

SIX DECADES OF LISTENING TO WOOD SING

By Michael O'Brien

It was 1958 and I propped a foot up on the seat of my tricycle. A red cowboy hat rested on my head, and a plastic Mickey Mouse guitar whose upper bout was formed by Mickey's round, black ears, rested on my knee. And for all the world to hear, I let wail a four-year-old's passionate rendition of *Home on the Range*.

By 1978, high school had come and gone — as had marching band, jazz band, Woodstock, rock bands, folk bands, college, the counter culture, long hair, James Taylor, Paul Simon, Joni Mitchell, Julian Bream, John Williams, Joan Baez, Vietnam, Pete Seeger, Ornette Coleman, Mingus, Miles, Milton Babbitt, the death of Stravinsky, Shostakovich, and the militant urge to change the world.



I joined the establishment and found myself studying conducting and composition at conservatory in Vienna, Austria. It was a place where a missed F# could land you in purgatory, and where some of the world's greatest musicians walked the halls, Zubin Mehta, Eric Leinsdorf, Hans Zwarofsky, Friederich Cerha, Johann Sonnleitner, Nicolas Harnoncourt, Joseph Mertin.

There I caught the Early Music bug, added harpsichord to conducting and composition

and began a 5-year apprenticeship with Peter Kukulka. He was the head conservator of musical instruments at the *Kunsthistorisches Museum*, and like so many others, he became a life-long source of inspiration. It was a heady time, as humbling as it was immeasurably enriching. It was also where I cut my teeth — and fingers! — as an instrument maker.



After nearly 8 years in that magical city and with a pocketful of diplomas, orders for three clavichords, one young daughter in tow and another on the way, I returned to the States and opened shop.

I made mostly clavichords, harpsichords, but also the occasional medieval Vielle, and even a reproduction 18th-century English Guitar. For ten years I also worked for Thomas and Barbara Wolf, two of the finest craftsmen I've ever been privileged to know. From there I became a conservator of musical instruments and wooden objects at the Smithsonian, earned a Ph.D. in



Musicology (Organology, really), made instruments, taught school, freelanced, and wrote lots of music.

Despite all that, I never completely forgot my first love. I once traded two years of tuning a client's harpsichord every six weeks for a really cool 50s-era Gibson dreadnought. Then I regretted my beloved Yamaha classical guitar, reset its bridge, added decent tuners and an arm rest. At one point, when college for my daughters was pretty much paid for, I sprang for a high-end Martin. That was really cool too, and it sounded great, especially for Bluegrass, but it seemed a little over-built and in a moment of incurable naive confidence, I thought I might make some improvements, maybe even customize it a little. Ha!

So I jumped on yet another learning curve. I began to take my own guitar playing seriously and began making guitars. It was great, because after decades of confinement within the necessary strictures of conservation and historical practice, the design freedom of modern guitar-making was thoroughly invigorating. It was like spring after a harsh winter.

So, it was thrilling to introduce these two harp guitars at "The Gathering" this year. So many thanks to Mike Doolin, Gregg Miner, Randall and Jane Sprinkle, and especially to Stephen Bennett for the opportunity both to perform and present as a luthier. What a fantastic coming together of so many great musicians, luthiers, and new friends!



STEEL-STRING HARP GUITAR

The goal here was to create something more graceful than the traditional Dyer/Knutsen models. So I made the bass arm slimmer, blended it into a Florentine cutaway with a single, sweeping curve, and slightly reduced the lower bout. I also outlined the basic guitar shape with a two-piece top.

Acoustically, I was looking for a sound that would enable a fairly unified melody played over several strings and across different areas of the fretboard — but with the sustaining characteristics of a traditional steel-string guitar. If the right balance could be achieved, and the bass resonance could ring without becoming boomy or muddy, this mix should be possible. I think the instrument comes very close to that.

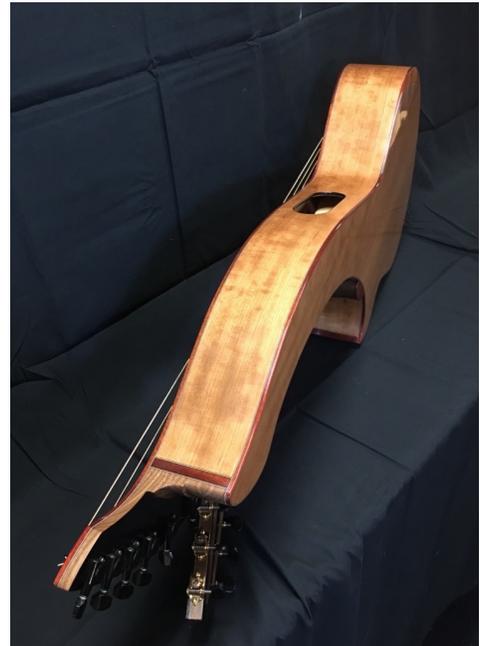
The guitar has an elevated, multi-scale fingerboard, a side port, six



sub-basses, a single bridge with separate saddles for the mains and subs, and plenty of room at the headstocks. The back is on the horizontal plane, but like many guitars with elevated fingerboards the top of the instrument tapers away from the heel.



Since it was to be mine, the string band and neck profile is that of a classical guitar (50mm wide at the nut, but with a 20" radius). This is almost non-existent on steel-string instruments, but it fits the way I play. If this instrument were to be for another player, with a different technique or playing style, these details would change.



The scaling also fits my hand: 25.4" (a fairly standard steel-string scale) for e' , and 660mm for E (same as a long-scale classical guitar), with fret 5 perpendicular to the center line. This makes the upper positions easy to reach with only a mild extension required in first or second position.

The sides and back are quilted Eastern Cherry, the top is Alpine Spruce, the bindings and bridge are Bloodwood and the neck is Black Walnut. The Fingerboard is Rocklite, which is a wonderfully acceptable alternative to the Ebonies.



These are sustainable species, not listed in the CITES appendices. Working as environmentally responsible as possible is important to me. Given the present conditions of tropical forests world-wide, I find it hard to ethically justify using the Rosewoods, Ebonies or similar species, despite their beauty and acoustic properties. In fact, I have turned down commissions from players who have insisted on these. (Confession: I do have a classical guitar in East Indian Rosewood which I began a few years ago and which I will finish. Also, the bridge and bindings of the nylon-string harp guitar—below—are East Indian Rosewood. Even though I still have some more small pieces in my shop, I'm done with it.)

BRACING

The top bracing is a modified, symmetrical X-brace pattern (to allow for the multi-scale bridge position), and the back is a modified radial pattern (to accommodate the sub bass arm). The top pattern tends to balance the two halves of the long dipole while creating many smaller areas, more or less proportional to each other, for overtones and higher frequencies. That's the theory at least. At this point in my career, I am able to trust my ear as much — if not more — than theory. A guitar body amplifies the strings in so many, complex ways, that, for me at least, I let my instincts and ear guide me most of the time.

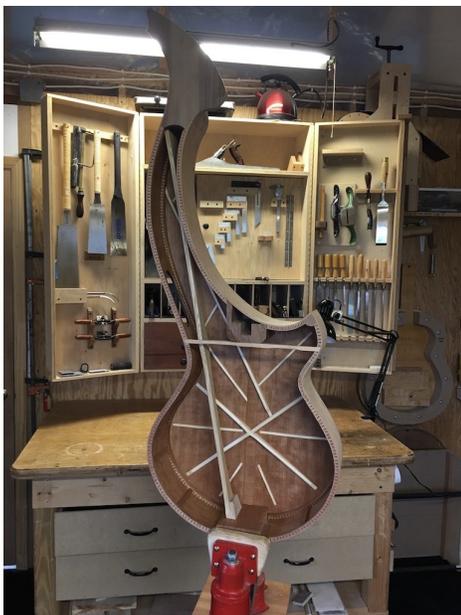


The back bracing pattern tends to favor the large monopole, and thus the lower fundamentals. Again, to me, this just seems appropriate for a harp guitar and for the sound ideal that I'm going for. I did not intend this guitar to be played with the back dampened on the player's torso. I tend toward a classical way of playing, keeping the back free to vibrate. It's just personal taste.



THE “FLYING BUTTRESS” BRACE

A long brace which is parallel to the sub-bass strings spans the entire length of the guitar. It runs from the sub-bass headstock to the heel block without touching anything along the way. Its purpose is mainly structural. However, it is free to vibrate, thus minimizing any dampening effect it might have. It's a piece of quartered, straight-grained ash, wider at the ends and middle. The joint at the heel block is reinforced with a second, small piece, and let into a small mortice. The extra mass in the middle creates a kind of pendulum effect and encourages the brace to vibrate. One can easily feel this through the side port.





The principle is something I borrowed from the late 17th-century and early 18th-century pianoforte designs of Bartolomeo Cristofori (on whom I wrote my dissertation — and also the bio for the New Grove Dictionary). One of Cristofori's great innovations was to separate the stress-bearing components from sound-production. It is a principle still used by modern pianos. In a different way I've also used this principle on a six-string guitar, which has a kind of "flying" X-brace on the back.

Also, the harp guitar's upper transverse brace is not only let into the linings, it is fixed permanently to the back of the neck block. It does not contact the sound board in key areas, mimicking Jeffery Elliott's open harmonic bars, found on many of today's classical guitars.



TWO-PIECE TOP

A joint in the top is inherently weak, particularly a cross-grained joint like this one. But it's necessary for highlighting the basic guitar shape. So, the joint is reinforced with a spruce patch and a small brace. Since the bass arm's liners are nearby anyway the overall loss of strength is negligible. A thin strip of black purfling adds visual refinement.



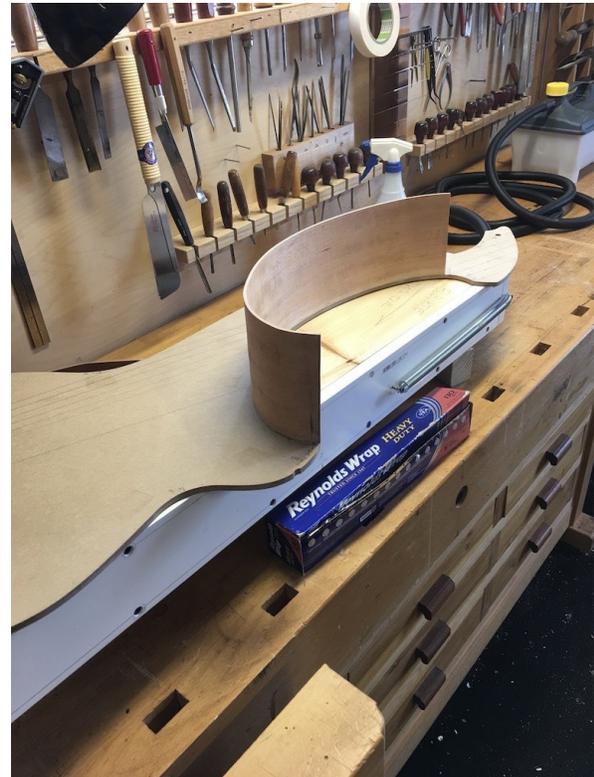
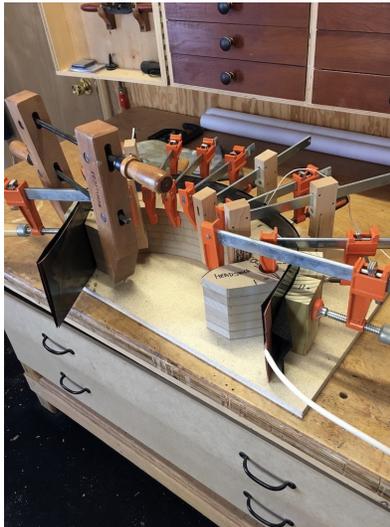
SIDE PORT

The side port is reinforced from behind with a patch and is bound. By adding a second sound hole, the boominess can be reduced, for basically the greater area of the sound hole, the less boomy the sound.



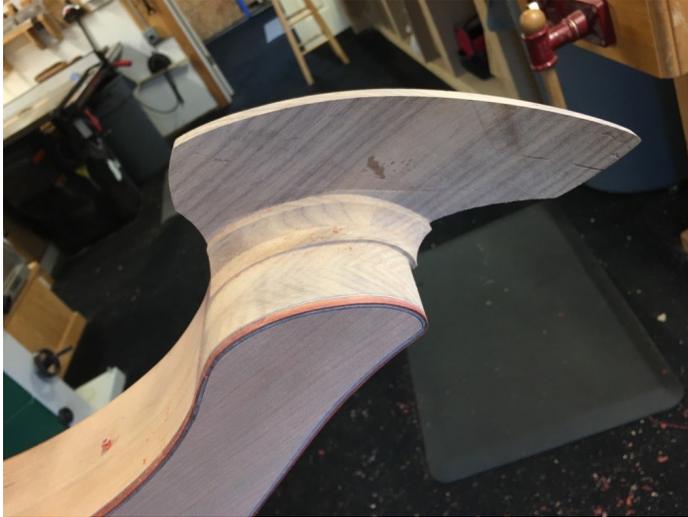
THE CURVE INTO THE CUTAWAY

In early designs I had considered adding a layer of carbon fiber to the curved side that extends from the bass arm across the neck joint into the Florentine cutaway, but ultimately chose to laminate it. I used a three-layer lamination, pre-bending each layer and gluing it all up with a structural laminating cement which is hard and has virtually no creep.



A CARVED SCOTIA

I've often thought the back of the sub-bass headstock on harp guitars was an awkward design spot. It's usually handled in a simple, utilitarian way. So I added a scotia profile carved directly into the block. A nice detail.

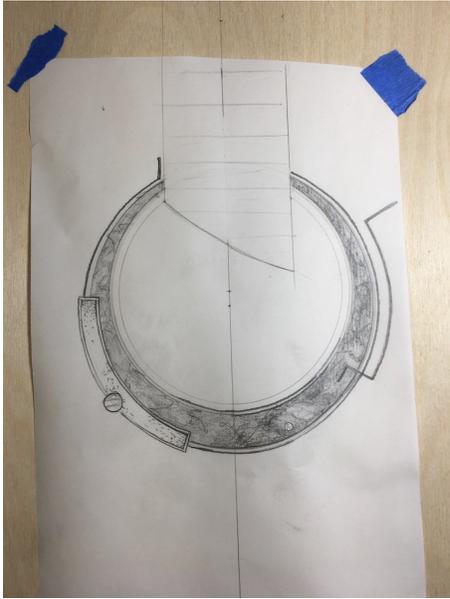


NECK BLOCK

Incorporating a single curve from the sub bass arm into the Florentine cutaway requires re-designing the traditional neck joint. I used a mortice and tenon within the perimeter of the guitar. Obviously, it must be precisely aligned, which is tricky. I used this joint effectively on a six-string prototype, which has since been sold. The harp-guitar's neck is otherwise a simple bolt-on with wood-to-wood contact.



ROSETTE AND OTHER INLAY



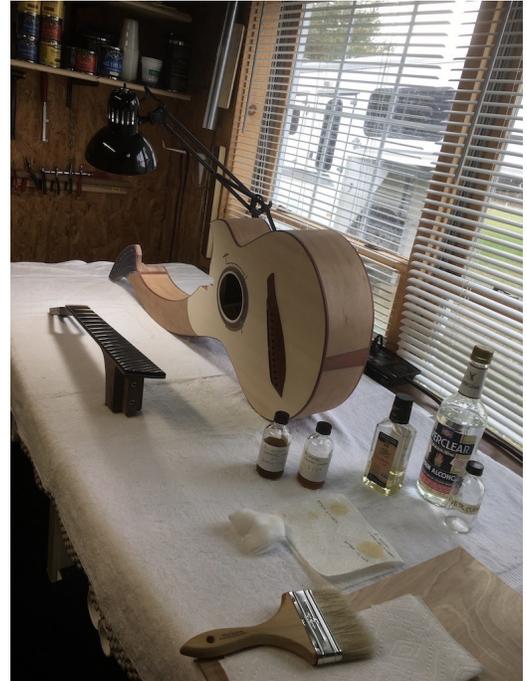
Rosettes and inlays are personal touches. Here are some photos of the rosette and the thin maple lines inlaid into the bass headstock.

After scoring a line with a scalpel, I then shaped it into a rectangular groove with a knife made into a small scraper. So the groove fits a strip of veneer which is inserted into it, glued and trimmed flush.



FRENCH POLISH

Although I have repaired vintage guitars that require nitrocellulose lacquer, I prefer a well-executed, traditional French Polish on new instruments. It's non-toxic, environmentally friendly, low-tech but high-skill, and exceptionally beautiful — great attributes in my mind. And it sounds better, at least to my ears (more details below).



CUSTOMIZING



This harp guitar was deliberately made to fit my personal esthetics and my way of playing. To get a sense of what might be comfortable for me, I traced my finger angles on a mock fingerboard and tweaked the fan-fretting pattern from there. For clients' instruments I would do the same thing or similar. (One fun example is an ukulele I made a few years ago. It was for a young rock musician whose newborn baby girl was named Lily. So his uke was a cutaway with on-board pick up and a mother-of-pearl "Lily" inlaid into the upper bout. It became known as "The Uke-Lily.")



THE FINISHED GUITAR



NYLON-STRING HARP GUITAR

This nylon-string instrument is purely classical, sleek and understated. It's a modern take on the traditional Austrian *Kontragitarre*, but intended for contemporary practice.

It's also multi-scale, with an elevated fingerboard, side port and cutaway. The four sub-bass strings are scaled to accommodate the *LaBella* ten-string sets, which are widely available. Sides and back are curly Claro Walnut. The top is Engelmann Spruce, and the necks are straight-grained, quartered Walnut. Walnut makes excellent necks, although it's heavier than Mahogany or Spanish Cedar. A continuous bone saddle accommodates all ten strings, and the bridge design, borrowed from Tom Bills, wraps the strings around the elevated portion of the bridge, back under the saddle where they are simply tied off.

DOUBLE NECK DESIGN

The twin necks of *Kontragitarren* traditionally join the body with a single, large joint, but I dovetailed each neck separately into the body. The necks join at the guitar body and at the headstocks in a slightly "updated" way. By configuring the tuners in a 4-2-4 pattern rather than the usual 3-3-4 the headstocks could be joined elegantly. On so many older instruments with sub basses the design of the headstocks is awkward, at least to my eye. But that's just personal taste.





The building process was straight forward, and a lot of it was done by hand. The initial plan called for routing the neck dovetails on a jig, but the complications of devising one that would work on this body's sloping shoulders made me change my mind. I have a lot of experience with hand-cut dovetails, having made so many clavichords. I once hand-cut dovetails into the cheek/bentside joint of a solid walnut double-bentside German harpsichord for Albert Fuller. Because of the geometry of the bentside curving away from the cheekpiece, a router jig was next to impossible. Tom Wolf and I had a lengthy discussion about it, and in the end he let me

cut them by hand. It was his name on the instrument, after all! Honestly, I sweated bullets the whole time, but in the end they came out perfectly, all nine inches of them, and so far as I know, that instrument is still in Albert's Manhattan flat for all to see some 30 years later. I even repeated the idea in the ceiling of my house, just for fun. So, I felt more comfortable cutting the neck dovetails by hand.



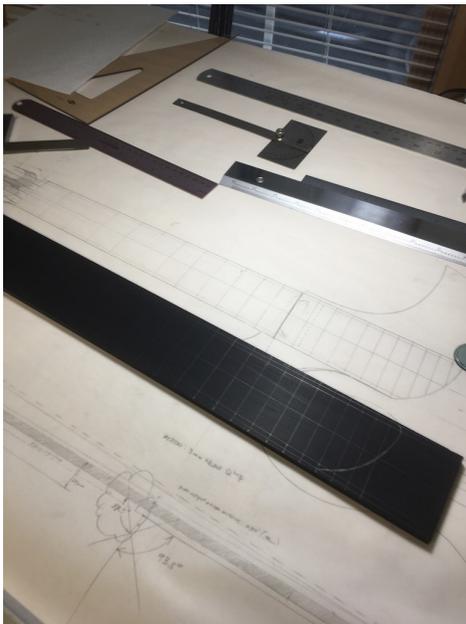
Once cut, the necks were dry-fitted at the correct angles and then joined at the body and headstocks. The details and curves were cut with a simple coping saw and finished by hand. Eventually they were glued to the body with hot hide glue.



MULTI SCALE

A couple of years ago, I actually measured the commercial fret-slotting templates I had. Using a rule that divides the inch into 100ths I found a few, very small errors. So I went to laying out and cutting the fret slots by hand, and have never looked back. Marking out and cutting by hand is admittedly impractical for even the smallest production shop, but I'm not interested in making production instruments, and there are many great shops doing that, making great guitars. Besides, I really love drawing with a pencil, cutting with a hand saw, and slicing through wood with a good chisel or plane. (I'm old-school and after all these decades I still love getting my hands on the wood itself. When one begins to notice that the light up ahead is

growing brighter and the light behind is growing dimmer, one begins to reflect carefully on how to spend one's time.)



For accuracy, I use a 0.3mm mechanical pencil sanded to a sharp point, like mechanical draftsmen used to do. The Starrett rule divides the inch into 100ths and with a magnifier it's possible to eye-ball the thousandths. (BTW: there are many fret calculators on-line. StewMac's is free and easy to use, so I make a print-out of the calculations I want and go from there.) The line that I draw represents the center of the fret slot which is thus the center of the fret crown. It's important to triple check everything, not only nut-to-fret distance, but fret-to-fret. Also, I mark the fret positions along the string path of lowest and highest strings (which spread), NOT along the parallel sides of a fingerboard billet or along a center line. By using the first tooth of a pull saw (which is hooked on most saws) to lightly score the saw's path and to allow you to see the width of the actual cut, it's possible to center the cut on the line against a guide. For depth control, I simply check each cut as I go rather than attach a stop to the saw blade (for better or worse, I have a fundamental distrust of gadgets). The whole process of laying out, checking and

correcting for errors takes about 45 minutes. Cutting the frets takes about half an hour. I'm fine with that, but I'm running an artisan shop, not a production one.



The shorter *e'* string is 645mm or comparable to a short-scale classical guitar, and the long *E* string is 655mm, slightly longer than "standard" classical scaling. The master fret is no. 5. So, again, the fan-fretting is fairly mild, laid out for ergonomic reasons, not acoustical ones.

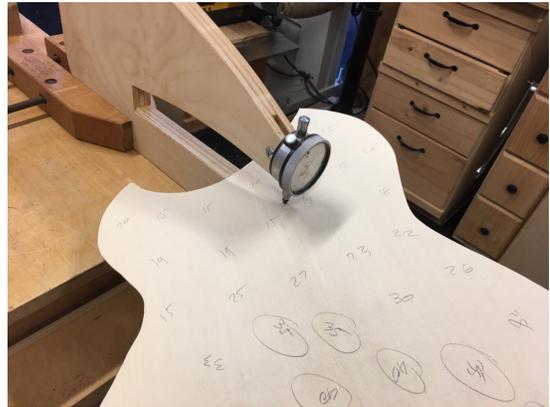


BRACING

The top bracing is a basic Kasha-style pattern but modified slightly to accommodate the long, angled bridge and the body's cutaway. The back is radially braced.



The greatest challenge of a nylon-string guitar is getting the higher positions and upper strings to sing out. So I monitor the thickening process of both the top and back with a caliper, but I voice by ear. I can't give a recipe for this, but by really listening one can hear fundamentals and partials in the so-called tap-tones. So I listen a lot for these, very carefully, if instinctively. Since 1978 I've heard a lot of wood sing to me. I don't know a better way to express it.



BRIDGE

The bridge of a guitar transmits vibrations throughout its entire length. It can only move in certain ways, either up or down (more or less as a whole), by pitch and by yaw, and very slightly side to side with the dimensional fluctuations of the soundboard. These movements roughly correspond to the monopole and dipole patterns of the top. The bridge does not, however, move along the length of the guitar since the top is virtually stable along the grain. That means that the bass end is not entirely isolated from the treble end — which seems to favor a single-bridge design for harp guitars rather than a multiple-bridge design. Two or more bridges, vibrating independently of each other could possibly conflict. Many great instruments do in fact have separate bridges for the sub bass strings and/or super trebles and they are truly great instruments. So I'm not entirely convinced by my own thinking on this. Still, every luthier has to make decisions, and I've chosen a single-bridge design, and I love the

homogeneity in sound I think it encourages. Either way, God and the Devil both lie in the details.



Similarly, the wrap-around method of tying off the strings theoretically favors a more efficient transfer of energy from the strings through the bridge to the soundboard. And I used it on this guitar.



FRENCH POLISH

I use a very traditional method of applying French Polish, with pumice, grain alcohol, button lac, droplets of olive oil during bodying up (which is spirited off), and in the later stages a very small amount of walnut oil emulsified directly in the shellac. Walnut oil is a drying oil and becomes hard over time, and since miniscule amounts remain in the finish, it adds a small measure of hardness. The whole process takes about 3-1/2 weeks with upwards of 30 applications.





I like the color possibilities of button lac, although it has to be de-waxed. For this I strain the dissolved shellac through coffee filters, and to save time (which can take a day or two), I run several at once, and it does a more thorough, cleaner, job. Then, I adjust the color by adding activated carbon pellets to the de-waxed shellac and filtering it out after a day or so, depending the desired color. I've sometimes used super-blond flakes, but I prefer the unifying effect of a slight amount of color in the finish. Preparing the shellac takes about a week.



All in all, this kind of French Polish is a fussy but very pleasant process. It can be almost Zen-like. No spray booth, no spray guns or noisy compressors, no hypersensitivity to dust, no toxic or volatile fumes, and a finish of exceptional beauty. Its only real drawback is that a French polished guitar is not really suitable for gigging an open-air farmer's market on a hot summer day when sweat runs and few people are listening anyway. A factory instrument is probably better for this.

THE FINISHED INSTRUMENT



Many thanks to Gregg Miner for inviting me to share my work. Because of him and the many, many great players around the world, the magical harp guitar with its haunting sub-basses is becoming a part of the mainstream. Thanks Gregg!

Even after six decades of experiencing it, the sound that emerges from a wooden box and vibrating strings is still a miracle to me.

For more instruments, photos and information on ordering an instrument, please visit my website: MKOguitars.com.

I'd love to hear from you!

Michael O'Brien, November 2019

