

From Music to Mathematics: Exploring the Connections

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Recommended Music to Accompany Chapter 2

Introduction to Music Theory

The selections below illustrate the tremendous changes that have occurred in classical music over the last 1500 years, ranging from Gregorian chant to the atonal compositions of Arnold Schoenberg. At first, we hear music with few voices and simple harmonies. Later, the idea of tonality begins to take shape and the use of a specific major or minor key becomes central to the underlying harmonic structure of a piece. A radical shift occurs at the start of the twentieth century, when many composers discard tonality altogether seeking more freedom and flexibility in utilizing all the notes of the chromatic scale, rather than favoring one over the others. Arnold Schoenberg championed this philosophy, stating that “[t]onality is not an eternal law of music, but simply a means toward the achievement of musical form.”¹

What to listen for: Obviously this is but a small survey of the evolution of Western classical music. The best way to become familiar with the genre is to listen frequently and to vary the era of composition. Try to listen for contrasts in the different styles with an eye (or ear) to the key musical concepts discussed in Chapter 2: pitch, tonality or atonality, intervals, chords, and harmony. Can you recognize how polyphony (multiple voices playing or singing together) has evolved? Can you hear the difference between a piece in a major versus a minor key? Can you hear the tonic-dominant relationship in Mozart’s *Eine Kleine Nachtmusik*? Can you hear how Barber’s *Agnus Dei* is more consonant (harmonically pleasing) than Schoenberg’s work? Can you hear why Schoenberg’s piece is described as atonal?

1. *Christus factus est pro nobis*, Gradual (Modo V), Gregorian chant (anonymous). Track 3 from an Angel Records CD titled Chant performed by the Benedictine Monks of Santo Domingo De Silos. *Gregorian chant* is some of the oldest music of the human race. The name refers to Pope Gregory the Great, who reigned from 590 to 604 and commanded that the singing of the monks of the Catholic church be transcribed and preserved for the future. The melodic texture is monophonic, consisting of a single melody with voices in unison. There is no rhythmic structure but rather a free-verse rhythm to accompany the Latin text.
2. *Salve cleri speculum/Salve iubar presulum*, English motet, Anonymous Four. Track 15 from a Harmonia Mundi (USA) CD titled Legends of St. Nicholas: Medieval Chant and Polyphony by the quartet Anonymous Four. Moving forward to the 13th and 14th centuries, the *motet* emerged as one of the earliest forms of polyphonic music (multiple voices playing or singing together). Often a fragment of Gregorian chant was taken and arranged into a more precise rhythmic structure (usually with longer notes) that formed the structural blueprint for the piece. This became known as the *cantus firmus* (fixed melody). Other faster lines of countermelodies accompanied and contrasted with the cantus firmus creating polyphonic music. In this piece the cantus firmus is sung in perfect fourths and fifths, the start of a basic harmonic vocabulary. Notice the sound is fuller than Gregorian chant but not as rich as the following pieces by Palestrina and Bach.

¹J. Machlis, *The Enjoyment of Music: An Introduction to Perceptive Listening*, 5th ed., W. W. Norton & Company, p. 471.

3. Giovanni Pierluigi da Palestrina (c. 1525/6 - 1594), *Lamentation I, Music for Maundy Thursday*. Track 1 on a Chaconne CD titled Music For Maundy Thursday: Palestrina. Palestrina was the most famous composer of the Roman school of musical composition in the 16th century. His style blends the melodic lines of different voices into a smooth polyphonic texture. Tonality, the idea of having a specific key, is not quite established here, but the cadences (the music leading up to a final chord) are suggestive of a dominant to tonic relationship. Palestrina was a deeply religious composer. This Lamentation of the Prophet Jeremiah would be sung at the beginning of the Thursday service of Holy Week.
4. Johann Sebastian Bach, Opening Chorale, *Wachet auf, ruft uns die Stimme* from the Cantata *Wachet auf, ruft uns die Stimme* BWV 140, 1731. Track 1 from a Deutsche Grammophon CD titled Bach Cantatas, performed by the Monteverdi Choir and the English Baroque Soloists under the direction of John Eliot Gardiner. Bach wrote over two hundred *cantatas* to be performed as part of Sunday religious services in Leipzig, Germany. Note the mixture of orchestra and voices in contrast to the earlier pieces. Notice also how the melody is carried in long notes (sopranos) while the lower voices react with quick, staggered, imitative lines.
5. Johann Sebastian Bach, Final Chorale, *Gloria sei dir gesungen* from the Cantata *Wachet auf, ruft uns die Stimme* BWV 140, 1731. Track 7 from the previous CD recording. The final chorale in the cantata, the main melody announced in the first chorale is now gloriously sung by all in hymn-like style to close the service. Note that the main melody is now sung twice as fast as the opening chorale. This is vintage four-part choral writing by one of the great masters.
6. Wolfgang Amadeus Mozart, Allegro from *Eine Kleine Nachtmusik* (A Little Night Music), K. 525, 1787. Track 1 from The Best of Mozart, Madacy Entertainment Group, Inc, performed by the “Zazerkalye” Chamber Orchestra conducted by Pavel Bubelnikov. This famous piece is in $\frac{4}{4}$ time in the key of G major. The opening theme (shown in Figure 2.46 of the text), alternates between the tonic G (first two measures) and the dominant D (next two measures). The dominant 7th chord built on D contains the notes D, F#, A and C, and the tritone between F# and C strongly wants to resolve to the major third between G and B. Listen for the tonic-dominant relationship throughout the piece.
7. Ludwig Van Beethoven, Adagio Sostenuto from the *Moonlight Sonata*, Sonata No. 14 in C sharp minor, Op. 27, No. 2, 1801. Track 4 from a Philips CD titled Beethoven: Favourite Piano Sonatas performed by pianist Alfred Brendel. In contrast with the jovial night music of Mozart in G major, Beethoven’s eerie yet sublimely beautiful opening movement to this sonata is in a minor key. In general, minor keys evoke sorrow and sound a bit more haunting than the major keys, although this is not a definitive rule. This is clearly evident when comparing this piece to Mozart’s. Beethoven composed the sonata in honor of the 17-year-old Countess Giulietta Guicciardi, his pupil, whom he evidently was in love with.
8. Richard Wagner, *Tristan und Isolde*, Prelude to Act 1, 1865. Track 2 from The Wagner Collection, the Decca Record Company Limited (London, 1992), performed by the Vienna Philharmonic under the direction of Sir Georg Solti. Wagner’s groundbreaking opera featured a new and unconventional approach to tonality and harmonic structure. Noteworthy was the manner in which the composer experimented with musical tension, often delaying or failing to resolve dissonant chords. This is immediately apparent the start with the famous “Tristan” chord: F, B, D#, and G#, a tense combination built over the unstable tritone between F and B (see Figure 2.47 of the text). This chord and the lack of resolution are repeated throughout the prelude. Wagner’s seminal

work is widely viewed to have laid the foundation for later composers to challenge and eventually discard the commonly held tenants of major-minor tonality.

9. Samuel Barber, *Agnus Dei* (Based on *Adagio for Strings*), 1967. Track 8 on the Telarc CD *Evocation of the Spirit* conducted by Robert Shaw and performed by the Robert Shaw Festival Singers. Barber, one of the most well-known 20th century American composers, took the slow movement from his String Quartet in B minor, Op. 11, 1936, and reworked it into the glorious *Adagio for Strings* for string orchestra in 1938. This was the music used for Oliver Stone's great Vietnam War film *Platoon*. Much later in his career, Barber set the music to the traditional Latin "Agnus Dei" text. The piece is in a minor key and drips with luscious harmonies and a tantalizingly slow, somber melody that appears to be continuously climbing up the B^b minor scale (see Figure 5.11 in the text). Barber's work has often been described as neo-romantic, harkening back to the great Romantic composers (e.g., Beethoven and Brahms.) Although the harmonic structure is more complicated, it is quite distant from the atonal works of his peers (note the contrast with Schoenberg's *Friede auf Erden*.)
10. Arnold Schoenberg, *Friede auf Erden* (Peace on Earth), Op. 13, 1907. Track 9 on the Telarc CD *Evocation of the Spirit* conducted by Robert Shaw and performed by the Robert Shaw Festival Singers. This is a challenging vocal work set to a poem by Conrad Ferdinand Meyer. Schoenberg was the first composer to truly break away from the notion of using a principle key. This piece has no key or tonal center, but experiments harmonically between consonance and dissonance. After listening to the other examples described above, it should be apparent how radically different this work sounds. This piece belongs to Schoenberg's atonal-expressionist period, preceding his famous 12-tone method discussed in Chapter 7 of the text.
11. Bobby McFerrin, *The 23rd Psalm*, 1990. Track 12 from the CD *Medicine Music*, Prob Noblem Music BMI. Here we have an elegant and moving vocal arrangement of Psalm 23. McFerrin dedicated the piece to his mother and adjusts the gender specific pronouns accordingly. The work is clearly tonal although certain voicings come from jazz-style chords, creating a sustained dissonance before resolving to the tonic at the end of each verse, a modern version of "tension and release."
12. Meade "Lux" Lewis, *Medium Blues*, (recorded in 1944). Track 6 from the CD *Classic Piano Blues*, Smithsonian Folkways, ©2008. This is a standard blues tune by one of the most popular boogie-woogie pianists, Meade "Lux" Lewis (1905–64). After a brief intro, the left-hand lays down a bass line that follows the standard 12-bar blues pattern: four bars on I (tonic), two bars on IV (subdominant), two bars on I, one bar on V (dominant), one bar on IV, and finally two bars back on I (see page 63 of the text). The second time through the sequence (as well as in later passes), the second measure shifts briefly to IV, so that the initial four bars are I-IV-I-I. This is a common variant to the opening of a blues. Try and count along with each measure in order to follow the chord changes underneath the melody.
13. Roosevelt "The Honeydripper" Sykes, *Sweet Old Chicago*, (recorded in 1961). Track 18 from the same CD as the previous tune. Sykes (1906–84) was a significant blues pianist originally from St. Louis, who later lived and played in Chicago. He recorded under a number of different pseudonyms such as Dobby Bragg, Willie Kelly, and The Honeydripper. As with *Medium Blues*, this famous song (originally written by Woody Payne) also follows the standard 12-bar blues pattern, using the opening I-IV-I-I variation. Notice that the lyrics for each verse follow an A-A-B pattern, where the opening line sung over the first four bars is repeated over the next four (bars 5–8).