

Straight talking

Andrew Ryan investigates a phenomenon in the instruments of Stradivari and Guarneri 'del Gesù': the presence of regular straight lines within the arches of the top and back



The arching of the c.1744 'Ole Bull' Guarneri 'del Gesù' has perfect examples of the straight lines

Everyone likes a mystery, especially violin makers. We spend a lifetime studying the work of Stradivari and Guarneri 'del Gesù' (GdG) in search of insights into their working methods and the underlying patterns that unite their work. Sometimes we find answers, sometimes just more questions.

One feature common to the arches of both Stradivari and GdG is the relationship between their longitudinal and recurve areas. A violin arch can be divided into three parts: the convex longitudinal area, a transitional concave recurve area, and the channel/edge area. The longitudinal arch area – the central

convex portion of the arch – was described in *The Strad* by Steve Sirr and John Waddle in December 2018 and January 2019 (figures 1 and 2). They determined that this 'longitudinal arch structure' (LAS) for Stradivari and GdG violins is about 41 per cent of the total arch area, and that the LAS of the front is nearly equal in area to that of the back.

While it is easy to define and visualise this longitudinal arch surface, and the edge/channel, the recurve area is more complex. On closer scrutiny it is found that there are area points hidden within the recurve that help define the complex transition of the arch as it flows into the channel/edge. These points are in the form of straight lines. Anywhere the arch transverses these straight lines the arch is curved, while along them the arch is flat. These lines in the arch can be readily observed by placing a smooth plastic straightedge on the arching, as in figure 3. (Note: Never put any straightedge directly on the arch of

a violin as it can easily mar the surface.) This feature has been observed and commented on by others, but I have previously never seen it surveyed or documented. I will not conjecture as to any structural or tonal benefits, as there is insufficient evidence to make any such claims, but only document its presence in the work of Stradivari and GdG.

The c.1744 'Ole Bull' GdG gives an excellent illustration of this feature. Figure 4 shows a cast of its top. The red lines indicate the path, direction and length of these flat sections. In the upper and lower bouts these paths are divergent, while in the central section they are closer to being parallel to the centre line. The cross-section overlay (blue) illustrates that they are located at the inflection point of the concave recurve and convex longitudinal areas of the arch. These patterns occur in both the tops and backs.

When the red lines illustrating the flat sections in figure 4 are extended (dotted black lines) it will be seen that they form angles. For backs, the two angles meet in the centre of its length. For tops, the two angles overlap. This discrepancy occurs from differences in their longitudinal profiles: back arches are parabolic while top arches have a flatter central section. In the C-bout, the cross-section of the LAS forms a radius (figure 5).

Although not as extreme as the very pronounced pyramidal form of the 'Ole Bull' arching, similar patterns can be seen in many Stradivari and GdG arches (figure 6). Minor asymmetries in the angles' positions are accounted for by deformation in the arches. >

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Measuring Edge area, Recurve areas and Longitudinal Arch Area.

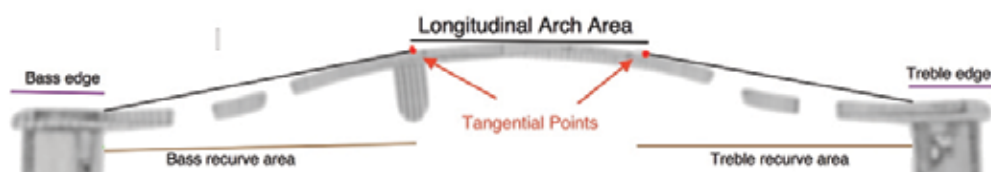


FIGURE 1 The top and back plates of an instrument can be divided into three distinct areas: the edge, the recurve, and the longitudinal arch structure (LAS)

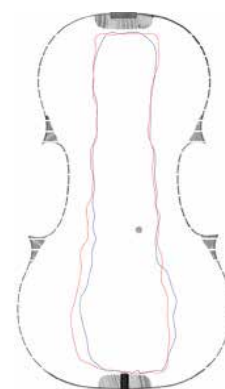


FIGURE 2 Front and back LAS of the 'Leonora Jackson' Stradivari

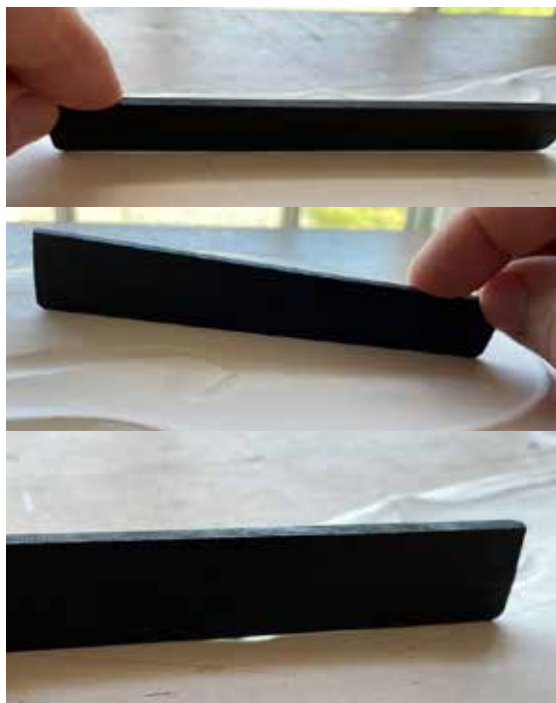


FIGURE 3 Laying a straightedge on a cast reveals the straight lines



FIGURE 4 Cast of the 'Ole Bull' top, showing the straight lines (red), their extensions (dotted black), and the cross sections (blue)



FIGURE 5 The C-bout cross-section of the LAS forms a radius

FIGURE 6 Lines as they appear on (left-right) GdG1737; GdG1734; AS1710; AS1712; AS1718 ('Maurin')



My own method for creating these flat sections in the arching is straightforward. I begin by establishing the long arch, then define the width of this flat central platform. This can vary but I generally mark it around 42mm across. Next, with a gouge I carve from the channel up to this central area in even, straight, parallel strokes (**figure 7**). I work from a finished channel but the method is the same if you are working from a flat edge

(**figure 8**). If you have worked accurately, the flat sections are created organically. You can confirm this by drawing the triangular form on to the arch and testing with a straightedge (**figure 9**). The short side of the lower angle is around 48 Cremonese points (one point = 3.5mm) or a little less than half the body length. The upper angle's short side is three quarters of that. In the central section the longitudinal arch area's width is usually about half the width of the

C-bout and has a final radius of between 90 and 102mm (**figure 10**). Lastly I refine the carving with thumb planes, and finally scrape the arch smooth (**figure 11**).

Even after 500 years the violin remains a fascinating product of human creativity. It is a complex amalgam of art, science and craftsmanship. While many details of the work of Stradivari and GdG are well understood, others invite further inquiry – including this phenomenon. ●



FIGURE 7 Carving the arch forms the straight lines organically



FIGURE 8 This method also works starting with a flat edge



FIGURE 9 Accuracy can be checked by drawing the angles and measuring with a straightedge



FIGURE 10 Checking the arch with a straightedge

THE LAS WIDTH IS USUALLY ABOUT HALF THAT OF THE C-BOUT



FIGURE 11 The arch is scraped smooth