Dear Fellow Luthiers,

This past month we learnt that an anonymous philanthropic foundation has awarded us a grant for our upcoming Competition and Exhibition next March. This grant will allow us to pay travel costs for judges, the recital hall at UBC, and for advertising and prizes.

In this edition of Sound Post, Dean Markel sends his initial impressions of Cremona. He took his violin plates (described in our August Newsletter) and under expert guidance, has now fashioned them into a completed instrument. If you want to know what it sounds like, listen to this snippet of Tchaikovsky's Violin Concerto played on the instrument.

I will also review a recent Oberlin seminar that advertised a low-cost approach to violin analysis. I will also extend my discussion of signature modes to a non-radiating mode, the "B0" that many violinists claim affects how they feel about playing their instrument.

Chris Waltham

President, VMABC

The BC Sound Post

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Articles

Postcard from Cremona by Dean Markel

Of all the cities in the world, Cremona, Italy, is perhaps the one most synonymous with violin making. It was home to Andrea Amati, Giuseppe Guarneri “del Gesù,” and, of course, Antonio Stradivari. It is believed to be the birthplace of the violin or, at the very least, the place where the violin, as we know it today, was perfected.

Cremona has a long and storied history, of which violin making is an important part. Violin making in the city reached its apex in the 1700s. Following Stradivari’s death in 1737, the craft began a slow decline that continued into the 1800s, as makers in other towns increasingly rivaled the quality of Cremonese instruments. It was not until the 20th century, with the founding of an international school of violin making in Cremona in 1937 that the craft began to experience a renaissance.

Today, the city is home to more than 150 violin makers, the Museo del Violino, and numerous shops catering to luthiers, offering an abundance of tools, wood, fittings, varnish supplies, and much more. For an aspiring violin maker, Cremona is *the* place to learn about the history of the craft and meet contemporary makers who are working at the highest levels of their profession.

I am currently enrolled in a short certificate course at the Academia Cremonensis. In addition to its three-year professional violin-making program, the school offers intensive courses designed for professional luthiers who want to expand their skills. As a primarily self-taught violin maker, I have found it to be an incredible experience to spend time in this vibrant city, learning about the craft from talented luthiers with a lifetime of experience. It has also been a pleasure to meet so many makers who are enthusiastic about sharing their knowledge and experience.

Academia Cremonesis:



A few sights from Cremona

The Torrazzo: Rising beside the cathedral is the Torrazzo, Europe's tallest brick bell tower, standing at 112.54 meters. It is clearly visible as you drive into the city. Climbing its 502 steps is well worth the effort, rewarding visitors with a breathtaking view of Cremona and the surrounding countryside.





Museo Del Violino: A highlight for violin makers is the Museo del Violino, located in Piazza Marconi near the historic center of Cremona. It houses a vast collection of string instruments, ranging from ancient to modern, including instruments by some of the most important makers in Cremona's history.

For violin makers, the museum is particularly significant because its collection includes surviving tools, forms, and patterns from the workshop of Antonio Stradivari.

Very much a living museum, it hosts performances every Saturday and Sunday, each featuring one of the museum's treasures, played in the acoustically stunning Giovanni Arvedi Auditorium. I recently had the opportunity to hear Antonio Stradivari's Golden Bell violin (1668), played by Christian Joseph Saccon. This instrument was made by Stradivari at the age of 24, shortly after he began working independently.

The museum bookstore also has an incredible collection of books, magazines, life-size posters, and technical drawings of violins, violas, cellos, and more.

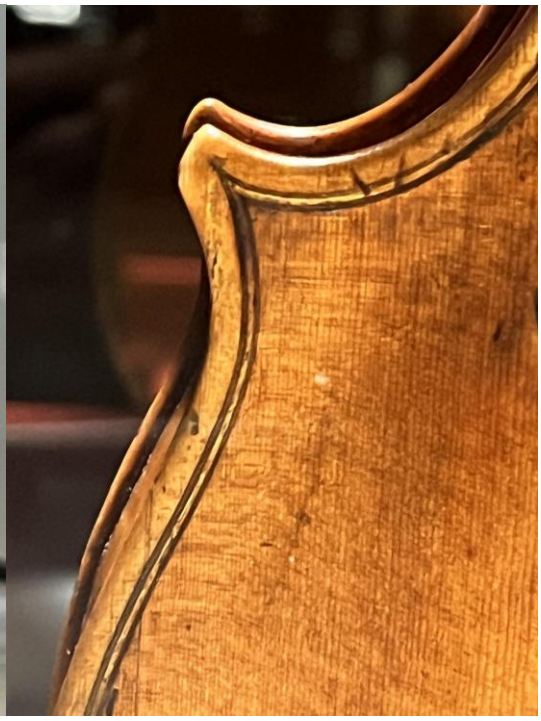




It is easy to spend an entire afternoon in the museum studying details such as corners, f-holes, and scrolls. Although these features may appear similar at first glance, each instrument reveals interesting individual characteristics and subtle changes that reflect a maker's evolving style throughout their career.

A few details from the 1658 "Hammerle" violino by Nicoló Amati:







The Giovanni Arveda Auditorium with the "Golden Bell" violin and security guard:





If you are interested in learning more about Cremona, the Museo del Violino, or the Academia Cremonensis, I highly encourage you to plan a visit or explore some of the links below.

https://museodelviolino.org/

https://academiacremonensis.org/it/

https://www.comune.cremona.it/

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The B0 mode: what it is, does, and how to adjust it.

There are two other significant violin modes that are not "signature modes", because they don't themselves radiate much, but are nonetheless important because they couple to modes that do. They are called the B0 and A1. For now I will just talk abut the B0, which is the lowest frequency-bending mode of the whole body of the violin.

Bending modes are not very good radiators because parts of the instrument go one way and other parts go the other. As the instrument is small compared to the wavelength of its sound, at least for string fundamentals, the parts going one way "short circuit" the opposite-going parts. That's not to say they don't radiate at all, they are just overshadowed by the efficient A0, B1- and B1+ breathing modes. (About a decade ago, I wrote an acoustics paper on the ancient Chinese instrument called the *qin*. The qin is essentially a rather solid beam, so the radiation is mostly from bending modes. However, it is a very quiet instrument.)

Most of the vibro-acoustic work on the B0 seems to have been done in the '90s. In 1998, Jim Woodhouse (see October Newsletter) summed it up in this paper in the European acoustics journal Acustica.

A diagram (Fig.1) from the paper shows how the B0 mode moves; it is a combination of neck and fingerboard motion.

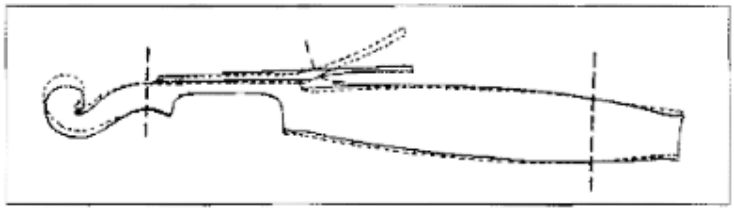


Figure 1. Cross-sectional sketch of a violin showing the body mode B0 (exaggerated, but drawn approximately to scale). Long dashed lines indicate nodes.

The B0 mode frequency can lie anywhere between 240 and 340 Hz, because the maple of the neck can vary greatly in density. This puts it in the same space as the A0, and many violinists claim that the instrument simply works better if the two modes are very close in frequency.

Woodhouse examines how the two modes interact with his engineer's eye. The mathematics is a little daunting for anyone not schooled in vibrational engineering, but he is always looking out for the musician's angle. The two modes couple and "repel" each other, so it is impossible to get them to line up perfectly. The most puzzling issue is how, if you do manage to bring the two modes close together at about C# on the G-string (there is little variation possible in the A0 frequency), then the playing over a much wider range of pitch seems to be improved. Woodhouse thinks it might be something to do with bowing transients but admits much more work needs to be done. I could not find anything more recent than 1998. These sort of experiments require double-blind playing-listening tests and luthiers willing to work with acousticians. Not an easy project to perform with any rigour.

Carleen Hutchens has written some practical tips for finding the B0 in the November 1993 Catgut journal:

"*The best place to begin tuning is to try to bring the B0 mode pitch to that of the A0 mode, for they usually lie fairly close in frequency. Hold the completely strung up violin in thumb and forefinger at a point on the nodal line across the widest part of the lower bout. Damp the strings against your shirt and tap on the end of the scroll. (Do not damp the strings against the fingerboard). The sound heard is the pitch of the B0 mode. Then BLOW across the f-hole on the G-string side (where there is most air motion) and listen to ascertain whether B0 is above or below A0. (These are complex sounds and it is not easy to identify their pitch without practice.*)"

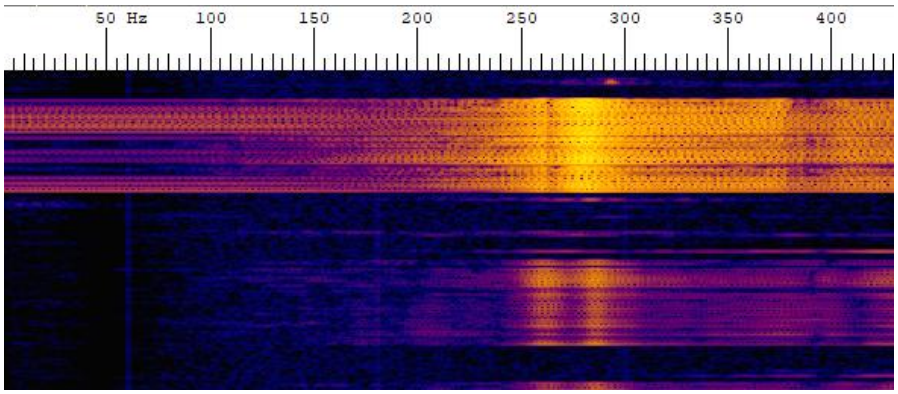


Figure 2: Finding the B0 and A0 on my 1992 Höfner.

The upper band in Fig.2 shows the frequency response of my Höfner when I tap the G-foot with the microphone in an f-hole. The lower band is from following Hutchens to find the B0. You can see that both resonances show up in both tests, but the top band is unequivocal that the A0 is about 280 Hz. So the B0 is about 260 Hz. I say "about", because the peak positions wander around a little depending on exactly how you hold the instrument.

What to do if the modes are a long way apart, say > 20 Hz? The A0 is fixed by the size of the f-holes (see October Newsletter). Hutchens has some recommendations about nudging the B0:

Lower B0:

- Add mass to the end of the fingerboard (as a temporary measure to see what happens).
- Remove wood from under the fingerboard in the area close to the neck.
- Thin the bending part of the neck-fingerboard.
- Dress down the fingerboard.

Raise B0:

- Reduce the mass of the moving end of the fingerboard by removing wood from under the end.
- Saw thin slivers of wood off the end of the fingerboard.

The mass of the chin rest, and the scroll and pegs can affect the B0 frequency. One can easily that a definitive systematic test of this B0-A0 hypothesis would be no small project, but a little work may improve an individual violin. I would love to hear of anyone having success.

CEW

Review

The October 16, 2026 VSA-Oberlin "First Friday" lecture.

Tom Nania: Measuring More with Less: Low-Cost Impact Hammers and Emerging Findings in Cello Acoustics

Tom Nania is a D'Addario (strings) engineer and archtop guitar expert. He also happens to have worked in a previous life at the Sudbury Neutrino Observatory (like me).

An instrumented impact hammer is one that continuously senses force that can be digitized with very small time steps in a laptop soundcard (or dedicated data acquisition system) and stored in a file. They are usually used with a tiny accelerometer that can be attached anywhere on an instrument with very little disturbance to its acoustics properties. These two data streams, force and acceleration, can be rearranged by frequency and divided one by the other to give a measure of an instrument's response to a calibrated force, be it from a plucked or bowed string. In the case of a violin, the most common measurement is to tap the top of the bridge on the G-side parallel to the soundboard, with the accelerometer attached with a piece of soft wax at the G-foot of the bridge. This arrangement gives the best indication of how the most important sound production region of the violin responds to a bow force on the bridge. The ratio of soundboard velocity (which you get from dividing the acceleration by the frequency) to input force is called the *admittance*. Some violin acousticians (e.g. Jim Woodhouse) go so far to claim that the bridge admittance is all you really need to know about a violin. The difference between this procedure and simply tapping with a passive object is that you get the *magnitude* of the violin's response, not just the frequencies of the signature modes.

Nania described the making of his impact hammer, which turned out to be a much more extensive engineering operation than I had expected from his abstract, requiring a well-equipped machine shop. It was more complicated than a system I built 20 years ago using the piezo from a BBQ lighter, and an ultra-cheap accelerometer from a car air bag trigger (which was, however, too big for a violin). Since then, Colin Gough has developed an even simpler system using cheap button microphones as force, acceleration and sound pressure sensors. You can also see his YouTube video.

This said, Nania did show some eye-popping cello data comparing a traditional Belgian bridge with the Amorim bridge. I'm a violinist so this was all news to me, but one look at the data, and I could see what all the fuss is about. Figure 3 is a screen shot of Nania's cello bridge admittance data with Belgian and Amorim bridges. You can see that the response of the instrument with the new bridge is about 15 dB louder above 1 kHz than with the traditional bridge. "A cello on steroids", someone predictably said. This is the frequency region where the human ear works best, where the "singer's formant" lies, and where the violin bridge is designed most to respond.

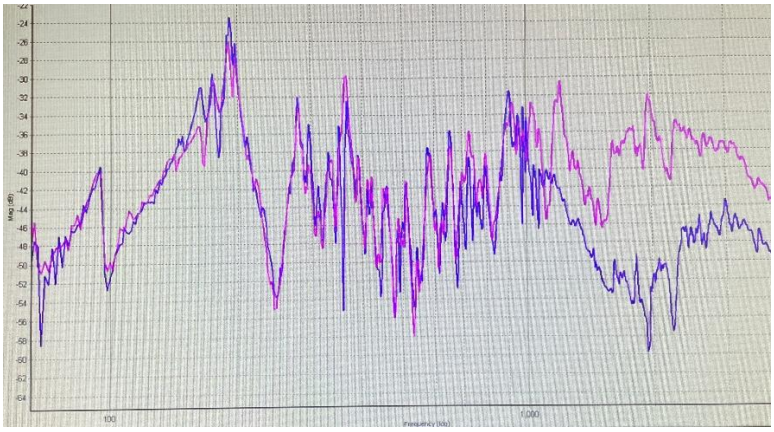


Figure 3: Cello bridge admittance with Belgian (blue) and Amorim (pink) bridges.

In summary, even as a violinist I found the cello revelations more interesting than the impact hammer how-to. More on cheaper/better ways to analyze violins later.

CEW

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