music (1600–1750) began when the first operas were written and when contrapuntal music became prevalent. German Baroque composers wrote for small ensembles including strings, brass, and woodwinds, as well as choirs, pipe organ, harpsichord, and clavichord. During the Baroque period, several major music forms were defined that lasted into later periods when they were expanded and evolved further, including the fugue, the invention, the sonata, and the concerto.[9] Composers from the Baroque era include Johann Sebastian Bach, George Frideric Handel and Georg Philipp Telemann. The music of the Classical period (1750–1800) is characterized by homophonic texture, often featuring a prominent melody with accompaniment. These new melodies tended to be almost voice-like and singable. The now popular instrumental music was dominated by further evolution of musical forms initially defined in the Baroque period: the sonata, and the concerto, with the addition of the new form, the symphony. Joseph Haydn and Wolfgang Amadeus Mozart are among the central figures of the Classical period.

In 1800, the Romantic era (1800–1890s) in music developed, with Ludwig van Beethoven and Franz Schubert as transitional composers who introduced a more dramatic, expressive style. During this era, existing genres, forms, and functions of music were developed, and the emotional and expressive qualities of music came to take precedence over technique and tradition. In Beethoven's case, motifs (developed organically) came to replace melody as the most significant compositional unit. The late 19th century saw a dramatic expansion in the size of the orchestra, and in the role of concerts as part of urban society. Later Romantic composers such as Pyotr Ilyich Tchaikovsky and Gustav Mahler created complex and often much longer musical works. They used more complex chords and used more dissonance to create dramatic tension.

Asian cultures

Indian classical music is one of the oldest musical traditions in the world.[10] The Indus Valley civilization has sculptures that show dance[11] and old musical instruments, like the seven holed flute. Various types of stringed instruments and drums have been recovered from Harrappa and Mohenjo Daro by excavations carried out by Sir Mortimer Wheeler.[12] The Rigveda has elements of present Indian music, with a musical notation to denote the metre and the mode of chanting.[13] Indian classical music (marga) is monophonic, and based on a single melody line or raga rhythmically organized through talas. Hindustani music was influenced by the Persian performance practices of the Afghan Mughals. Carnatic music popular in the southern states, is largely devotional; the majority of the songs are addressed to the Hindu deities. There are a lot of songs emphasising love and other social issues.

Asian music covers the music cultures of Arabia, Central Asia, East Asia, South Asia, and Southeast Asia. Chinese classical music, the traditional art or court music of China, has a history stretching over around three thousand years. It has its own unique systems of musical notation, as well as musical tuning and pitch, musical instruments and styles or musical genres. Chinese music is pentatonic-diatonic, having a scale of twelve notes to an octave (5 + 7 = 12) as does European-influenced music. Persian music is the music of Persia and Persian language countries: *musiqi*, the science and art of music, and *muzik*, the sound and performance of music (Sakata 1983). See also: Music of Iran, Music of Afghanistan, Music of Tajikistan, Music of Uzbekistan.

20th and 21st century music

With 20th century music, there was a vast increase in music listening as the radio gained popularity and phonographs were used to replay and distribute music. The focus of art music was characterized by exploration of new rhythms, styles, and sounds. Igor Stravinsky, Arnold Schoenberg, and John Cage were all influential composers in 20th century art music. The invention of sound recording and the ability to edit music gave rise to new sub-genre of classical music, including the acousmatic [14] and Musique concrète schools of electronic composition.

Double bassist Reggie Workman, tenor saxophone player Pharoah Sanders, and drummer Idris Muhammad performing in 1978

Jazz evolved and became a significant genre of music over the course of the 20th century, and during the second half of that century, rock music did the same. Jazz is an American musical art form that originated in the beginning of the 20th century in African American communities in the Southern United States from a confluence of African and European music traditions. The style's West African pedigree is evident in its use of blue notes, improvisation, polyrhythms, syncopation, and the swung note.[15] From its early development until the present, jazz has also incorporated music from 19th and 20th century American popular music.[16] Jazz has, from its early 20th century inception, spawned a variety of subgenres, ranging from New Orleans Dixieland (1910s) to 1970s and 1980s-era jazz-rock fusion.

Rock music is a genre of popular music that developed in the 1960s from 1950s rock and roll, rockabilly, blues, and country music. The sound of rock often revolves around the electric guitar or acoustic guitar, and it uses a strong back beat laid down by a rhythm section of electric bass guitar, drums, and keyboard instruments such as organ, piano, or, since the 1970s, analog synthesizers and digital ones and computers since the 1990s. Along with the guitar or keyboards, saxophone and blues-style harmonica are used as soloing instruments. In its "purest form," it "has three chords, a strong, insistent back beat, and a catchy melody."[17] In the late 1960s and early 1970s, rock music branched out into different subgenres, ranging from blues rock and jazz-rock fusion to heavy metal and punk rock, as well as the more classical influenced genre of progressive rock and several types of experimental rock genres.

Performance

Chinese Naxi musicians

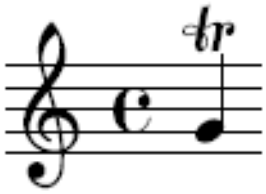
Performance is the physical expression of music. Often, a musical work is performed once its structure and instrumentation are satisfactory to its creators; however, as it gets performed, it can evolve and change. A performance can either be rehearsed or improvised. Improvisation is a musical idea created without premeditation, while rehearsal is vigorous repetition of an idea until it has achieved cohesion. Musicians will sometimes add improvisation to a well-rehearsed idea to create a unique performance.

Many cultures include strong traditions of solo and performance, such as in Indian classical music, and in the Western Art music tradition. Other cultures, such as in Bali, include strong traditions of group performance. All cultures include a mixture of both, and performance may range from improvised solo playing for one's enjoyment to highly planned and organised performance rituals such as the modern classical concert, religious processions, music festivals or music competitions. Chamber music, which is music for a small ensemble with only a few of each type of instrument, is often seen as more intimate than symphonic works.

Aural tradition

Many types of music, such as traditional blues and folk music were originally preserved in the memory of performers, and the songs were handed down orally, or aurally (by ear). When the composer of music is no longer known, this music is often classified as "traditional." Different musical traditions have different attitudes towards how and where to make changes to the original source material, from quite strict, to those that demand improvisation or modification to the music. A culture's history may also be passed by ear through song.

Ornamentation



In a score or on a performer's music part, this sign indicates that the musician should perform a trill—a rapid alternation between two notes.

The detail included explicitly in the music notation varies between genres and historical periods. In general, art music notation from the 17th through the 19th century required performers to have a great deal of contextual knowledge about performing styles. For example, in the 17th and 18th century, music notated for solo performers typically indicated a simple, unadorned melody. However, performers were expected to know how to add stylistically appropriate ornaments, such as trills and turns. In the 19th century, art music for solo performers may give a general instruction such as to perform the music expressively, without describing in detail how the performer should do this. The performer was expected to know how to use tempo changes, accentuation, and pauses (among other devices) to obtain this "expressive" performance style. In the 20th century, art music notation often became more explicit and used a range of markings and annotations to indicate to performers how they should play or sing the piece.

In popular music and jazz, music notation almost always indicates only the basic framework of the melody, harmony, or performance approach; musicians and singers are expected to know the performance conventions and styles associated with specific genres and pieces. For example, the "lead sheet" for a jazz tune may only indicate the melody and the chord changes. The performers in the jazz ensemble are expected to know how to "flesh out" this basic structure by adding ornaments, improvised music, and chordal accompaniment.

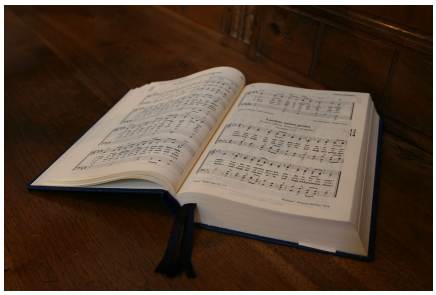
Production

Jean-Gabriel Ferlan performing at a 2008 concert at the collège-lycée Saint-François Xavier

Music is composed and performed for many purposes, ranging from aesthetic pleasure, religious or ceremonial purposes, or as an entertainment product for the marketplace. Amateur musicians compose and perform music for their own pleasure, and they do not derive their income from music. Professional musicians are employed by a range of institutions and organisations, including armed forces, churches and synagogues, symphony orchestras, broadcasting or film production companies, and music schools. Professional musicians sometimes work as freelancers, seeking contracts and engagements in a variety of settings.

There are often many links between amateur and professional musicians. Beginning amateur musicians take lessons with professional musicians. In community settings, advanced amateur musicians perform with professional musicians in a variety of ensembles and orchestras. In some cases, amateur musicians attain a professional level of competence, and they are able to perform in professional performance settings. A distinction is often made between music performed for the benefit of a live audience and music that is performed for the purpose of being recorded and distributed through the music retail system or the broadcasting system. However, there are also many cases where a live performance in front of an audience is recorded and distributed (or broadcast).

Composition



An old songbook showing a composition

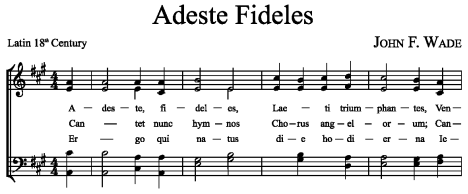
"Composition" is often classed as the creation and recording of music via a medium by which others can interpret it (i.e., paper or sound). Many cultures use at least part of the concept of preconceiving musical material, or composition, as held in western classical music. Even when music is notated precisely, there are still many decisions that a performer has to make. The process of a performer deciding how to perform music that has been previously composed and notated is termed interpretation. Different performers' interpretations of the same music can vary widely. Composers and song writers who present their own music are interpreting, just as much as those who perform the music of others or folk music. The standard body of choices and techniques present at a given time and a given place is referred to as performance practice, whereas interpretation is generally used to mean either individual choices of a performer, or an aspect of music that is not clear, and therefore has a "standard" interpretation.

In some musical genres, such as jazz and blues, even more freedom is given to the performer to engage in improvisation on a basic melodic, harmonic, or rhythmic framework. The greatest latitude is given to the performer in a style of performing called free improvisation, which is material that is spontaneously "thought of" (imagined) while being performed, *not* preconceived. Improvised music usually follows stylistic or genre conventions and even "fully composed" includes some freely chosen material. Composition does not always mean the use of notation, or the known sole authorship of one individual. Music can also be determined by describing a "process" that creates musical sounds. Examples of this range from wind chimes, through computer programs that select sounds. Music from random elements is called Aleatoric music, and is associated with such composers as John Cage, Morton Feldman, and Witold Lutosławski.

Music can be composed for repeated performance or it can be improvised: composed on the spot. The music can be performed entirely from memory, from a written system of musical notation, or some combination of both. Study of

composition has traditionally been dominated by examination of methods and practice of Western classical music, but the definition of composition is broad enough to include spontaneously improvised works like those of free jazz performers and African drummers such as the Ewe drummers.

Notation



Sheet music is written representation of music. This is a homorhythmic (i.e., hymn-style) arrangement of a traditional piece entitled *Adeste Fideles*, in standard two-staff format for mixed voices.

Notation is the written expression of music notes and rhythms on paper using symbols. When music is written down, the pitches and rhythm of the music is notated, along with instructions on how to perform the music. The study of how to read notation involves music theory, harmony, the study of performance practice, and in some cases an understanding of historical performance methods. Written notation varies with style and period of music. In Western Art music, the most common types of written notation are scores, which include all the music parts of an ensemble piece, and parts, which are the music notation for the individual performers or singers. In popular music, jazz, and blues, the standard musical notation is the lead sheet, which notates the melody, chords, lyrics (if it is a vocal piece), and structure of the music. Scores and parts are also used in popular music and jazz, particularly in large ensembles such as jazz "big bands."

In popular music, guitarists and electric bass players often read music notated in tablature (often abbreviated as "tab"), which indicates the location of the notes to be played on the instrument using a diagram of the guitar or bass fingerboard. Tabulature was also used in the Baroque era to notate music for the lute, a stringed, fretted instrument. Notated music is produced as sheet music. To perform music from notation requires an understanding of both the rhythmic and pitch elements embodied in the symbols and the performance practice that is associated with a piece of music or a genre.

Improvisation

Musical improvisation is the creation of spontaneous music. Improvisation is often considered an act of instantaneous composition by performers, where compositional techniques are employed with or without preparation. Improvisation is a major part of some types of music, such as blues, jazz, and jazz fusion, in which instrumental performers improvise solos and melody lines. In the Western art music tradition, improvisation was an important skill during the Baroque era and during the Classical era; solo performers and singers improvised virtuoso cadenzas during concerts. However, in the 20th and 21st century, improvisation played a smaller role in Western Art music.

Theory

Music theory encompasses the nature and mechanics of music. It often involves identifying patterns that govern composers' techniques and examining the language and notation of music. In a grand sense, music theory distills and analyzes the parameters or elements of music – rhythm, harmony (harmonic function), melody, structure, form, and texture. Broadly, music theory may include any statement, belief, or conception of or about music.[18] People who study these properties are known as music theorists. Some have applied acoustics, human physiology, and psychology to the explanation of how and why music is perceived. Music has many different fundamentals or elements. These are, but are not limited to: pitch, beat or pulse, rhythm, melody, harmony, texture, allocation of voices, timbre or color, expressive qualities (dynamics and articulation), and form or structure.

Pitch is a subjective sensation, reflecting generally the lowness or highness of a sound. Rhythm is the arrangement of sounds and silences in time. Meter animates time in regular pulse groupings, called measures or bars. A melody is a

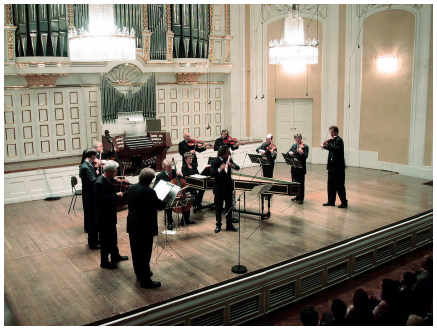
series of notes sounding in succession. The notes of a melody are typically created with respect to pitch systems such as scales or modes. Harmony is the study of vertical sonorities in music. Vertical sonority refers to considering the relationships between pitches that occur together; usually this means at the same time, although harmony can also be implied by a melody that outlines a harmonic structure. Notes can be arranged into different scales and modes. Western music theory generally divides the octave into a series of 12 notes that might be included in a piece of music. In music written using the system of major-minor tonality, the **key** of a piece determines the scale used. Musical texture is the overall sound of a piece of music commonly described according to the number of and relationship between parts or lines of music: monophony, heterophony, polyphony, homophony, or monody.

Timbre, sometimes called "Color" or "Tone Color" is the quality or sound of a voice or instrument.[19] Expressive Qualities are those elements in music that create change in music that are not related to pitch, rhythm or timbre. They include Dynamics and Articulation. Form is a facet of music theory that explores the concept of musical syntax, on a local and global level. Examples of common forms of Western music include the fugue, the invention, sonata-allegro, canon, strophic, theme and variations, and rondo. Popular Music often makes use of strophic form often in conjunction with Twelve bar blues. Analysis is the effort to describe and explain music.

Cognition

Further information: Hearing (sense) and Psychoacoustics

The field of music cognition involves the study of many aspects of music including how it is processed by listeners. Rather than accepting the standard practices of analyzing, composing, and performing music as a given, much research in music cognition seeks instead to uncover the mental processes that underlie these practices. Also, research in the field seeks to uncover commonalities between the musical traditions of disparate cultures and possible cognitive "constraints" that limit these musical systems. Questions regarding musical innateness, and emotional responses to music are also major areas of research in the field.



A chamber music group consisting of stringed instrument players, a flautist, and a harpsichordist perform in Salzburg

Deaf people can experience music by feeling the vibrations in their body, a process that can be enhanced if the individual holds a resonant, hollow object. A well-known deaf musician is the composer Ludwig van Beethoven, who composed many famous works even after he had completely lost his hearing. Recent examples of deaf musicians include Evelyn Glennie, a highly acclaimed percussionist who has been deaf since age twelve, and Chris Buck, a virtuoso violinist who has lost his hearing. This is relevant because it indicates that music is a deeper cognitive process than unexamined phrases such as, "pleasing to the ear" suggests. Much research in music cognition seeks to uncover these complex mental processes involved in listening to music, which may seem intuitively simple, yet are vastly intricate and complex.

University of Montreal researcher Valorie Salimpoor and her colleagues have now shown that the pleasurable feelings associated with emotional music are the result of dopamine release in the striatum--the same anatomical areas that underpin the anticipatory and rewarding aspects of drug addiction [20] .

Sociology

This Song Dynasty (960–1279) painting, entitled the "Night Revels of Han Xizai," shows Chinese musicians entertaining guests at a party in a 10th century household.

Music is experienced by individuals in a range of social settings ranging from being alone to attending a large concert. Musical performances take different forms in different cultures and socioeconomic milieus. In Europe and North America, there is often a divide between what types of music are viewed as a "high culture" and "low culture." "High culture" types of music typically include Western art music such as Baroque, Classical, Romantic, and modern-era symphonies, concertos, and solo works, and are typically heard in formal concerts in concert halls and churches, with the audience sitting quietly in seats.

Other types of music—including, but not limited to, jazz, blues, soul, and country—are often performed in bars, nightclubs, and theatres, where the audience may be able to drink, dance, and express themselves by cheering. Until the later 20th century, the division between "high" and "low" musical forms was widely accepted as a valid distinction that separated out better quality, more advanced "art music" from the popular styles of music heard in bars and dance halls.

However, in the 1980s and 1990s, musicologists studying this perceived divide between "high" and "low" musical genres argued that this distinction is not based on the musical value or quality of the different types of music. Rather, they argued that this distinction was based largely on the socioeconomics standing or social class of the performers or audience of the different types of music. For example, whereas the audience for Classical symphony concerts typically have above-average incomes, the audience for a rap concert in an inner-city area may have below-average incomes. Even though the performers, audience, or venue where non-"art" music is performed may have a lower socioeconomic status, the music that is performed, such as blues, rap, punk, funk, or ska may be very complex and sophisticated.

When composers introduce styles of music that break with convention, there can be a strong resistance from academic music experts and popular culture. Late-period Beethoven string quartets, Stravinsky ballet scores, serialism, bebop-era jazz, hip hop, punk rock, and electronica have all been considered non-music by some critics when they were first introduced. Such themes are examined in the sociology of music. The sociological study of music, sometimes called sociomusicology, is often pursued in departments of sociology, media studies, or music, and is closely related to the field of ethnomusicology.

Media and technology

Further information: Computer music

The music that composers make can be heard through several media; the most traditional way is to hear it live, in the presence, or as one of the musicians. Live music can also be broadcast over the radio, television or the Internet. Some musical styles focus on producing a sound for a performance, while others focus on producing a recording that mixes together sounds that were never played "live." Recording, even of essentially live styles, often uses the ability to edit and splice to produce recordings considered better than the actual performance.

A 12-inch (30-cm) $33\frac{1}{3}$ rpm record (left), a 7-inch 45 rpm record (right), which are both analog sound storage mediums, and a CD (above), a digital medium.

As talking pictures emerged in the early 20th century, with their prerecorded musical tracks, an increasing number of moviehouse orchestra musicians found themselves out of work.[21] During the 1920s live musical performances by orchestras, pianists, and theater organists were common at first-run theaters.[22] With the coming of the talking motion pictures, those featured performances were largely eliminated. The American Federation of Musicians (AFM) took out newspaper advertisements protesting the replacement of live musicians with mechanical playing devices. One 1929 ad that appeared in the *Pittsburgh Press* features an image of a can labeled "Canned Music / Big Noise Brand / Guaranteed to Produce No Intellectual or Emotional Reaction Whatever"[23]

Since legislation introduced to help protect performers, composers, publishers and producers, including the Audio Home Recording Act of 1992 in the United States, and the 1979 revised Berne Convention for the Protection of Literary and Artistic Works in the United Kingdom, recordings and live performances have also become more accessible through computers, devices and Internet in a form that is commonly known as Music-On-Demand.

In many cultures, there is less distinction between performing and listening to music, since virtually everyone is involved in some sort of musical activity, often communal. In industrialized countries, listening to music through a recorded form, such as sound recording or watching a music video, became more common than experiencing live performance, roughly in the middle of the 20th century.

Sometimes, live performances incorporate prerecorded sounds. For example, a disc jockey uses disc records for scratching, and some 20th century works have a solo for an instrument or voice that is performed along with music that is prerecorded onto a tape. Computers and many keyboards can be programmed to produce and play Musical Instrument Digital Interface (MIDI) music. Audiences can also *become* performers by participating in karaoke, an activity of Japanese origin centered on a device that plays voice-eliminated versions of well-known songs. Most karaoke machines also have video screens that show lyrics to songs being performed; performers can follow the lyrics as they sing over the instrumental tracks.

Internet

The advent of the Internet has transformed the experience of music, partly through the increased ease of access to music and the increased choice. Chris Anderson, in his book *The Long Tail: Why the Future of Business is Selling Less of More*, suggests that while the economic model of supply and demand describes scarcity, the Internet retail model is based on abundance. Digital storage costs are low, so a company can afford to make its whole inventory available online, giving customers as much choice as possible. It has thus become economically viable to offer products that very few people are interested in. Consumers' growing awareness of their increased choice results in a closer association between listening tastes and social identity, and the creation of thousands of niche markets.[24]

Another effect of the Internet arises with online communities like YouTube and MySpace. MySpace has made social networking with other musicians easier, and greatly facilitates the distribution of one's music. YouTube also has a large community of both amateur and professional musicians who post videos and comments. Professional musicians also use YouTube as a free publisher of promotional material. YouTube users, for example, no longer only download and listen to MP3s, but also actively create their own. According to Don Tapscott and Anthony D. Williams, in their book *Wikinomics*, there has been a shift from a traditional consumer role to what they call a "prosumer" role, a consumer who both creates and consumes. Manifestations of this in music include the production of mashes, remixes, and music videos by fans.[25]

Business

The music industry refers to the business industry connected with the creation and sale of music. It consists of record companies, labels and publishers that distribute recorded music products internationally and that often control the rights to those products. Some music labels are "independent," while others are subsidiaries of larger corporate entities or international media groups. In the 2000s, the increasing popularity of listening to music as digital music files on MP3 players, iPods, or computers, and of trading music on file sharing sites or buying it online in the form of digital files had a major impact on the traditional music business. Many smaller independent CD stores went out of business as music buyers decreased their purchases of CDs, and many labels had lower CD sales. Some companies did well with the change to a digital format, though, such as Apple's iTunes, an online store that sells digital files of songs over the Internet.

Education

Non-professional

The incorporation of music training from preschool to post secondary education is common in North America and Europe. Involvement in music is thought to teach basic skills such as concentration, counting, listening, and cooperation while also promoting understanding of language, improving the ability to recall information, and creating an environment more conducive to learning in other areas.[26] In elementary schools, children often learn to play instruments such as the recorder, sing in small choirs, and learn about the history

A Suzuki violin recital with students of varying ages.

of Western art music. In secondary schools students may have the opportunity to perform some type of musical ensembles, such as choirs, marching bands, concert bands, jazz bands, or orchestras, and in some school systems, music classes may be available. Some students also take private music lessons with a teacher. Amateur musicians typically take lessons to learn musical rudiments and beginner- to intermediate-level musical techniques.

At the university level, students in most arts and humanities programs can receive credit for taking music courses, which typically take the form of an overview course on the history of music, or a music appreciation course that focuses on listening to music and learning about different musical styles. In addition, most North American and European universities have some type of musical ensembles that non-music students are able to participate in, such as choirs, marching bands, or orchestras. The study of Western art music is increasingly common outside of North America and Europe, such as the Indonesian Institute of the Arts in Yogyakarta, Indonesia, or the classical music programs that are available in Asian countries such as South Korea, Japan, and China. At the same time, Western universities and colleges are widening their curriculum to include music of non-Western cultures, such as the music of Africa or Bali (e.g. Gamelan music).

Academia

Musicology is the study of the subject of music. The earliest definitions defined three sub-disciplines: systematic musicology, historical musicology, and comparative musicology or ethnomusicology. In contemporary scholarship, one is more likely to encounter a division of the discipline into music theory, music history, and ethnomusicology. Research in musicology has often been enriched by cross-disciplinary work, for example in the field of psychoacoustics. The study of music of non-western cultures, and the cultural study of music, is called ethnomusicology. Students can pursue the undergraduate study of musicology, ethnomusicology, music history, and music theory through several different types of degrees, including a B.Mus, a B.A. with concentration in music, a B.A. with Honors in Music, or a B.A. in Music History and Literature. Graduates of undergraduate music programs can go on to further study in music graduate programs.

Graduate degrees include the Master of Music, the Master of Arts, the Doctor of Philosophy (PhD) (e.g., in musicology or music theory), and more recently, the Doctor of Musical Arts, or DMA. The Master of Music degree, which takes one to two years to complete, is typically awarded to students studying the performance of an instrument, education, voice or composition. The Master of Arts degree, which takes one to two years to complete and often requires a thesis, is typically awarded to students studying musicology, music history, or music theory. Undergraduate university degrees in music, including the Bachelor of Music, the Bachelor of Music Education, and the Bachelor of Arts (with a major in music) typically take three to five years to complete. These degrees provide students with a grounding in music theory and music history, and many students also study an instrument or learn singing technique as part of their program.

The PhD, which is required for students who want to work as university professors in musicology, music history, or music theory, takes three to five years of study after the Master's degree, during which time the student will complete advanced courses and undertake research for a dissertation. The DMA is a relatively new degree that was created to provide a credential for professional performers or composers that want to work as university professors in musical performance or composition. The DMA takes three to five years after a Master's degree, and includes advanced courses, projects, and performances. In Medieval times, the study of music was one of the Quadrivium of the seven Liberal Arts and considered vital to higher learning. Within the quantitative Quadrivium, music, or more accurately harmonics, was the study of rational proportions.

Zoomusicology is the study of the music of non-human animals, or the musical aspects of sounds produced by non-human animals. As George Herzog (1941) asked, "do animals have music?" François-Bernard Mâche's *Musique, mythe, nature, ou les Dauphins d'Arion* (1983), a study of "ornitho-musicology" using a technique of Nicolas Ruwet's *Language, musique, poésie* (1972) paradigmatic segmentation analysis, shows that bird songs are organised according to a repetition-transformation principle. Jean-Jacques Nattiez (1990), argues that "in the last analysis, it is

a human being who decides what is and is not musical, even when the sound is not of human origin. If we acknowledge that sound is not organised and conceptualised (that is, made to form music) merely by its producer, but by the mind that perceives it, then music is uniquely human."

Music theory is the study of music, generally in a highly technical manner outside of other disciplines. More broadly it refers to any study of music, usually related in some form with compositional concerns, and may include mathematics, physics, and anthropology. What is most commonly taught in beginning music theory classes are guidelines to write in the style of the common practice period, or tonal music. Theory, even of music of the common practice period, may take many other forms. Musical set theory is the application of mathematical set theory to music, first applied to atonal music. *Speculative music theory*, contrasted with *analytic music theory*, is devoted to the analysis and synthesis of music materials, for example tuning systems, generally as preparation for composition.

Ethnomusicology

Ethnomusicology In the West, much of the history of music that is taught deals with the Western civilization's art music. The history of music in other cultures ("world music" or the field of "ethnomusicology") is also taught in Western universities. This includes the documented classical traditions of Asian countries outside the influence of Western Europe, as well as the folk or indigenous music of various other cultures. Popular styles of music varied widely from culture to culture, and from period to period. Different cultures emphasised different instruments, or techniques, or uses for music. Music has been used not only for entertainment, for ceremonies, and for practical and artistic communication, but also for propaganda.

Ethnomusicologist Frances Densmore recording Blackfoot chief Mountain Chief for the Bureau of American Ethnology (1916)

There is a host of music classifications, many of which are caught up in the argument over the definition of music. Among the largest of these is the division between classical music (or "art" music), and popular music (or commercial music – including rock music, country music, and pop music). Some genres do not fit neatly into one of these "big two" classifications, (such as folk music, world music, or jazz music).

As world cultures have come into greater contact, their indigenous musical styles have often merged into new styles. For example, the United States bluegrass style contains elements from Anglo-Irish, Scottish, Irish, German and African instrumental and vocal traditions, which were able to fuse in the United States' multi-ethnic society. Genres of music are determined as much by tradition and presentation as by the actual music. Some works, like George Gershwin's *Rhapsody in Blue*, are claimed by both jazz and classical music, while Gershwin's *Porgy and Bess* and Leonard Bernstein's *West Side Story* are claimed by both opera and the Broadway musical tradition. Many current music festivals celebrate a particular musical genre.

Indian music, for example, is one of the oldest and longest living types of music, and is still widely heard and performed in South Asia, as well as internationally (especially since the 1960s). Indian music has mainly three forms of classical music, Hindustani, Carnatic, and Dhrupad styles. It has also a large repertoire of styles, which involve only percussion music such as the talavadya performances famous in South India.

Music therapy

Music therapy is an interpersonal process in which the therapist uses music and all of its facets—physical, emotional, mental, social, aesthetic, and spiritual—to help clients to improve or maintain their health. In some instances, the client's needs are addressed directly through music; in others they are addressed through the relationships that develop between the client and therapist. Music therapy is used with individuals of all ages and with a variety of conditions, including: psychiatric disorders, medical problems, physical handicaps, sensory impairments, developmental disabilities, substance abuse, communication disorders, interpersonal problems, and aging. It is also used to: improve learning, build self-esteem, reduce stress, support physical exercise, and facilitate a host of other health-related activities.

One of the earliest mentions of Music Therapy was in Al-Farabi's (c. 872 – 950) treatise *Meanings of the Intellect*, which described the therapeutic effects of music on the soul.[27] Music has long been used to help people deal with their emotions. In the 17th century, the scholar Robert Burton's *The Anatomy of Melancholy* argued that music and dance were critical in treating mental illness, especially melancholia.[28] He noted that music has an "excellent power ...to expel many other diseases" and he called it "a sovereign remedy against despair and melancholy." He pointed out that in Antiquity, Canus, a Rhodian fiddler, used music to "make a melancholy man merry, ...a lover more enamoured, a religious man more devout." [29] [30] [31] In November 2006, Dr. Michael J. Crawford[32] and his colleagues also found that music therapy helped schizophrenic patients.[33] In the Ottoman Empire, mental illnesses were treated with music.[34]

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External links

- BBC Blast Music (http://www.bbc.co.uk/blast/music/) For 13–19-year-olds interested in learning about, making, performing and talking about music.
- The Virginia Tech Multimedia Music Dictionary (http://www.music.vt.edu/musicdictionary/), with definitions, pronunciations, examples, quizzes and simulations
- The Music-Web Music Encyclopedia (http://www.music-web.org/), for musicians, composers and music lovers
- Dolmetsch free online music dictionary (http://dolmetsch.com/musictheorydefs.htm), complete, with references to a list of specialised music dictionaries (by continent, by instrument, by genre, etc.)
- Musical Terms (http://www.naxos.com/education/glossary.asp) – Glossary of music terms from Naxos
- "On Hermeneutical Ethics and Education: Bach als Erzieher" (http://www.uned.es/dpto_fil/revista/polemos/articulos/MA_Quintana_On Hermeneutical Ethics &Education (Internet)2.doc), a paper by Prof. Miguel Ángel Quintana Paz in which he explains the history of the different views hold about music in Western societies, since the Ancient Greece to our days.
- Monthly Online Features From Bloomingdale School of Music (http://www.bsmny.org/features), addressing a variety of musical topics for a wide audience
- Arts and Music Uplifting Society towards Transformation and Tolerance (http://www.musicfoundations.org/pages/3/index.htm) Articles meant to stimulate people's awareness about the peace enhancing, transforming, communicative, educational and healing powers of music.
- Scientific American, *Musical Chills Related to Brain Dopamine Release* (http://www.scientificamerican.com/podcast/episode.cfm?id=musical-chills-related-to-brain-dop-11-01-09)

History

History of music

Music is found in every known culture, past and present, varying wildly between times and places. Around 50,000 years ago, early modern humans began to disperse from Africa, reaching all the habitable continents. Since all people of the world, including the most isolated tribal groups, have a form of music, scientists conclude that music is likely to have been present in the ancestral population prior to the dispersal of humans around the world. Consequently music may have been in existence for at least 50,000 years and the first music may have been invented in Africa and then evolved to become a fundamental constituent of human life.[1]

A culture's music is influenced by all other aspects of that culture, including social and economic organization and experience, climate, and access to technology. The emotions and ideas that music expresses, the situations in which music is played and listened to, and the attitudes toward music players and composers all vary between regions and periods. "Music history" is the distinct subfield of musicology and history which studies music (particularly Western art music) from a chronological perspective.

Music history eras

Musical eras	
Prehistoric	
Ancient	(before AD 500)
Early	(500 – 1760)
Common practice	(1600 – 1900)
Modern and contemporary	(1900 – present)

Prehistoric music

Prehistoric music, once more commonly called primitive music, is the name given to all music produced in preliterate cultures (prehistory), beginning somewhere in very late geological history. Prehistoric music is followed by ancient music in most of Europe (1500 BCE) and later musics in subsequent European-influenced areas, but still exists in isolated areas.

Prehistoric music thus technically includes all of the world's music that has existed before the advent of any currently extant historical sources concerning that music, for example, traditional Native American music of preliterate tribes and Australian Aboriginal music. However, it is more common to refer to the "prehistoric" music of non-European continents – especially that which still survives – as folk, indigenous or traditional music. The origin of music is unknown as it occurred prior to the advent of recorded history. Some suggest that the origin of music likely stems from naturally occurring sounds and rhythms. Human music may echo these phenomena using patterns, repetition and tonality. Even today, some cultures have certain instances of their music intending to imitate natural sounds. In some instances, this feature is related to shamanistic beliefs or practice.[2] [3] It may also serve entertainment (game)[4] [5] or practical (luring animals in hunt)[4] functions.

It is probable that the first musical instrument was the human voice itself, which can make a vast array of sounds, from singing, humming and whistling through to clicking, coughing and yawning. In 2008 archaeologists discovered

a bone flute in the Hohle Fels cave near Ulm, Germany.[6] [7] [8] The five-holed flute has a V-shaped mouthpiece and is made from a vulture wing bone. The oldest known wooden pipes were discovered near Greystones, Ireland, in 2004. A wood-lined pit contained a group of six flutes made from yew wood, between 30 and 50 cm long, tapered at one end, but without any finger holes. They may once have been strapped together.[9]

Biblical period

"David with his harp" Paris Psalter, c. 960, Constantinople

According to Easton's Bible Dictionary, Jubal was named by the Bible as the inventor of musical instruments (Gen. 4:21). The Hebrews were much given to the cultivation of music. Their whole history and literature afford abundant evidence of this. After the Deluge, the first mention of music is in the account of Laban's interview with Jacob (Gen. 31:27). After their triumphal passage of the Red Sea, Moses and the children of Israel sang their song of deliverance (Ex. 15). But the period of Samuel, David, and Solomon was the golden age of Hebrew music, as it was of Hebrew poetry. Music was now for the first time systematically cultivated. It was an essential part of training in the schools of the prophets (1 Sam. 10:5). There now arose also a class of professional singers (2 Sam. 19:35; Eccl. 2:8). Solomon's Temple, however, was the great school of music. In the conducting of its services large bands of trained singers and players on instruments were constantly employed (2 Sam. 6:5; 1 Chr. 15:16; 23;5; 25:1-6). In private life also music seems to have held an important place among the Hebrews (Eccl. 2:8; Amos 6:4-6; Isa. 5:11, 12; 24:8, 9; Ps. 137; Jer. 48:33; Luke 15:25).[10]

Music and theatre scholars studying the history and anthropology of Semitic and early Judeo-Christian culture, have also discovered common links between theatrical and musical activity in the classical cultures of the Hebrews with those of the later cultures of the Greeks and Romans. The common area of performance is found in a "social phenomenon called litany," a form of prayer consisting of a series of invocations or supplications. *The Journal of Religion and Theatre* notes that among the earliest forms of litany, "Hebrew litany was accompanied by a rich musical tradition:"[11]

> "While Genesis 4.21 identifies Jubal as the “father of all such as handle the harp and pipe,” the Pentateuch is nearly silent about the practice and instruction of music in the early life of Israel. Then, in I Samuel 10 and the texts which follow, a curious thing happens. “One finds in the biblical text,” writes Alfred Sendrey, “a sudden and unexplained upsurge of large choirs and orchestras, consisting of thoroughly organized and trained musical groups, which would be virtually inconceivable without lengthy, methodical preparation.” This has led some scholars to believe that the prophet Samuel was the patriarch of a school which taught not only prophets and holy men, but also sacred-rite musicians. This public music school, perhaps the earliest in recorded history, was not restricted to a priestly class--which is how the shepherd boy David appears on the scene as a minstrel to King Saul."[11]

Ancient music

The prehistoric era is considered to have ended with the development of writing, and with it, by definition, prehistoric music. "Ancient music" is the name given to the music that followed. The "oldest known song" was written in cuneiform, dating to 4,000 years ago from Ur. It was deciphered by Prof. Anne Draffkorn Kilmer (University of Calif. at Berkeley), and was demonstrated to be composed in harmonies of thirds, like ancient *gymel*,[12] and also was written using a Pythagorean tuning of the diatonic scale.

Double pipes, such as those used by the ancient Greeks, and ancient bagpipes, as well as a review of ancient drawings on vases and walls, etc., and ancient writings (such as in Aristotle, *Problems,* Book XIX.12) which described musical techniques of the time, indicate polyphony. One pipe in the aulos pairs (double flutes) likely served as a drone or "keynote," while the other played melodic passages. Instruments, such as the seven holed flute and various types of stringed instruments have been recovered from the Indus valley civilization archaeological sites.[13]

Indian classical music (*marga*) can be found from the scriptures of the Hindu tradition, the Vedas. Samaveda, one of the four vedas, describes music at length. The history of musical development in Iran (Persian music) dates back to the prehistoric era. The great legendary king, Jamshid, is credited with the invention of music. Music in Iran can be traced back to the days of the Elamite Empire (2,500-644 B.C). Fragmentary documents from various periods of the country's history establish that the ancient Persians possessed an elaborate musical culture. The Sassanid period (A.D. 226-651), in particular, has left us ample evidence pointing to the existence of a lively musical life in Persia. The names of some important musicians such as Barbod, Nakissa and Ramtin, and titles of some of their works have survived.

The term Early music era may also refer to contemporary but traditional or folk music, including Asian music, Persian music, music of India, Jewish music, Greek music, Roman music, the music of Mesopotamia, the music of Egypt, and Muslim music.

Early music

Early music is a general term used to describe music in the European classical tradition from after the fall of the Roman Empire, in 476 AD, until the end of the Baroque era in the middle of the 18th century. Music within this enormous span of time was extremely diverse, encompassing multiple cultural traditions within a wide geographic area; many of the cultural groups out of which medieval Europe developed already had musical traditions, about which little is known. What unified these cultures in the Middle Ages was the Roman Catholic Church, and its music served as the focal point for musical development for the first thousand years of this period. Very little non-Christian music from this period survived, due to its suppression by the Church and the absence of music notation; however, folk music of modern Europe probably has roots at least as far back as the Middle Ages.

Western Art Music

Medieval music

While musical life was undoubtedly rich in the early Medieval era, as attested by artistic depictions of instruments, writings about music, and other records, the only repertory of music which has survived from before 800 to the present day is the plainsong liturgical music of the Roman Catholic Church, the largest part of which is called Gregorian chant. Pope Gregory I, who gave his name to the musical repertory and may himself have been a composer, is usually claimed to be the originator of the musical portion of the liturgy in its present form, though the sources giving details on his contribution date from more than a hundred years after his death. Many scholars believe that his reputation has been exaggerated by legend. Most of the chant repertory was composed anonymously in the centuries between the time of Gregory and Charlemagne.

During the 9th century several important developments took place. First, there was a major effort by the Church to unify the many chant traditions, and suppress many of them in favor of the Gregorian liturgy. Second, the earliest polyphonic music was sung, a form of parallel singing known as organum. Third, and of greatest significance for music history, notation was reinvented after a lapse of about five hundred years, though it would be several more centuries before a system of pitch and rhythm notation evolved having the precision and flexibility that modern musicians take for granted.

Several schools of polyphony flourished in the period after 1100: the St. Martial school of organum, the music of which was often characterized by a swiftly moving part over a single sustained line; the Notre Dame school of polyphony, which included the composers Léonin and Pérotin, and which produced the first music for more than two parts around 1200; the musical melting-pot of Santiago de Compostela in Galicia, a pilgrimage destination and site where musicians from many traditions came together in the late Middle Ages, the music of whom survives in the Codex Calixtinus; and the English school, the music of which survives in the Worcester Fragments and the Old Hall Manuscript. Alongside these schools of sacred music a vibrant tradition of secular song developed, as exemplified in the music of the troubadours, trouvères and Minnesänger. Much of the later secular music of the early Renaissance evolved from the forms, ideas, and the musical aesthetic of the troubadours, courtly poets and itinerant musicians, whose culture was largely exterminated during the Albigensian Crusade in the early 13th century.

Forms of sacred music which developed during the late 13th century included the motet, conductus, discant, and clausulae. One unusual development was the *Geisslerlieder*, the music of wandering bands of flagellants during two periods: the middle of the 13th century (until they were suppressed by the Church); and the period during and immediately following the Black Death, around 1350, when their activities were vividly recorded and well-documented with notated music. Their music mixed folk song styles with penitential or apocalyptic texts. The 14th century in European music history is dominated by the style of the *ars nova*, which by convention is grouped with the medieval era in music, even though it had much in common with early Renaissance ideals and aesthetics. Much of the surviving music of the time is secular, and tends to use the formes fixes: the ballade, the virelai, the lai, the rondeau, which correspond to poetic forms of the same names. Most pieces in these forms are for one to three voices, likely with instrumental accompaniment: famous composers include Guillaume de Machaut and Francesco Landini.

Renaissance music

The beginning of the Renaissance in music is not as clearly marked as the beginning of the Renaissance in the other arts, and unlike in the other arts, it did not begin in Italy, but in northern Europe, specifically in the area currently comprising central and northern France, the Netherlands, and Belgium. The style of the Burgundian composers, as the first generation of the Franco-Flemish school is known, was at first a reaction against the excessive complexity and mannered style of the late 14th century *ars subtilior*, and contained clear, singable melody and balanced polyphony in all voices. The most famous composers of the Burgundian school in the mid-15th century are Guillaume Dufay, Gilles Binchois, and Antoine Busnois.

By the middle of the 15th century, composers and singers from the Low Countries and adjacent areas began to spread across Europe, especially into Italy, where they were employed by the papal chapel and the aristocratic patrons of the arts (such as the Medici, the Este, and the Sforza families). They carried their style with them: smooth polyphony which could be adapted for sacred or secular use as appropriate. Principal forms of sacred musical composition at the time were the mass, the motet, and the laude; secular forms included the chanson, the frottola, and later the madrigal.

The invention of printing had an immense influence on the dissemination of musical styles, and along with the movement of the Franco-Flemish musicians, contributed to the establishment of the first truly international style in European music since the unification of Gregorian chant under Charlemagne. Composers of the middle generation of the Franco-Flemish school included Johannes Ockeghem, who wrote music in a contrapuntally complex style, with varied texture and an elaborate use of canonical devices; Jacob Obrecht, one of the most famous composers of masses in the last decades of the 15th century; and Josquin des Prez, probably the most famous composer in Europe before Palestrina, and who during the 16th century was renowned as one of the greatest artists in any form. Music in the generation after Josquin explored increasing complexity of counterpoint; possibly the most extreme expression is in the music of Nicolas Gombert, whose contrapuntal complexities influenced early instrumental music, such as the canzona and the ricercar, ultimately culminating in Baroque fugal forms.

Portrait of Italian composer Claudio Monteverdi in Venice, 1640, by Domenico Fetti.

By the middle of the 16th century, the international style began to break down, and several highly diverse stylistic trends became evident: a trend towards simplicity in sacred music, as directed by the Counter-Reformation Council of Trent, exemplified in the music of Giovanni Pierluigi da Palestrina; a trend towards complexity and chromaticism in the madrigal, which reached its extreme expression in the avant-garde style of the Ferrara School of Luzzaschi and the late century madrigalist Carlo Gesualdo; and the grandiose, sonorous music of the Venetian school, which used the architecture of the Basilica San Marco di Venezia to create antiphonal contrasts. The music of the Venetian school included the development of orchestration, ornamented instrumental parts, and continuo bass parts, all of which occurred within a span of several decades around 1600. Famous composers in Venice included the Gabrielis, Andrea and Giovanni, as well as Claudio Monteverdi, one of the most significant innovators at the end of the era.

Most parts of Europe had active and well-differentiated musical traditions by late in the century. In England, composers such as Thomas Tallis and William Byrd wrote sacred music in a style similar to that written on the continent, while an active group of home-grown madrigalists adapted the Italian form for English tastes: famous composers included Thomas Morley, John Wilbye and Thomas Weelkes. Spain developed instrumental and vocal styles of its own, with Tomás Luis de Victoria writing refined music similar to that of Palestrina, and numerous other composers writing for the new guitar. Germany cultivated polyphonic forms built on the Protestant chorales, which replaced the Roman Catholic Gregorian Chant as a basis for sacred music, and imported the style of the Venetian school (the appearance of which defined the start of the Baroque era there). In addition, German composers wrote enormous amounts of organ music, establishing the basis for the later Baroque organ style which culminated in the work of J.S. Bach. France developed a unique style of musical diction known as musique mesurée, used in secular chansons, with composers such as Guillaume Costeley and Claude Le Jeune prominent in the movement.

One of the most revolutionary movements in the era took place in Florence in the 1570s and 1580s, with the work of the Florentine Camerata, who ironically had a reactionary intent: dissatisfied with what they saw as contemporary musical depravities, their goal was to restore the music of the ancient Greeks. Chief among them were Vincenzo Galilei, the father of the astronomer, and Giulio Caccini. The fruits of their labors was a declamatory melodic singing style known as monody, and a corresponding staged dramatic form: a form known today as opera. The first operas, written around 1600, also define the end of the Renaissance and the beginning of the Baroque eras.

Music prior to 1600 was modal rather than tonal. Several theoretical developments late in the 16th century, such as the writings on scales on modes by Gioseffo Zarlino and Franchinus Gaffurius, led directly to the development of common practice tonality. The major and minor scales began to predominate over the old church modes, a feature which was at first most obvious at cadential points in compositions, but gradually became pervasive. Music after 1600, beginning with the tonal music of the Baroque era, is often referred to as belonging to the common practice period.

Baroque music

J. S. Bach

Instrumental music became dominant in the Baroque, and most major music forms were defined. Counterpoint was one of the major forces in both the instrumental and the vocal music of the period. Although a strong religious musical tradition continued, secular music came to the fore with the development of the sonata, the concerto, and the concerto grosso.

Much Baroque music was designed for improvisation, with a figured bass provided by the composer for the performer to flesh out and ornament. The keyboard, particularly the harpsichord, was a dominant instrument, and the beginnings of well temperament opened up the possibilities of playing in all keys and of modulation.

Much Baroque music featured a basso continuo consisting of a keyboard, either harpsichord or organ (sometimes a lute instead), and a bass instrument, such as a viola da gamba or bassoon. The three outstanding composers of the period were Johann Sebastian Bach, George Frideric Handel, and Antonio Vivaldi, but a host of other composers, some with huge output, were active in the period.

The harpsichord

Classical music era

The music of the Classical period is characterized by homophonic texture, or an obvious melody with accompaniment. These new melodies tended to be almost voice-like and singable, allowing composers to actually replace singers as the focus of the music. Instrumental music therefore quickly replaced opera and other sung forms (such as oratorio) as the favorite of the musical audience and the epitome of great composition. However, opera did not disappear: during the classical period, several composers began producing operas for the general public in their native languages (previous operas were generally in Italian).

Wolfgang Amadeus Mozart's compositions characterized music of the classical era.

Along with the gradual displacement of the voice in favor of stronger, clearer melodies, counterpoint also typically became a decorative flourish, often used near the end of a work or for a single movement. In its stead, simple patterns, such as arpeggios and, in piano music, Alberti bass (an accompaniment with a repeated pattern typically in the left hand), were used to liven the movement of the piece without creating a confusing additional voice. The now-popular instrumental music was dominated by several well-defined forms: the sonata, the symphony, and the concerto, though none of these were specifically defined or taught at the time as they are now in music theory. All three derive from sonata form, which is used to refer both to the overlying form of an entire work and the structure of a single movement. Sonata form matured during the Classical era to become the primary form of instrumental compositions throughout the 19th century.

The early Classical period was ushered in by the Mannheim School, which included such composers as Johann Stamitz, Franz Xaver Richter, Carl Stamitz, and Christian Cannabich. It exerted a profound influence on Joseph

Haydn and, through him, on all subsequent European music. Wolfgang Amadeus Mozart was the central figure of the Classical period, and his phenomenal and varied output in all genres defines our perception of the period. Ludwig van Beethoven and Franz Schubert were transitional composers, leading into the Romantic period, with their expansion of existing genres, forms, and even functions of music.

Romantic music

In the Romantic period, music became more expressive and emotional, expanding to encompass literature, art, and philosophy. Famous early Romantic composers include Schumann, Chopin, Mendelssohn, Bellini, and Berlioz. The late 19th century saw a dramatic expansion in the size of the orchestra, and in the role of concerts as part of urban society. Famous composers from the second half of the century include Johann Strauss II, Brahms, Liszt, Tchaikovsky, Verdi, and Wagner. Between 1890 and 1910, a third wave of composers including Dvořák, Mahler, Richard Strauss, Puccini, and Sibelius built on the work of middle Romantic composers to create even more complex – and often much longer – musical works. A prominent mark of late 19th century music is its nationalistic fervor, as exemplified by such figures as Dvořák, Sibelius, and Grieg. Other prominent late-century figures include Saint-Saëns, Fauré, Rachmaninoff and Franck.

The title character from a 19th century performance of Wagner's opera *Siegfried*

20th century music

The 20th Century saw a revolution in music listening as the radio gained popularity worldwide and new media and technologies were developed to record, capture, reproduce and distribute music. Music performances became increasingly visual with the broadcast and recording of music videos and concerts. Music of all kinds also became increasingly portable. Headphones allowed people sitting next to each other to listen to entirely different performances or share the same performance.

20th Century music brought a new freedom and wide experimentation with new musical styles and forms that challenged the accepted rules of music of earlier periods. The invention of musical amplification and electronic instruments, especially the synthesizer, in the mid-20th century revolutionized popular music and accelerated the development of new forms of music.

Classical Music

Classical music is a broad, somewhat imprecise term, referring to music produced in, or rooted in the traditions of art, ecclesiastical and concert music. A music is classical if it includes some of the following features: a learned tradition, support from the church or government, or greater cultural capital. Classical music is also described as complex, lasting, transcendent, and abstract. In many cultures a classical tradition coexisted with traditional or popular music, occasionally for thousands of years, and with different levels of mutual borrowing with the parallel tradition.

Byzantium

Byzantine music (Greek: Βυζαντινή Μουσική) is the music of the Byzantine Empire composed to Greek texts as ceremonial, festival, or church music.[1] Greek and foreign historians agree that the ecclesiastical tones and in general the whole system of Byzantine music is closely related to the ancient Greek system.[2] It remains the oldest genre of extant music, of which the manner of performance and (with increasing accuracy from the 5th century onwards) the names of the composers, and sometimes the particulars of each musical work's circumstances, are known.

Asia

Asian music covers the music cultures of Arabia, Central Asia, East Asia, South Asia, and Southeast Asia.

India

Indian music is one of the oldest musical traditions in the world.[14] The Indus Valley civilization left sculptures which show dance[15] and musical instruments (some no longer in use), like the seven holed flute. Various types of stringed instruments and drums have been recovered from Harrappa and Mohenjo Daro by excavations carried out by Sir Mortimer Wheeler.[16] The Rigveda has elements of present Indian music, with a musical notation to denote the metre and the mode of chanting.[17] Early Indian musical tradition also speaks of three accents and vocal music known as "Samagan" (Sama meaning melody and Gan meaning to sing).[18] The classical music of India includes two major traditions: the southern Carnatic music and the northern Hindustani classical music. India's classical music tradition is millennia long and remains important to the lives of Indians today as a source of religious inspiration, cultural expression, and entertainment.

Purandara Dasa, the father of Carnatic music

Indian classical music (marga) is monophonic, and based on a single melody line or raga rhythmically organized through talas. Carnatic music is largely devotional; the majority of the songs are addressed to the Hindu deities. There are a lot of songs emphasising love and other social issues. In contrast to Carnatic music, Hindustani music was not only influenced by ancient Hindu musical traditions, Vedic philosophy and native Indian sounds but also by the Persian performance practices of the Afghan Mughals. The origins of Indian classical music can be found from the oldest of scriptures, part of the Hindu tradition, the Vedas. Samaveda, one of the four vedas describes music at length.

China

Chinese classical music is the traditional art or court music of China. It has a long history stretching for more than three thousand years. It has its own unique systems of musical notation, as well as musical tuning and pitch, musical instruments and styles or musical genres. Chinese music is pentatonic-diatonic, having a scale of twelve notes to an octave (5+7 = 12) as does European-influenced music.

Persia

Persian music is the music of Persia and Persian language countries: *musiqi*, the science and art of music, and *muzik*, the sound and performance of music (Sakata 1983). See: Music of Iran, Music of Afghanistan, Music of Tajikistan, Music of Uzbekistan.

Ancient Iranians attached great importance to music and poetry, as they still do today. 7th century plate depicts Sassanid era musicians. The British Museum.

Greece

Greek written history extends far back into Ancient Greece, and was a major part of ancient Greek theater. In ancient Greece, mixed-gender choruses performed for entertainment, celebration and spiritual reasons. Instruments included the double-reed aulos and the plucked string instrument, the lyre, especially the special kind called a kithara. Music was an important part of education in ancient Greece, and boys were taught music starting at age six.

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[14] World Music: The Basics By Nidel Nidel, Richard O. Nidel (page 219)

[15] World History: Societies of the Past By Charles Kahn (page 98)

[16] World History: Societies of the Past By Charles Kahn (page 11)

[17] World Music: The Basics By Nidel Nidel, Richard O. Nidel (page 10)

[18] The Music of India By Jamila Massey, Reginald Massey (page 13)

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External links

- *The Dictionary of the History of Ideas* (http://etext.lib.virginia.edu/DicHist/analytic/anaIII.html) see Music and Science, Music as a Demonic Art, Music as a Divine Art
- Edinburgh University Collection of Historic Musical Instruments (http://www.music.ed.ac.uk/euchmi/)
- Essentials of Music (http://www.essentialsofmusic.com/) Classical Music eras, composers, glossary *from Sony Music Entertainment*
- Glossary of Musical Instruments & Styles (http://www.oddmusic.com/resources/glossary.html) and Quotes (http://www.oddmusic.com/resources/quotes.html) from OddMusic.com (http://www.oddmusic.com/)
- Historic American Sheet Music (http://scriptorium.lib.duke.edu/sheetmusic/)
- Lester S. Levy Sheet Music Collection (http://levysheetmusic.mse.jhu.edu/) popular American music, 1780–1960
- Music History Resources (http://web.archive.org/web/20091027024049/http://www.geocities.com/papandrew/) at GeoCities.com
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- National Music Museum (http://www.usd.edu/smm/) *from the University of South Dakota*
- Russell Collection of Early Keyboard Instruments (http://www.music.ed.ac.uk/russell/) from the University of Edinburgh
- Tim Gracyk's Phonographs and Old Records (http://www.gracyk.com/portable.shtml)
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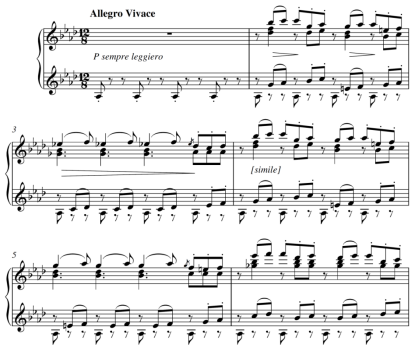
Production

Musical composition

Musical composition can refer to an original piece of music, the structure of a musical piece, or the process of creating a new piece of music. People who practice composition are called composers.



Scherzo in A flat (Borodin)

Musical compositions

A piece of music exists in the form of a composition in musical notation or as a single acoustic event (a live performance or recorded track). If composed before being performed, music can be performed from memory, through written musical notation, or through a combination of both. Compositions comprise musical elements, which vary widely from person to person and between cultures. Improvisation is the act of composing during the performance, assembling musical elements spontaneously.

Piece is a, "general, non-technical term [that began to be] applied mainly to instrumental compositions from the 17th century onwards....other than when they are taken individually 'piece' and its equivalents are rarely used of movements in sonatas or symphonies....composers have used all these terms [in their different languages] frequently in compound forms [e.g. Klavierstück]....In vocal music...the term is most frequently used for operatic ensembles..."[1]

Composition as musical form

In discussing the structure or organization of a musical work, the *composition* of that work is generally called its musical form. These techniques draw a parallel to art's formal elements. Sometimes, the entire form of a piece is through-composed, meaning that each part is different, with no repetition of sections; other forms include strophic, rondo, verse-chorus, or other parts. Some pieces are composed around a set scale, where the compositional technique might be considered the usage of a particular scale. Others are composed during performance (see improvisation), where a variety of techniques are also sometimes used.Some are used from particular songs which are familiar.

Important in tonal musical composition is the scale for the notes used, including the mode and tonic note. In music using twelve tone techniques, the tone row is even more comprehensive a factor than a scale. Similarly, music of the Middle East employs compositions that are rigidly based on a specific mode (maqam) often within improvisational contexts, as does Indian classical music in both the Hindustani and the Carnatic systems, gamelans of Java and Bali, and much music in Africa.

Composing music

People who practice composition are called composers. **Compositional techniques** are the methods used to create music. Useful skills in composition include writing musical notation, music theory, instrumentation, and handling musical ensembles (orchestration). Other skills include extended techniques such as improvisation, musical montage, preparing instruments, using non-traditional instruments, and other methods of sound production.

Compositional instrumentation

The task of adapting a composition for musical instruments/ensembles, called arranging or orchestrating, may be undertaken by the composer or separately by an arranger based on the composer's core composition. A composition may have multiple arrangements based on such factors as intended audience type and breadth, musical genre or stylistic treatment, recorded or live performance considerations, available musicians and instruments, commercial goals and economic constraints.

Based on such factors, composers or arrangers must decide upon the instrumentation of the original work. Today, the contemporary composer can virtually write for almost any combination of instruments. Some common group settings include music for Full Orchestra (consisting of just about every instrument group), Wind Ensemble (or Concert Band, which consists of larger sections and greater diversity of wind, brass and percussion instruments than are usually found in the orchestra), or a chamber group (a small number of instruments, but at least two). The composer may also choose to write for only one instrument, in which case this is called a solo.

Composers are not limited to writing only for instruments, they may also decide to write for voice (including choral works, operas, and musicals) or percussion instruments or electronic instruments. Alternatively, as is the case with musique concrète, the composer can work with many sounds often not associated with the creation of music, such as typewriters, sirens, and so forth.

In Elizabeth Swados' *Listening Out Loud*, she explains how a composer must know the full capabilities of each instrument and how they must complement each other, not compete. She gives an example of how in an earlier composition of hers, she had the tuba above the piccolo. This would clearly drown the piccolo out, thus giving it no purpose in the composition. Each instrument chosen to be in a piece must have a reason for being there that adds to what the composer is trying to convey within the work

Arranging

Arranging is composition which employs prior material so as to comment upon it such as in mash-ups and various contemporary classical works. It may be thought of as analysis.[2]

Legal status

US Copyrights

Copyrights afford the owner of a work control over and exclusive rights to the work. Even though the first US copyright laws did not include musical compositions, they were added as part of the Copyright Act of 1831.

In the US, the copyright symbol is ©, or the letter c inside a circle. The first year the work was published follows the copyright symbol, and the name of the copyright holder thereafter. A music copyright is often notated as ℗, or a letter P (instead of the letter C) inside a circle. This is because this type of copyright also covers phonorecords, which are physical objects, such as CDs, where the works is contained.

UK

Copyright, Designs and Patents Act 1988 defines a musical work to mean *a work consisting of music exclusive of any words or action intended to be sung, spoken or performed with the music.*[3]

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[3] Sheet music was held to be covered by the term "book" in the Statute of Anne: see *Bach v. Longman [1777]* but that merely conferred a right to print and reprint the music

External links

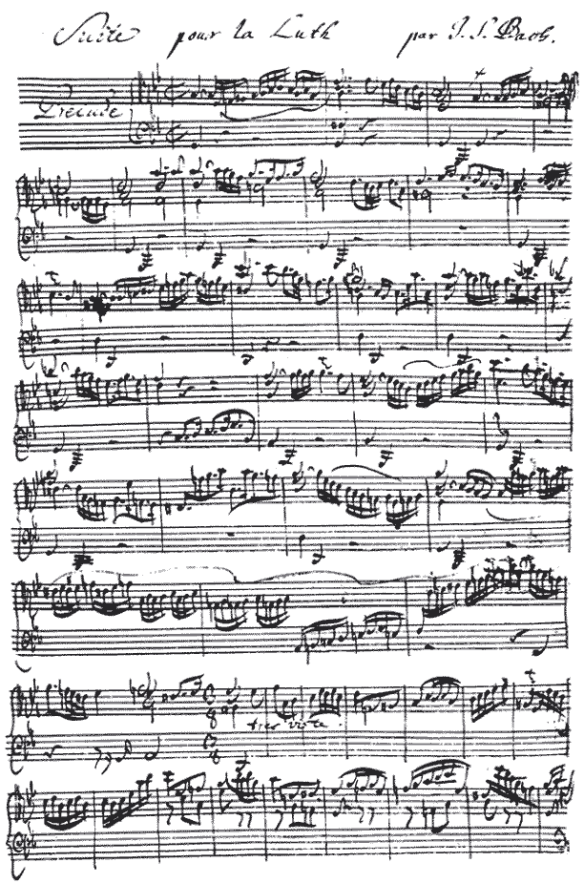
- Composition Today (http://www.compositiontoday.com) News, competitions, interviews and other resources for composers.
- Internet Concert Project: Album for the Young Student New Music (http://www.bsmny.org/icp/a4ty09), an online performance and documentary feature from Bloomingdale School of Music (http://www.bsmny.org) (January 2010)
- A Beginner's Guide to Composing (http://www.bsmny.org/features/composing), an online feature from Bloomingdale School of Music (http://www.bsmny.org) (February 2008)
- Gems of compositional wisdom (http://www.cosmoedu.net/DoctorFields/index.html)
- A Practical Guide to Musical Composition (http://www.musique.umontreal.ca/personnel/Belkin/bk/index.html)
- ComposersNewPencil (http://www.composersnewpencil.com) - Information, articles and music composition resources.
- How to compose music (http://www.learn-piano.org/compose-music.html)
- How to compose Music (Wikihow) (http://www.wikihow.com/Compose-Music)
- Répertoire International des Sources Musicales (http://www.rism.info/), online database to locations of musical manuscripts from around the world

Musical notation

Music notation or **musical notation** is any system that represents aurally perceived music, through the use of written symbols.

Western history

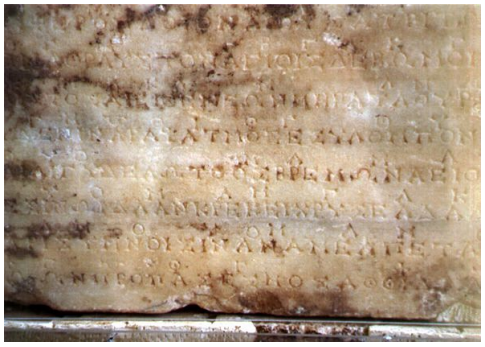
The earliest form of musical notation can be found in a cuneiform tablet that was created at Nippur, Iraq in about 2000 B.C. The tablet represents fragmentary instructions for performing music, that the music was composed in harmonies of thirds, and that it was written using a diatonic scale.[1] A tablet from about 1250 B.C. shows a more developed form of notation.[2] Although the interpretation of the notation system is still controversial, it is clear that the notation indicates the names of strings on a lyre, the tuning of which is described in other tablets.[3] Although they were fragmentary, these tablets represent the earliest recorded melodies found anywhere in the world.[3]



Hand-written musical notation by J. S. Bach: beginning of the Prelude from the Suite for Lute in G minor BWV 995 (transcription of Cello Suite No. 5, BWV 1011) BR Bruxelles II. 4805.

Ancient Greece

Ancient Greek musical notation was capable of representing pitch and note-duration, and to a limited extent, harmony. It was in use from at least the 6th century BC until approximately the 4th century AD; several complete compositions and fragments of compositions using this notation survive. The notation consists of symbols placed above text syllables. An example of a complete composition is the Seikilos epitaph, which has been variously dated between the 2nd century BC to the 1st century AD. Three hymns by Mesomedes of Crete exist in manuscript. The Delphic Hymns, dated to the 2nd century BC, also use this notation, but they are not completely preserved. Ancient Greek notation appears to have fallen out of use around the time of the Decline of the Roman Empire.



Photograph of the original stone at Delphi containing the second of the two hymns to Apollo. The music notation is the line of occasional symbols *above* the main, uninterrupted line of Greek lettering.

Byzantine Empire

Byzantine music notation style in a Romanian "Book of Hymns at the Lord's Resurrection", 1823

Byzantine music is vocal religious music, based on the monodic modal singing of Ancient Greece and the pre-islamic Near East. The notation developed for it is similar in principle to subsequent Western notation, in that it is ordered left to right, and separated into measures. The main difference is that notation symbols are *differential* rather than absolute, i.e. they indicate pitch *change* (rise or fall), and the musician has to deduce correctly, from the score and the note they are singing presently, which note comes next. The pitch symbols themselves resemble brush strokes and are colloquially called *gántzoi* ("hooks") in Modern Greek. Notes themselves are represented in written form only between measures, as an optional reminder, along with modal and tempo directions if needed. Additional signs are used to indicate embellishments and microtones (pitch changes smaller than a semitone), both essential in Byzantine chant (*see* Romanian anastasimatarion *picture, left*).

The seven standard note names in Byzantine "solfege" are: *pá, vú,* g^h*á,* d^h*ē, ké, zō, nē*, corresponding to Western *re, mi, fa, sol, la, si, do*. Byzantine music uses the eight natural, non-tempered scales called *Ēkhoi*, "sounds", exclusively, and therefore the absolute pitch of each note may slightly vary each time, depending on the particular *Ēkhos* used. Byzantine notation is still used in many Orthodox Churches. Better cantors can also use standard Western notation while adding non-notatable embellishment material from memory and "sliding" into the natural scales from experience.

Persia and Arab world

In 1252, Safi al-Din al-Urmawi developed a form of musical notation, where rhythms were represented by geometric representation. Many subsequent scholars of rhythm have sought to develop graphical geometrical representations. For example, a similar geometric system was published in 1987 by Kjell Gustafson, whose method represents a rhythm as a two-dimensional graph.[4]

Early Europe

Scholar and music theorist Isidore of Seville, writing in the early 7th century, remarked that it was impossible to notate music. By the middle of the 9th century, however, a form of notation began to develop in monasteries in Europe for Gregorian chant, using symbols known as neumes; the earliest surviving musical notation of this type is in the *Musica disciplina* of Aurelian of Réôme, from about 850. There are scattered survivals from the Iberian Peninsula before this time, of a type of notation known as Visigothic neumes, but its few surviving fragments have not yet been deciphered.[5]

To address the issue of exact pitch, a staff was introduced consisting originally of a single horizontal line, but this was progressively extended until a system of four parallel, horizontal lines was standardized. The vertical positions of each mark on the staff indicated which pitch or pitches it represented (pitches were derived from a musical mode. Although the four-line staff has remained in use until the present day for plainchant, for other types of music, staffs with differing numbers of lines have been used at various times and places

Early Music Notation

for various instruments. The modern five-line staff was first adopted in France and became almost universal by the 16th century (although the use of staffs with other numbers of lines was still widespread well into the 17th century).

Because the neum system arose from the need to notate melodies, exact timing was initially not a particular issue because the music generally followed the natural rhythms of the Latin language. However, by the 10th century a system that represented up to four note lengths had been developed. These lengths were relative rather than absolute and depended on the duration of the neighbouring notes. Not until the 14th century did something like the present system of fixed note lengths arise. Starting in the 15th century, vertical *bar lines* were used to divide the staff into sections.These did not initially divide the music into measures (bars) of equal length (as most music then featured far fewer regular rhythmic patterns than in later periods), but appear to have been introduced as an aid to the eye for "lining up" notes on different staves that were played or sung at the same time. The use of regular measures (bars) became commonplace by the end of the 17th century.

The founder of what is now considered the standard music stave was Guido d'Arezzo,[6] an Italian Benedictine monk who lived from 995–1050.Guido D'Arezzo's achievements paved the way for the modern form of written music, music books, and the modern concept of a composer.[6] He named musical notes based on an ancient hymn dedicated to Saint John the Baptist, called Ut Queant Laxis, written by the Lombard historian Paul the Deacon. The first stanza is:

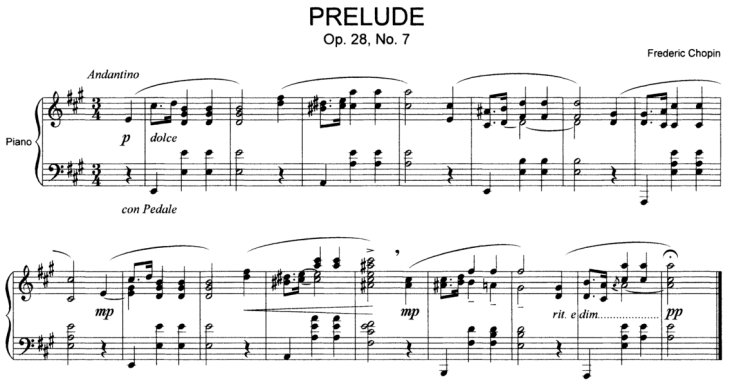
1. **Ut** queant laxis
2. **re**sonare fibris,
3. **Mi**ra gestorum
4. **fa**muli tuorum,
5. **Sol**ve polluti
6. **la**bii reatum,
7. **S**ancte **I**ohannes.

Guido used the first letters of each verse to name the Solfège syllables: Ut, Re, Mi Fa, Sol, La, and Si (the exception being Si, which has the S of *Sancte* and the I of *Iohannes*—it also helps in that, if two adjacent notes had the same vowel, verbal communication errors became more likely). In the 17th century, Ut was changed in most countries except France to the easily singable, "open" syllable Do, said to have been taken from the name of the Italian theorist Giovanni Battista Doni.[7]

Modern notation

Modern music notation originated in European classical music and is now used by musicians of many different genres throughout the world.

The system uses a five-line staff. Pitch is shown by placement of notes on the staff (sometimes modified by accidentals), and duration is shown with different note values and additional symbols such as dots and ties. Notation is read from left to right, which makes setting music for right-to-left scripts difficult.



An example of modern musical notation: Prelude, Op. 28, No. 7, by Frederic Chopin

A staff (or stave, in British English) of written music generally begins with a clef, which indicates the position of one particular note on the staff. The treble or G clef was originally a letter G and it identifies the second line up on the

five line staff as the note G above middle C. The bass or F clef shows the position of the note F below middle C. Notes representing a pitch outside of the scope of the five line staff can be represented using ledger lines, which provide a single note with additional lines and spaces.

Following the clef, the key signature on a staff indicates the key of the piece by specifying that certain notes are flat or sharp throughout the piece, unless otherwise indicated.

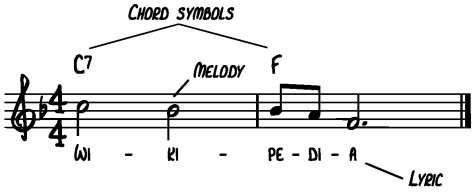
Following the key signature is the time signature. Measures (bars) divide the piece into groups of beats, and the time signatures specify those groupings.

Directions to the player regarding matters such as tempo, dynamics and expression appear above or below the staff. For vocal music, lyrics are written. For short pauses (breaths), retakes (looks like ') are added.

In music for ensembles, a "score" shows music for all players together, while "parts" contain only the music played by an individual musician. A score can be constructed from a complete set of parts and vice versa. The process can be laborious but computer software offers a more convenient and flexible method.

Specialized notation conventions

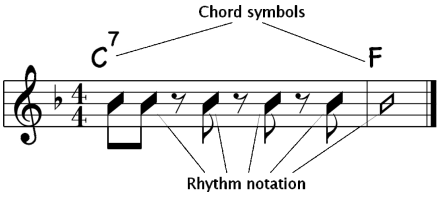
- Percussion notation conventions are varied because of the wide range of percussion instruments. Percussion instruments are generally grouped into two categories: pitched and non-pitched. The notation of non-pitched percussion instruments is the more problematic and less standardized.
- Figured bass notation originated in Baroque basso continuo parts. It is also used extensively in accordion notation. The bass notes of the music are conventionally notated, along with numbers and other signs that determine the chords to play. It does not, however, specify the exact pitches of the harmony, leaving that for the performer to improvise.



A lead sheet

- A lead sheet specifies only the melody, lyrics and harmony, using one staff with chord symbols placed above and lyrics below. It is used to capture the essential elements of a popular song without specifying how the song should be arranged or performed.

- A chord chart or "chart" contains little or no melodic information at all but provides detailed harmonic and rhythmic information, using slash notation and rhythmic notation. This is the most common kind of written music used by professional session musicians playing jazz or other forms of popular music and is intended primarily for the rhythm section (usually containing piano, guitar, bass and drums).

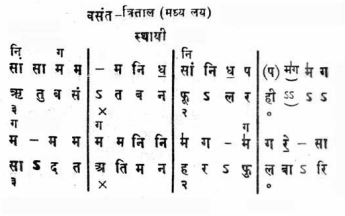


A chord chart

- Simpler chord charts for songs may contain only the chord changes, placed above the lyrics where they occur. Such charts depend on prior knowledge of the melody, and are used as reminders in performance or informal group singing.
- The shape note system is found in some church hymnals, sheet music, and song books, especially in the Southern United States. Instead of the customary elliptical note head, note heads of various shapes are used to show the position of the note on the major scale. Sacred Harp is one of the most popular tune books using shape notes.

Notation in various countries

India



Indian music, early 20th century

The Indian scholar and musical theorist Pingala (c. 200 BC), in his *Chanda Sutra*, used marks indicating long and short syllables to indicate meters in Sanskrit poetry.

In the notation of Indian rāga, a solfege-like system called sargam is used. As in Western solfege, there are names for the seven basic pitches of a major scale (Shadja, Rishabh, Gandhar, Madhyam, Pancham, Dhaivat and Nishad, usually shortened Sa Re Ga Ma Pa Dha Ni). The tonic of any scale is named Sa, and the dominant Pa. Sa is fixed in any scale, and Pa is fixed at a fifth above it (a Pythagorean fifth rather than an equal-tempered fifth). These two notes are known as achala swar ('fixed notes'). Each of the other five notes, Re, Ga, ma, Dha and Ni, can take a 'regular' (shuddha) pitch, which is equivalent to its pitch in a standard major scale (thus, shuddha Re, the second degree of the scale, is a whole-step higher than Sa), or an altered pitch, either a half-step above or half-step below the shuddha pitch. Re, Ga, Dha and Ni all have altered partners that are a half-step lower (Komal-"flat") (thus, komal Re is a half-step higher than Sa). Ma has an altered partner that is a half-step higher (teevra-"sharp") (thus, tivra Ma is an augmented fourth above Sa). Re, Ga, ma, Dha and Ni are called vikrut swar ('movable notes'). In the written system of Indian notation devised by Ravi Shankar, the pitches are represented by Western letters. Capital letters are used for the achala swar, and for the higher variety of all the vikrut swar. Lowercase letters are used for the lower variety of the vikrut swar.

Other systems exist for non-twelve-tone equal temperament and non-Western music, such as the Indian *svar lippi*. New systems that remove handicaps in existing systems are also being developed like **Ome Swarlipi** [8].

Russia

Further information: Znamenny Chant

In Byzantium and Russia, sacred music was notated with special 'hooks and banners'.

China

Chinese Guqin notation, 1425

The earliest known examples of text referring to music in China are inscriptions on musical instruments found in the Tomb of Marquis Ye of Zeng (d. 433 B.C.). Sets of 41 chimestones and 65 bells bore lengthy inscriptions concerning pitches, scales, and transposition. The bells still sound the pitches that their inscriptions refer to. Although no notated musical compositions were found, the inscriptions indicate that the system was sufficiently advanced to allow for musical notation. Two systems of pitch nomenclature existed, one for relative pitch and one for absolute pitch. For relative pitch, a solmization system was used.[9]

The tablature of the guqin is unique and complex; the older form is composed of written words describing how to play a melody step-by-step using the plain language of the time, i.e. Descriptive Notation (Classical Chinese); the newer form, composed of bits of Chinese characters put together to indicate the method of play is called Prescriptive Notation. Rhythm is only vaguely indicated in terms of phrasing. Tablatures for the qin are collected in what is called qinpu.

Gongche notation used Chinese characters for the names of the scale.

The jianpu system of notation (probably an adaptation of a French Galin-Paris-Cheve system) had gained widespread acceptance by 1900. It uses a movable do system, with the numbers 1,2,3,4,5,6,7 standing for do, re, mi, fa, sol, la, si. Dots above or below a numeral indicate the octave of the note it represents. Key signatures, barlines, and time signatures are also employed. Many symbols from Western standard notation, such as bar lines, time signatures, accidentals, tie and slur, and the expression markings are also used. The number of dashes following a numeral represents the number of crotchets (quarter notes) by which the note extends. The number of underlines is analogous to the number of flags or beams on notes or rests in standard notation.

Japan

Further information: Shakuhachi musical notation

Japanese music is highly diversified, and therefore requires various systems of notation. In Japanese shakuhachi music, for example, glissandos and timbres are often more significant than distinct pitches, whereas taiko notation focuses on discrete strokes.

Indonesia

Notation plays a relatively minor role in the oral traditions of Indonesia. However, in Java and Bali, several systems were devised beginning at the end of the 19th century, initially for archival purposes. Today the most widespread are cipher notations ("not angka" in the broadest sense) in which the pitches are represented with some subset of the numbers 1 to 7, with 1 corresponding to either highest note of a particular octave, as in Sundanese gamelan, or lowest, as in the kepatihan notation of Javanese gamelan. Notes in the ranges outside the central octave are represented with one or more dots above or below the each number. For the most part, these cipher notations are mainly used to notate the skeletal melody (the balungan) and vocal parts (gerongan), although transcriptions of the elaborating instrument variations are sometimes used for analysis and teaching. Drum parts are notated with a system of symbols largely based on letters representing the vocables used to learn and remember drumming patterns; these symbols are typically laid out in a grid underneath the skeletal melody for a specific or generic piece. The symbols used for drum notation (as well as the vocables represented) are highly variable from place to place and performer to performer. In addition to these current systems, two older notations used a kind of staff: the Solonese script could capture the flexible rhythms of the pesinden with a squiggle on a horizontal staff, while in Yogyakarta a ladder-like vertical staff allowed notation of the balungan by dots and also included important drum strokes. In Bali, there are a few books published of Gamelan gender wayang pieces, employing alphabetical notation in the old Balinese script.

Composers and scholars both Indonesian and foreign have also mapped the slendro and pelog tuning systems of gamelan onto the western staff, with and without various symbols for microtones. The Dutch composer Ton de Leeuw also invented a three line staff for his composition Gending. However, these systems do not enjoy widespread use.

In the second half of the twentieth century, Indonesian musicians and scholars extended cipher notation to other oral traditions, and a diatonic scale cipher notation has become common for notating western-related genres (church hymns, popular songs, and so forth). Unlike the cipher notation for gamelan music, which uses a "fixed Do" (that is, 1 always corresponds to the same pitch, within the natural variability of gamelan tuning), Indonesian diatonic cipher notation is "moveable-Do" notation, so scores must indicate which pitch corresponds to the number 1 (for example, "1=C").

Other systems and practices

Cipher notation

In many cultures, including Chinese (jianpu or gongche), Indonesian (kepatihan), and Indian (sargam), the "sheet music" consists primarily of the numbers, letters or native characters representing notes in order. Those different systems are collectively known as cipher notations. The numbered notation, or numerical notation, is an example, so are letter notation and Solfège if written in musical sequence.

Solfège

Solfège is a way of assigning syllables to names of the musical scale. In order, they are today: *Do Re Mi Fa Sol La Ti Do'* (for the octave). The classic variation is: *Do Re Mi Fa Sol La Si Do'* . These functional names of the musical notes were introduced by Guido of Arezzo (c.991 – after 1033) using the beginning syllables of the first six musical lines of the Latin hymn Ut queant laxis. The original sequence was *Ut Re Mi Fa Sol La*, where each verse started a scale note higher. "Ut" later became "Do". The equivalent syllables used in Indian music are: *Sa Re Ga Ma Pa Dha Ni*, while the 'bilinear music notation' system offers a fully chromatic method. The European (Guido-Kodály) and Indian solfeges are both used for tonsilabo notation. See also: solfège, sargam, Kodály Hand Signs. In China Xi is used instead of Ti.

Tonic sol-fa is a type of notation using the initial letters of solfège.

Letter notation

The notes of the 12-tone scale can be written by their letter names A–G, possibly with a trailing sharp or flat symbol, such as A♯ or B♭. This is the most common way of specifying a note in English speech or written text.

In Northern and Central Europe (e.g., Germany, Austria, Poland, Czech Republic, Slovakia, Hungary, Denmark, Norway, Finland, Estonia, Latvia, Flemish Belgium, and the Netherlands—and with diminishing frequency in Sweden), the letter system used is slightly differently for historical reasons. Due to the effects of globalization though, it is slowly getting phased out by the international system, especially among rock and pop musicians. In these countries, the note called simply B elsewhere (i.e., B♮) is called H, and the note B♭ is named B. (The C chromatic scale thus looks like this: C C♯ D D♯ E F F♯ G G♯ A B H C) Also, in pronouncing the tone names, the endings "-is" (for sharp) or "-es"/"-s" (for flat) are used; e.g., the note a semitone above C is either "Cis" or "Des", and A♭ is "As". Sometimes this is also used in writing (instead of using the sharp or flat symbol), especially in flowing text.

Tablature

Tablature was first used in the Middle Ages for organ music and later in the Renaissance for lute music.[10] In most lute tablatures, a staff is used, but instead of pitch values, the lines of the staff represent the strings of the instrument. The frets to finger are written on each line, indicated by letters or numbers. Rhythm is written separately with one or another variation of standard note values indicating the duration of the slowest moving part. Few seem to have remarked on the fact that tablature combines in one notation system both the physical and technical requirements of play (the lines and symbols on them and in relation to each other representing the actual performance actions) with the unfolding of the music itself (the lines of tablature taken horizontally represent the actual temporal unfolding of the music). In later periods, lute and guitar music was written with standard notation. Tablature caught interest again in the late 20th century for popular guitar music and other fretted instruments, being easy to transcribe and share over the internet in ASCII format. Websites like OLGA.net [11] (currently off-line pending legal disputes) have archives of text-based popular music tablature.

Klavar notation

Klavar notation (or "klavarskribo") is a chromatic system of notation geared mainly towards keyboard instruments, which transposes the usual "graph" of music. The pitches are indicated horizontally, with "staff" lines in twos and threes like the keyboard, and the sequence of music is read vertically from top to bottom. A considerable body of repertoire has been transcribed into Klavar notation. Klavar notation eliminates the need of accidentals and key signatures, and its advocates claim that this facilitates music-reading.

12-note non-equal temperament

Sometimes the pitches of music written in just intonation are notated with the frequency ratios, while Ben Johnston devised a system that represents just intonation with traditional western notation, with the addition of accidentals that indicate the cents to lower or raise a pitch.

Chromatic staff notations

Over the past three centuries, hundreds of music notation systems have been proposed as alternatives to traditional western music notation. Many of these systems seek to improve upon traditional notation by using a "chromatic staff" in which each of the 12 pitch classes has its own unique place on the staff. Examples are the *Ailler-Brennink* notation, Jacques-Daniel Rochat's *Dodeka*[12] system, Tom Reed's *Twinline* notation, Paul Morris' *TwinNote*[13] , John Keller's *Express Stave*, and José A. Sotorrio's *Bilinear Music Notation*. These notation systems do not require the use of standard key signatures, accidentals, or clef signs. They also represent interval relationships more consistently and accurately than traditional notation. The Music Notation Project (formerly known as the Music Notation Modernization Association) has a website with information on many of these notation systems.[14]

Graphic notation

The term 'graphic notation' refers to the contemporary use of non-traditional symbols and text to convey information about the performance of a piece of music. Practitioners include Christian Wolff, Earle Brown, Anthony Braxton, John Cage, Morton Feldman, Krzysztof Penderecki, Cornelius Cardew, and Roger Reynolds. See *Notations*, edited by John Cage and Alison Knowles, ISBN 0-685-14864-5.

Simplified Music Notation

Simplified Music Notation is an alternative form of musical notation designed to make sight-reading easier. It is based on classical staff notation, but incorporates sharps and flats into the shape of the noteheads. Notes such as double sharps and double flats are written at the pitch they are actually played at, but preceded by symbols called *history signs* that show they have been transposed. The notation was designed to help people who struggle with sight-reading, including those who suffer from working memory impairments, dyslexia and other learning difficulties.

Parsons code

Parsons code is used to encode music so that it can be easily searched. This style is designed for individuals with no musical background.

Braille music

Braille music is a complete, well developed, and internationally accepted musical notation system that has symbols and notational conventions quite independent of print music notation. It is linear in nature, similar to a printed language and different from the two-dimensional nature of standard printed music notation. To a degree Braille music resembles musical markup languages [15] such as XML for Music [16] or NIFF.

Integer notation

In integer notation, or the integer model of pitch, all pitch classes and intervals between pitch classes are designated using the numbers 0 through 11. It is not used to notate music for performance, but is a common analytical and compositional tool when working with chromatic music, including twelve-tone technique, serial, or otherwise atonal music.

Tonsilabos

Tonsilabo notation is devised as a way of conveying music simply as text. It is used for instrumental as well as vocal music and has the advantage that the ***same text*** can be applied by *human or computer*—whether in text documents and messages or by the computer program playing tonsilabo music. It is also extremely expressive in terms of number and accuracy of pitches, rhythm and syncopation and is adaptable to solfeges of any option.

Music notation on computer

Many computer programs have been developed for creating music notation (called *scorewriters* or *music notation software*). Music may also be stored in various digital file formats for purposes other than graphic notation output.

File formats

With the integration of computers and music, a variety of file formats have emerged for storing notation. One simple format is the Abc notation. A special category in this field is format for computer video games. [17]

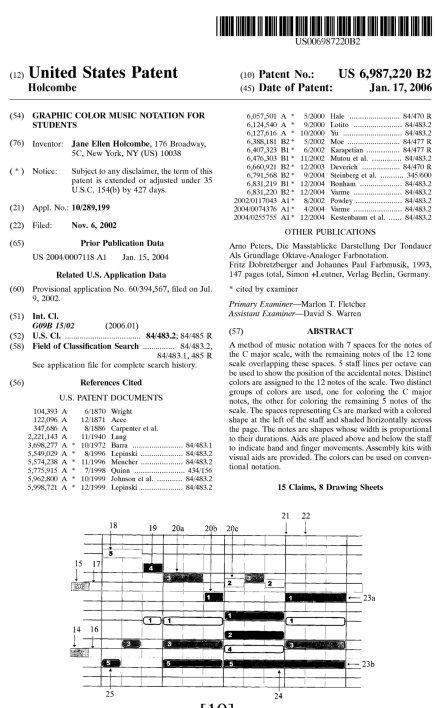
Perspectives of musical notation in composition and musical performance

According to Philip Tagg and Richard Middleton, musicology and to a degree European-influenced musical practice suffer from a 'notational centricity', a methodology slanted by the characteristics of notation.[18]

Notation-centric training induces particular forms of *listening*, and these then tend to be applied to *all* sorts of music, appropriately or not. Musicological methods tend to stress those musical parameters that can easily be notated...they tend to neglect or have difficulty with widened parameters that are not easily notated. Examples include the unique vocal style of Joni Mitchell and the String Quartets of Elliott Sharp. Because of conventional musical notation limitations, many present-day composers in various genres prefer to compose music that is either not notated, or notated only through the computer language of digital recording.

Patents

In some countries, new musical notations can be patented. In the United States, for example, about 90 patents have been issued on new notation systems. The earliest patent, U.S. Patent 1383 [20] was published in 1839.



US006987220B2

(12) **United States Patent**
Holcombe

(10) **Patent No.: US 6,987,220 B2**
(45) **Date of Patent: Jan. 17, 2006**

(54) **GRAPHIC COLOR MUSIC NOTATION FOR STUDENTS**

(76) Inventor: **Jane Ellen Holcombe**, 176 Broadway, 5C, New York, NY (US) 10038

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 427 days.

(21) Appl. No.: **10/289,199**

(22) Filed: **Nov. 6, 2002**

(65) **Prior Publication Data**

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(51) **Int. Cl.**
G09B 15/02 (2006.01)

(52) **U.S. Cl.** ..... **84/483.2**; 84/485 R

(58) **Field of Classification Search** ..... 84/483.2, 84/483.1, 485 R

See application file for complete search history.

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Primary Examiner—Marlon T. Fletcher
Assistant Examiner—David S. Warren

(57) **ABSTRACT**

A method of music notation with 7 spaces for the notes of the C major scale, with the remaining notes of the 12 tone scale overlapping these spaces. 5 staff lines per octave can be used to show the position of the accidental notes. Distinct colors are assigned to the 12 notes of the scale. Two distinct groups of colors are used, one for coloring the C major notes, the other for coloring the remaining 5 notes of the scale. The spaces representing Cs are marked with a colored shape at the left of the staff and shaded horizontally across the page. The notes are shapes whose width is proportional to their durations. Aids are placed above and below the staff to indicate hand and finger movements. Assembly kits with visual aids are provided. The colors can be used on conventional notation.

15 Claims, 8 Drawing Sheets

Recent US 6987220 [19] on a new color based musical notation scheme

Notes

[1] Kilmer & Civil 1986,.
[2] Kilmer 1965,.
[3] West 1994,.
[4] Toussaint 2004 (http://www.cs.mcgill.ca/research/reports/2004/SOCS-TR-2004.6.pdf), 3.
[5] Zapke 2007,
[6] Otten 1910 (http://www.newadvent.org/cathen/07065a.htm).
[7] McNaught 1893, 43.
[8] http://www.omenad.net/articles/omeswarlipi.htm
[9] Bagley 2004 (http://www.britac.ac.uk/events/2004/abstracts/2004-bagley.htm).
[10] Apel 1961, xxiii and 22.
[11] http://www.olga.net/
[12] http://www.dodeka.info/
[13] http://twinnote.org/
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[15] http://www.musicmarkup.info/scope/markuplanguages.html
[16] http://emusician.com/ar/emusic_xml_music/
[17] Musical notation codes (http://www.music-notation.info/en/compmus/notationformats.html)
[18] Tagg 1979, 28–32; Middleton 1990, 104–6.
[19] http://v3.espacenet.com/textdoc?DB=EPODOC&IDX=US6987220
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- CCARH — Center for Computer Assisted Research in the Humanities (http://253.ccarh.org) Information on Stanford University Course on music representation. Links page shows examples of different notations.
- Ensemble Kerylos (http://www.kerylos.fr/repertoire.php). Ensemble that performs on reconstructed ancient instruments and plays Ancient Greek melodies. **(French)**
- Music Markup Language (http://www.musicmarkup.info). XML-based language for music notation.
- Potato print (http://d.t.read.googlepages.com/readingpotatoprint). Examples of musical symbols from the 16th and 17th century
- Ricci Adams' MusicThoery.net (http://www.musictheory.net). A collection of interactive lessons and trainers that can be downloaded for offline use.
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Music theory

Music theory is the study of how music works. It examines the language and notation of music. It seeks to identify patterns and structures in composers' techniques, across or within genres, styles, or historical periods. In a grand sense, music theory distills and analyzes the fundamental parameters or elements of music—rhythm, harmony (harmonic function), melody, structure, form, texture, etc. Broadly, music theory may include any statement, belief, or conception of or about music.[1] A person who studies these properties is known as a **music theorist**. Some have applied acoustics, human physiology, and psychology to the explanation of how and why music is perceived.

Fundamentals of music

Music has many different fundamentals or elements. These include but are not limited to: pitch, beat or pulse, rhythm, melody, harmony, texture, allocation of voices, timbre or color, expressive qualities (dynamics and articulation), and form or structure. In addition to these "fundamentals" there are other important concepts employed in music both in Western and non-Western cultures including "Scales and/or Modes" and "Consonance vs. Dissonance."

Pitch

Pitch is a subjective sensation, reflecting generally the lowness or highness of a sound. In a musical context, some people have what is called "perfect pitch" and can assign an isolated tone to its place on a musical scale. Human perception of pitch can be comprehensively fooled to create auditory illusions. Despite these perceptual oddities, perceived pitch is nearly always closely connected with the fundamental frequency of a note, with a lesser connection to sound pressure level, harmonic content (complexity) of the sound, and to the immediately preceding history of notes heard.[2] In general, the higher the frequency of vibration, the higher the perceived pitch is, and lower the frequency, the lower the pitch.[3] However, even for tones of equal intensity, perceived pitch and measured frequency do not stand in a simple linear relationship.[4]

At and below about 1,000 Hz, the perceived pitch of a tone gets lower as sound pressure increases, but above approximately 2,000 Hz, the pitch increases as the sound gets louder.[5]

In Western music, there have long been several competing pitch standards defining tuning systems. Most made a particular key sonorous, with increasingly remote ones more and more problematic; the underlying problem is related to the physics of vibrations.

In addition, fixing notes to standard frequencies (required for instrument makers) has varied as well. "Concert A" was set at 435 Hz by France in 1859 while in England, concert A varied between 439 and 452 Hz. A frequency of 440 Hz was recommended as the standard in 1939, and in 1955 the International Organization for Standardization affirmed the choice.[6] A440 is now widely, though not exclusively, used as the A above middle C.

The difference in frequency between two pitches is called an interval. The most basic interval is the unison, which is simply two of the same pitch, followed by the slightly more complex octave, which indicates either a doubling or halving of the fundamental frequency.

Scales and Modes

Notes can be arranged into different scales and modes. Western music theory generally divides the octave into a series of 12 notes that might be included in a piece of music. This series of twelve notes is called a chromatic scale. In the chromatic scale, the interval between adjacent notes is called a half-step or *semitone*. Patterns of half and whole steps (2 half steps, or a *tone*) can make up a scale in that octave. The scales most commonly encountered are the seven toned major, the harmonic minor, the melodic minor, and the natural minor. Other examples of scales are the octatonic scale, and the pentatonic or five-toned scale, which is common in but not limited to folk musics. There

are scales that do not follow the chromatic 12-note pattern, for example in classical Persian, Indian and Arabic music. Arabic and Persian classical traditions often make use of quarter-tones, half the size of a semitone, as the name suggests.

In music written using the system of major-minor tonality, the **key** of a piece determines the scale used. (One way of showing how various keys relate to one another may be seen in the circle of fifths.) Transposing a piece from C major to D major will make all the notes two semitones (or one full step) higher. Even in modern equal temperament, changing the key can change the feel of a piece of music, because it changes the relationship of the composition's pitches to the pitch range of the instruments that play the piece. This often affects the music's timbre, as well as having technical implications for the performers. However, performing a piece in one key rather than another may go unrecognized by the casual listener, since changing the key does not change the relationship of the individual pitches to each other.

Consonance and Dissonance

Consonance can be roughly defined as harmonies whose tones complement and increase each others' resonance, and dissonance as those that create more complex acoustical interactions (called 'beats'). A simplistic example is that of "pleasant" sounds versus "unpleasant" ones. Another manner of thinking about the relationship regards stability; dissonant harmonies are sometimes considered to be unstable and to "want to move" or "resolve" toward consonance. However, this is not to say that dissonance is undesirable. A composition made entirely of consonant harmonies may be pleasing to the ear and yet boring because there are no instabilities to be resolved.

Melody is often organized so as to interact with changing harmonies (sometimes called a chord progression) that accompany it, setting up consonance and dissonance. The art of melody writing depends heavily upon the choices of tones for their nonharmonic or harmonic character.

Rhythm

Rhythm is the arrangement of sounds and silences in time. Meter animates time in regular pulse groupings, called measures or bars. The time signature or meter signature specifies how many beats are in a measure, and which value of written note is counted and felt as a single beat. Through increased stress and attack (and subtle variations in duration), particular tones may be accented. There are conventions in most musical traditions for a regular and hierarchical accentuation of beats to reinforce the meter. Syncopated rhythms are rhythms that accent unexpected parts of the beat. Playing simultaneous rhythms in more than one time signature is called polymeter. See also polyrhythm.

In recent years, rhythm and meter have become an important area of research among music scholars. Recent work in these areas includes books by Bengt-Olov Palmqvist, Fred Lerdahl and Ray Jackendoff, and Jonathan Kramer.

Melody

A melody is a series of tones sounding in succession. The tones of a melody are typically created with respect to pitch systems such as scales or modes. The rhythm of a melody is often based on the inflections of language, the physical rhythms of dance, or simply periodic pulsation. Melody is typically divided into phrases within a larger overarching structure. The elements of a melody are pitch, duration, dynamics, and timbre.

Harmony

Harmony is the study of vertical sonorities in music. Vertical sonority refers to considering the relationships between pitches that occur together; usually this means at the same time, although harmony can also be implied by a melody that outlines a harmonic structure.

The relationship between two pitches is referred to as an interval. A larger structure involving more than two pitches is called a chord. In common practice and popular music, harmonies are generally tertian. This means that the

interval of which the chords are composed is a third. Therefore, a root-position triad (with the root note in the lowest voice) consists of the root note, a note a third above, and a note a third above that (a fifth above the root). Seventh chords add a third above the top note of a triad (a seventh above the root). There are some notable exceptions. In 20th century classical music, many alternative types of harmonic structure were explored. One way to analyze harmony in common practice music is through a Roman numeral system; in popular music and jazz a system of chord symbols is used; and in post-tonal music, a variety of approaches are used, most frequently set theory.

The perception of pitch within harmony depends on a number of factors including the interaction of frequencies within the harmony and the roughness produced by the fast beating of nearby partials. Pitch perception is also affected by familiarity of the listener with the music, and cultural associations.

"Harmony" as used by music theorists can refer to any kind of simultaneity without a value judgement, in contrast with a more common usage of "in harmony" or "harmonious", which in technical language might be described as consonance.

Monophony is the texture of a melody heard only by itself. If a melody is accompanied by chords, the texture is homophony. In homophony, the melody is usually but not always voiced in the highest notes. A third texture, called polyphony, consists of several simultaneous melodies of equal importance.

Texture

Musical texture is the overall sound of a piece of music commonly described according to the number of and relationship between parts or lines of music: monophony, heterophony, polyphony, homophony, or monody. The perceived texture of a piece may also be affected by the timbre of the instruments, the number of instruments used, and the distance between each musical line, among other things.

Timbre

Timbre, sometimes called "Color", or "Tone Color" is the quality or sound of a voice or instrument.[7] The quality of timbre varies widely from instrument to instrument, or from voice to voice. The timbre of some instruments can be changed by applying certain techniques while playing. For example, the timbre of a trumpet changes when a mute is inserted into the bell, or a voice can change its timbre by the way a performer manipulates the vocal apparatus, (e.g. the vocal cords, mouth and diaphragm). Generally, there is no common musical notation that speaks specifically to a change in timbre, (as "pianissimo" would indicate "very soft" for a change in dynamics).

Expressive Qualities

Expressive Qualities are those elements in music that create change in music that are not related to pitch, rhythm or timbre. They include Dynamics and Articulation.

Dynamics

In music, the term "dynamics" normally refers to the softness or loudness of a sound or note: e.g. pianissimo or fortissimo. Until recently, most dynamics in written form were done so in Italian, but recently are sometimes written or translated into English. Another sense of the word refers to any aspect of the execution of events in a given piece; either stylistic (staccato, legato etc.) or functional (velocity) are also known as dynamics. The term is also applied to the written or printed musical notation used to indicate dynamics.

Articulation

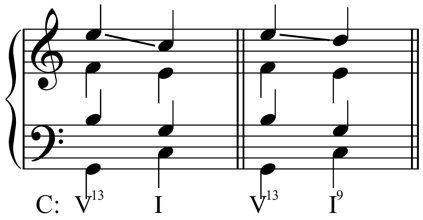
Articulation is the manner in which the performer applies their technique to execute the sounds or notes—for example, *staccato* or *legato*. Articulation is often described rather than quantified, therefore there is room to interpret how to execute precisely each articulation. For example, *Staccato* is often referred to as "separated" or "detached" rather than having a defined, or numbered amount by which the separation or detachment is to take place. Often the manner in which a performer decides to execute a given articulation is done so by the context of the piece or phrase. Also, the type or style of articulation will depend on the instrument and musical period, e.g. the classical period, but there is a generally recognized set of articulations that most all instruments (and voices) have in common. They are, in order of long to short: *legato* ("smooth, connected"); *tenuto* ("pressed", "lengthened but detached"); *marcato* (heavily accented and detached); *staccato* ("separated", "detached"); "martelé" (or "rooftop accent" or "teepee accent") for its written shape (short and hard). Any of these may be combined to create certain "in-between" articulations. For example, *portato* is the combination of *tenuto* and *staccato*. Some instruments have unique methods by which to produce sounds such *spicatto* for strings, where the bow bounces off the string.

Form or Structure

Form is a facet of music theory that explores the concept of musical syntax, on a local and global level. The syntax is often explained in terms of phrases and periods (for the local level) or sections or genre (for the global scale). Examples of common forms of Western music include the fugue, the invention, sonata-allegro, canon, strophic, theme and variations, and rondo. Popular Music often makes use of strophic form many times in conjunction with Twelve bar blues.

Theories of harmonization

Four-part writing



Four-part voice leading for dominant thirteenth chords in the common practice period.[8] Play

Four-part chorale writing is used to teach and analyze the basic conventions of "Common-Practice Period music", the time period lasting from approximately 1650 to 1900.[9] In the German musicology tradition referred to as functional harmony. Johann Sebastian Bach's four voice chorales written for liturgical purposes serve as a model for students. These chorales exhibit a fusion of linear and vertical thinking. In analysis, the harmonic function and rhythm are analyzed as well as the shape and implications of each of the four lines. Students are then instructed to compose chorales, often using given melodies (as Bach would have done), over a given bass line, or to compose within a chord progression, following rules of voice leading. Though traditionally conceived as a vocal exercise for Soprano, Alto, Tenor, and Bass, other common four-part writings could consist of a brass quartet (two Trumpets, French Horn, and Trombone) or a string quartet (including violin I, violin II, viola and cello).

There are seven chords used in four-part writing that are based upon each note of the scale. The chords are usually given Roman Numerals I, II, III, IV, V, VI and VII to refer to triadic (three-note) chords based on each successive note of the major or minor scale the piece is in. Chords may be analyzed in two ways. Case-sensitive harmonic analysis would state that major-mode chords (I, IV, V^7, etc.), including augmented (for example, VII^+), would be notated with upper-case Roman numerals, and minor-mode chords, including diminished (ii, iii, vi, and the diminished vii chord, vii^o), would be notated with lower-case Roman numerals. When a scale degree other than the root of the chord is in the bass, the chord is said to be in inversion, and this is indicated by numbers written above the roman numeral. With triads a 6 indicates first inversion, and 6 4 indicates second inversion. With seventh chords, 6 5 indicates first inversion, 4 3 indicates second inversion, and 4 2 indicates third inversion. (I^6, $IV^{4/3}$,$V^{4/2}$, etc.)

Schenkerian harmonic analysis, patterned after the theories of Heinrich Schenker, would state that the mode does not matter in the final analysis, and thus all harmonies are notated in upper-case.

The skill in harmonizing a Bach chorale lies in being able to begin a phrase in one key and to modulate to another key either at the end of the first phrase, the beginning of the next one, or perhaps by the end of the second phrase. Each chorale often has the ability to modulate to various tonally related areas: the relative major (III) or minor (vi), the Dominant (V) or its relative minor (iii), the Sub-Dominant (IV) or its relative minor (ii). Other chromatic chords may be used, like the diminished seventh (made up of minor thirds piled on top of each other) or the Secondary dominant (the Dominant's Dominant – a kind of major version of chord II). Certain standard cadences are observed, most notably $II^{b7} - V^7 - I$. The standard collection of J. S. Bach's chorales was edited by Albert Riemenschneider and this collection is readily available, e.g. here [10].

Music perception and cognition

Further information: Music cognition, Fred Lerdahl, and Ray Jackendoff

Jackendoff and Lerdahl attempt to develop a "musical grammar". Using Jackendoff's background as a linguist and Lerdahl's compositional and theoretical background, a series of generative rules are defined to explain the hierarchical structure of tonal music. The rules focus on musical grouping, or methods in which rhythmic groups of notes, as well as formal hierarchies, are perceived by listeners. Three sets of rules are given: "Grouping Well-Formedness Rules", "Grouping Preference Rules" and "Transformational Rules". These rules are designed to interpret how listeners group structures in tonal music. These groupings then play into the segmentation of events by listeners, which in turn determine the hierarchical structure perceived by the listener. Although this theory is well developed and complete, it is by far not the only system designed to discuss music in this manner, and there is no acceptance of this theory as being the sole theory by which to discuss perception of music (see Jonathan Kramer).

Serial composition and set theory

Further information: serialism, set theory (music), Arnold Schoenberg, Milton Babbitt, David Lewin, and Allen Forte

Twelve-tone technique was developed by Arnold Schoenberg to order and repeat all the 12 pitches of the chromatic scale with specific order. From 1947, this technique has been alternatively designated in French and English sources by the word serialism. An ordered row of the 12 pitches is created, then all possible transformations are explored. The analytic techniques involve writing a 12 × 12 matrix of the tone row, and all of its forms (transposition, inversion, retrograde, retrograde inversion, and possibly other mappings, such as the cycle-of-fourths or M5 transformation). This technique is primarily associated with the composers of the Second Viennese School, but also has been incorporated into the languages of many other composers.

The term serialism does not necessarily refer only to twelve-tone technique, especially in the German language; many composers have explored serialism using fewer than 12 notes, repeating tones inside of the row, serialism of microtonal scales, permutational serialism (in which note order is not fixed), distributional serialism, and serial composition without pitches at all. Also, composers such as Pierre Boulez explored integral serialism, or the serialization of all possible musical parameters (pitch, rhythm, dynamics, etc.).

Set Theory is another approach to understanding atonal music that may or may not be serial. Although more akin to the mathematical field of Group Theory than mathematical Set Theory, the nomenclature has become standard inside the musical community. Set theory represents the pitch classes as numbers to allow a methodology of examining music without tonic or triadic functional harmony. This technique allows for exploration of the construction of a serial tone row as well as less strict atonal works. This technique has been extended with a great deal of mathematical rigor to both tonal and atonal systems by David Lewin in his transformational approach utilizing networks of related sets.

Musical semiotics

Further information: music semiology and Jean-Jacques Nattiez

Music subjects

Notation

Musical notation is the symbolic representation of music (not to be confused with audio recording). Historically, and in the narrow sense, this is achieved with graphic symbols. Computer file formats have become important as well.[11] Spoken language and hand signs are also used to symbolically represent music, primarily in teaching.

In standard Western music notation, music is represented graphically by notes placed on a staff or staves with the vertical axis roughly corresponding to pitch and the horizontal axis roughly corresponding to time. Note head shapes, stems, flags, and ties are used to indicate duration. Additional symbols represent key, tempo, dynamics, accents, rests, etc.

Mathematics

Music and mathematics are strongly intertwined. As noted above, the concept of pitch and temperament are both strongly tied to mathematics, and acoustics in particular. Analysis often takes a mathematical route; musical set theory and Transformational theory are both steeped in mathematics.

Some methods of composition are mathematically based. Iannis Xenakis developed several methods using stochastic methods. The French school of spectral music uses mathematical analysis of sounds to develop compositional materials.

In music history mathematics were the foundation of the first understanding of tones, intervals, and scales developed by the Greeks between 530 and 500 BC. This discovery was based upon shortening a harp's string by a half, creating an octave. Further, separating the same string into two-thirds or four equal parts produced intervals known as fifths and fourths, respectively. This discovery had a philosophical impact on the importance of mathematics, "It was the first consistent realization that there is a mathematical rationality in the universe and that the human mind can make sense of that rationality," said Kitty Ferguson, the author of *The Music of Pythagoras*. Recently, Princeton University music theorist Dmitri Tymoczko discovered that relationships between notes exist in multi-dimensional geometric forms, or orbifolds. Tymoczko made his discovery when writing down all possible two note chords in columns on a sheet of paper. After doing so Tymoczko observed the possibility that a pattern existed,

> Suddenly Tymoczko realized that if he cut two triangles from the piece of paper, turned one of the triangles upside down, and reconnected the two triangles where the chords overlapped, the two-note chords on one edge of the resulting strip of paper would be the reversed versions of those on the opposite edge. If he then twisted the paper and attached the two edges, the chords would line up. "That's when I got a tingly feeling in my fingers," he says.

Two-note chords, the minimalist form of a chord (as a chord is any combination any number of notes played simultaneously) is represented graphically by a Mobius strip, a two-dimensional surface embedded in a three-dimensional space. As the chords are composed of increasing numbers of notes, the geometric form they take on becomes increasingly sophisticated. Three-note chords are represented by twisted three-dimensional shapes, and four-note chords, four-dimensional shapes. These principals on tonal relationships apply to every genre of music and have been unintentionally practiced by theorists and composers since medieval times. The significance of this finding is rooted in teaching and applying music theory. The simplistic relationships of tones as geometric shapes allow students of music to understand the composition of complex musical scores. In doing so, students can apply the relationships used in preeminent examples of melodic composition more easily into their own writing. Tymoczko explains this simplicity as being

> the "amazing and mysterious" thing about music … Three singers can go from a pleasing C-major chord to the complementary and more plaintive A-minor chord by moving just one note: changing from CEG to CEA. Someone playing Hey Jude on the piano can move his or her fingers very little while moving from one sonorous chord to another. Miraculously, the chords that sound good together and the ones that produce efficient voice leading are the same.

It was this idea that lead to the study of mathematical music theory and explains his discovery of orbifolds and representations of these relationships. Tymoczko used these tools to as facilitators for his own compositions and an analysis of Western music in his book *A Geometry of Music: Harmony and Counterpoint in the Extended Common Practice*.[12]

Analysis

Analysis is the effort to describe and explain music. Analysis at once is a catch-all term describing the process of describing any portion of the music, as well as a specific field of formal analysis or the field of stylistic analysis. Formal analysis attempts to answer questions of hierarchy and form, and stylistic analysis attempts to describe the style of the piece. These two distinct sub-fields often coincide.

Analysis of harmonic structures is typically presented through a roman numeral analysis. However, over the years, as music and the theory of music have both grown, a multitude of methods of analyzing music have presented themselves. Two very popular methods, Schenkerian analysis and Neo-Riemannian analysis, have dominated much of the field. Schenkerian analysis attempts to "reduce" music through layers of foreground, middleground, and, eventually and importantly, the background. Neo-Riemannian (or Transformational) analysis began as an extension of Hugo Riemann's theories of music, and then expanding Riemann's concepts of pitch and transformation into a mathematically rich language of analysis. While both theories originated as methods of analysis for tonal music, both have been extended to use in non-tonal music as well.

Ear training

Aural skills – the ability to identify musical patterns by ear, as opposed to by the reading of notation – form a key part of a musician's craft and are usually taught alongside music theory. Most aural skills courses train the perception of relative pitch (the ability to determine pitch in an established context) and rhythm. Sight-singing – the ability to sing unfamiliar music without assistance – is generally an important component of aural skills courses. Absolute pitch or perfect pitch describes the ability to recognise a particular audio frequency as a given musical note without any prior reference.

Notes

[1] Boretz 1995, .
[2] Lloyd and Boyle 1978, 142.
[3] Benade 1960, 31.
[4] Stevens, Volkmann, and Newman 1937, 185; Josephs 1967, 53–54.
[5] Olson 1967, 248–51 (http://books.google.com/books?id=RUDTFBbb7jAC&pg=PA248).
[6] Cavanagh (1999). (http://www.wam.hr/Arhiva/US/Cavanagh_440Hz.pdf)
[7] Harnsberger 1997.
[8] Benward and Saker 2009, 179.
[9] Kostka and Payne 2004, .
[10] http://www.jsbchorales.net/
[11] Castan 2009 (http://www.music-notation.info/en/compmus/notationformats.html).
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Media and technology

Computer music

Computer music is a term that was originally used within academia to describe a field of study relating to the applications of computing technology in music composition; particularly that stemming from the Western art music tradition. It includes the theory and application of new and existing technologies in music, such as sound synthesis, digital signal processing, sound design, sonic diffusion, acoustics, and psychoacoustics. The field of computer music can trace its roots back to the origin of electronic music, and the very first experiments and innovations with electronic instruments at the turn of the 20th century. More recently, with the advent of personal computing, and the growth of home recording, the term computer music is now sometimes used to describe any music that has been created using computing technology.

History

Much of the work on computer music has drawn on the relationship between music theory and mathematics. The world's first computer to play music was CSIRAC which was designed and built by Trevor Pearcey and Maston Beard. Mathematician Geoff Hill programmed the CSIRAC to play popular musical melodies from the very early 1950s. In 1951 it publicly played the Colonel Bogey March[1] of which no known recordings exist. However, CSIRAC played standard repertoire and was not used to extend musical thinking or composition practice which is current computer-music practice.

The oldest known recordings of computer generated music were played by the Ferranti Mark 1 computer, a commercial version of the Baby Machine from the University of Manchester in the autumn of 1951. The music program was written by Christopher Strachey. During a session recorded by the BBC, the machine managed to work its way through "Baa Baa Black Sheep", "God Save the King" and part of "In the Mood".[2]

Two further major 1950s developments were the origins of digital sound synthesis by computer, and of algorithmic composition programs beyond rote playback. Max Mathews at Bell Laboratories developed the influential MUSIC I program and its descendents, further popularising computer music through a 1962 article in Science. Amongst other pioneers, the musical chemists Lejaren Hiller and Leonard Isaacson worked on a series of algorithmic composition experiments from 1956-9, manifested in the 1957 premiere of the *Illiac Suite* for string quartet.[3]

Early computer-music programs typically did not run in real time. Programs would run for hours or days, on multi-million-dollar computers, to generate a few minutes of music. John Chowning's work on FM synthesis from the 1960s to the 1970s, and the advent of inexpensive digital chips and microcomputers opened the door to real-time generation of computer music. By the early 1990s, the performance of microprocessor-based computers reached the point that real-time generation of computer music using more general programs and algorithms became possible.

Advances

Advances in computing power and software for manipulation of digital media have dramatically affected the way computer music is generated and performed. Current-generation micro-computers are powerful enough to perform very sophisticated audio synthesis using a wide variety of algorithms and approaches. Computer music systems and approaches are now ubiquitous, and so firmly embedded in the process of creating music that we hardly give them a second thought: computer-based synthesizers, digital mixers, and effects units have become so commonplace that use of digital rather than analog technology to create and record music is the norm, rather than the exception.

Research

Despite the ubiquity of computer music in contemporary culture, there is considerable activity in the field of computer music, as researchers continue to pursue new and interesting computer-based synthesis, composition, and performance approaches. Throughout the world there are many organizations and institutions dedicated to the area of computer and electronic music study and research, including the ICMA (International Computer Music Association), IRCAM, GRAME, SEAMUS (Society for Electro Acoustic Music in the United States), CEC (Canadian Electroacoustic Community), and a great number of institutions of higher learning around the world.

Computer-generated music

Computer-generated music is music composed by, or with the extensive aid of, a computer. Although any music which uses computers in its composition or realisation is computer-generated to some extent, the use of computers is now so widespread (in the editing of pop songs, for instance) that the phrase computer-generated music is generally used to mean a kind of music which could not have been created *without* the use of computers.

We can distinguish two groups of computer-generated music: music in which a computer generated the score, which could be performed by humans, and music which is both composed and performed by computers. There is a large genre of music that is organized, synthesized, and created on computers.

Computer-generated scores for performance by human players

Many systems for generating musical scores actually existed well before the time of computers. One of these was Musikalisches Würfelspiel *(Musical dice game*; 18th century), a system which used throws of the dice to randomly select measures from a large collection of small phrases. When patched together, these phrases combined to create musical pieces which could be performed by human players. Although these works were not actually composed with a computer in the modern sense, it uses a rudimentary form of the random combinatorial techniques sometimes used in computer-generated composition.

The world's first digital computer music was generated in Australia by programmer Geoff Hill on the CSIRAC computer which was designed and built by Trevor Pearcey and Maston Beard, although it was only used to play standard tunes of the day. Subsequently, one of the first composers to write music with a computer was Iannis Xenakis. He wrote programs in the FORTRAN language that generated numeric data that he transcribed into scores to be played by traditional musical instruments. An example is *ST/48* of 1962. Although Xenakis could well have composed this music by hand, the intensity of the calculations needed to transform probabilistic mathematics into musical notation was best left to the number-crunching power of the computer.

Computers have also been used in an attempt to imitate the music of great composers of the past, such as Mozart. A present exponent of this technique is David Cope. He wrote computer programs that analyse works of other composers to produce new works in a similar style. He has used this program to great effect with composers such as Bach and Mozart (his program *Experiments in Musical Intelligence* is famous for creating "Mozart's 42nd Symphony"), and also within his own pieces, combining his own creations with that of the computer.

Music composed and performed by computers

Later, composers such as Gottfried Michael Koenig had computers generate the sounds of the composition as well as the score. Koenig produced algorithmic composition programs which were a generalisation of his own serial composition practice. This is not exactly similar to Xenakis' work as he used mathematical abstractions and examined how far he could explore these musically. Koenig's software translated the calculation of mathematical equations into codes which represented musical notation. This could be converted into musical notation by hand and then performed by human players. His programs Project 1 and Project 2 are examples of this kind of software. Later, he extended the same kind of principles into the realm of synthesis, enabling the computer to produce the sound

directly. SSP is an example of a program which performs this kind of function. All of these programs were produced by Koenig at the Institute of Sonology in Utrecht, Holland in the 1970s.

Procedures such as those used by Koenig and Xenakis are still in use today. Since the invention of the MIDI system in the early 1980s, for example, some people have worked on programs which map MIDI notes to an algorithm and then can either output sounds or music through the computer's sound card or write an audio file for other programs to play.

Some of these simple programs are based on fractal geometry, and can map midi notes to specific fractals, or fractal equations. Although such programs are widely available and are sometimes seen as clever toys for the non-musician, some professional musicians have given them attention also. The resulting 'music' can be more like noise, or can sound quite familiar and pleasant. As with much algorithmic music, and algorithmic art in general, more depends on the way in which the parameters are mapped to aspects of these equations than on the equations themselves. Thus, for example, the same equation can be made to produce both a lyrical and melodic piece of music in the style of the mid-nineteenth century, and a fantastically dissonant cacophony more reminiscent of the avant-garde music of the 1950s and 1960s.

Other programs can map mathematical formulae and constants to produce sequences of notes. In this manner, an irrational number can give an infinite sequence of notes where each note is a digit in the decimal expression of that number. This sequence can in turn be a composition in itself, or simply the basis for further elaboration.

Operations such as these, and even more elaborate operations can also be performed in computer music programming languages such as Max/MSP, SuperCollider, Csound, Pure Data (Pd), Keykit, and ChucK. These programs now easily run on most personal computers, and are often capable of more complex functions than those which would have necessitated the most powerful mainframe computers several decades ago.

There exist programs that generate "human-sounding" melodies by using a vast database of phrases. One example is Band-in-a-Box, which is capable of creating jazz, blues and rock instrumental solos with almost no user interaction. Another is Impro-Visor, which uses a stochastic context-free grammar to generate phrases and complete solos.

Another 'cybernetic' approach to computer composition uses specialized hardware to detect external stimuli which are then mapped by the computer to realize the performance. Examples of this style of computer music can be found in the middle-80's work of David Rokeby (Very Nervous System) where audience/performer motions are 'translated' to MIDI segments. Computer controlled music is also found in the performance pieces by the Canadian composer Udo Kasemets such as the Marce(ntennia)l Circus C(ag)elebrating Duchamp (1987), a realization of the Marcel Duchamp process piece *Erratum Musical* using an electric model train to collect a hopper-car of stones to be deposited on a drum wired to an Analog:Digital converter, mapping the stone impacts to a score display (performed in Toronto by pianist Gordon Monahan during the 1987 Duchamp Centennial), or his installations and performance works (e.g. Spectrascapes) based on his Geo(sono)scope (1986) 15x4-channel computer-controlled audio mixer. In these latter works, the computer generates sound-scapes from tape-loop sound samples, live shortwave or sine-wave generators.

Computer-Aided Algorithmic Composition

Computer-Aided Algorithmic Composition (CAAC, pronounced "sea-ack") is the implementation and use of algorithmic composition techniques in software. This label is derived from the combination of two labels, each too vague for continued use. The label *computer-aided composition* lacks the specificity of using generative algorithms. Music produced with notation or sequencing software could easily be considered computer-aided composition. The label *algorithmic composition* is likewise too broad, particularly in that it does not specify the use of a computer. The term computer-aided, rather than computer-assisted, is used in the same manner as Computer-Aided Design.

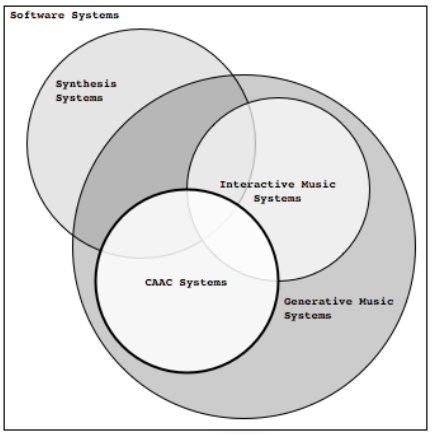

Diagram illustrating the position of CAAC in relation to other Generative music Systems

Video-Driven Soundtrack Composer

A new concept insofar as the music generated is driven by an associated video. This process has been developed by Tunepresto and is available as a commercial product, Abaltat Muse, for users to create their own music based on their video pictures or slideshows. The process involves an analysis of the color saturation in the pictures, together with the calculation of the duration of the footage. The user then chooses a style of music and a soundtrack is created using the video analysis information combined with the rules of the chosen musical style. The music generated is royalty-free since the user is the originator of the music.

Machine Improvisation

Machine Improvisation uses computer algorithms to create improvisation on existing music materials. This is usually done by sophisticated recombination of musical phrases extracted from existing music, either live or pre-recorded. In order to achieve credible improvisation in particular style, machine improvisation uses machine learning and pattern matching algorithms to analyze existing musical examples. The resulting patterns are then used to create new variations "in the style" of the original music, developing a notion of stylistic reinjection. This is different from other improvisation methods with computers that use algorithmic composition to generate new music without performing analysis of existing music examples.

Statistical style modeling

Style modeling implies building a computational representation of the musical surface that captures important stylistic features from data. Statistical approaches are used to capture the redundancies in terms of pattern dictionaries or repetitions, which are later recombined to generate new musical data. Style mixing can be realized by analysis of a database containing multiple musical examples in different styles. Machine Improvisation builds upon a long musical tradition of statistical modeling that began with Hiller and Isaacson's *Illiac Suite for String Quartet* (1957) and Xenakis' uses of Markov chains and stochastic processes. Modern methods include the use of lossless data compression for incremental parsing, prediction suffix tree and string searching by factor oracle algorithm (basically a *factor oracle* is a finite state automaton constructed in linear time and space in an incremental fashion[4]).

Uses of Machine Improvisation

Machine Improvisation encourages musical creativity by providing automatic modeling and transformation structures for existing music. This creates a natural interface with the musician without need for coding musical algorithms. In live performance, the system re-injects the musician's material in several different ways, allowing a semantics-level representation of the session and a smart recombination and transformation of this material in real-time. In offline version, Machine Improvisation can be used to achieve style mixing, an approach inspired by Vannevar Bush's memex imaginary machine.

Implementations

Matlab implementation of the Factor Oracle machine improvisation can be found as part of Computer Audition toolbox.

OMax is a software environment developed in IRCAM. OMax uses OpenMusic and Max. It is based on researches on stylistic modeling carried out by Gerard Assayag and Shlomo Dubnov and on researches on improvisation with the computer by G. Assayag, M. Chemillier and G. Bloch (aka the *OMax Brothers*) in the Ircam Music Representations group.

Musicians working with machine improvisation

Gerard Assayag (IRCAM, France), Jeremy Baguyos (University of Nebraska at Omaha, USA) Tim Blackwell (Goldsmiths College, Great Britain), George Bloch (Composer, France), Marc Chemiller (IRCAM/CNRS, France), Nick Collins (University of Sussex, UK) Shlomo Dubnov (Composer, Israel / USA), Mari Kimura (Juilliard, New York City), George Lewis (Columbia University, New York City), Bernard Lubat (Pianist, France), Joel Ryan (Institute of Sonology, Netherlands), Michel Waisvisz (STEIM, Netherlands), David Wessel (CNMAT, California), Michael Young (Goldsmiths College, Great Britain), Pietro Grossi (CNUCE, Institute of the National Research Council, Pisa, Italy), Toby Gifford and Andrew Brown (Griffith University, Brisbane, Australia).

Live coding

Live coding[5] (sometimes known as 'interactive programming', 'on-the-fly programming',[6] 'just in time programming') is the name given to the process of writing software in realtime as part of a performance. Historically, similar techniques were used to produce early computer art, but recently it has been explored as a more rigorous alternative to laptop musicians who, live coders often feel, lack the charisma and pizzazz of musicians performing live.[7]

Generally, this practice stages a more general approach: one of interactive programming, of writing (parts of) programs while they are interpreted. Traditionally most computer music programs have tended toward the old write/compile/run model which evolved when computers were much less powerful. This approach has locked out code-level innovation by people whose programming skills are more modest. Some programs have gradually integrated real-time controllers and gesturing (for example, MIDI-driven software synthesis and parameter control). Until recently, however, the musician/composer rarely had the capability of real-time modification of program code itself. This legacy distinction is somewhat erased by languages such as ChucK, SuperCollider, and Impromptu.

TOPLAP, an ad-hoc conglomerate of artists interested in live coding was formed in 2004, and promotes the use, proliferation and exploration of a range of software, languages and techniques to implement live coding. This is a parallel and collaborative effort e.g. with research at the Princeton Sound Lab, the University of Cologne, and the Computational Arts Research Group at Queensland University of Technology.

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Education

Music education

Music education is a field of study associated with the teaching and learning of music. It touches on all domains of learning, including the psychomotor domain (the development of skills), the cognitive domain (the acquisition of knowledge), and, in particular and significant ways,the affective domain, including music appreciation and sensitivity. The incorporation of music training from preschool to postsecondary education is common in most nations because involvement in music is considered a fundamental component of human culture and behavior. Music, like language, is an accomplishment that distinguishes us as humans.[1]

Overview

In elementary schools, children often learn to play instruments such as keyboards or recorders, sing in small choirs, and learn about the elements of musical sound and history of music. Although music education in many nations has traditionally emphasized Western classical music, in recent decades music educators tend to incorporate application and history of non-western music to give a well-rounded musical experience and teach multiculturalism and international understanding. In primary and secondary schools, students may often have the opportunity to perform in some type of musical ensemble, such as a choir, orchestra, or school band: concert band, marching band, or jazz band. In some secondary schools, additional music classes may also be available. In junior high school or its equivalent, music usually continues to be a required part of the curriculum.[2]

At the university level, students in most arts and humanities programs may receive academic credit for taking music courses, which typically take the form of an overview course on the history of music, or a music appreciation course that focuses on listening to music and learning about different musical styles. In addition, most North American and European universities have some type of music ensemble in which students from various fields of study may participate such as a choir, concert band, marching band, or orchestra. Many universities also offer degree programs in the field of music education, allowing their students to become certified educators of primary and secondary school ensembles as well as beginner music classes. Advanced degrees can lead to university employment. These degrees come with the completion of varied technique classes, private instruction, numerous ensembles, and in depth observations of educators in the area. Music education departments in North American and European universities also often support interdisciplinary research in such areas as music psychology, music education historiography, educational ethnomusicology, sociomusicology, and philosophy of education.

The study of Western art music is increasingly common in music education outside of North America and Europe, including Asian nations such as South Korea, Japan, and China. At the same time, Western universities and colleges are widening their curriculum to include music of non-Western cultures, such as the music of Africa or Bali (e.g. Gamelan music), as well as even rock music (see popular music pedagogy).

Music education also takes place in individualized, life-long learning, and community contexts. Both amateur and professional musicians typically take music lessons, short private sessions with an individual teacher. Amateur musicians typically take lessons to learn musical rudiments and beginner- to intermediate-level musical techniques.

Instructional methodologies

While instructional strategies are bound by the music teacher and the music curriculum in his or her area, many teachers rely heavily on one of many instructional methodologies that emerged in recent generations and developed rapidly during the latter half of the 20th Century:

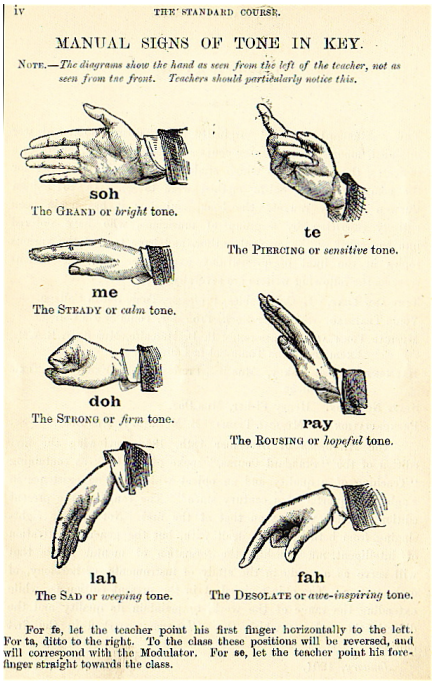
Major international music education methods

Dalcroze method

The Dalcroze method was developed in the early 20th century by Swiss musician and educator Émile Jaques-Dalcroze. The method is divided into three fundamental concepts - the use of solfege, improvisation, and eurhythmics. Sometimes referred to as "rhythmic gymnastics", eurhythmics teaches concepts of rhythm, structure, and musical expression using movement, and is the concept for which Dalcroze is best known. It focuses on allowing the student to gain physical awareness and experience of music through training that takes place through all of the senses, particularly kinesthetic. According to the Dalcroze method, music is the fundamental language of the human brain and therefore deeply connected to what human beings are.

Kodály method

Zoltán Kodály (1882–1967) was a prominent Hungarian music educator and composer who stressed the benefits of physical instruction and response to music. Although not really an educational method, his teachings reside within a fun, educational framework built on a solid grasp of basic music theory and music notation in various verbal and written forms. Kodály's primary goal was to instill a lifelong love of music in his students and felt that it was the duty of the child's school to provide this vital element of education. Some of Kodály's trademark teaching methods include the use of solfege hand signs, musical shorthand notation (stick notation), and rhythm solmization (verbalization). Even though most countries have properly used their own folk music traditions to construct their own sequence of instruction, America primarily uses the Hungarian sequence even though Hungarian folk music is completely different from American.



Depiction of Curwen's Solfege hand signs. This version includes the tonal tendencies and interesting titles for each tone.

Orff Schulwerk

Carl Orff was a prominent German composer. The Orff Schulwerk is considered an "approach" to music education. It begins with a student's innate abilities to engage in rudimentary forms of music, using basic rhythms and melodies. Orff considers the whole body a percussive instrument and students are led to develop their music abilities in a way that parallels the development of western music. The approach encourages improvisation and discourages adult pressures and mechanical drill, fostering student self-discovery. Carl Orff developed a special group of instruments, including modifications of the glockenspiel, xylophone, metallophone, drum, and other percussion instruments to accommodate the requirements of the Schulwerk courses.[3]

Suzuki method

The Suzuki method was developed by Shinichi Suzuki in Japan shortly after World War II, and it uses music education to enrich the lives and moral character of its students. The movement rests on the double premise that "all children can be well educated" in music, and that learning to play music at a high level also involves learning certain character traits or virtues which make a person's soul more beautiful. The primary method for achieving this is centered around creating the same environment for learning music that a person has for learning their native language. This 'ideal' environment includes love, high-quality examples, praise, rote training and repetition, and a time-table set by the student's developmental readiness for learning a particular technique. While the Suzuki Method is quite popular internationally, within Japan its influence is less significant than the Yamaha Method, founded by Genichi Kawakami in association with the Yamaha Music Foundation.

Simply Music method

Simply Music is a playing-based music education institution. The program is primarily based on creating, developing and presenting playing-based piano and keyboard programs. The Simply Music method was created by Australian music educator, Neil Moore, and first released in January 1998. Simply Music first translates entire pieces into simple shapes and patterns. Simply Music does not diminish the importance of learning to read music. Instead, the process is delayed. Composition and improvisation are demystified, by introducing them very early on in the program as something natural and enjoyable. By drawing on some simple principles learned in the foundation pieces and developing these, students learn, through a playful process of experimentation, to create their own unique pieces and arrangements. The accompaniment program equips students with the skills to play in bands and ensembles, opening the door to playing a vast array of popular music quickly. The Simply Music curriculum unfolds over six to ten years and consists of the Foundation Program (unfolding over the first 3 to 5 years), the Development Program (unfolding over years 6 to 10), as well as an array of Special Programs that are woven throughout the curriculum from the earliest stages. Music used throughout the program includes contemporary, classical, gospel, blues, jazz and traditional styles. Students also are immersed in composition, improvisation, developing arrangements and contemporary accompaniment.

Other Notable methods

In addition to the four major international methods described above, other approaches have been influential. Lesser-known methods are described below:

Gordon Music Learning Theory

This method is based on an extensive body of research and field testing by Edwin E. Gordon and others. Music Learning Theory provides the music teacher a comprehensive method for teaching musicianship through *audiation*, Gordon's term for hearing music in the mind *with understanding*. Teaching methods help music teachers establish sequential curricular objectives in accord with their own teaching styles and beliefs.[4]

World Music Pedagogy

The growth of cultural diversity within school-age populations prompted music educators from the 1960s onward to diversify the content of the music curriculum, and to work with ethnomusicologists and some of the world's artist-musicians in establishing instructional practices relevant to the musical traditions. 'World music pedagogy' was coined by Patricia Shehan Campbell to describe world music content and practice in elementary and secondary school music programs. Pioneers of the movement, especially Barbara Reeder Lundquist and William M. Anderson, influenced a second generation of music educators (including Bryan J. Burton, Mary Goetze, Ellen McCullough-Brabson, and Mary Shamrock) to design and deliver curricular models to teachers of music of various levels and specializations.

Conversational Solfege

Deriving influence from both Kodály methodology and Gordon's Music Learning Theory, **Conversational Solfege** was developed by Dr. John M. Feierabend, chair of music education at the Hartt School at the University of Hartford. The philosophy of this method is to view music as an aural art with a literature based curriculum. The sequence of this methodology involves a 12 step process to teach music literacy. Steps include rhythm and tonal patterns and decoding the patterns using syllables and notation. Unlike traditional Kodály method, this method follows Kodály's actual instructions and uses a sequence based on American folk songs instead of using the sequence that is used in Hungary based on Hungarian folk songs.

Carabo-Cone Method

This early-childhood approach sometimes referred to as the Sensory-Motor Approach to Music was developed by the violinist Madeleine Carabo-Cone. This approach involves using props, costumes, and toys for children to learn basic musical concepts of staff, note duration, and the piano keyboard. The concrete environment of the specially planned classroom allows the child to learn the fundamentals of music by exploring through touch.[5]

MMCP

The Manhattanville Music Curriculum Project was developed in 1965 and is an alternative method in shaping positive attitudes toward music education. This creative approach centers around the student being the musician and involved in the discovery process. The teacher gives the student freedom to create, perform, improvise, conduct, research, and investigate different facets of music in a spiral curriculum.

Self education

There are multiple software products which were developed to encourage easy and entertaining engagement of people into playing and learning music. The applications provide simulation environment where harmony, rhythm and just beauty of classical music are learned through the following automated music performance. [6]

History of Music Education in the United States

18th century

After the preaching of Reverend Thomas Symmes, the first singing school was created in 1717 in Boston, Massachusetts for the purposes of improving singing and music reading in the church. These singing schools gradually spread throughout the colonies. Reverend John Tufts published *An Introduction to the Singing of Psalm Tunes Using Non-Traditional Notation* which is regarded as the first music textbook in the colonies. Between 1700 to 1820, more than 375 tune books would be published by such authors as Samuel Holyoke, Francis Hopkinson, William Billings, and Oliver Holden.[7]

19th century

In 1832, Lowell Mason and George Webb formed the Boston Academy of Music with the purposes of teaching singing and theory as well as methods of teaching music. Mason published his *Manuel of Instruction* in 1834 which were based upon the music education works of Pestalozzian System of Education founded by Swiss educator Johann Heinrich Pestalozzi. This handbook gradually became used by many singing school teachers. From 1837-1838, the Boston School Committee allowed Lowell Mason to teach music in the Hawes School as a demonstration. This is regarded as the first time music education was introduced to public schools in the United States. In 1838 the Boston School Committee approved the inclusion of music in the curriculum and Lowell Mason became the first recognized supervisor of elementary music. In later years Luther Whiting Mason became the Supervisor of Music in Boston and spread music education into all levels of public education (grammar, primary, and high school). During the middle of

the 19th century, Boston became the model to which many other cities across the United States included and shaped their public school music education programs.[8] Music methodology for teachers as a course was first introduced in the Normal School. The concept of classroom teachers in a school that taught music under the direction of a music supervisor was the standard model for public school music education during this century. (See also: *Music education in the United States*)

Early 20th century

In the United States, teaching colleges with four year degree programs developed from the Normal Schools and included music. Oberlin Conservatory first offered the Bachelor of Music Education degree. Osbourne G. McCarthy, and American music educator introduced details for studying music for credit in Chelsea High School. Notable events in the history of music education in the early 20th century also include:

- Founding of the Music Supervisor's National Conference (changed to Music Educators National Conference in 1934, later MENC: The National Association for Music Education in 1998) in Keokuk, Iowa in 1907.
- Rise of the school band and orchestra movement leading to performance oriented school music programs.
- Growth in music methods publications.
- Frances Elliot Clark develops and promotes phonograph record libraries for school use.
- Carl Seashore and his *Measures of Musical Talent* music aptitude test starts testing people in music.

Mid & Late 20th century

The following table illustrates some notable developments from this period:

Date	Major Event	Historical Importance for Music Education
1950	The Child's Bill of Rights in Music [9]	A student-centered philosophy was formally espoused by MENC.
1953	The American School Band Directors Association formed	The band movement becomes organized.
1957	Launch of Sputnik	Increased curricular focus on science, math, technology with less emphasis on music education.
1959	Contemporary Music Project	The purpose of the project was to make contemporary music relevant in children by placing quality composers and performers in the learning environment. Leads to the Comprehensive Musicianship movement.
1961	American Choral Directors Association formed	The choral movement becomes organized.
1963	Yale Seminar	Federally supported development of arts education focusing on quality music classroom literature. Juilliard Project leads to the compilation and publication of musical works from major historical eras for elementary and secondary schools.
1965	National Endowment for the Arts	Federal financial support and recognition of the value music has in society.
1967	Tanglewood symposium	Establishment of a unified and ecletic philosophy of music education. Specific emphasis on youth music, special education music, urban music, and electronic music.
1969	GO Project	35 Objectives listed by MENC for quality music education programs in public schools. Published and recommended for music educators to follow.
1978	The Ann Arbor Symposium	Emphasized the impact of learning theory in music education in the areas of: auditory perception, motor learning, child development, cognitive skills, memory processing, affect, and motivation.

1984	Becoming Human Through Music symposium	"The Wesleyan Symposium on the Perspectives of Social Anthropology in the Teaching and Learning of Music" (Middletown, Connecticut, August 6–10, 1984). Emphasized the importance of cultural context in music education and the cultural implications of rapidly changing demographics in the United States.
1990	Multicultural Symposium in Music Education	Growing out of the awareness of the increasing diversity of the American School population, the three-day Symposium for music teachers was co-sponsored by MENC, the Society for Ethnomusicology, and the Smithsonian Institution, in order to provide models, materials, and methods for teaching music of the world's cultures to school children and youth.
1994	National Standards for Music Education	For much of the 1980s, there was a call for educational reform and accountability in all curricular subjects. This led to the National Standards for Music Education [10] introduced by MENC. The MENC standards were adopted by some states, while other states have produced their own standards or largely eschewed the standards movement.
1999	The Housewright Symposium / Vision 2020	Examined changing philosophies and practices and predicted how American music education will (or should) look in the year 2020.
2007	Tanglewood II [11]: Charting the Future	Reflected on the 40 years of change in music education since the first Tanglewood Symposium of 1967, developing a declaration regarding priorities for the next forty years.

Music course offerings and even entire degree programs in online music education developed in the first decade of the 21st century at various institutions, and the fields of world music pedagogy and popular music pedagogy have also seen notable expansion.

Standards and assessment

Standards are curricular statements used to guide educators in determining objectives for their teaching. Use of standards became a common practice in many nations during the 20th century. For much of its existence, the curriculum for music education in the United States was determined locally or by individual teachers. In recent decades there has been a significant move toward adoption of regional and/or national standards. MENC: The National Association for Music Education, created nine voluntary content standards, called the *National Standards for Music Education*.[standardfoot] These standards call for:

1. Singing, alone and with others, a varied repertoire of music.
2. Performing on instruments, alone and with others, a varied repertoire of music.
3. Improvising melodies, variations, and accompaniments.
4. Composing and arranging music within specified guidelines.
5. Reading and notating music.
6. Listening to, analyzing, and describing music.
7. Evaluating music and music performances.
8. Understanding relationships between music, the other arts, and disciplines outside the arts.
9. Understanding music in relation to history and culture.

Many states and school districts have adopted their own standards for music education.

Washington State has piloted a classroom based performance assessment which requires 5th and higher grade students to compose music on a staff and sight sing from sheet music without the aid of instruments. It is designed to assess standards expected to be attained by all students.[12] Sight singing is a learning requirement in the state at the 8th grade level. Other states are evaluating possible performance assessments as well.

Integration with other subjects

Some schools and organizations promote integration of arts classes, such as music, with other subjects, such as math, science, or English. It is thought that by integrating the different curricula will help each subject to build off of one another, enhancing the overall quality of education. Music education can play a vital role in the development of the whole child and their scholastic journey.

One example is the Kennedy Center's "Changing Education Through the Arts" program. CETA defines arts integration as finding a natural connection(s) between one or more art forms (dance, drama/theater, music, visual arts, storytelling, puppetry, and/or creative writing) and one or more other curricular areas (science, social studies, English language arts, mathematics, and others) in order to teach and assess objectives in both the art form and the other subject area. This allows a simultaneous focus on creating, performing, and/or responding to the arts while still addressing content in other subject areas.[13]

Significance of Music Education

According to the Florida Music Educators Association, “Music and the Fine Arts have been a significant portion of every culture’s educational system for more than 3,000 years. The human brain has been shown to be “hard-wired” for music; there is a biological basis for music being an important part of human experience. Music and the Arts surround daily life in our present day culture. Most present day artists, architects, and musicians acquired their interests during public school Fine Arts classes... Education without the Fine Arts is fundamentally impoverished and subsequently leads to an impoverished society.” [14]

William Earhart, former president of the Music Educators National Conference, “Music enhances knowledge in the areas of mathematics, science, geography, history, foreign language, physical education, and vocational training."[15] Music not only inspires creativity and performance, but academic performance over all is seriously impacted. A research study produced by the Harris Poll has shown that 9 out of 10 individuals with post graduate degrees participated in music education. The National Report of SAT test takers study indicated students with music performance experience scored higher on the SAT: 57 points higher on verbal and 41 points higher on math.[16] Schools that have high academic performance in the US are spending 20 to 30% of their budget in the arts with emphasis on music education.[17]

Music education also increases one's success in society. The Texas Commission on Drugs and Alcohol Abuse Report noted that students who participated in band or orchestra reported the lowest lifetime and current use of all substances.[18]

An education in music also increases overall brain activity. Research done at the University of Wisconsin has indicated that students with piano or keyboard experience performed 34% higher on tests that measure spatial-temporal lobe activity, which is the part of the brain that is used when doing mathematics, science, and engineering.[19]

Music also improves learning. Specifically, music aids in text recall. Wallace (1994) studied setting text to a melody. One experiment created a three verse song with a non-repetitive melody; each verse had different music. A second experiment created a three verse song with a repetitive melody; each verse had exactly the same music. Another experiment studied text recall without music. The repetitive music produced the highest amount of text recall; therefore, music serves as a mnemonic device.[20] Smith (1985) studied background music with word lists. One experiment involved memorizing a word list with background music; participants recalled the words 48 hours later. Another experiment involved memorizing a word list with no background music; participants also recalled the words 48 hours later. Participants who memorized word lists with background music recalled more words demonstrating music provides contextual cues.[21]

It is important to note that "While studies show positive influences in other academic areas, music and the Fine Arts are an academic discipline that are, as the other academics, an independent way of learning and knowing." [14]

Unfortunately, music in our schools are being cut at a drastic rate due to budget cuts being forced upon the schools. The Assistant Superintendent for Curriculum and Instruction with Chesapeake Public Schools in Chesapeake, Virginia [22], Dr. Patricia Powers states, “It is not unusual to see program cuts in the area of music and arts when economic issues surface. It is indeed unfortunate to lose support in this area especially since music and the art programs contribute to society in many positive ways.” What some school boards do not know is that cutting music might cause test scores to fall due to the positive effect on everything from academics to citizenship and even personal hygiene.[15]

Music advocacy

In some communities - and even entire national education systems - music is provided little support as an academic subject area, and music teachers feel that they must actively seek greater public endorsement for music education as a legitimate subject of study. This perceived need to change public opinion has resulted in the development of a variety of approaches commonly called "music advocacy". Music advocacy comes in many forms, some of which are based upon legitimate scholarly arguments and scientific findings, while other examples rely on unconvincing data and remain rather controversial.

Among the more recent high-profile music advocacy projects that have become the subject of widespread controversy are the "Mozart Effect" (which is now widely believed to be based on misinterpretation and exaggeration), the National Anthem Project, and the movement referred to as Cultural Diversity in Music Education which seeks out means of equitable pedagogy across students regardless of their race, ethnicity, or socioeconomic circumstance. Even though the “Mozart Effect” is a controversy it has some significance in proving that it is reliable. The test has two, a group that has music taught and a group with no music taught. When this test was given to three-year-olds their temporal test improved by 35% over those with no music; this lasted for several days. The only flaw to this test is the different age groups, the older you are the less of the effect it will have on you.[23]

Many contemporary music scholars assert that music advocacy will only be truly effective when based on empirically sound arguments that transcend political motivations and personal agendas. This position regarding music advocacy has especially been advanced by music education philosophers (such as Bennett Reimer, Estelle Jorgensen, David J. Elliott, Keith Swanwick,), yet a gap remains between the discourse of music education philosophy and the actual practices of music teachers and music organization executives.

Influential music educators

- Leonard Bernstein
- Anahit Tsitsikian
- Heitor Villa-Lobos
- Nadia Boulanger
- Charles Hoffer
- Allen Britton
- Peter W. Dykema
- Will Earhart
- Edwin Gordon
- Jacob Eisenberg
- David Elliott
- Philip C. Hayden
- Emile Jaques-Dalcroze
- Zoltán Kodály
- Paul R. Lehman
- Charles Leonhard
- Joseph E. Maddy
- Michael L. Mark
- Ellis Marsalis
- Wynton Marsalis
- Lowell Mason
- Luther Whiting Mason
- James Mursell
- Carl Orff
- Bennett Reimer
- Keith Swanwick
- R. Murray Schafer
- Jack Wagner
- Shinichi Suzuki
- John Tufts
- Dmitry Kabalevsky
- John T. Madden

International professional organizations

- International Society for Music Education [24]
- International Society for Philosophy of Music Education[25]
- International Association for Jazz Education[26]
- Netsounds European Network of Music Educators [27]

American professional organizations

- MENC: The National Association for Music Education [28]
- MTNA: Music Teachers National Association [29]
- American Choral Directors Association [30]
- American String Teachers Association [31]

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[5] A Sensory-Motor Approach to Music Learning. Book I - Primary Concepts (http://www.eric.ed.gov/ERICWebPortal/custom/portlets/recordDetails/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED034358&ERICExtSearch_SearchType_0=eric_accno&accno=ED034358)

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[9] http://www.menc.org/resources/view/child-s-bill-of-rights

[10] http://menc.org/resources/view/national-standards-for-music-education

[11] http://www.bu.edu/tanglewoodtwo/

[12] "Zoo Tunes" (http://www.k12.wa.us/Assessment/WASL/Arts/CBPAfullSets.aspx)

[13] http://surfaquarium.com/ceta.htm

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[26] IAJE: International Association for Jazz Education (http://iaje.org/)

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Ethnomusicology

Ethnomusicology is defined as "the study of social and cultural aspects of music and dance in local and global contexts."[1]

Coined by the musician Jaap Kunst from the Greek words ἔθνος *ethnos* (nation) and μουσική *mousike* (music), it is often considered the anthropology or ethnography of music. Jeff Todd Titon has called it the study of "people making music."[2] Although it is often thought of as a study of non-Western musics, ethnomusicology also includes the study of Western music from an anthropological or sociological perspective. Bruno Nettl (1983) believes it is a product of Western thinking, proclaiming "ethnomusicology as western culture knows it is actually a western phenomenon."[3] Nettl believes that there are limits to the extraction of meaning from a culture's music because of a Western observer's perceptual distance from the culture; however, the growing prevalence of scholars who study their own musical traditions, and an increasing range of different theoretical frameworks and research methodologies has done much to address criticisms such as Nettl's.

Ethnomusicologist Frances Densmore recording Blackfoot chief Mountain Chief for the Bureau of American Ethnology (1916)

History

While musicology's traditional subject has been the history and literature of Western art music, ethnomusicologists study all music as a human social and cultural phenomenon. The primary precursor to ethnomusicology, comparative musicology, emerged in the late 19th century and early 20th century through the practice of people such as Béla Bartók, Zoltán Kodály, Alan Lomax, Constantin Brăiloiu, Vinko Zganec, Franjo Ksaver, Carl Stumpf, Erich von

Hornbostel, Curt Sachs, Hugh Tracey, and Alexander J. Ellis.[4] Comparative musicology and early ethnomusicology tended to focus on non-Western music that was transmitted through oral traditions. But, in more recent years, the field has expanded to embrace all musical styles from all parts of the world.

The Society for Ethnomusicology has been the primary academic organization for the discipline of ethnomusicology since its inception in 1955.

Theories and methods

Ethnomusicologists often apply theories and methods from cultural anthropology, cultural studies and sociology as well as other disciplines in the social sciences and humanities. Though some ethnomusicologists primarily conduct historical studies, the majority are involved in long-term participant observation. Therefore, ethnomusicological work can be characterized as featuring a substantial, intensive ethnographic component.

Some ethnomusicological works are created not necessarily by 'ethnomusicologists' proper, but instead by anthropologists examining music as an aspect of a culture. A well-known example of such work is Colin Turnbull's study of the Mbuti pygmies. Another is Jaime de Angulo, a linguist who intensively studied the music of the natives of Northern California.[5] Additionally, Anthony Seeger, Distinguished Professor of Ethnomusicology and the Director of the Ethnomusicology Archive at the University of California, Los Angeles, studied the music and society of the Suya people in Mato Grosso, Brazil.[6]

Academic programs

Many universities in North America and Europe offer ethnomusicology classes and act as centers for ethnomusicological research. The following list includes graduate and undergraduate degree-granting programs (number in parentheses indicates year the program was founded).[7]

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External links

- Outreach Ethnomusicology (http://www.outreachethnomusicology.com/) Ethnomusicology Fieldwork Research Resource
- SIL publications on Ethnomusicology listed by country (http://www.ethnologue.com/show_subject.asp?code=ETM)
- Yale Music Library Research Guide for Ethnomusicology (http://guides.musiclib.yale.edu/content.php?pid=23177)
- ILAM (http://ilam.ru.ac.za/) International Library of African Music
- Links: Ethnomusicology, Folk Music, and World Music (University of Washington) (http://guides.lib.washington.edu/ethnomusicology)
- University of Washington Digital Collections – Ethnomusicology Musical Instrument Collection (http://content.lib.washington.edu/ethnomusicweb/index.html) Images of musical instruments from around the world.

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Recorder, DBaba, DGMurdockIII, DVD R W, Daayviid, Dan D. 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