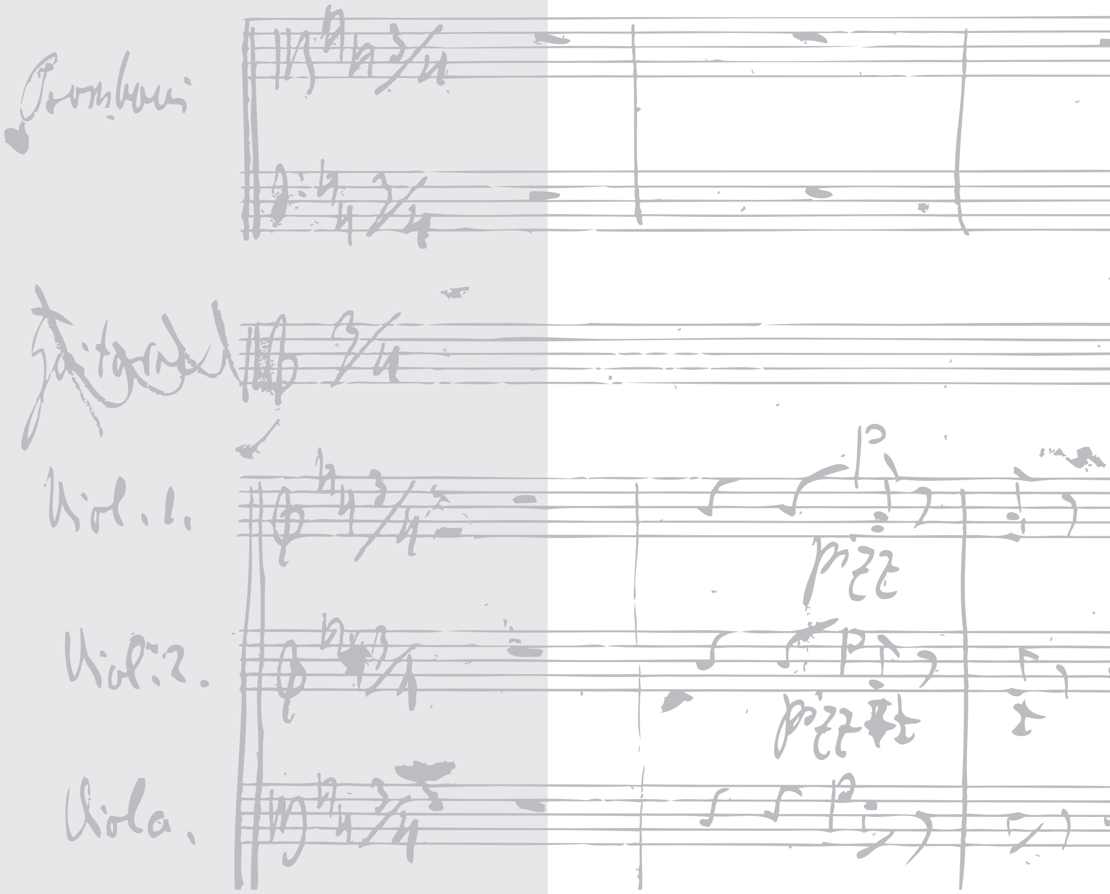

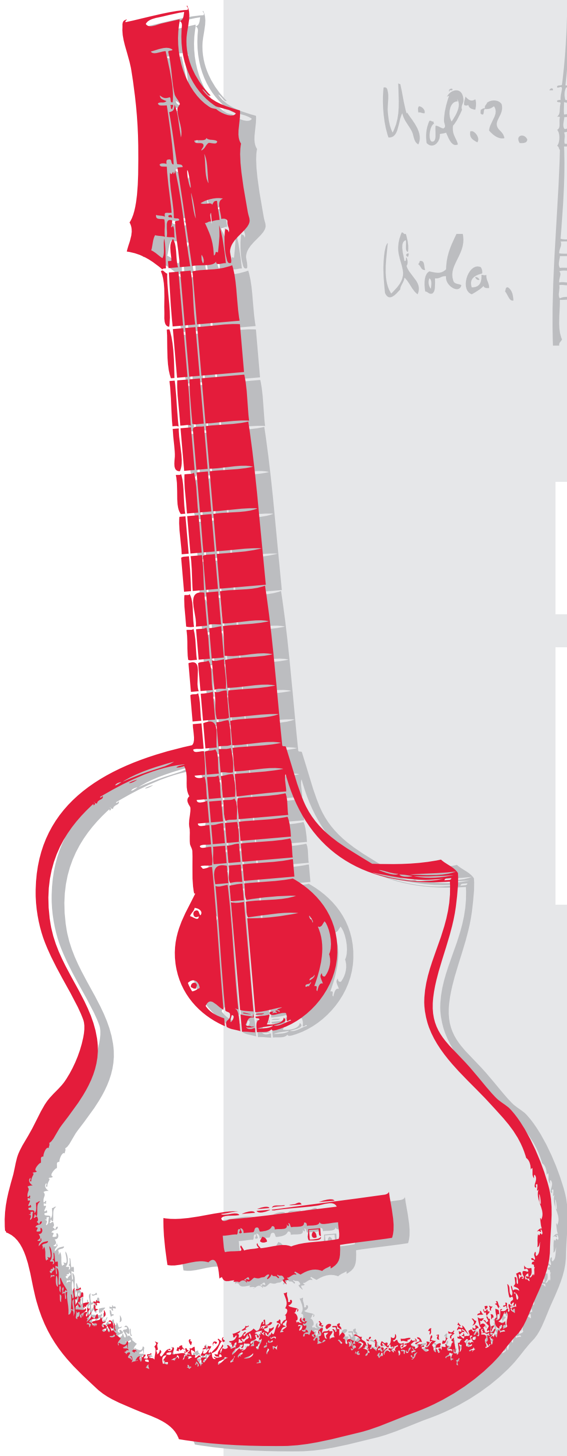

Seth F. Josel
Ming Tsao

The Techniques of Guitar Playing

Bärenreiter

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The Techniques of Guitar Playing

Bärenreiter Kassel · Basel · London · New York · Praha

UNIVERSITY OF GOTHENBURG
ACADEMY OF MUSIC AND DRAMA

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Foreword

The “Techniques of Guitar Playing” by Seth F. Josel and Ming Tsao is a new instruction manual for guitarists wishing to improve their mastery of the variety of expressive means used in contemporary music and also for composers wanting to write for the guitar. The book is the result of a working project in artistic development with the title “The Guitar as a Vehicle for New Music Performance Practice” financed by the Faculty of Fine, Applied and Performing Arts at the University of Gothenburg.

This book is a fine illustration of the mission of the Academy of Music and Drama itself, balancing as it does in the borderlands between education and research. With courses at the basic level running parallel to advanced studies, development projects and research in several disciplines, the Academy offers a wealth of possibilities for motivating as well as inspiring the creation and practice of new art.

Seth F. Josel is an eminent guitarist with engagements in many countries and with contemporary music as his hallmark. He has given first performances of more than one hundred works and collaborated with many composers. One of them is Ming Tsao, professor of composition at the Academy of Music and Drama and active as a composer in Europe and the United States. Their close collaboration has resulted in several new works for the guitar and now also in this instruction manual for the guitar.

As the Principal of the Academy of Music and Drama, my hope is that this new book will be distributed far and wide. It is an honor to contribute to a project resting on such fine foundations, a book that will indubitably give a great deal of joy to the guitarists and composers of our day.

Gothenburg, June 2013

Staffan Rydén
Principal
Academy of Music and Drama
University of Gothenburg

Preface

Instrumento admirable, tan sobrio como rico, que áspera o dulcemente se adueña del espíritu, y en el que andando el tiempo se concentran los valores esenciales de nobles instrumentos caducados cuya herencia recoge sin pérdida de su propio carácter, de aquel que debe al pueblo por su origen.

This admirable instrument, both sober and sumptuous, seizes the soul sometimes roughly yet sometimes sweetly, having absorbed the essential values of noble bygone instruments whose heritage takes shelter—with no loss of individual character—in the people itself. How can one deny that the guitar, among all plucked-fretted stringed instruments, is the richest and most complete in its harmonic and polyphonic possibilities?

Manuel De Falla, preface to Emilio Pujol's
"Escuela Razonada de la Guitarra" (translation Christopher Williams)

The earliest known music for the six-stringed instrument now commonly referred to as the classical guitar was composed in the mid- to late eighteenth century. Guitar music from this period survives in method books such as Federico Moretti's *Principj per la chitarra*, written in 1792.

In the nineteenth century guitarists and composers passionately explored the instrument's nearly boundless potential. Dionisio Aguado dedicates a whole chapter in his *Nuevo método para guitarra* (1837) to the "richness of the guitar" in which he explores the multitudinous timbral possibilities of the instrument: natural and artificial harmonics, vibrato to extend the duration of notes, sounds produced with the left hand only, muffled sounds, sounds imitating an ensemble of violin, viola, and bass (i.e., three-part writing), differences in timbre between different strings and playing with or without fingernails, and even sounds analogous to little bells.[1] Aguado indicates further how "with some degree of propriety the guitar can mimic certain instruments," and proceeds to describe how to approximate the sound of a drum, a trumpet, or a harp.[2] Similarly, in his edition of the guitar method book by Fernando Sor published some years later, Napoléon Coste (1805–83), describes how the guitarist can imitate a horn, a trumpet, an oboe, or a harp.[3]

One of the great innovative orchestrators of the nineteenth century, who in many ways revolutionized the orchestra, was Hector Berlioz, a guitarist. Berlioz included the guitar in such compositions as *Huit Scènes de Faust*, *Benvenuto Cellini*, *Beatrice et Benedict*, and *Roméo et Juliet*. His contemporary Robert Schumann was sufficiently impressed with the guitar that he intended to use it in the "Romanze" of his fourth symphony (1841 version).[4]

The history of twentieth century literature for the classical guitar is as rich as it is diverse. Since the 1920s, the guitar has served an array of very different artistic purposes: composers have employed it (a) to contribute to a particular *Klangfarbe* as in Anton Webern's op. 10; (b) to evoke a folk atmosphere as in Arnold Schönberg's *Serenade*, the "Nachtmusik II" of Gustav Mahler's *7. Sinfonie*,

1 Aguado, *Nuevo método para guitarra*, 42 ff.

2 ibid, 48.

3 Sor, *Méthode pour la guitare*, 14–16.

4 Manuscript facsimile courtesy of the Gesellschaft der Musikfreunde in Wien.

or the *Bühnenmusik* of Alban Berg's *Wozzeck*; (c) to explore the instrument's sound spectrum as in Manuel De Falla's *Homenaje pour le Tombeau de Claude Debussy* and Heitor Villa-Lobos's *Douze Etudes*; and (d) to provide a platform for experimentation (particularly with regard to various tunings) as in early works by Harry Partch and Percy Grainger.

The guitar continues to feature in contemporary works, taking a range of roles in a variety of settings: (a) it produces the very precise "plucked string" timbre integral to the serial or serial-influenced compositions of Pierre Boulez (*Le Marteau sans Maître*), Karlheinz Stockhausen (*Gruppen*), Henri Pousseur (*L'ibericare*), Karel Goeyvaerts (*Nr. 6*) and Milton Babbitt (*Sheer Pluck*); (b) it performs as an equal contributor to the polyphony of the ensemble in works by Elliott Carter (*Syringa*) and Jean Barraqué (*Concerto*); (c) it becomes an instrument of "political protest" in combination with texts by Miguel Barnet and Christopher Caudwell in music by Hans Werner Henze (*El Cimarrón*) and Helmut Lachenmann (*Salut für Caudwell*) respectively; and (d) it generates spectral phenomena specific to the plucked strings of the guitar in works by Tristan Murail (*Tellur*) and Horatio Radulescu (*Subconscious Wave*). The solo guitar in recent years has also become a medium for virtuosic and "polyphonic" works such as Alvaro Company's *Las Seis Cuerdas*, Luciano Berio's *Sequenza XI*, Brian Ferneyhough's *Kurze Schatten II*, Elliott Carter's *Changes*, James Dillon's *Shrouded Mirrors*, Klaus K. Hübler's *Reißwerck* and the many guitar compositions of Maurizio Pisati. Other contemporary composers, among them Rolf Riehm (*Toccata Orpheus*), Helmut Oehring (*Foxfire Eins*), Josh Levine (*Downstream*), and Richard Barrett (*Colloid*) have used the guitar to create a unique and sometimes rarified sound world through the use of extended techniques or the use of elaborate guitar preparations.

The Techniques of Guitar Playing is aimed at musicians, composers, and others involved in creating contemporary art music particularly for the guitar. A thorough, in-depth guide to guitar techniques is long overdue, given the expanding use of the instrument in contemporary classical music. Several factors have contributed to this trend. Small chamber ensembles have become a predominate force in contemporary music, especially in Europe and America, while a number of guitar virtuosos have dedicated themselves to developing the instrument in this context as well as in solo settings. In addition, guitar studies have emerged increasingly as an academic discipline, which in turn has generated greater interest in current guitar literature.

However, writing for and playing the guitar both present special challenges, especially in the context of contemporary music. Established composers as varied as Luciano Berio, Pierre Boulez, Elliott Carter, and Mauricio Kagel have successfully realized major works for or with the instrument largely because they relied on close, painstaking collaborations with particular guitarists. Moreover, even for composers who themselves play the guitar, writing for it often remains problematic. The composer must contend with how to blend and balance the guitar's unique timbre and dynamic qualities with other instruments. They must be aware of the rich variety of sounds that the guitar itself can produce, even from a single plucked string. No less importantly, they must be able to notate an array of such techniques so that the performer can properly interpret them.

Music students and faculty in both Europe and the America have repeatedly asked for an up-to-date book explaining contemporary guitar performance practice. Similarly, young composers throughout the world have requested more information about writing for the guitar but have no access to the necessary repertoire or expertise. Indeed, only three books on extended performance technique for modern classical guitar have appeared to date: Patrizia Rebizzi and Ruggero Tajè's *La Chitarra nella Musica de '900 (tecniche e semiografia nella musica contemporanea)*, published in 1987, John Schneider's *The Contemporary Guitar*, published in 1985, and Jean-Luc Mas' *Sonorités Nouvelles*, published in 1984. Even in major metropolitan areas, very few guitarists possess the requisite knowledge and experience to successfully address contemporary guitar literature.

There is thus a pressing need for a solid reference book that will facilitate an understanding not only of more extended guitar techniques but also of orchestrating new sounds with the guitar as well as contemporary guitar notations—that is, how best to integrate the guitar into different musical settings, and how, visually, to convey new musical ideas and techniques to guitarists. Through detailed, comprehensive documentation (both graphic and acoustic), *The Techniques of Guitar Playing* will help aspiring composers to expand the literature and performers to better interpret it. The audio tracks on the Bärenreiter website will hope to sonically illuminate many of the timbres and textures discussed throughout. In each of the examples from the literature cited, if the tempo indication is not in the example itself, then we have provided it for the reader below in order to fully appreciate the musical context in which a given technique is executed.

This book addresses as many paths as possible that have been traversed by the contemporary guitar in order to give the reader a sense of the guitar's rich recent history and unlimited future possibilities. Rather than cataloguing techniques for the guitar, our book presents these techniques within the stylistic, aesthetic, and historical contexts from which they are inseparable. We give equal importance to guitar acoustics, literature, history, orchestration and playing techniques. Originally, we intended to also include the electric guitar because of its ever-increasing use in contemporary music. However, the vastness of the electric guitar's sound palette in combination with sophisticated analog and digital technologies, requires that this subject be dealt with in a separate volume.

The Techniques of Guitar Playing aspires to be user friendly, incorporating clear fingering charts, harmonic charts, bi-tone charts, etc., as well as best defining the musical context for each example from the literature cited. Furthermore, over the years, as performer and composer, we have been in a unique position to practically experience what does and does not work with the guitar in a multitude of contexts. Throughout the book, we occasionally offer suggestions both in terms of practical notation of techniques and their orchestration. These suggestions are not meant to delimit the guitar's potential but rather to serve as a springboard for further imaginative speculation with the instrument by young composers and musicians. Indeed, we hope that this book will motivate, inspire, and provoke composers and performers to further explore, experiment and create new works for the classical guitar.

Acknowledgments

This book owes its existence to many associates, colleagues, and friends. Dr. Michael Töpel and Dr. Christiana Nobach of Bärenreiter Press have supported the project from its outset. Staffan Rydén and Anders Carlsson at the Academy of Music and Drama, University of Gothenburg, helped us to obtain the Artistic Research and Development Grant necessary to carry the work forward to publication. Jean-Baptiste Joly arranged a stay at the Akademie Schloß Solitude where Seth Josel was able to complete a significant portion of the research for the first and third chapters. Guitarists Magnus Andersson, Elena Casoli, Eliot Fisk, Daniel Göritz, Maurizio Grandinetti, Geoffrey Morris, Stefan Östersjö, Helenus de Rijke, Jürgen Ruck, John Schneider, and Alan Thomas, as well as composers Richard Barrett and Maurizio Pisati, all offered important insights into the instrument and its use, while guitar historians Gary Boye, Julio Gimeno, Monica Hall, Richard Long, Matanya Ophee, Kenneth Sparr and Stanley Yates contributed crucial information about the instrument's history. We would like to extend special thanks to guitarist Alexander Dunn and guitar historian Luis Briso de Montiano, both of whom offered unstinting support and assistance at many different stages in the book's research phase. Elmar Juchem, executive director of the Kurt Weill Foundation, kindly assisted with questions regarding the contra-guitar and supplied us with important materials. Barry Ould from Bardic Music provided us with unpublished sketches and materials by Percy Grainger. We would like to thank luthiers Gary Southwell and Christian Koehn for their invaluable answers to our many queries regarding the guitar's construction and acoustics. Marc Sabat proved indispensible in the recording and analysis of the multiphonics featured in Chapter 2 and produced the spectrograms in Appendix A. Rama Gottfried helped develop the bi-tone chart in Chapter 3 and produced the formula that appears in Appendix A. Eliot Fisk, Heather Frasch, Lucia Mense, and Christopher Williams generously assisted with various translations. We are likewise grateful to Sebastian Zidak, Dieter Spies, and Danilo Aurello for their graphics and engraving of musical figures. Mark Parker tirelessly helped to prepare the high-resolution scans; Trevor Babb also provided assistance in securing materials from the Yale University music library. Thanks must also be extended to Luisa Greenfield, Stuart Fisher, Eli Friedmann and Gary Southwell for providing us with photographs for use in the manuscript. Several archives and libraries kindly opened their doors to us, amongst them Biblioteca Nazionale Centrale di Firenze, The Royal Library Copenhagen, The Music and Theatre Library of Sweden, Die Bayerische Staatsbibliothek, Die Gesellschaft der Musikfreunde in Wien, and Gilmore Music Library at Yale University. Behind the scenes at these institutions we received expert guidance from various librarians, in particular Emily Ferrigno in New Haven, Marina Demina in Stockholm, and Francesca Gallori in Florence.

Finally, we are indebted to Geoffrey Morris, Martin Iddon, and Richard Barrett for providing valuable critical commentary on final drafts of the manuscript, and to Kate Levine for her generous assistance in editing and proofreading the final draft.

1

Guitar Basics

1.1 Essential components of the guitar

The classical guitar is comprised of a soundbox, soundboard, fretboard, neck, and six strings. Traditionally, when playing the guitar, the right hand (RH) plucks and strums the strings and the left hand (LH) stops the strings on the fretboard. Figure 1.1 illustrates the basic components of the modern classical guitar.

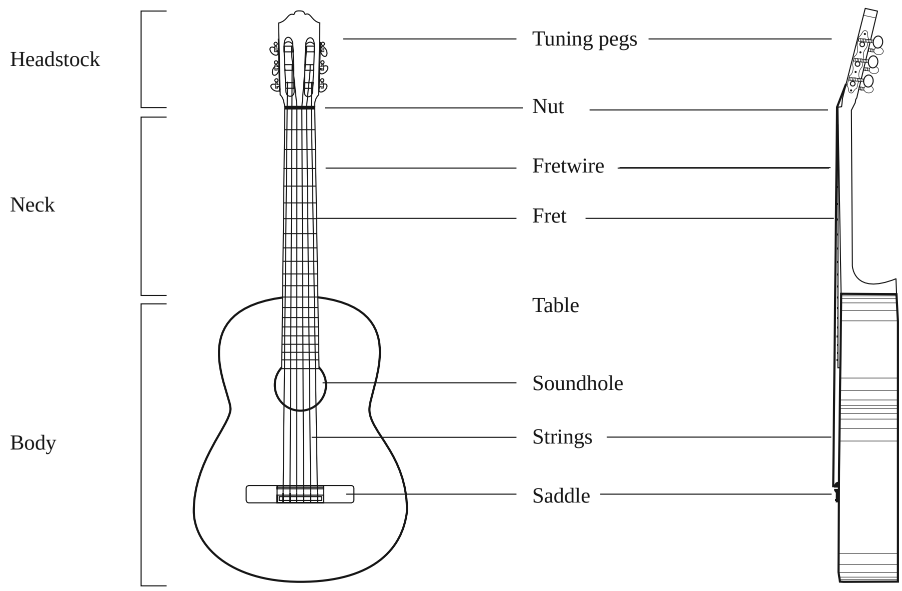


Figure 1.1. Front and side views of the guitar

1.1.1 Strings

Since the 1940s classical guitar strings have been made primarily of nylon, although today the three treble strings may be made of carbon fiber or composite materials.[5] The three bass strings each consist of a core of nylon filaments with either silver or bronze thread wound around it.[6]

5 Rifat Esenbel and Mario Parodi produced the first nylon strings in 1938, but such strings only became available commercially in the 1940s as a result of a collaboration between the luthier Albert Augustine and Andrés Segovia, aided by the DuPont Company. Nylon quickly replaced the gut (mostly made from the dried and twisted intestines of sheep) that had been used prior. Although gut strings were pleasing for their warmth of tone, they were inherently unreliable, for they had trouble holding pitch. Over time, they also became dry and brittle and therefore had a tendency to break easily. With its improved strength and surface texture, the new nylon material appealed to Segovia greatly and soon became the industry standard. McCreadie, *Classical Guitar Companion*, 63.

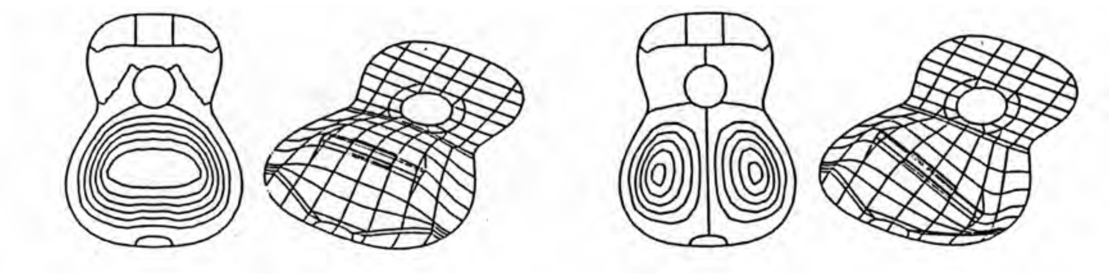
6 The bass strings can be round wound or flat wound. Round-wound strings have a “brighter” tone than flat-wound strings.

The three treble strings are made either with clear or rectified nylon. Clear nylon strings sound brighter in tone whereas rectified nylon strings sound slightly duller. However, rectified strings are slightly coarser in texture thus providing a guitarist with more resistance and consequently a more stable LH grip. Both bass and treble strings are also produced in different tensions, from very light to very high. Vibrating length, mass, and pitch ultimately determine string tension *on* the guitar, but the component materials, construct, and gauge of the string define the string's inherent tensile qualities. Higher tension strings are usually stiffer and thicker and require more finger strength to produce sound. However, a string made of denser material than nylon, such as fluorocarbon, may be as thin or thinner than a nylon string and yet possess equal or higher tension. Similarly, bass strings of the same diameter but with a different ratio of core to wrap could have two different tensions, even when tuned to the same pitch.

With their greater density, the wound strings have greater sustain and amplitude; however, because of their metal binding, they also produce noise when plucked with the fingernail. The three nylon strings have less sustain and amplitude but also less noise when plucked. Generally, the sustain of a note plucked at a moderate dynamic level on any of the lower three strings lasts twice as long as a note similarly plucked on any of the upper three.

1.1.2 Soundboard

For the strings to resonate at an audible level, their vibrations must be amplified through a *soundboard*, a sheet of wood over which the strings are attached, and which vibrates sympathetically with them. The soundboard, as a surface, vibrates in a number of simple and complex modes simultaneously. The soundboard is thus responsible to a great extent for the instrument's tone and volume. Figure 1.2 depicts the first six ways in which the soundboard resonates.[7]



(a) 168 HZ (Fundamental Mode) (b) 244 HZ

7 "Resonant guitar modes create large vibrations and hence radiate sound efficiently. These modes have a direct effect on the acoustic spectral response. Most guitars tend to have three body resonances in the 100–200 Hz region, due to top/back coupling and the Helmholtz mode by virtue of the soundhole. The fundamental mode (as illustrated in Figure 1.2) usually radiates the greatest sound intensity, and the wavefronts radiate outwards in a roughly spherical manner. The dipole radiates a volume with two large, diametrically opposing lobes. The radiation is less efficient at higher frequencies, and consequently higher frequency modes do not show as strong resonances, although they contribute to the instrumental timbre." Traube, "Timbre of the Classical Guitar," 18–19.

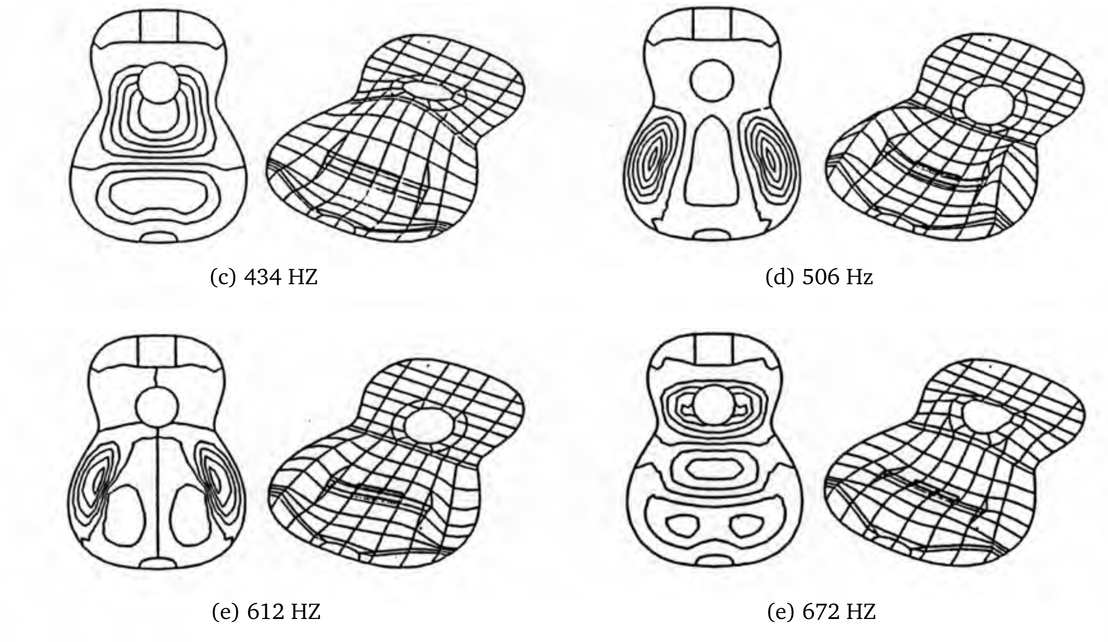


Figure 1.2. The soundboard vibrating at some of its resonant frequencies[8]

The outer contours of the soundboard form a figure eight. Its convex curves are called *bouts*. The neck connects to the smaller upper bout, while the bridge attaches to the broader lower bout below. The concavity between the two bouts makes the guitar easy to rest on one's knee.

Generally, the soundboard's *tonewood* is considered the primary defining characteristic of a guitar. For this crucial component, makers of classical guitars employ wood mainly from two genera of trees, spruce or cedar. Of the many species of spruce, the most commonly used by luthiers are the European spruce and the Engelman spruce. These tonewoods tend to be "bright" and "punchy," have a long sustain in the treble strings, and possess excellent tonal differentiation. Of the cedars, Western redcedar is the most popular and is known for its warmth and "mellow" character. The overtones of cedar guitars may tend to be somewhat "murkier" than that of their spruce counterparts.

1.1.3 Soundbox

The top (soundboard), sides, and back of the guitar form a hollow, resonant chamber, which is referred to as the *soundbox*. The resonance depends upon the fluctuation of air at the *soundhole* driven by the air's vibration inside the box. The guitar thus acts almost like a Helmholtz resonator, a device that functions much as an empty bottle does when one blows across the top of it.[9]

Every soundbox has its resonant frequency set at roughly 90–120 hertz, approximately a perfect

8 Brooke, "Numerical Simulation of Guitar Radiation," 28. Adapted from B.E. Richardson, G.P. Walker, and M. Brooke, "Synthesis of guitar tones from fundamental parameters relating to construction," *Proceedings of the Institute of Acoustics*, 12 (1990): 757–764.

9 The classic Helmholtz resonator is a hollow, spherical container with an open hole at the top of the neck or *port* through which gas (usually air) flows in or out. Hermann Von Helmholtz developed the device in the 1850s for his investigations into acoustics. Any vessel with a comparable structure can function similarly. (See 5.1, for a detailed description of the process.)

fifth below the initial resonance of the soundboard. The fundamental frequency has a strong bearing on the character of the guitar. The higher the instrument's fundamental frequency is, the stronger the higher frequencies that emerge in its harmonic spectrum, thus giving it a "brighter" sound. Conversely, the lower its fundamental frequency, the stronger the lower frequencies are that emerge. This imbues the instrument with a "warmer" sound.

In the past, the sides and back of the highest quality guitars were made of Brazilian rosewood. However, due to deforestation and the resulting scarcity of Brazilian rosewood, East Indian rosewood is now more commonly used. It is important to note that, because of its particular material and size, each part of the guitar—soundbox, fretboard, neck—has its own frequency that contributes to the overall resonant frequency of the instrument.

1.1.4 Fretboard

The *fretboard* or *fingerboard*, as it is sometimes called, is a strip of wood that is laminated to the front of the instrument's neck. With rare exceptions, the fretboard is made of ebony (sourced from a variety of species), and the neck is made from either mahogany or Spanish cedar. The strings run above the fretboard between the bridge and the tuning pegs on the headstock. When one presses the string to the fretboard the extent of vibrating string diminishes, causing a change in pitch. This action is referred to as "stopping" the strings. The frets on the guitar consist of raised strips of robust metal, fixed perpendicular to the strings.[10] In theory, frets enable a musician to stop the string consistently in the same place, hence allowing for an acceptable standard of intonation. A fretted surface combined with finger pressure, as opposed to finger pressure alone, also enhances the resonance of stopped notes. Since pitch frequency ascends in a logarithmic manner, the distance between two adjacent frets decreases as one moves up the fretboard toward the soundhole. For example, the distance between the second and third frets is approximately 32.5 mm, whereas the distance between the fourteenth and fifteenth frets, one octave higher, is approximately half that distance. A typical classical guitar fretboard extends to an eighteenth fret for strings 6 through 2, and to a nineteenth fret for the highest E string.[11] Thus, the interval span on a single string is an octave plus a minor sixth, and potentially an octave plus a major sixth on the high E string. Since the late twentieth century, the luthiers Renato Barone, Gregory Byers, Thomas Humphrey, Fritz Mueller, Antoine Pappalardo and Gary Southwell, among others, have been designing guitars that feature elevated fretboards.[12] Inspired by the form of bowed stringed instruments, the chief advantages of this design are that it facilitates LH play on the upper frets and improves resonance in the uppermost range of the instrument.

The guitar's *action*—that is, the vertical distance between the strings and fretboard—can determine how easy or difficult it is to sound notes when the fingers apply pressure. Generally, a low action is considered more playable but carries with it the danger that a fret will impede the vibrating string, causing unwanted buzzing. This phenomenon is known as fret buzz.[13]

Plucked notes that are in a harmonic relationship with the resonant frequency of the guitar will have greater sustain and amplitude. When the resonant frequency of a plucked note and that

10 Frets may consist of nickel (18% nickel-silver), soft nickel, brass, stainless steel, or EVO copper alloy (nickel free).

11 Currently, several luthiers often include an extra fret for the high E string so that a high *C* can be obtained.

12 An earlier rendition of the raised fretboard by the luthier Johann Georg Stauffer (1778–1853) provided easier access to positions beyond the twelfth fret.

13 Fret buzz may also arise from excessive fret wear or from warping of the neck due to extreme weather conditions.

of the guitar body interfere with each other in such a way that noticeably modulates the note's volume, either a *wolf tone* or *dead tone* arises.[14] Wolf and dead tones are, respectively, a result of constructive and destructive waveform interference, such that wolf tones sound amplified and dead tones lack resonance and sustain. Where the wolf and dead tones occur on a fretboard is linked to the fundamental frequency of a guitar and can be altered by a luthier through adjustments to the mass of that particular instrument.

1.2 How a guitar tone is produced

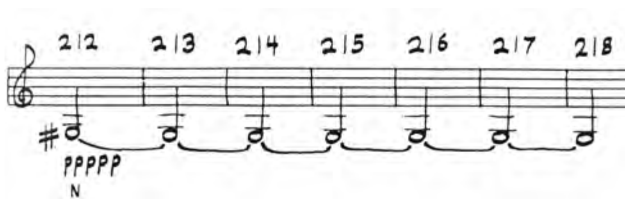
The vibration of the plucked string is transmitted to the soundboard via the *bridge*, the structure to which the strings attach. On the interior of the soundboard is a system of *struts* that at once supports the bridge and counters the tension on it created by the strings, yet also oscillates with the soundboard's vibrations as the strings are plucked. How—and how well—the struts respond to the vibrations will strongly affect an instrument's sound. The back, because it rests against the performer's body, plays a less important role acoustically, as do the sides of the guitar, which do not radiate much sound.

From the moment a note sounds, it rises very quickly to its peak amplitude, after which the amplitude more gradually declines. The first, highly transient phase of the waveform is referred to as the *attack*, while the subsequent, comparatively steady state is called the *decay*. Although the rates of both attack and decay help to distinguish an instrument's typical acoustics, the attack contributes more to a sound's expressive nature. On the guitar, the angle at which a string is depressed as well as the point of attack play important roles in determining a note's amplitude and timbre.

A longer decay means a greater sustain. The sustain of a plucked note can be enhanced through sympathetic vibrations on another string, as these will increase the note's resonance. One way to induce a string to vibrate sympathetically with a plucked note is to silently double the note an octave below.

Wound strings have greater sustain than non-wound strings. Depending on how and where the string is fingered, a wound string can sustain for approximately ten seconds and a non-wound string for approximately five seconds. Typically, because of their more pronounced harmonic spectrum, wound strings sound richer and more resonant than bare nylon strings.

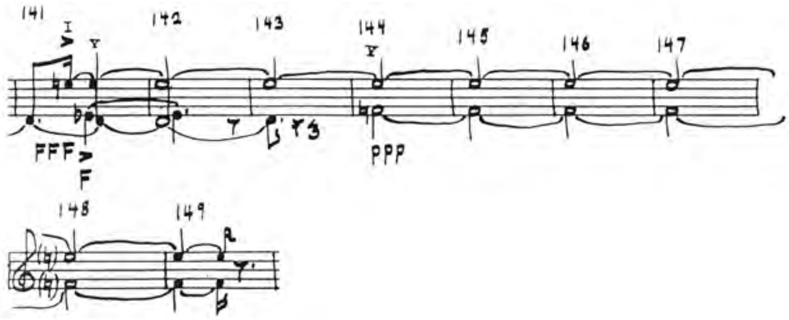
La Monte Young's work *for Guitar* pushes the limits of sustain and thereby challenges the sensitivity of the guitarist's touch. The passages in Examples 1.1 and 1.2 demand that both the softest and loudest sounds audible within the piece be sustained for an almost untenable duration: the guitarist must play a sounding $G^{\sharp 3}$ on string 6 at *ppppp* for nearly nine and one half seconds and sustain *E* on open string 1 at *fff* for nearly ten seconds.[15]



Example 1.1. La Monte Young, *for Guitar*, measures 212–218, Just Eternal Music (♩ = 352; N = with the fingernail)

14 A dead tone is not to be confused with fret buzz, which can also interfere with the sustain of a note.

15 Throughout this volume, the authors follow the Acoustical Society of America's system for designating register in which C^4 = middle *C*.



Example 1.2. La Monte Young, *for Guitar*, measures 141–149, Just Eternal Music (Tempo: ♩ = 92)

1.3 Traditional and nontraditional tunings

Table 1.0 shows the standard tuning for the six strings of a classical guitar. Figure 1.3 depicts the conventional notation for the open strings, with all pitches notated an octave higher than sounding.

String Number	Note Name	Standard tuning frequency
6	*E*	83 HZ
5	*A*	110 HZ
4	*D*	146 HZ
3	*G*	202 HZ
2	*B*	248 HZ
1	*e*	330 HZ

Table 1.0. Standard tuning

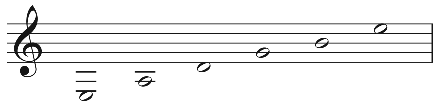


Figure 1.3. Written pitches of the six open strings. The sound is one octave lower than notated.

One way in which composers have explored the manifold musical possibilities of the guitar has been through altering the instrument's tuning. Over the past few decades, in particular, composers have employed variant tunings in many different contexts, no matter what their personal musical style and aesthetics, and with diverse objectives in mind. Some works manifest a keen interest in the guitar's resonance, which can be changed fundamentally by changing the tuning: some tunings reinforce the guitar's resonant frequency while others disrupt it by causing acoustic interference. A tuning can also help maintain a particular harmonic language by—for instance—making certain chords "easier" to grasp on the fretboard. In yet other instances, composers have altered the guitar's tuning to try out alternative temperaments, almost in the manner of Pythagoras's stretched-string experiment. Finally, composers have prescribed diverse tunings such as different quarter-tone tunings that produce quarter-tone fretted notes.

Deviations from the guitar's standard tuning range from so-called drop tunings, in which the sixth string is detuned to a lower pitch, to painstakingly structured microtonal tunings. Sections 3.1–3.5 document five general categories of tunings for the guitar. The first two groups consist of historical tunings and more recent *scordatura* that reflect the twelve-tone well-tempered system. The primary purposes of these alternative tuning systems is to allow for "an extended range of notes upon the instrument, unusual chord voicings, or particular timbral effect; [they may also reflect] a desire to alter the resonance and attack characteristics of the instrument."[16] The third and fourth groups represent extended tuning systems: *just intonation* and other microtonal tunings. These microtonal tunings offer tremendous sonic potential and alter the resonance of the guitar in truly unique and dramatic ways. The last group consists of tunings that change within a composition and hence during the course of a performance. As mentioned, some variants will support the instrument's resonance while others may interfere with it. It is also important to note that increasing string tension may result in a stiffer soundboard, which in turn will undermine the overall sustain of the instrument.

Generally, when the guitar has a scordatura tuning, it is best to notate the guitar part transposed as if it were set in standard tuning. For obvious reasons, it is also advisable in this context to score the string number on which a note is played. Adding a smaller upper stave for the actual sounding pitches can be very helpful as well. For common drop tunings such as detuning the fifth or sixth strings by a half or whole tone, it is common to notate the guitar part in the actual tuning—i.e., not transposed.

1.3.1 Historical tunings

During the nineteenth and early twentieth centuries, guitarists began experimenting with alternate tunings. Of these, the most commonly used today is the *drop D*, in which the sixth string is tuned down a whole step from the usual *E*. The string then resonates with the fifth and fourth strings in such a way that reinforces the fundamental *D*.

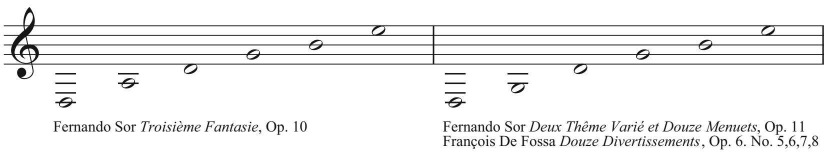


Figure 1.4. Drop tunings

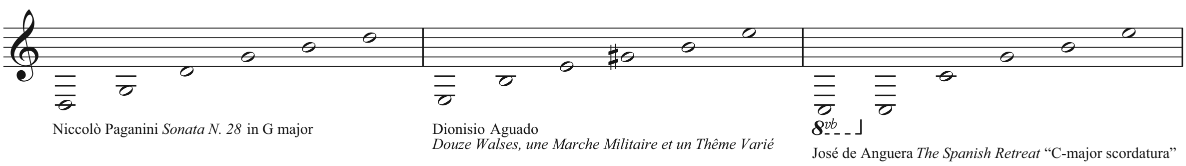


Figure 1.5. Alternative tunings ca. 1800–1850

16 Morris, "Contemporary Guitar Repertoire," 190.

Figure 1.6. Alternative tunings ca. 1900–1960

1.3.2 Equal tempered tunings

Figure 1.7. Various equal tempered tunings