



Carving a scroll using angular templates

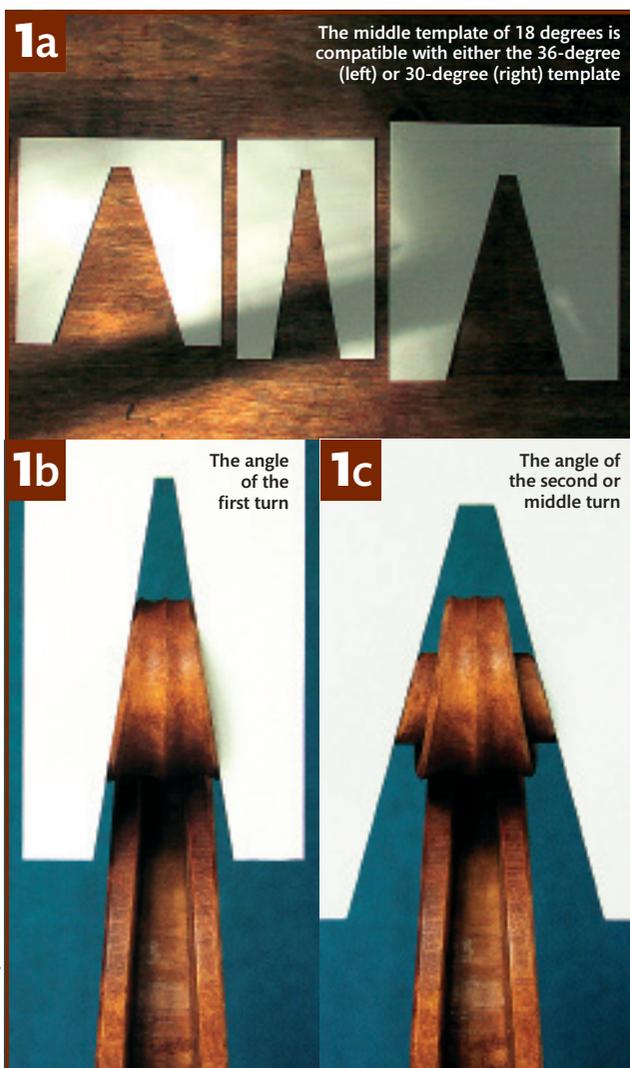
Practical advice on using proportional ratios in your scroll making

BY TORBJÖRN ZETHELIUS

VIOLIN MAKER BASED IN STOCKHOLM, SWEDEN

I AM FASCINATED BY FINDING THE GEOMETRICAL relationships that make up the perfect beauty of the violin. I have been inspired by the aesthetic ideals of the Renaissance, which are probably best illustrated by Leonardo da Vinci's famous drawing of the 'Vitruvian Man', a human form inscribed in a square and a circle. In this image, da Vinci shows how nature was perceived by the artists and philosophers (in other words, the scientists) of his time. The drawing is based on Euclidean geometrical principles, which, alongside Pythagorean ideas that favoured whole-number ratios, became the preferred choice for design during that period.

I have been trying to discover the geometry concealed within the violin – itself a product of the Renaissance, and combining the era's theories of design and proportion with its perception of acoustics – and its construction methods, and I think we can gain a great deal by understanding the reasoning behind the instrument's creation. Here I will show how I create the front view of a violin scroll using the old Cremonese measurement *oncia* in combination with proportionately correlated templates, inspired by the geometric principles of the Renaissance. Using these templates, it's possible to create a variety of scrolls of different appearances while staying true to classical form.



1 To create the front view, I use cardboard templates set to specific angles (figure 1a). When viewed from the front, most classical Cremonese scrolls use angles that are interdependent – one gives the lines of the scroll's first turn (figure 1b), and another corresponds with the scroll's second or middle turn (figure 1c). The wider angle is usually related to the narrower one by a ratio of 5:3 or 2:1. Most commonly, I've seen a 36-degree outer angle and 2:1 ratio, resulting in an 18-degree inner angle, or a 30-degree outer angle with a 5:3 ratio, also resulting in an 18-degree inner angle. Other ratios and angles do exist, but they are less common.

2

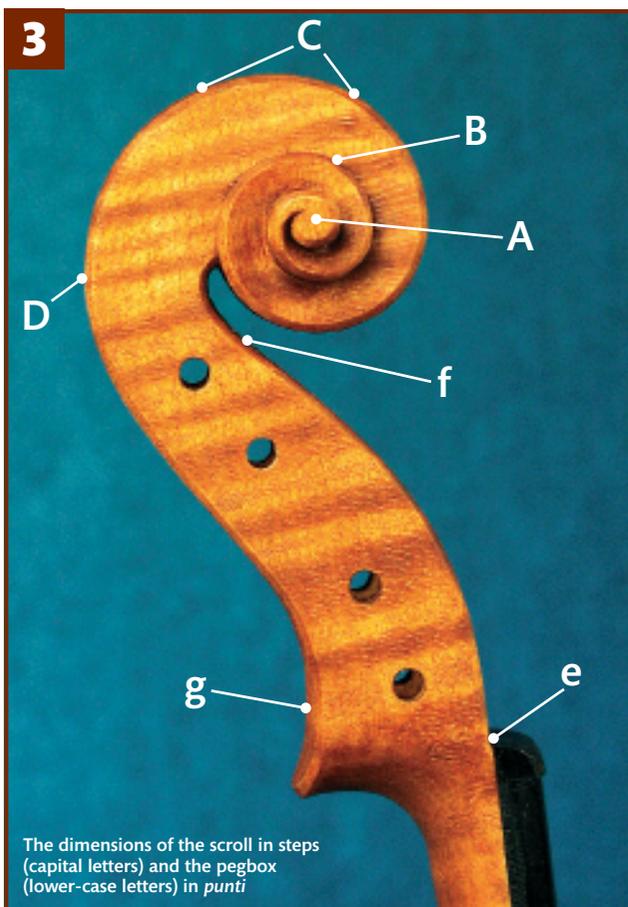


One Cremonese *oncia* is equivalent to approximately 39.1mm

2

When making violins I use the Cremonese *oncia* measurement, as found in the architect Alessandro Capra's *Nuova architettura dell'agrimensura di terre et acque*, published in Cremona in 1672. One *oncia* is approximately 39.1mm. My ruler (figure 2) is 10 *oncie* long, with each *oncia* subdivided into 12 *punti*. The *punti* are grouped in threes to make reading easier. A ruler like this was probably the only means of measurement that most classical violin makers had. Using it makes calculating ratios somewhat harder, as I will shortly explain.

3



The dimensions of the scroll in steps (capital letters) and the pegbox (lower-case letters) in *punti*

3

Next I decide which ratios to use for the scroll. In this case I'm basing my measurements on the triangular numbers 3, 6 and 10, commonly associated with Pythagoras. They consist of ratios of 1:2 (3 and 6) and 3:5 (6 and 10) – the 3:5 ratio between the middle turn and the width of the scroll, and the 1:2 ratio between the narrowest point and the middle turn.

I want my scroll to be one *oncia* wide (at point A), and here I encounter the problem of adapting the Cremonese measurement to my chosen ratios – the 12 *punti* of an *oncia* aren't easily divisible by 10. So for ease of calculating the scroll proportions using traditional methods (without mechanical devices such as proportional or spacing dividers), I divide each *punto* into two steps, resulting in 24 steps per *oncia*. I then add one additional step, creating 25 steps (12.5 *punti* or 40.7mm), a figure more easily divisible by 5.

The rest is simple. To find the proportions (width) of the middle turn (point B), I calculate $\frac{3}{5}$ of 25 – 15 steps. Next I find the proportions (width) of the narrowest part of the scroll, which begins before the scroll's apex and extends to where the angular template is applied on the front. Using the 1:2 ratio, it is half of the middle turn, so 7.5 steps (point C). The back side (point D) is in the visual line with the scroll, so I decide to make it half the scroll's width.

To complete the picture, I also include the outside (and inside, in brackets) dimensions of the pegbox. For these, I use whole *punti* because it works well with modern string spacing.

The final measurements are:

- | | |
|------------------------------|---|
| A 25 steps (40.7mm) | e 5–8 <i>punti</i> (16.3–26.1mm) |
| B 15 steps (24.4mm) | f 3–6 <i>punti</i> (9.8–19.6mm) |
| C 7.5 steps (12.2mm) | g 8 <i>punti</i> (26.1mm) |
| D 12.5 steps (20.4mm) | |

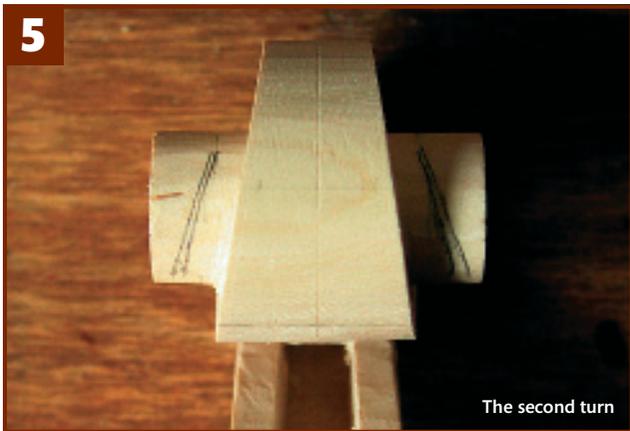
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The template positioned on the head

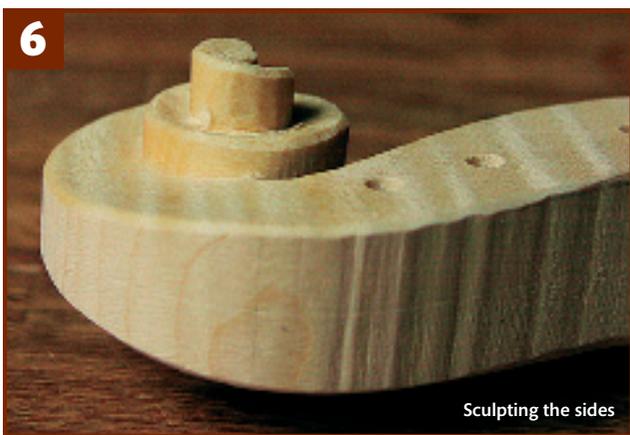
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Here, the 18-degree template is positioned on the scroll head, parallel to the plane of the neck (a line has been drawn to show where the corresponding wider template is placed). The narrowest width of the top of the scroll extends all the way to where the template is positioned. In the lower part, where the scroll leaves the template, I work freehand (the width is given by the angle of the template). >



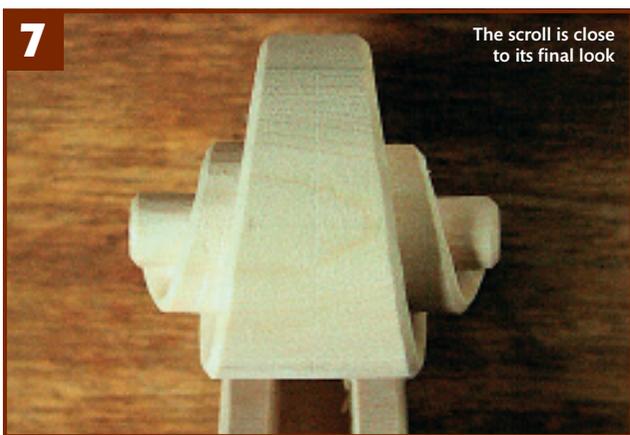
The second turn

5 I next prepare the second turn for carving. I am using the 30-degree template to produce a 3:5 ratio relationship with the 18-degree template from stage four, but for comparison I have traced the lines of both the 30- and 36-degree templates on to the scroll. As can be seen, there's little difference between them.



Sculpting the sides

6 When cutting the bevel or chamfer, I gouge away excess wood from the sides. Personal style comes into play here. Seen from the back, the middle turn could be straight or given a slight convex curve – whichever seems fitting for this particular scroll. The important thing is that the lines flow smoothly and harmoniously.



The scroll is close to its final look

7 The 18- and 30-degree templates (3:5 ratio) have been helpful in creating a harmonious sense in the finished scroll. At this stage, I can start to get a feeling for the final look of the scroll.

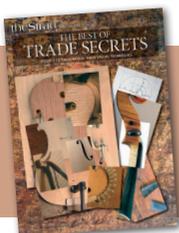
8 A front view of the finished scroll. I have applied the ground, and the scroll is now ready to be varnished. ■



The finished scroll

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