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Building a Ganassi Viol

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Abstract
Comments and step by step description of the process and method of building a Renaissance viol after Silvestro Ganassi.

Introduction
Before being invited to participate in this project, I had spent many years building viols modelled on 17th and 18th century English and French originals and Italian-inspired medieval fiddles, based chiefly on iconography, but I had barely touched on Renaissance viols. I was planning to build a Renaissance viol combining iconography and my experience in medieval fiddle construction – I wanted to move forward from the medieval, rather than backward from the baroque, but hadn't found the time or the occasion. Happily, Thilo Hirsch made the perfect offer with this "Ganassi project". Here are a couple of examples of my earlier work that were of use to me in working on the Ganassi viol:

I built a viol based on the ones – there are two – in the Bologna altarpiece painted by Lorenzo Costa in 1497, with the following characteristics:

- low ribs, cut out rather than bent, with concave curve
- carved top, thicker down the middle and on the bass side, but not on a diagonal
- back slightly arched
- no bracing
- body of walnut (it could be another wood)
- through neck

ill. 1: Lorenzo Costa, Enthroned Madonna and Child, 1497 (detail), Bologna, San Giovanni in Monte, photo: J. Kraft.

ill. 2: Renaissance viol after Lorenzo Costa by J. Kraft, photo: J. Kraft

On my medieval fiddles, the top is flat on the outside, but thicker down the center along the entire length inside. This provides a way to reinforce the front in bending it onto the ribs, as we have done with the Ganassi.

With this approach to early viol-making, it was very interesting to take the process quite a few steps further along in building this Ganassi model. Here is a step-by-step description of that process.

PREPARATION

My initial approach was to study the technical drawing and the 3D model, and to make note of Stephan Schürch's observations in building the prototype. I very quickly looked into the choice of wood:

Front: I selected the kind of spruce that I always use for a carved front: light and strong, from the French Jura near Switzerland, and well seasoned, of course. I chose to do a carved front in order to have more control over the height of the arching: because of the considerable thickness, it would have been very difficult to bend. In any case, the inside thicknesses, ranging from 7-3.5mm would necessarily be carved, even with a bent front.

Ribs: I chose maple from a supply that I have had since 1980 (when it was already ten years old), selecting pieces that were lightly flamed in order to avoid cracking

while bending such thick wood along sharp curves. Because of the unusual thickness, I had to cut the ribs from viol backs – all my pre-cut rib wood was too thin.

Back: I chose the back to match the ribs.

Neck: The neck, like the ribs and the back, is not highly flamed. Because of the very wide scroll, I didn't think I would be able to use one of my seasoned viol necks. But when I approached my wood supplier (Bernard Michaud at Bois de Lutherie) about getting a larger piece, he suggested simply adding pieces to widen the scroll. I followed his advice.

Pegs and endpin: I no longer do lathe work, so I had to order them.

Purfling: The purfling is plum, hand drawn.
I set the wood aside and proceeded to make templates: one for the outside shape, one for the lengthwise arching, and four for the widthwise archings. I did not make templates for the neck or the scroll, relying instead on a drawing on tracing paper.

FRONT
Once the two halves of the front were glued and cut to shape, the edge was traced to 4mm with a marking gauge. The front was shaped with a gouge, a plane and finally, a scraper.

ill. 3: shaping the front, photo: N. P. Stefanovitch

ill. 4: front with arching template, photo: N. P. Stefanovitch

Next, I transferred the thickness mapping to the inside of the front, using tracing paper and carbon paper. Where we were given leeway to change the thickness near the treble bridge foot, I made it thicker under that foot. Using a drill press, I marked the mapped-out thicknesses and then proceeded to gouge them out.

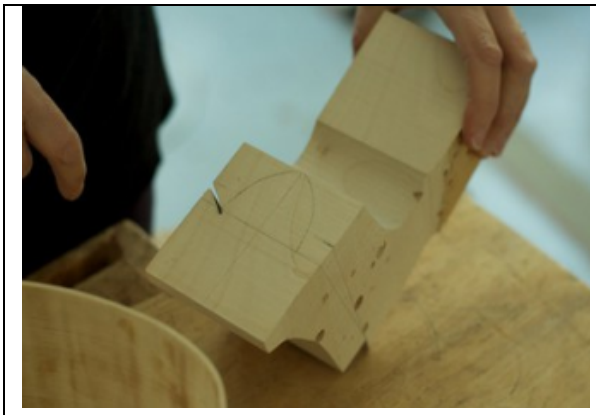
ill. 5: front inside with the mapped-out thicknesses, photo: Nemo Perier Stefanovitch

RIB AND BACK PREPARATION

On later viols, I build without a mold, gluing the ribs and blocks together upside down on a board to ensure that the front will match the original tracing. For the Ganassi, I chose to build the body from the back, without a mold. I reasoned that with ribs so thick, there was little chance of deformation between the front and the back. In addition, the curved back, the variable height of the ribs in the lower bouts, and the through-neck would have made it very difficult to control the neck angle (and bridge height) – a critical aspect of the instrument. I should point out here that when building my own viols I am not averse to trying different neck angles, but in this instance I wanted to limit the uncertainty and follow the drawing as closely as possible.

NECK PREPARATION

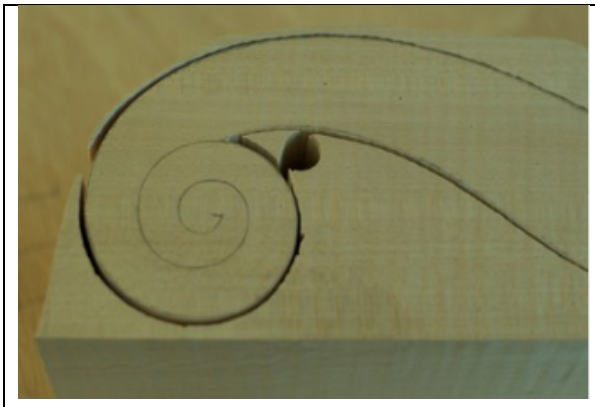
After hearing Stephan Schürch describe his problem with inserting the ribs into the neck block at the proper angle, I took the precaution of making a fake neck block for a trial run. It worked perfectly, so I was able to proceed with confidence, very thankful that I could benefit from another luthier's experience.



ill. 6: fake neck block, photo: N. P. Stefanovitch

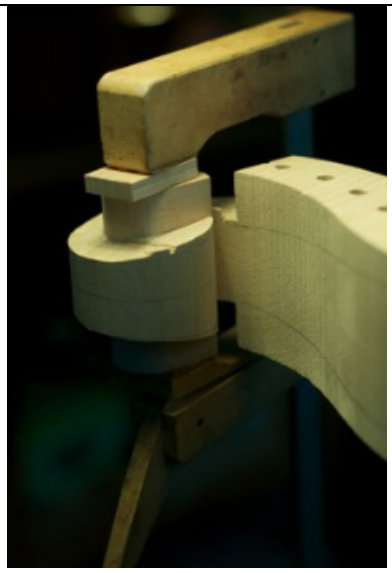
ill. 7: neck block with tracing paper, photo: N. P. Stefanovitch

Using my tracing paper neck outline, I drew the shape onto the neck block with carbon paper and cut it out. I used the same tracing paper/carbon paper technique for each side of the scroll. I could then carve the scroll using the same method as for a violin, except that I had to glue on ears to make the scroll wide enough. I used a double bass makers' technique of cutting pieces from the part of the pegbox next to the scroll, which enabled me to match the wood.



ill. 8: scroll outline, photo: N. P. Stefanovitch

ill. 9: saw cuts for the scroll, photo: N. P. Stefanovitch



ill. 10: ears glued on the scroll, photo: N. P. Stefanovitch

ill. 11: carving the scroll, photo: N. P. Stefanovitch

ill. 12: drilling the pegbox, photo: N. P. Stefanovitch

ill. 13: scroll and pegbox, photo: N. P. Stefanovitch

Once the scroll was finished, I traced the rib slots and cut them with a large-set handsaw. The slots required supplementary filing in order to fully insert the thick ribs.

ill. 14: sawing the rib slots, photo: N. P. Stefanovitch

ill. 15: filing the rib slots, photo: N. P. Stefanovitch

I then copied the curve of the heel foot from the drawing onto tracing paper and transferred it onto the neck block.

ill. 16: shaping the curve of the heel foot of the neck, photo: N. P. Stefanovitch

BACK

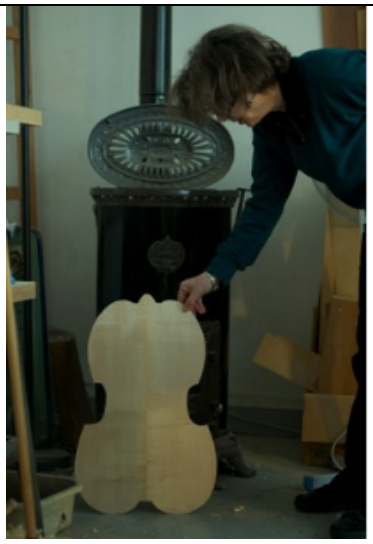
Once the back was jointed and thicknessed, I tried curving it by force, as we were asked to do. But I felt uncomfortable about applying that much pressure to the back and was afraid that I would lose control over the neck angle. So I decided instead to heat-shape the back.

ill. 17: bending the back by force, photo: N. P. Stefanovitch

ill. 18: heat-bending the back, photo: N. P. Stefanovitch

However, after a few minutes on the bending iron, the back began to curve inward laterally. I was concerned that this would be a problem for the stability of the instrument, but when I tried to straighten it out, the center joint opened up. At this point, rather than force the joint closed with the risk of having it crack open again, I decided to unglue and redo the entire joint. (Fortunately, there was enough extra width to allow this.) The result was quite satisfactory: the back retained its lengthwise curve while remaining perfectly flat crosswise.

Just prior to gluing in the bracing, I heat-shrunk the back by placing it in front of a hot stove. This created a slight outward curve (on the outside), matched by a curve in the bracing. These curves had to be minimal in order to keep the ribs, once glued, from leaning in.



ill. 19: shrinking the back by placing it in front of a hot stove, photo: N. P. Stefanovitch

ill. 20: gluing the back ribs, photo: N. P. Stefanovitch

GLUING STRUCTURE

To ensure an accurate neck angle and alignment, I borrowed a simple technique that I use in fiddle making. I built a base composed of a 12 mm plywood board that followed the contour of the back, nailed to another narrower 15 mm board running the full length of the viol. I traced a central line lengthwise: to be used as a reference for alignment. I then glued a wedge to the upper part of the back-shaped board and planed it to match the back curve. This would provide support for the gluing of the back to the neck block and later to the ribs. I attached the back to this board with small nails along the edge (outside, not through, the back), carefully aligning it with the center line at both ends. Once the back was in place, I glued the bottom block with a single clamp.

ill. 21: gluing structure with the back attached, photo: N. P. Stefanovitch

ill. 22: gluing the bottom block to the back, photo: N. P. Stefanovitch

NECK GLUING

After adjusting the ribs in the neck slots, I was able to remove the surplus wood on the outside of the slot to shape the heel – this would have been very difficult to do after gluing in the ribs. In any case, the ribs adhered well to the neck block without the pressure of the outer part of the heel – it wouldn't be necessary, as I might have feared, to clamp them.

ill. 23/24: shaping the neck, photo: N. P. Stefanovitch

Next, the neck was glued to the back, using the center line of the board for lateral alignment (at the bottom, the heel and the scroll) and a square to control it. I placed a wedge under the scroll to ensure the proper neck angle and controlled the neck projection at the bottom block.

ill. 25: gluing the neck, photo: N. P. Stefanovitch

RIBS

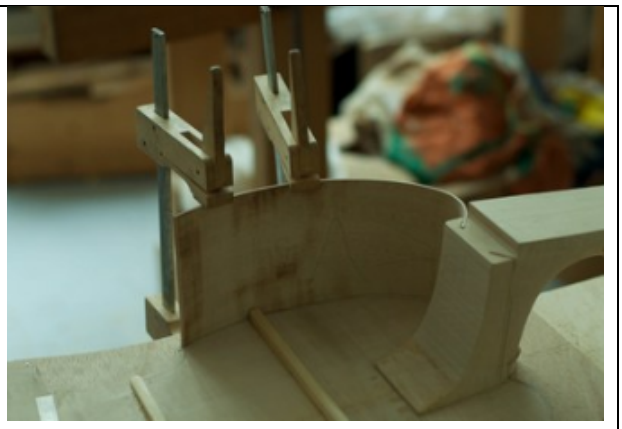
I planed the ribs slightly thinner (2.3 mm) at the top and bottom, where they are reinforced by the sharp curve and glued to – or into – the end blocks. I left the c-bouts at full thickness (2.8 mm). This may not have been necessary, but it seemed reasonable in the absence of a sound post. (This decision was more intuitive than logical, therefore more difficult to explain.) Using a template, I traced the outer perimeter of the ribs on a board and bent the ribs according to this tracing.

ill. 26: bending ribs, photo: N. P. Stefanovitch

ill. 27: bent ribs, photo: N. P. Stefanovitch

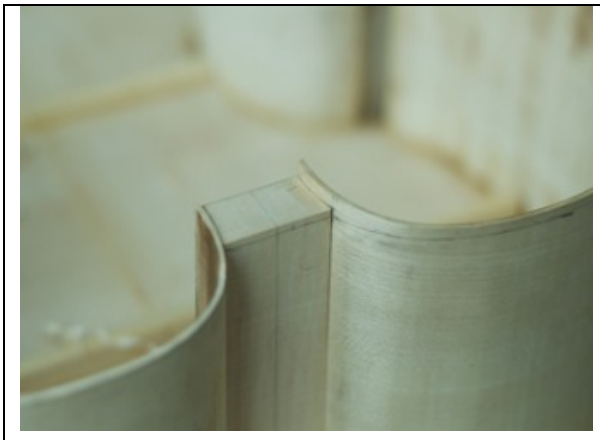
The top ribs were inserted into the neck block and cut and adjusted to the back curve. They were then cut to length at right angles and beveled, as were the other ribs. The top ribs could then be glued into the neck block and onto the back.

ill. 28: top ribs inserted into the neck block, photo: N. P. Stefanovitch



ill. 29: top rib glued into the neck block and to the back, photo: N. P. Stefanovitch

The c-ribs were glued to the back and to the upper ribs. The corners were held together with adhesive tape while the linen corner reinforcements were glued in and until they dried. The lower ribs were glued to the c's, the bottom block and the back. I controlled the verticality with a square.



ill. 30: lower ribs glued to the bottom block,
photo: N. P. Stefanovitch

ill. 31: gluing the ribs to the back,
photo: N. P. Stefanovitch

CLOSING THE BOX

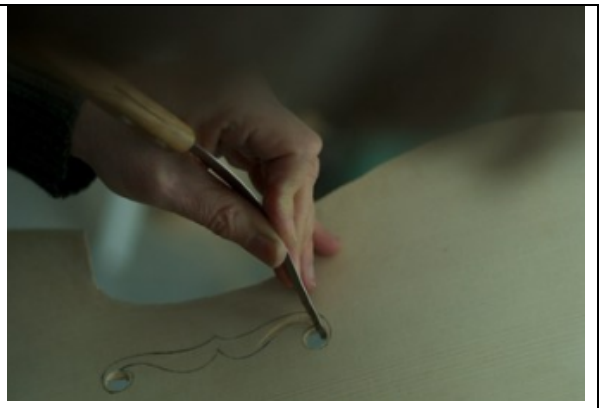
Once all the joints and linen reinforcements were dry, I removed the body and neck from the board and clamped the front into position, inserting 4mm dowels through to the top and bottom blocks to keep it in place. I once again controlled the height of the neck projection at the bridge.

ill. 32: neck projection at the bridge,
photo: N. P. Stefanovitch

ill. 33: linen strips for the reinforcements,
photo: N. P. Stefanovitch

The contour was not perfect, so I wedged temporary braces against the inside of the ribs to correct this. I had attached strings to them for easy removal through the sound holes once the front was glued. One of the braces was collapsible. (I performed a trial run to make sure they could all be removed!) I made sure that atmospheric conditions were dry for gluing the front.

ill. 34: temporary braces,
photo: N. P. Stefanovitch



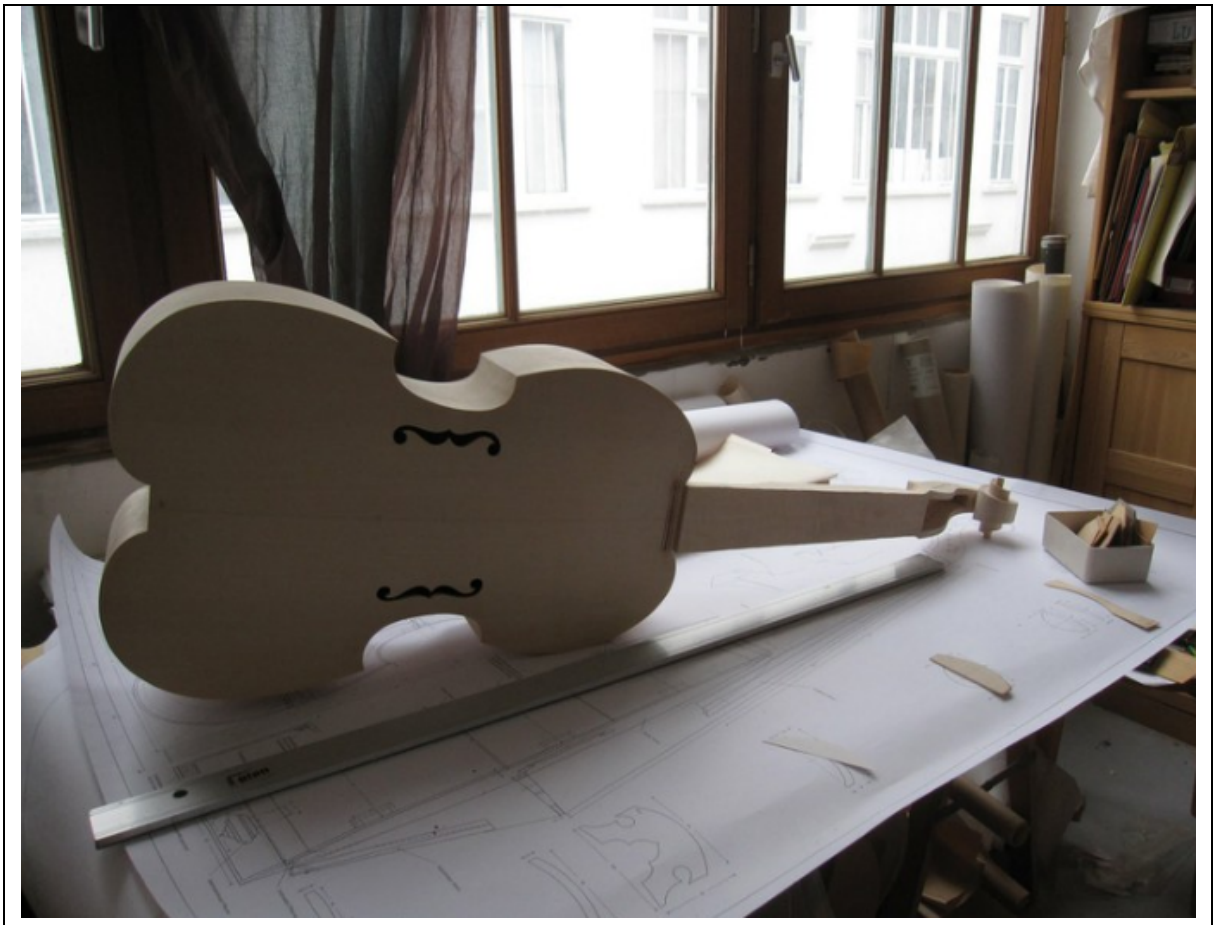
ill. 35: cutting soundholes, photo: N. P. Stefanovitch

ill. 36: gluing the front, photo: N. P. Stefanovitch

Normally, once the front was glued I should have put in all the purfling. However, knowing that I wouldn't have time to finish the purfling and set up the viol (to say nothing of the varnish) before the conference in May 2013, I decided to inlay only the purfling that ran under the fingerboard – which would be impossible to do once the fingerboard was glued.

ill. 37: cutting the purfling, photo: N. P. Stefanovitch

ill. 38: purfling under the fingerboard, photo: N. P. Stefanovitch



ill. 39: checking for projection, photo: N. P. Stefanovitch

When that was completed, I was able to finish the fingerboard, checking once again for projection and bridge height.

ill. 40: fingerboard inside, photo: N. P. Stefanovitch

ill. 41: gluing the fingerboard, photo: N. P. Stefanovitch

BRIDGE AND STRING SETUP

I initially set up the viol without varnish. At first the sound was very clear on the top two strings (and all the way to the end of the fingerboard) but weak in the middle and low registers. The sound was there but wasn't projecting.

ill. 42: viol set up without varnish, photo: N. P. Stefanovitch

ill. 43: cutting the bridge, photo: N. P. Stefanovitch

The bridge came out 1mm higher than on the drawing. I thinned down the crown – under the strings – which improved the sound somewhat. Later I thinned out the middle all the way across, which gave more presence to the middle strings. The tailpiece was a bit too close to the bridge, but when I pulled it back, the sound became freer on the low strings. Finally, and most importantly, I decided to use a thicker gauge on the four lower strings. This gave much more presence to the middle and low regis-

ters. (Current stringing: d': 72, a: 92, e: 126, c: 160, G: 210, D: 290.) If the viol is played at a'=440 Hz, which is how I set it up, I would consider trying a thicker G string. At a'=465 Hz the current stringing would probably work.

VARNISH

I prepared the viol for varnishing by wetting and scraping all the surfaces. I would have liked to give the viol a bit of color by staining it slightly with tea, but I complied with the request to add no colour. I applied a total of four coats of varnish. Each time, I started this process early in the morning after spraying the air with a vaporiser, to eliminate as much dust as possible. I proceeded to dilute the varnish with white spirit and applied a first coat with a varnish brush. Then I placed the viol in a light box to dry and harden. After three days of drying intermittently in the lightbox, in a sunny room, and overnight, outside the lightbox, the instrument was sanded lightly with a 1200 abrasive and linseed oil. Once it was wiped clean, I applied a second, less-diluted coat of varnish.

ill. 44: varnishing the ribs, photo: N. P. Stefanovitch

ill. 45: varnishing the pegbox, photo: N. P. Stefanovitch

It dried under similar conditions, but for four days. After sanding, a third, thicker coat was applied and left to dry for one week. Then came the final coat, of equal thickness, always with a brush. One week later, I sanded this coat with 1200 and then 1600 abrasive, without removing too much varnish. I wanted to end up with a surface that was smooth but not too shiny.

The two control samples – spruce and maple – that were provided to me, received the same treatment simultaneously. The viol dried in a sunlit room for several weeks before I set it up again. The initial sound of the varnished viol was a bit more subdued than it had been previously, but not markedly different.

CONCLUSION

This is a very well-designed instrument, and the technical drawing is excellent. The quality of the three instruments attests to this. I did not tune the viol to the 465mhz pitch, but in view if the fact that none of the three viols has a wolf at 440mhz I think it would be safe to try some slight variations on a future instrument – either a higher bridge set-up to raise the pressure on the front, or a slightly thinner front. I would also try to lighten the neck, by thinning down the heel. But first I would like to hear how these viols develop over the course of time.

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