

# ViolinMind

Intonation and Technique

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# Preface

## A note from Hans Jørgen Jensen

ViolinMind is an adaptation of the first part of CelloMind. This new book would not have been possible without the important contribution and deep knowledge of professor Grigory Kalinovsky. Professor Kalinovsky and I have discussed and gone over all the chapters in great detail to ensure that all concepts were adapted 100% to the violin.

Throughout my instructional career, I have spent a great deal of time and energy on teaching my students great intonation. I remember vividly the first time a student asked me, “Why do I have to play that note higher?” after I had asked for a certain pitch to be raised.

My answer was simple: “Because it sounds better.”

The students then replied, “I don’t think so...I like it lower.”

That incident inspired me to start searching for and reading all the material I could get my hands on about intonation so that I would be able to explain the *reason* for wanting a certain pitch to be raised or lowered.

The science behind intonation can be explained in ways that are much easier to understand than your average high-school science class. However, because scientists are usually not performing musicians, there has always been a large gap between the *science* of intonation and practical application.

I remember another special lesson when cellist Allan Steele (as a teenager) came to his lesson and told me with an incredibly excited expression in his eyes: “I have found the F!”

“What F?” I asked him. He replied, “The F that makes the 7th partial vibrate on the G string.”

Before that lesson, I had mostly shown Allan something called tonic sympathetic vibrations, but Allan had now taken it one step further and started to explore the entire fingerboard on his own.

At the following lesson I asked Allan, “Why are your ears now suddenly so much better? Why are you able to really play in tune now?”

Allan answered, “I have started to do what you asked me to do all the time, and by hearing and listening to the sympathetic vibrations, I can now calibrate the pitch that I need and want.”

“What do you mean?” I responded.

Then, Allan explained how he was able to do it: “I know that the 7th partial F is 31 cents [a unit of intervallic measurement] lower than the piano pitch, so when using it as a tonic, I place it higher than the 7th partial on the G string.”

From that lesson on, I rarely needed to talk about intonation with Allan. I think he loved that there are scientific theories behind intonation. Ultimately, it inspired Allan to take decisions about intonation into his own hands.

People with great intonation are intuitively sensitive to sympathetic vibrations. However, this is also a skill that almost anyone can develop with organized practice.

At its core, intonation is very personal, subjective, and intuitive. However, understanding the science behind intonation and integrating it with our natural instinct can open up a whole new world of possibilities. One of the end goals of our practice is to reach that autonomous stage where all movements become almost automatic. When performing—*when engaging your mind*—you must be free to focus on the musical and expressive aspects of the music. Yet, we must also remember that no matter how advanced we become, it is always important to continue seeking opportunities to grow and improve.

This book is a resource to help us all do exactly that.

# How to Use This Book

This book should be studied in the order the chapters are presented (unless you are already familiar with the material) as the concepts in each chapter build on one another. However, practicing only the just intonation exercises for a prolonged period of time can lead to undesirable effects on intonation in your playing. Therefore, we recommend that after familiarizing yourself with the general concepts, you should practice the just and the Pythagorean chapters concurrently.

As a general rule, we recommend practicing a minimum of 30 minutes per day on a few chapters of the book. It is the steady daily practice over a longer time period that will assure that all the information in this book will transform into intuitive skills that will become an integral part of your violin playing.

## A Note on Fingerings

When following fingering markings for scales and arpeggios, please note that notes without fingerings are meant to be played “in position.” For downward scales and arpeggios, use the same fingerings as are marked going upwards, unless otherwise indicated.

## Healthy Practicing

One of the most important aspects of practicing a musical instrument is to use healthy, efficient biomechanical movement patterns when practicing and playing. The “no pain, no gain” philosophy can be very dangerous; it should not be part of our vocabulary.

Remember to perform proper warm-ups and cool-downs before and after practicing. Give yourself adequate time for taking breaks. Also, switching back and forth between different repertory and technique studies can help with concentration and fatigue. Over-practicing one kind of technique can lead to injury or other issues, even when done correctly.

Treat your body and mind with the utmost intelligence and respect, and know when enough is enough.

## Routine and Goal-Setting Strategies

*“Many people fail in life, not for lack of ability or brains or even courage but simply because they have never organized their energies around a goal.”*

— Elbert G. Hubbard

Goal setting is a powerful tool for building both long-term vision and short-term motivation. High-performing achievers use it in almost all fields, including music and sports.

# Overview

Intonation, at the highest accuracy level, is an intuitive skill that requires a very sophisticated inner and outer hearing. For those with highly developed listening skills, theoretical knowledge about intonation is not a necessity in order to master it. However, if your listening abilities are not quite at that level, understanding the theories about intonation can be a great help in refining your ear and making intonation a more intuitive part of your playing.

It is quite possible to spend a considerable amount of time working on the different intonation sections of this book—perhaps as long as one to two years! Trying to absorb the information too quickly can lead to confusion, which is why we recommend using short and focused practice sessions over longer periods of time. In our experience, once students spend the necessary time to start applying the information to their own playing, an incredible change in their ability to play in tune takes place. Over the years, we have seen numerous players with less than perfect ears develop intonation control at the highest level.

In general, the chapters in this book are intended to be studied in the order presented, as each chapter builds on the concepts introduced previously. However, practicing only the just intonation exercises for a prolonged period of time can lead to undesirable effects on intonation in your playing. Therefore, we recommend that after familiarizing yourself with the general concepts, you should practice the just and the Pythagorean chapters concurrently. The following is a brief overview of what to expect from each chapter.

## Chapter 1: Introduction to Intonation

This brief overview provides an introduction to the three primary intonation systems in use today: equal temperament, just intonation, and Pythagorean tuning.

## Chapter 2: The Harmonic Overtone Series

The harmonic overtone series (or harmonic series) is one of the most basic aspects of intonation and the scientific backbone for just intonation. Thoroughly understanding the harmonic series and committing it to memory is essential to developing a more refined sense of intonation.

## Chapter 3: Tonic Sympathetic Vibrations of the Open Strings

Sympathetic vibrations play a very important role in sound production and intonation on string instruments. The most resonant sympathetic vibrations of the instrument are known as the tonic sympathetic vibrations.

## Chapter 4: Cents Explained

Cents are used in this book to compare and measure similar intervals in different tuning systems. It is a great tool for sensitizing the ear and refining the mind to hear and visualize very small differences between the same intervals that may be tuned in a variety of ways.

## Chapter 5: Just Intonation and the Harmonic Series

Just intonation is based on the harmonic series and is used for tuning double stops and chords. This chapter teaches how the first eight partials compare to and deviate from equal temperament.

## Chapter 6: Dissonant and Consonant Double Stops

Dissonant and consonant double stops are very important aspects of harmony and have a tremendous influence on intonation. This chapter teaches you how to hear the beating (or absence of beating) in double stops. Training your ear and mind to hear the difference between dissonant and consonant intervals is a great way to learn how to play double stops in tune.

## Chapter 7: Just Intonation System for Double Stops

Developing the ability to visualize and imagine the sound of the just intervals in your mind is one of the most important aspects of intonation to master. In this chapter, you will explore listening to the beats (or absence of beats) when tuning perfect and imperfect consonant double stops and chords.

## Chapter 8: Just Intonation System for Major Triads

Just intonation is not a fixed-note tuning system but a relational system where each pitch must always relate to its corresponding dominant pitch. In the arpeggio exercises for this chapter, the keys are organized around one of the open strings as the dominant pitch. Practicing the arpeggios with just intonation will provide a better foundation for understanding the just intonation system and how to use it in practical applications.

## Chapter 9: The Just Scales

While particularly applicable to performers specializing in early Classical and Baroque performance practice, learning to play the just major and minor scales is very beneficial for any musician striving to develop a more sophisticated sense of intonation. The scale exercises highlight how overtones affect sympathetic vibrations, which will help refine your ear and mind for intonation.

## Chapter 10: The Pythagorean Comma

The Pythagorean comma is the 24-cent difference between twelve stacked perfect fifths and seven stacked octaves. It is also the interval difference between all enharmonic keys and enharmonic Pythagorean pitches. By understanding how the Pythagorean comma works, you will understand why, for example, C sharp major is slightly sharper than D flat major and how this guides musicians in expressive playing.

## Chapter 11: The 24 Enharmonic Pythagorean Pitches

Pythagorean tuning is a very sophisticated and beautiful system. Most people use it intuitively; however, learning how it works will make a tremendous difference in developing a more comprehensive understanding and control of intonation.

## Chapter 12: The Pythagorean Triads

Practicing all the major and minor triads using Pythagorean tuning is an excellent way to become familiar with all the keys that use the Pythagorean pitches.

## Chapter 13: The Pythagorean Semitones

The Pythagorean chromatic scale is a vital element in adding color and expression to music. In this chapter, you will learn about the two different kinds of semitones in the scale. Additionally, the concept of the Pythagorean half-step attraction is applied to standard violin repertoire.

## Chapter 14: The Pythagorean Scales

The Pythagorean major and minor scales are the basis of playing scales and music with an expressive, melodic quality. When Casals talked about “expressive intonation,” in reality he was advocating for Pythagorean intonation.

## Chapter 15: The Syntonic Comma

The Syntonic comma is the 22 cents difference between a Pythagorean major third (408 cents) and a just major third (386 cents). It is used regularly to switch from vertical just tuning to horizontal Pythagorean melodic tuning.

## Chapter 16: Advanced Sympathetic Vibrations

The charts in this chapter illustrate the most important harmonics of the open strings that can be activated by sympathetic vibrations. Practicing the exercises in this chapter will sharpen the way you perceive pitches, as well as how you navigate the entire fingerboard.

## Chapter 17: Tartini Tones

Tartini tones, also known as difference tones (because they are produced by the frequency differential of the two pitches), are a great tool for improving intonation. Focusing on the ability to recognize and hear these tones will aid you in playing double stops in tune.

## Chapter 18: Double Stop Studies in Tritones

Tritones are dissonant intervals and must always be resolved. In this chapter, you will learn more about the tritone and how it resolves, depending on whether it is notated as an augmented fourth or a diminished fifth.

## Chapter 19: Intonation Performance Practice in the Bach Sonatas and Partitas for Solo Violin

Just intonation plays a major role in the J. S. Bach Sonatas and Partitas for Violin Solo due to the frequent use of double stops, chords, and the vertical harmonic aspects within the composition. Today, however, many violinists use a combination of just and Pythagorean intonation for maximum expressive effect. The selected samples in this chapter will help you understand how these systems can be used to accentuate different aspects of Bach's music.

## Chapter 20: Intonation Performance Practice with Piano

Playing together with a keyboard tuned using equal temperament presents a different set of challenges. The concept of compatibility between Pythagorean and equal temperament is introduced, and samples from the repertory are used in order to show how to adjust intonation when playing together with a keyboard.

## Appendix

The appendix explore a number of topics related to intonation in greater detail:

- I. The Helmholtz Intonation Chart
- II. Harmonic Series in Scientifically Accurate Cents
- III. Just Intonation in Consonant Double Stops
- IV. The Schisma
- V. The Two Fingerboards

## Chapter 1:

# Introduction to Intonation

Developing a sophisticated understanding of **intonation** is a critical component of musical expression and a continuous challenge for any string player. Unfortunately, the theories behind how intonation works are often complicated and introduced with little practical application. In other words, they are not particularly useful for musicians. Through the intonation studies in this book, we aim to present these theories in clear and understandable terms that will improve your ability to play in tune.

For string players, intonation is a particularly sensitive and dynamic process where each pitch must adjust to its musical function, be it melodic or harmonic. Throughout history, musicians have used many different intonation systems. Today, we use a combination of three main systems, depending on the context. For example, when playing with the piano, string players are influenced by the piano's **equal temperament** tuning. On the other hand, many musicians who specialize in authentic Baroque and Classical performance practice use **just intonation**—a system based on the **harmonic series** (also called the **harmonic overtone series**). Furthermore, when playing melodically, we are strongly affected by the balance of, and gravitational pull toward, perfect intervals (i.e., perfect fourths, perfect fifths, unisons, and octaves). This melodic expression is called **Pythagorean tuning**, which is based on pure perfect fifths.

Knowing when and how to use these different intonation systems is a major challenge for musicians today. By understanding these theories of intonation and learning how to apply them, you will cultivate a more refined and comprehensive ability of how to play in tune.

## Cents

The **cent**, a fundamental concept in building a more sophisticated sense of intonation, is a logarithmic unit of measure used for musical intervals. One octave contains 1200 cents. Typically, cents are used to measure extremely small, finite intervals, or used to compare the sizes of similar intervals in different tuning systems.

It is difficult to establish how many cents are perceptible to the human ear because it varies from one person to the next. However, most professional musicians can distinguish differences in pitches from five to six cents and above.

## Intonation Systems Today

There are three primary intonation systems in use today:

1. Equal temperament—a system that divides the octave into 12 equal **semitones**
2. Just intonation—a relational pitch system based on the natural harmonic overtone series
3. Pythagorean tuning—a system based on stacked pure perfect fifths

## Equal Temperament

The 12-tone equal temperament system divides the octave into 12 equal-sized semitones, each one consisting of 100 cents. Keyboard instruments (such as the piano) are tuned using equal temperament. This system enables these instruments to play in all keys with minimal flaws in intonation.

In equal temperament, however, perfect fifths and perfect fourths are not completely in tune—they are two cents smaller or larger, respectively, than their just and Pythagorean counterparts. In addition, major intervals are slightly larger in equal temperament compared to just intonation, and minor intervals are slightly smaller.



## Exercise 2.1 Harmonic Series First Eight Partial on the Open Strings

1. Practice the eight partials with a variety of fingerings, on one string.
2. Locate and play the first eight harmonics on the indicated strings.
3. Study and memorize the harmonic series and the overtone chart.
4. Know the names and numbers of the eight partials on all four strings.

The image displays four musical staves, each representing a different string on a violin. Each staff shows the first eight partials of its harmonic series. The notes are indicated by solid black dots for the lower partials and open circles for the higher partials. Roman numerals (I, II, III, IV) are placed below the first partial of each string to indicate the fretting hand position. The G string is labeled 'G String' and 'IV', the D string 'D String' and 'III', the A string 'A String' and 'II', and the E string 'E String' and 'I'. The 8th partial of the D, A, and E strings is marked with a dashed line and the label '8va'.

**G String**  
 Partial: 1 IV

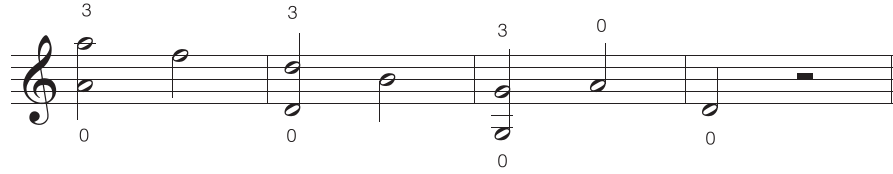
**D String**  
 Partial: 1 III

**A String**  
 Partial: 1 II

**E String**  
 Partial: 1 I

# Duport Double Stop Exercises with the Open Strings

## Exercise 3.4 First Position Octaves



## Exercise 3.5 Second Position Unisons and Octaves



## Exercise 3.6 Second Position Octaves (Minor)

