

What is the purpose of the small mark to be found in the backs of some Cremonese instruments? Maker YANN POULAIN explains his theories about the mysterious ventral pin

The ventral pin in a 1743 violin by Guarneri 'del Gesù', visible through one of the instrument's f-holes

THE MYSTERY OF THE VIOLIN'S BELLY BUTTON

The violin is undoubtedly one of the greatest inventions of the Renaissance period. It came about as a result of structural changes in 15th-century bowed string instruments as well as the development of a makers' method and of the tools required by it. Andrea Amati, the father of the violin and founder of the Cremonese school, initiated this working method, and it was still being used by Cremonese makers at the end of the 18th century.

Now, more than 400 years later, through research undertaken by contemporary violin makers on surviving vintage instruments and tools, many of the secrets of this method have been revealed. However, there is still a mystery surrounding the presence of a small conical hole in the back of these instruments – evidence of the ventral pin. In some

instruments it is just on the inside surface of the back and obscured by dust, whereas in others it goes through the thickness of the plate and is visible from the outside, filled by a wooden ventral pin. Its diameter varies from 1.5 to 2.5mm. Usually positioned in the centre of the instrument, it represents, as I see it, the human belly button: a proof of birth and connection to the 'creative mother'. This comparison may seem fanciful in our modern world, but it should not be forgotten that the Renaissance perception of the world was quite different from ours. After all, the violin has a belly, ribs and even a soul (the soundpost is called *l'âme* in French), so why not a belly button?

The ventral pin is found in instruments dating from the 16th to the 18th centuries that were made not only in Cremona but also in Mantua, Turin and Venice. Andrea Amati was the first to use it, and he passed this trademark to all his descendants:

his sons Antonio and Girolamo (the Brothers Amati), his grandson Nicolò and his great-grandson Girolamo. All the assistants trained by Nicolò, such as



A 16th-century German carpentry workshop

Andrea Guarneri, Giacomo Gennaro and Giovanni Battista Rogeri, also left conical pins in the backs of their instruments. The ventral pin travelled up to Mantua with Pietro, son of Andrea Guarneri, who may have transmitted it to Antonio Zanotti and Camillo Camilli. It persisted in Cremona until the 18th century with Guarneri's other son, Giuseppe ('filius Andrea'), and his grandson Giuseppe Guarneri 'del Gesù'.

The case of 'del Gesù' is particularly interesting because the position of his ventral pin moved as he himself moved premises. His 'Dancla' violin, made in 1727 when he was still at the Casa Guarneri, features a ventral pin positioned halfway between the locating pins in its back, as did his father's instruments. But in the 1730s, when he moved away to start up his own business, his ventral pin started to be placed higher in the backs of his instruments.

Finally, the ventral pin can also be observed in Venice, in the instruments of Pietro Guarneri (brother of 'del Gesù') and Sancto Serafin, and in Turin in the work of Enrico Catenari, founder of the Piedmontese school. It is proof of a well-used process that was transmitted from generation to generation.

So why don't we find the ventral pin in the instruments of the Cremonese Stradivari and Rugeri families? It is well known that Antonio Stradivari preferred not to leave tool marks on his instruments, which might explain the absence there of the ventral pin. Evidence has not been found that either Stradivari or Francesco Rugeri were Nicolò's assistants at the Casa Amati, and they both established their businesses in Cremona later – in the second half of the 17th century. Given their wealth, these two makers possibly possessed new, top-of-the-range tools and so didn't need to use Amati's method.

So how can the presence of the ventral pin from the 16th century through to its disappearance in the 18th century be explained? Among the theories to have appeared over the years is one claiming that the ventral pin came about when, in order to determine the thicknesses of a plate, concentric circles were drawn around a central mark, the repeated use of dividers thus leaving a conical hole. Another theory is that this hole marked the highest point of the long arch, in which

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case it is a mark left by a clamping tool. Christian Rault (in 'Les modifications structurelles radicales des instruments à cordes au XVIe siècle' in the journal *Pastel*) believes that it could have been used as an anchor point for a central soundpost on 15th-century instruments.

It is clear that the violin was the pinnacle of what 16th-century artisans

could achieve with the rudimentary tools at their disposal. The workbench is the most essential of all their tools. Its top would have been made of a thick, hard wooden board pierced by several circular holes for receiving bench hooks, and by a square mortise into which the claw was pushed. The bench hooks held in place the piece being worked on. ▶



Jean Boudichon's *L'Artisan* shows the carpentry tools in use around 1500

JEAN BOUDICHON: L'ARTISAN, OU LE TRAVAIL. ÉCOLE NATIONALE SUPÉRIEURE DES BEAUX-ARTS, PARIS

The luthier's workshop engraving from
Alembert and Diderot's 1758 *Encyclopédie*



COURTESY YANN POULAIN

The fact that Stradivari's instruments have no ventral pin does not necessarily prove that he didn't use the same methods as his forefathers

The claw was a square wooden block with a toothed metal hook at the top, and its purpose was to grip the piece of wood firmly during planing. From the 16th through to the 18th century, this method of working at the bench remained the same.

In his book about the history of carpentry (*La menuiserie*, 1920), Henri Havard lists the contents of a toolbox observed in a painting from 1572 belonging to architect and engineer Hans Vredeman de Vries, which contained the following carpenter's tools: a bench, a rule, a bench hook, a square, a thicknessing calliper, a plane, a marking gauge, an axe, a mallet, a chisel, a gouge and a glue pot. The only tool missing is the clamp, and apart from that, the box would have contained the entire range of instruments and tools that carpenters have today. It's difficult to say whether or not clamps were part of the

artisan's toolbox in the 16th century: and if they were, they would surely have been rudimentary handmade wooden tools with little capacity for firm tightening.

The entry on lutherie in Denis Diderot and Jean le Rond d'Alembert's *Encyclopédie* (1758) supports this claim. It features an engraving of a luthier's workshop (shown above) in which there is a wooden 'feet mounted vice' fixed to one of the benches. It is quite different from the solid metal bench vice that is used nowadays. The authors draw the reader's attention to the man planing the front of an instrument on the bench blocked by a bench dog. It is also interesting to note the instrument bearing seven closing clamps linked by string in the left-hand back corner of the room.

The violin changed very little right up until the end of the Classical period. But the world around it was constantly in the

process of modernisation, and the tools and techniques of craftsmen changed dramatically from the 17th century onwards. The first Industrial Revolution, which started during the second half of the 18th century, radically transformed craftsmen's tools, causing major changes throughout Europe. Essentially, an agricultural society was transformed into one of mechanised production, and innovations in agriculture, manufacturing and transportation disrupted the socio-economic and cultural characteristics of society. It began with the mechanisation of the textile industry, the development of iron manufacturing techniques and an increased use of refined coal.

The first machine tools were made of wood. The production of iron tools gradually became mechanised, and metal became increasingly common until the advent of mass-produced tools and machine tools in places such as Sheffield and Birmingham in the early 19th century. Until the 19th century, however, metal was worked manually using basic tools. It was easy to make small metal parts, but the production of large and elaborate parts was costly and laborious, particularly the cutting of threads on metal screws and nuts. ▶

A carpenter's workshop of around 1425, as shown on the Merode Altarpiece



ST. JOSEPH PORTRAYED AS A MEDIEVAL CARPENTER FROM THE MERODE ALTERPIECE C.1425 (OIL ON PANEL) BY THE MASTER OF FLEWALLE. METROPOLITAN MUSEUM OF ART, NEW YORK/BRIDGEMAN ART LIBRARY

It is significant that production of the modern violin's neck elevation with its dovetail joint, which requires the use of a solid metal clamp, first appeared early in the 19th century. The invention of more sophisticated tools at this time enabled more complicated repairs to be carried out, and so it became important to preserve the value of old instruments. This led to the establishment of large restoration workshops such as that of Jean-Baptiste Vuillaume.

The invention of the bow screw (probably by Nicolas Pierre Tourte around 1750, according to B. Millant and J.F. Raffin in *L'archet*, 2000), which replaced the clip-in frog, coincides to a certain extent with all these changes. And in 18th- and 19th-century bows, the mark that remains from the drilling of the head mortise is a conical hole. Could it be that the ventral pin also follows on from a drilling mark?

Stradivari's tools, which are preserved at the Museo Stradivariano in Cremona, show that he used highly advanced implements for the time. The multiple thickening dividers, purfling marker and

THE VENTRAL PIN EXPERIMENT

Yann Poulain explains how he went about making a violin using pins instead of clamps

The thickening of the ribs, the jointing of the back and table and the carving of the scroll were done using the valet and the claw. The joints of the back and table were glued with bars and wedges, and the ribs were bent and glued on to the mould in the manner described by Simone Sacconi (in *I segreti di Stradivari*, 1972). [1]

After planing the ribs, the linings on the back were glued using V-shaped wire clamps. Two knife cuts on the ribs marked the centre of the top and bottom blocks. The rib structure was placed on to the flat side of the back, the knife marks coinciding with the joint. The top and bottom of the structure were traced gently on to the back with a scribe. About 1.75mm inside the lines, two small nails were hammered into the back and their heads clipped off with pincers. [2 & 3]

The structure was returned to the back as before and pressed on gently. With no possibility of moving owing to the presence of the nails, the outside of the rib structure could be drawn around, as well as the outline of the plate by using a wooden wedge to allow the overhang. [4]

The nails were taken out with pliers. The holes for the positioning pins were drilled with a brace and a 2mm-diameter bit. At equal distance from them, a third hole was



[2]



[1]



[3]

small metal clamps were all handcrafted by goldsmiths. However, his clamps did not have the same function as the ones employed today. According to Roger Hargrave (in *Giuseppe Guarneri del Gesù*, 1998), these clamps served only to hold the neck and rib structure on the back while the centre line was set and the outline drawn. There is a fundamental difference between clamping firmly and using a clamp for positioning pieces.

It is essential to remember that all stages of assembly, gluing and clamping were undertaken without clamps as we know them today. Gluing the ribs on to the blocks could be carried out using string; the fingerboard could be attached

to the neck with a strap that could also be used for closing the soundbox; the linings could be glued with small metal V-shaped needle clamps, and the bass-bar with wooden V-shaped clamps. A Baroque neck could be nailed on to the ribs. These processes are very much in the spirit of the 16th century: cheap, light and simple.

The fact that Stradivari's instruments have no ventral pin does not necessarily prove that he did not use the same methods as his forefathers. A careful observation of his arching board conserved at the Museo Stradivariano has brought to light a central hole that is 15mm in diameter. Is there a connection between this hole and the ventral pin?

drilled with the old 15mm diameter drill bit. This bit had a central guidance forming a protrusion of 5mm compared to the end of the cut. The depth of the hole was between 8 and 10mm for the back. [5]

The plate was sawn by hand, clamped on to the bench with a bench hook. The thickness of the edge was marked out. The back was then placed on to the arching board, which was held on the bench with a bench hook and a claw. The back was clamped on to the board by the bench dog and the two wooden sticks (which had already been used for gluing the ribs on to the mould) placed against the edge of the top and bottom bouts. The back was now secured for gouging of the arching and freely defining its height (this stage can also be done on the bench without the board, allowing variations

in the position of the pin in the instruments of 'del Gesù'). [6]

The outline was finished with a fine rasp and a knife. Now the fluting could be done, the back held with the ventral pin and the locating nails. The arching was finished with finger planes and scrapers. [7] The back and the board were then returned for hollowing, the pin's hole offering a good reference point for the thickest point of the back. [8] The inside arching was quickly gouged away, the back maintained as much by the locating pins as by the shape of the arching, the force of the gouge going down the board. Using a knife and rasp, a maple pin was shaped to fit the conical hole that had been left by the drill bit, and it was glued in. [9]

Once the back, ribs and neck were glued together and nailed, one end of the jointed

wood plank for the front was squared off. A slot was cut into the neck for receiving the front, leaving enough space for the overhang. Two small nails were then hammered on to the centre of the top and bottom blocks at 3.5mm from the outside of the ribs. Their heads were chopped off as before. The front was pressed on to the ribs. The outside of the ribs and the outline were traced on. Arching and hollowing were done as described for the back. The locating pins, placed further inside on the belly because it is more fragile than the back, were hidden by the fingerboard and the tailpiece. The depth of the big hole for the pin could be drilled less than 7mm because rough arching and hollowing on spruce needs less force, leaving no trace of its use.



[4]



[6]



[8]



[5]



[7]



[9]

PHOTOS YANN POULAIN

In his violin making treatise of 1903 (*L'art du luthier*), French violin maker Auguste Tolbecque makes a telling statement: 'To operate safely, during rough arching, the back will be laid on the workbench, it will be maintained either by clamps and wedges, or by the bench hook and a pin in a hole.' Is it really possible to make a violin without any clamps? I decided, with my colleague Frédéric Chaudière, to take up the challenge in order to try and solve the ventral pin mystery. Our equipment consisted of a bench with a valet, a claw, an arching—hollowing board with a 15mm diameter metal bench dog at its centre, an old drill bit of the same diameter, and

2mm nails. We locked up all our clamps so that we wouldn't be tempted to use them. (For details of this experiment, see box above.) We found it entirely possible to achieve our goal.

When all is said and done, it must be acknowledged that the use of a pin in making violins was an ingenious system devised in response to the technical limitations of the period from the 16th to the 18th century. I believe that its basic function was a purely practical one.

In addition to being efficient, its application saves the use of a clamp, thus facilitating the transfer to modern makers of the skills of luthiers from Andrea Amati in the 16th century through to

Giuseppe Guarneri in the 18th. It is also convenient when changing position and therefore workbench, as demonstrated in instruments by Guarneri 'del Gesù'.

Stradivari perhaps used it differently, which would account for the lack of evidence of it on his instruments. We know that he also made lutes, mandolins, harps and guitars, and so he would have had additional tools at his disposal, including metal clamps.

Ultimately, I hope that this article will encourage new approaches to research on the Cremonese method from the 16th to the 18th century, which, although it has revealed many of its secrets, still holds many mysteries. ■