

# Mathematics and Music: Structure and Form

## CD #2: Tonality and the Evolution of Polyphony

This CD illustrates the tremendous changes that have occurred in music over the last two millennia 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 notion of key becomes central to the underlying harmonic structure of a work. Composers wrote in a specific major or minor key to establish a tonal center. A radical shift occurs at the start of the 20th century, when many composers discarded 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 writes “Tonality is not an eternal law of music, but simply a means toward the achievement of musical form.”

**What to listen for:** Obviously this is a small survey of the evolution of Western “classical” music. For more development and to hear the complete pieces of some of the selections on this CD, you are encouraged to listen to the CD’s on reserve for the course, listed at the end of these notes. Try to listen for contrasts in the different styles with an eye (or ear) to pitch, tonality or atonality, intervals, chords and harmony. As you listen to the first four tracks, can you recognize how polyphony (multiple voices playing or singing together) evolved? Can you hear the difference between a piece in a major versus a minor key? Can you hear the tonic and dominant 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? The music compiled here accompanies the class lectures on the keyboard, major and minor scales, intervals and tonality.

1. *Christus factus est pro nobis*, Gradual (Modo V), Gregorian chant (anonymous). Track 3 from an Angel Records CD entitled 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 entitled 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.
3. Giovanni Pierluigi da Palestrina (c. 1525/6 - 1594), *Lamentation I, Music for Maundy Thursday*. Track 1 on a Chaconne CD entitled 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 entitled 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 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 entitled 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 the two works. Beethoven composed the sonata in honor of the 17-year-old Countess Giulietta Guicciardi, his pupil, whom he evidently was in love with.
8. 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 composers in the US, 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 drips with luscious harmonies and a tantalizingly slow and somber melody that appears to be continuously climbing up the scale. Barber’s work has often been described as neo-romantic, harking back to the great Romantic composers (eg. 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*.)
9. 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 on this CD, it should be apparent how radically different this work sounds. This piece belongs to Schoenberg’s atonal-expressionist period, preceding his famous twelve-tone method that we will study next semester.

10. Bobby McFerrin, *The 23rd Psalm*, 1990. Track 12 from the CD Medicine Music, Prob Noblem Music BMI. Keeping with the religious theme throughout this CD, here is 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 that create a dissonant feel before resolving to the tonic at the end of each verse. This would be a great candidate for one of our local a cappella groups.

**Recordings on Reserve in the Music Library:** (recommended, not required)

1. Giovanni Pierluigi da Palestrina (c. 1525/6 - 1594), *Lamentation I, Music for Maundy Thursday*. Performed by Musica Contexta (CD 3828).
2. Johann Sebastian Bach, *Wachet auf, ruft uns die Stimme* (Cantata), BWV 140, 1731. Monteverdi Choir and the English Baroque Soloists under the direction of John Eliot Gardiner (CD 2895).
3. Johannes Brahms, *Symphony no. 4 in E minor*, Op. 98, 1885. London Symphony Orchestra, Adrian Boult conducting (CD 841).
4. Pyotr Ilyich Tchaikovsky, *Symphony, No. 6, Pathetique*, Op. 74, 1893. Chicago Symphony Orchestra, Claudio Abbado conducting (CD 776).
5. Igor Stravinsky, *Le Sacre Du Printemps* (The Rite of Spring), 1913. Cleveland Symphony Orchestra, Pierre Boulez conducting (CD 1384).