



# WOOD FORUM

Newsletter of the Sonoma County Woodworkers Association

Volume 35, Issue 6

June 2015

## In Fine Voice

by Art Hofmann

This month we will visit Schoenstein Organ Company, located in Benicia, California, for a tour of the factory facility with the owner, Dr. Jack Bethards. This maker of pipe organs has been producing distinguished instruments for five generations, first in San Francisco and then at its present site. The company has built hundreds of instruments, installed mostly in churches throughout the nation, and remains one of a handful of such companies in the country. It has built, for instance, the powerful pipe organ of the Mormon Tabernacle Choir in Salt Lake City. Our timing is spot on, Dr. Bethards assures me, and we will see a rather large instrument being restored.

Organ making, as Paul Schürch told us when he was here last year, comprises numerous trades including woodwork, metal work, leather work, besides musical skills such as voicing. The wood shop is enormous, stocked with old beefy machines from America's prime industrial period, the '50's and '60's. We will learn the history of organ making in this area,



beginning with the orchestrion, a forerunner of the juke box that used piano rolls. Schoenstein made and installed these in the San Francisco's German beer halls in the 1800's.

After a tour of the plant, we will lunch there, on Napoli pizza and soft drinks with SCWA footing the tab. Please invite your friends and family, except for small children, who might not mix well with the extensive machinery.

Where: 4001 Industrial Way, Benicia, CA

When: Saturday, June 6 at 10: 15 AM

### Directions

It might be best to buddy up for the long ride (an hour and seven minutes) to Benicia. Either arrange that beforehand, or go to the Petaluma Park & Ride at Exit 472B (this is the Lakeville interchange in southern Petaluma) and pick up some other members who want a ride, or get a ride for yourself. Take Route 37 most of the way. This has various names, beginning with Lakeville H'wy, which turns into Columbus Highway, and finally, Lake Hermann Drive. Once in Benicia, take a right on Industrial Way and look for the address, 4001 Industrial Way.

# SCWA May 2015 Meeting

by Walter Doll and Art Hofmann

Larry Stroud opened the meeting at 7 pm. After guest attendees stepped up to introduce themselves, Larry began the meeting by announcing a new lending library for members called the Guild Lending Library consisting of 19 DVDs including titles from David Marks' wood shows and Taunton Press. Any member wishing to borrow from this library can look at the available titles on our website, send an email to the Guild Chair, and it will be mailed to you for a two week loan. It operates much like Netflix, so you'll receive the DVD in the mail with a return mailer enclosed. This is a new benefit for members only.

The James Krenov Foundation in Ft. Bragg has announced a new award, the JK Award, to be presented to an artisan in our annual *Artistry in Wood* show. This will be a \$500 award for the piece that exemplifies the qualities that James Krenov valued: craftsmanship and reverence for the wood. A group from JKF will attend our show and judge the entries and announce the award.

New members who need advice about a specific project of theirs will soon be able contact members of the Guild by finding Guild members on our website, because these expert members will be highlighted on the web page. Guild members are willing to be taken out to lunch, for example and you'll have one-on-one time with them.

Michael Wallace announced to members the upcoming Maker's Fair in San Mateo, a lively event with all sort of vendors and exhibits, and exhibitionism.

Art Hofmann then introduced Mark Tindley, by saying that making a copy of a Stradivarius violin is an arduous task and not something that the average woodworker usually attempts in his spare time, yet that is precisely the instance here. The violin that we were going to see tonight was two years in the making. Mark worked on it in his spare time when he wasn't

earning a living as a cabinetmaker. He had the foresight to document the process and post pictures online, so that some of us could follow his progress. Now it is done, and it was our privilege this evening to enjoy the results, to not only see the instrument itself, but to hear it as well.

Mark began by showing us a slide of Greg Zahl's latest project, a part of a Jewish Temple somewhere on the Peninsula, a large light and airy room, the windows of which were decorated with an overlay of a branching tree. The furniture, a standing cabinet container for a Torah Cabinet (Greg's) and a table (Mark's) both bore inlay work of pomegranate fruit, which was of course, Greg's. We may be hearing about this project in the future.

Mark told us that this was the first violin he attempted. He usually makes furniture and cabinets. However, he has played the instrument since he was a child. This is a copy of an original made in 1721. Others have made replicas of these violins, reproducing even the defects. Mark copied the dimensions and curvature, but emphasized that there are others who copy the violin in every detail, even the pitting and wear marks. Nevertheless, it's basically the same process. Stradivarius made about eleven hundred strung instruments: violins, violas, cellos, and even guitars. Almost every Strad you'll see today has had the neck removed, saving the scroll and then rebuilt with a longer neck to accommodate tonal changes in modern orchestras!

Mark started with a drawing of all the exact measurements of this 1721 violin, all the sizes, thicknesses, *f*-hole shapes, curves and elevations. Hundreds of dimensions are involved in order to make a copy. You can travel to Cremona and see all the original tooling and molds Stradivarius used in his shop.

Mark identified all the parts and nomenclature. He used Engelmann spruce for the top plate, and maple for



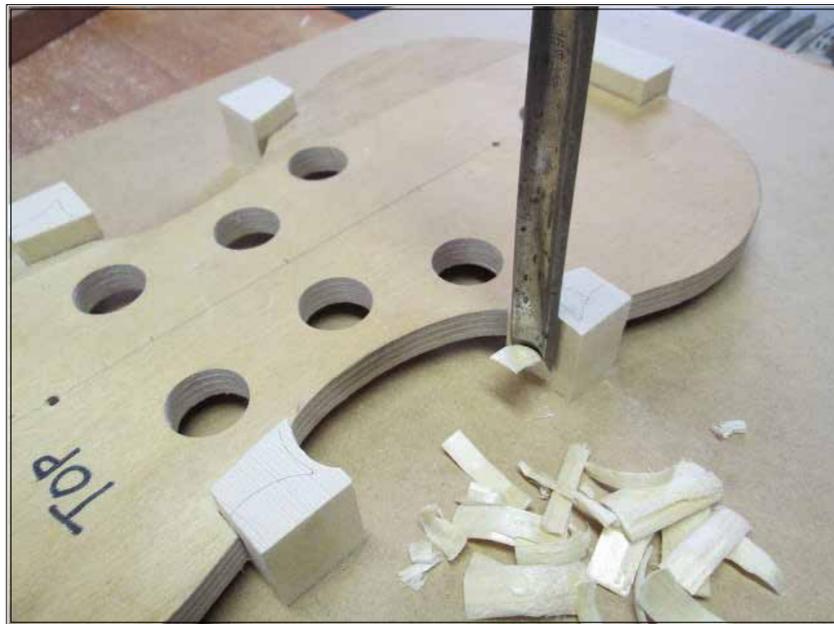
the back plate. The fingerboard is ebony; the tailpiece, pegs and chin rest are made of rosewood. The entire violin shape in its rib form is called the garland.

The first step is to make the mold. He bought thin plywood and glued a paper copy of the plate on it and cut and smoothed the curves on a spindle sander to form a template. Then he drilled two reference holes top and bottom for exact alignments going forward with the process. Mark used this to create another larger template, then the difference between the two is the overhang that houses the curved rib that encircles the garland. The 1/8" alignment holes keep both templates aligned.

Next, Mark glued support blocks around the garland to support the rib placement. He glued them in with hide glue, which he used throughout because it is reversible;

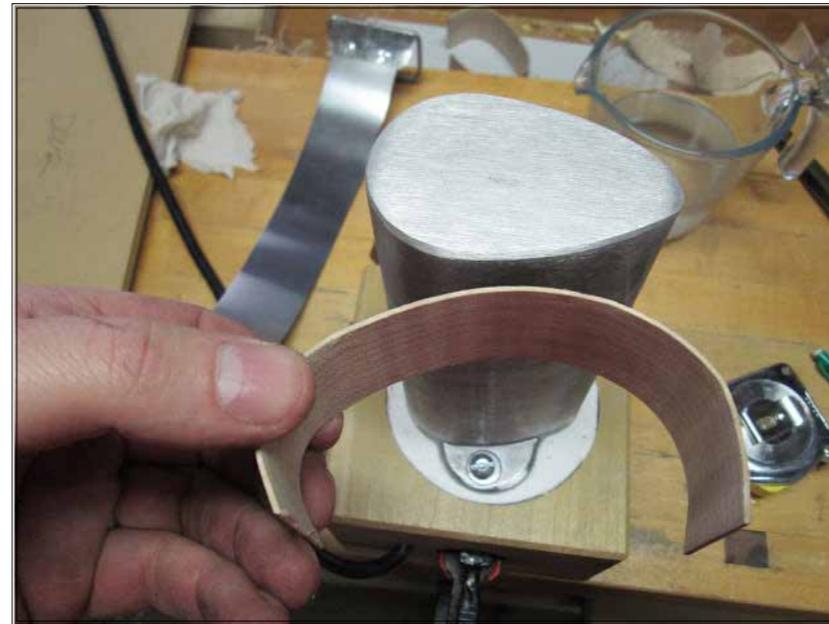
it is possible to break the joint and change alignments. You can also adjust water content to make it weaker or stronger, depending on the desired open time and the strength of the bond needed. Further down the road of a violin's life it will need repairs, because of the various cross grain wood directions and the resulting cracks. By using hide glue, it may be taken apart with moist heat and repaired over and over through the years. Furthermore, you can easily peel off the squeeze out of hide glue without affecting the subsequent finish.

Mark then put the larger template on top of the blocks and used it to guide the carving of the blocks to the shape of the rib. When carving, he used an incannel gouge and then went to the spindle sander to fair the curves. These finished blocks will support the thin, spindly rib. You are generally working to a tolerance of a tenth of a millimeter, or for us non-metric people, four thousandths of an inch.



An important issue for the violin maker to constantly consider is reducing mass and weight wherever possible, to make the instrument comfortable to play for long periods. So Mark scraped the thin ribs to a thickness that you can almost see through. It's a balancing act between the instrument strength and sound quality. He used digital calipers to measure his progress with the scraper plane. Once the ribs were

created, he used a metal bending strap with a wet cloth against the rib, forming the desired curve around a heated bending iron. The moist wood is needed for the sharp curves in the center of the instrument. The larger curves at the top and bottom require only dry heat. The sharp curves are concaved around "C-Bouts."



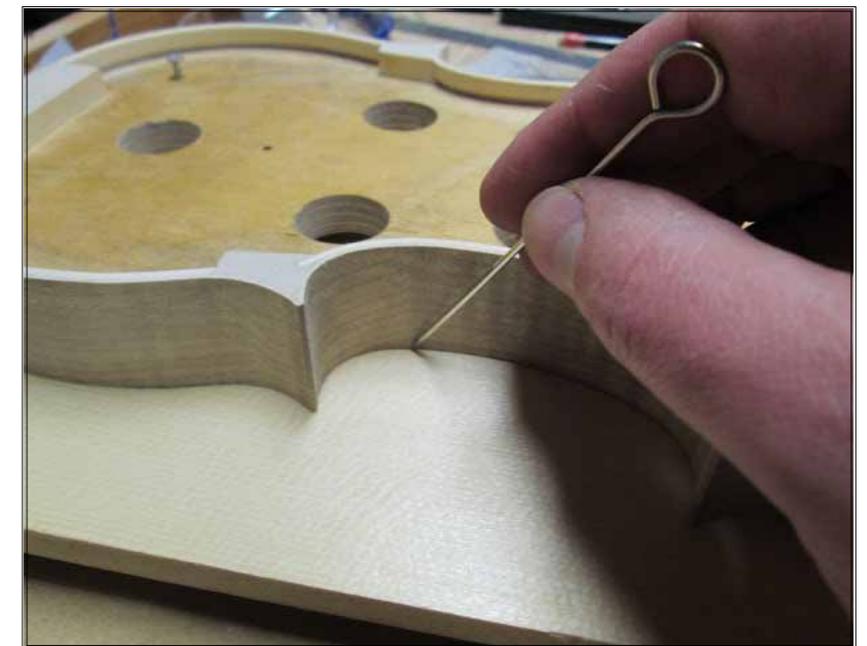
Mark prepared and bent only four strips: the two outside curves, and the small sections for the C-Bouts. (Yes, he made extra ribs just in case). Next step was to glue the ribs into place, starting with the two C-Bouts. Hide glue, as previously mentioned, allows for re-gluing if something goes awry. Mark experimented with different concentrations of glue in order to have enough open time. Full strength, the glue set up in a few seconds, so he diluted the glue. Once in place, he trimmed the rib level with the tops of the alignment blocks. He used cauls padded with pieces of an old belt to clamp the ribs.

The next step is to fabricate curved linings to attach to the ribs in order to provide adequate glue surface for the top plate to adhere to. Obviously the 1mm thick ribs are not going to provide much gluing surface. So Mark makes these linings out of spruce and bends them on the bending iron. When he's satisfied with the fit, he glues them to the ribs and clamps them with small clamps made out of clothes-pins, lots of

them with rubber bands around them to tighten their grip. After the glue sets up he uses a knife to undercut the linings in order to save weight in the finished instrument. Then he planes the ribs and linings level with the corner blocks.

Mark showed a chisel technique that he uses a lot in his furniture making life. He polishes the back of the chisel to an amazingly reflective surface and as he brings the chisel up to the angle he needs, he can get instant feedback by looking at this reflection instead of slowing down to measure the angle with another tool.

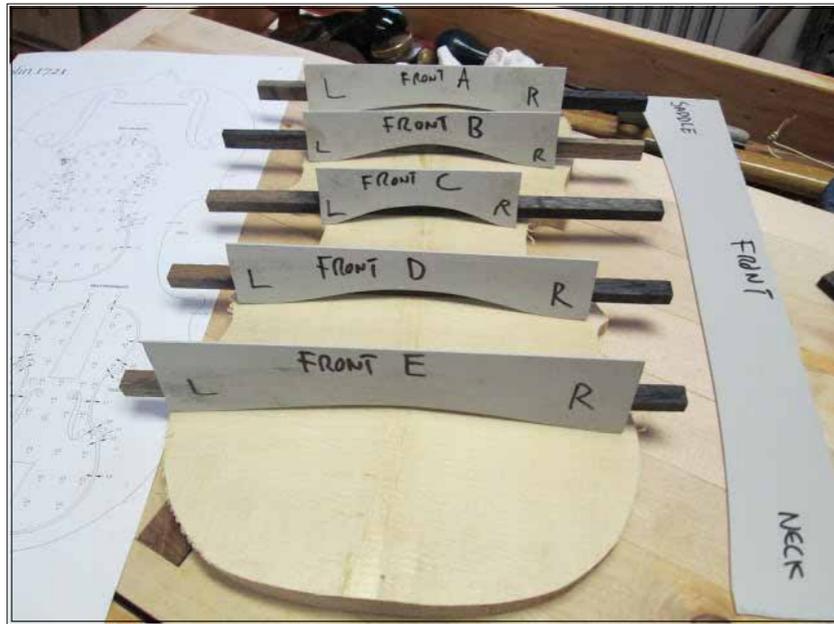
Next comes the fabrication of the top plate, made of air-dried Engelmann spruce, and the back plate, made of flame maple. He book matched the wood, planed the joining surfaces, and carefully glued them up. Preceding the glue up he heats the wood glue surfaces with a hair dryer to assure optimal glue line strength.



Here again the original template and the 1/8" registration pins come into play. Those old violin makers drilled right through the plates and then carefully plugged the holes before finishing. So he uses these templates to make the plates, scribing with an upholsterer's pin to mark the outside line of the plate. Mark likes to use an upholsterer's pin to scribe lines

for fine joinery. Then Mark scribes again, but using a washer and a pencil, spinning along and creating the outside line to cut to.

Now Mark turned his attention to carving the interior surfaces of the plate, by making cardboard templates of the elevations given by his Stradivarius literature. The cross section templates guide the removal of wood in two dimensions: across the plates, and top to bottom. Mark ended up with a massive number of templates to guide the critical task of carving the two plates, which are different from each other.



Patiently removing material where the template touches, he eventually gets a perfect fit across the entire template. Very tedious. These are actually still blanks, they have not yet been cut out and sanded to the final shapes. Almost all of the carving is done with a razor sharp gouge, then he turns to a rasp. His favorite rasp is a French one made by Auriou. The random stitching of the teeth on these gouges prevents a gruesome scratch that gives your typical rasp a bad reputation for fine work. Following that he uses various small scrapers, some handmade, to further refine the wood surface. Next, Mark worked on the purfling design around the top edge of the top plate. He starts by brushing glue sizing on the spruce to make the soft wood crisper and easier to create the purfling channel. This purfling

consists of three strips of wood, two of dyed pear wood and a center strip of poplar. It is about 3 mm thick and forms the decorative double black line around the top plate of the violin.



To make the black purfling he uses thinly sliced pear wood, first bleached in a solution of lye to cleanse the wood prior to dyeing. After letting it sit overnight, he then puts the wood strips into a solution of water and logwood, turning the wood a dark purple, and lets that sit overnight. Next he pours off the logwood water and replaces it with a solution of ferrous sulfate and water, bringing the wood strips to a boil, then lets that sit for a few days. The finished product is deep black and ready to use. He now has strips of .6mm white poplar and black pear that he hammer veneers into a sandwich ready to be cut into 2mm strips. These delicate strips are marked out with a gauge and then cut by hand with a Japanese marking knife. He ends up with a pile of purfling strips to work with, enough for 2 or 3 violins or lots of mistakes.

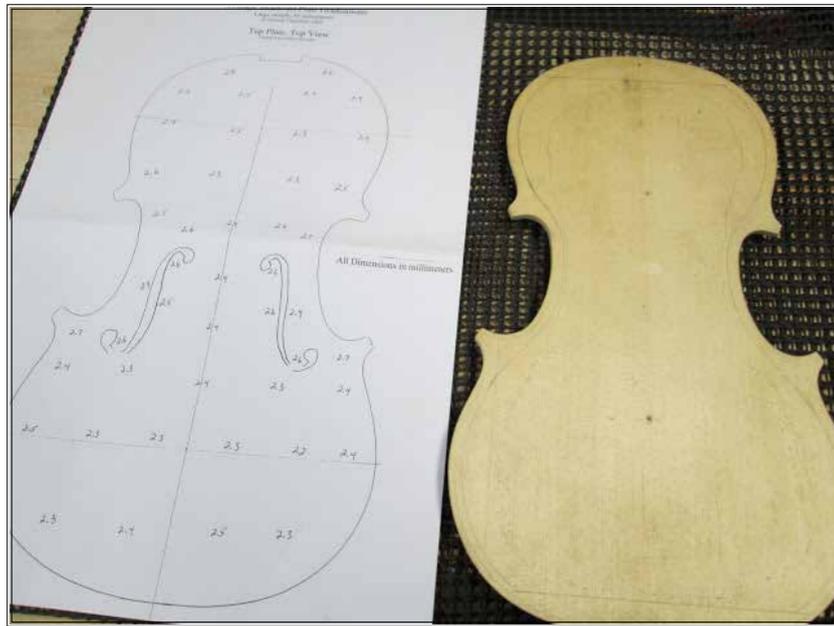
At this point with the exterior rim of the top formed, it is necessary while there is still some 'meat' in the top, to insert the purfling, for which purpose Mark purchased a specialist purfling tool from a supplier. Junk! This tool needed heavy modification, since it

did not come close to performing its purpose. (As Jim Budlong, the COR teacher says, Every new tool is a kit.) Mark re-ground the knives, and reformed the fence, and then marked out the outlines for the purfling. Next came the painstaking and risky procedure of cutting the channel for the purfling itself, which he accomplished with another specialist tool, that once again needed extensive modifying.

Then came a shaping process of making the grooves in the purfling area, i.e. cutting away some of it. This is accomplished by drawing a pencil line at precisely the points you want the groove to deepen, both sides of it. Then comes some dicey stuff! The groove itself is accomplished with very sharp gouges, and with proper concentration. You go around the violin top twice, and of course finish up with scrapers. Mark says that this raised edge is way more pronounced on the instruments of skilled makers, but he was fearful of bottoming out of purfling.



Next came a process of measuring for consistent thickness all around the top, and here his choice was to buy or make a kind of deep reaching caliper. Mark opted to make one of plywood and a dial indicator and a sharpened dowel. Checking constantly, he found he was out a bit here and there, a thousandth or so, which he addressed with a scraper.



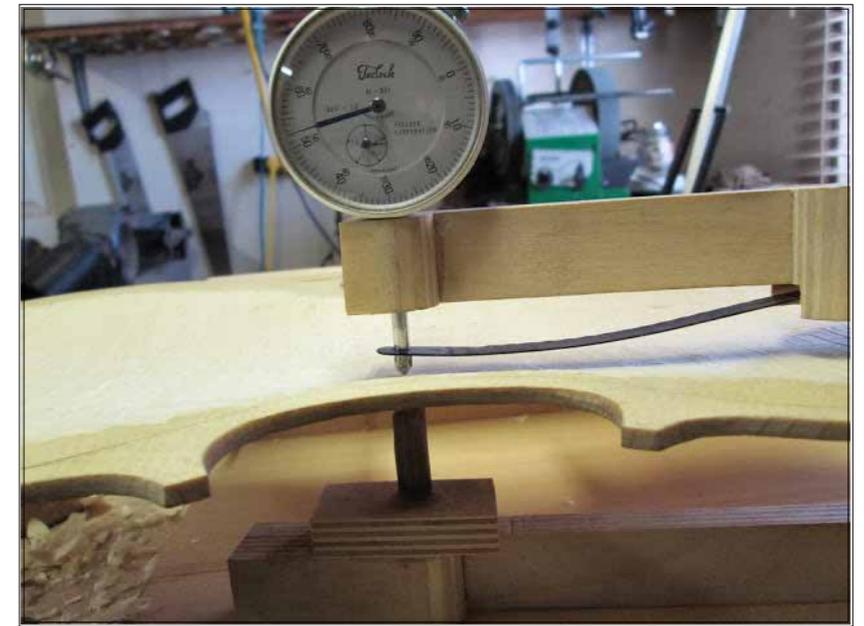
Then the inside of the bottom had to be hollowed out. First you mark out the *f*-holes, for a complex set of reasons, but basically so that the final thicknesses remain correct. Hollowing the inside of the top was next. Mark bought a chart showing the average thickness measurements of a survey of 40+ Stradivarius violin tops. Turns out they are quite thin, almost inconceivably thin, between 2.2 mm and 2.9 mm thick (less than 3/32" to a bit under an 1/8"). This proved helpful. The rim part of the underside that is going to be glued to the sides has to be marked, so that the maker knows to leave it be. Mark made a holding



device for the top, which he copied from the literature, so that when it was it addressed with the carving tools, especially at first, it wouldn't skip away. At first you take aggressive cuts, and work away at it. How do you know when to stop? Here, Stradivarius used a graduation punch, which Mark copied, that employs a coupling nut with a little bit of leather glued on it. It is kind of a punch that makes a mark when it comes down on something, and of course it is quite adjustable. It features a very sharp point and you carve and punch until the indentation gets smaller and smaller and finally disappears. Light shines through the plate, it is so thin. Ultimately, carving with gouges and planing with ever smaller thumb planes gets you to the 3 mm thickness that you need. The graduation punch is amazingly accurate. You wind up with something that is quite bright if held to the light, but not consistent in thickness, because you want the sound of a Strad, and it is the top plate, more than any other part that gives you that sound. If you get the graduations right, it is going to sound alright, and that is the name of the game.

The next issue was the *f*-holes, which was approached via holes that had to be drilled into the now precious top piece, not without trepidation, since it represented a lot of work at this point. Mark turned to his radial arm drill fitted with an expensive brad point drill bit. He advanced these with a scroll saw, but way wide of the lines, not feeling very confident about his use of that tool. For his final cuts, he relied on his Japanese knife.

Mark next described the process of back plate hollowing. A section in the middle is thicker, about 4 mm. This piece supports the sound bar and adds to the overall heft of the instrument. Mark used a toothed plane blade for the first time. Toothed planes have serrations in the blade which are excellent for removing highly figured wood. Blades are sharpened exactly the same as normal blades. The result looks like a mess but can easily be cleaned up with scrapers.

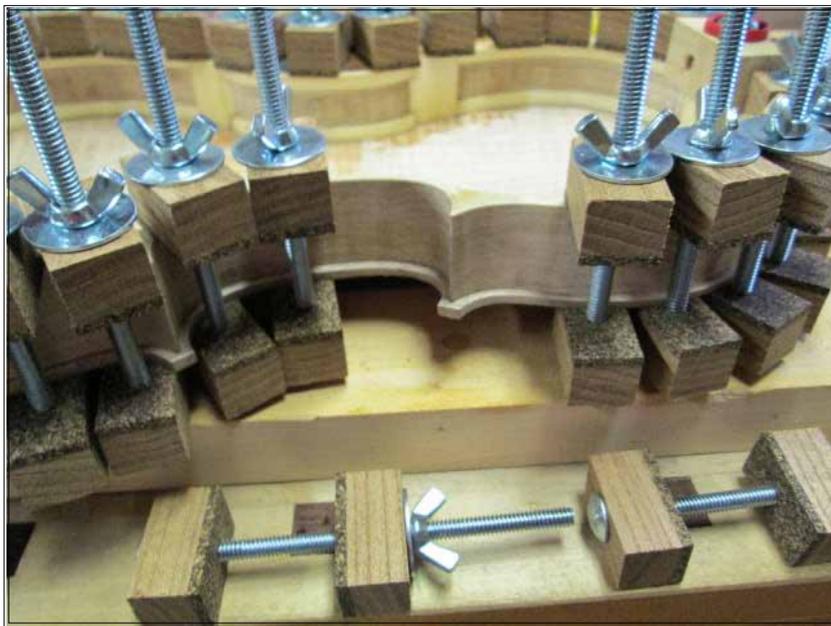


A bass bar has to be fitted very precisely to the bottom and glued. This calls for some extreme scribing. The wood for the bar, a piece of spruce, runs lengthwise down the instrument. The grain, of course, must be perfectly straight, and should probably be a split piece rather than sawn. You are not gluing to a flat surface, but a compound curve. This calls for scribing using a washer. Only when the lines are exact, does he knife away at it until he gets an approximate fit. Then comes the work of applying chalk along the length and fitting and re-fitting, a job that requires putting the bar in place over and over again. To assure that he is getting it in precisely the right spot, he glues in some



redwood temporary blocks with paper joints, which come out later. Chalk is applied to the bar and it is fit, until nothing but chalk is visible. This takes ages. At a certain point the whole thing touches, and he takes off the chalk, and glues the bar. The bar follows the line of the G-String. Mark then tailor-made some clamps of plywood with cork glued to them that had a deep enough reach to glue the bass bar to the bottom. The bar must then be worked to the necessary shape, which is dictated largely by tradition. The top plate is now stiffened, so that the violin can stand the pressure of the strings and bridge, and transmit low frequency vibrations from the strings to the body of the instrument.

Now he had to get the violin out of the mold, using a very fine knife and a hammer, an hour which he found incredibly stressful. Modern makers have molds that are in parts, and can be taken off in pieces.



Then it was time to assemble the parts on hand. Mark made his own clamps for gluing the violin together. First it is assembled “dry.” The violin is essentially held together by the clamps. A couple of clamps are then removed, glue worked into that portion of the joint with a palette knife, and the clamps replaced. The sequence is repeated all the way around the body. It is not possible to glue the whole at once, obviously,

because the glue would set before you got very far. The room has to be warm for this operation; the glue is hot of course, as is the palette knife, and the violin-to-be is warmed through as well.



Next Mark made the tapered hole for the end pin with a tapered reamer, and afterwards addressed the neck. Mark made the neck of maple, which began with a block and a template. A series of holes are drilled to mark the scroll. You plane the surface that the fingerboard is eventually glued to with a block plane, remembering that you need a perfect glue surface. The scroll isn't all that difficult to make. It has been cut as close to the line as possible, on a band saw, and then addressed with a knife to create a chamfer, and knifed to the chamfer line. Templates are employed, the fish tail template wraps around the block, a peg box template, too. You have to adhere to a perfect center line; it must be perfectly symmetrical. You mark it out as perfectly as possible and then make a lot of cuts with a handsaw and take out chunks methodically. A series of holes has been drilled delineating the course of the spiral, and you cut with the saw - not too deep - accordingly.

Then you work from the top, cutting with a chisel. The second turn then had to be marked out, and you rough

out the scroll. Then you turn to gouges, and eventually you get into the ‘eye.’ Four or five different gouges - ever narrower - are necessary until the scroll emerges, which at first looks flat. Further refinement is necessary to get the grooved shape at this point. This is hellishly hard, but satisfying when you get to that point.

Now comes chiseling out the peg box. The end of the peg block goes down at certain angle, for which Mark uses a technique familiar from furniture making. He cuts a block at the defined angle, clamps it to the work, and runs the chisel down it.

Then comes making the radius for the ebony fingerboard, which is an exact 42 mm. If you ever want a radius it is wise to draw the whole circle first and assure yourself of the exact dimension. The fingerboard is of ebony, gorgeous stuff, which Mark assures us, is also very cheap. (Universal laughter here.) It cost \$150 a board foot. To achieve the fingerboard, it must



be marked out very carefully with a marking gauge and knife lines, and then rubbed with chalk, which leaves a visible line after the excess is removed. This is a practice Mark recommends for all dark woods. The tapers for the fingerboard were done on the sliding table saw held in place with a Fritz-and-Franz jig (YouTube). The length of the fingerboard is done with a block plane, measuring it constantly with a template for high spots. The fingerboard now must be glued, but

must be tailored first to the instrument. When Mark makes furniture, he keeps the cut-off piece from angled cuts to use as a reference for all sorts of other work. Here he employs it on a shooting board to square the end off perfectly. He tests it with a bevel gauge. Fitting the neck to the body requires extensive operation to achieve the glue joint, and involves cutting into the body at precisely the right place, right through the purfling. After its final position is determined, it is affixed with temporary redwood blocks held in with super-glue, to be removed later. After the fingerboard is glued, the nut is then fitted. This has to be the right distance from the top, as it locates and supports the strings at the correct height over the fingerboard. This is marked out with a compass, and is taken down to the right height and relationship to the body of the instrument. After fitting the neck, the button at the bottom is marked out and carved with knives.

Now comes the step of getting the instrument clean, and bringing it to the stage known as “in the white,” a violin before the finishing process. The violin at this point has to go on vacation; it is set out to sunbathe in a dust bin – known in American English as a trash can – with a rig of UV lamps, obtainable at Wal-Mart. Spruce in particular is amenable to such treatment. Mark showed slides of treated spruce and untreated spruce that had been laying around in his shop, but not exposed to intense UV light; the treated wood looked much darker.



On to the pegs. Mark lays no claims to being a great wood turner. He made a template of aluminum for a copying jig, the half profile of the peg, and cut them very quickly from rosewood. This enabled him to turn six identical pegs. The pegs are indented for the fingers to grab them, which Mark formed on his spindle sander. Mark made his own tapering tool, rather than buy one for \$200, by reaming a block of maple with the same tool he used to make the peg holes, which he fitted with a plane blade to come up with a something like a pencil sharpener. This worked out well.



Moving to the other end of the instrument, Mark made the tailpiece from Honduran rosewood. He screwed it to a waste block to facilitate the work, another tried and true technique he uses when working with small pieces. He used the purfling chisel to cut grooves for the strings, then sawed slots with an improvised saw he made from junior hacksaw blades and a rudimentary handle. He then cut the 4mm holes on his drill press, changing the angle for each one, since the each of the holes had to be perpendicular to the rounded tailpiece. The tailpiece involved several more complex operations to bring it to completion (details on Picasso).

Chin rest: Again, Mark turned to Honduran rosewood, this time a block of the stuff, which he cut on the



bandsaw. The shape curves to fit the violin and also makes a slight cup for the chin on the other side. He taped the offcuts back to the original block, something like making a cabriolet leg on a piece of furniture, in order to approach the complex shape. He then shaped the chin rest with chisels, gouges and scrapers, before fitting it with a metal adjuster, which he purchased. Looking over the assortment of fittings on the bench occasioned a moment of pride. Pretty damn cool!

Then came the finish. Mark began with several coats of shellac. He brewed his own, beginning with flakes and dissolving them in denatured alcohol and waiting for several days. This he applied in a careful way, making sure that each stroke began and ended on the top or bottom plate, so as not to make a gummy mess running down the ribs. The figure of the maple back began to emerge with the first coat. In between coats, the violin went back into the dustbin to speed up drying. Mark applied a varnish from a violin company, which worked out well for the first clear coats, but turned out to be an error for color coats, probably due to a bad batch. This had to be stripped very cautiously with a superfine Scotchbrite pad and denatured alcohol. He then ground his own varnish with some color, and after testing, applied this, waiting a day between coats, finishing with clear varnish, leveling this with superfine sandpaper and detergent until he was satisfied.



There was a round of applause for Mark at the end, of course. This was a different sort of project, one that demanded enormous skill and perseverance. It was highly unusual, in that violin making is a specialist skill that requires the maker to spend long years in school and training. That a furniture maker should attempt one is not typical. Mark's élan for the whole evening carried his listeners along. En route, he gave us many woodworking tips, too. And it was all very inspiring. He wound up the evening with an English air, *Margaret's Waltz*, that he learned from the Shetland fiddler, Aly Bain. An even bigger round of applause brought the evening to an end.

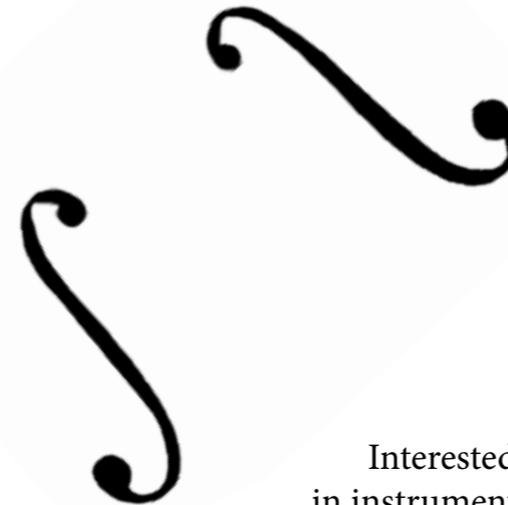
The next step called for fitting the saddle, an ebony piece, to the body of the violin; after making this piece, it had to be fitted leaving slight gaps, which Mark filled with black wax. Had the fit been exact, seasonal movement of the spruce top plate would eventually lead to a crack. Then came the fitting of the pegs. Holes had already been drilled for these, which needed reaming to precise measurements. The pegs, now with a hole, their ends properly domed, were inserted. Mark turned to a purchased blank for the bridge, though he vows to one day make his own. Still, the blank had to be fitted to the instrument, and he originally made it way too high, so it had to come down some. The sound post, split from a short length of spruce was turned, and carefully pared to fit, and then inserted with a specialized tool. Then the violin was finished and he could assemble it, which he happily did.



Should you want to follow the progress of the violin in pictures, you can do so at:

<http://tinyurl.com/MarksViolin>

Photos used in this article are by Mark Tindley & Jose Cuervo



Interested in instrument making? Be sure to check out the following in the Wood Forum Archives:

<http://tinyurl.com/Del-Tredici>

<http://tinyurl.com/Ribbecke>





*Garde-bijoux* by Kent Odell



*Michael's Printer Table* by Kai Herd



*Two Doors, Two Drawers, Two Owls*  
by Anthony Leighton



*Danny & Gabe's Stools* by Joe Scannell



*Stacking Tables* by John Sheridan



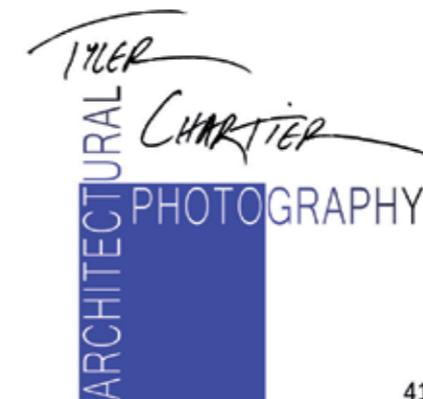
*Sunshine* by Les Cizek



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*Wood Forum* is the monthly newsletter of the Sonoma County Woodworkers Association. Please feel free to submit articles and photographs for inclusion in the publication. You can send your submissions to the Wood Forum Editor at [SCWAEditor@gmail.com](mailto:SCWAEditor@gmail.com). Advertisements are also accepted with a per-entry cost of \$5 per column inch.

## Membership Application

I would like to join the SCWA to meet other people interested in the craft, the art and the business of fine woodworking. Enclosed is my check in the amount of \$35 for the annual dues. I understand that this fee entitles me to attend monthly meetings and to receive the Wood Forum newsletter by email or via the SCWA's website.

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Please send check and completed application to:

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