

VIBRANT DETAILS

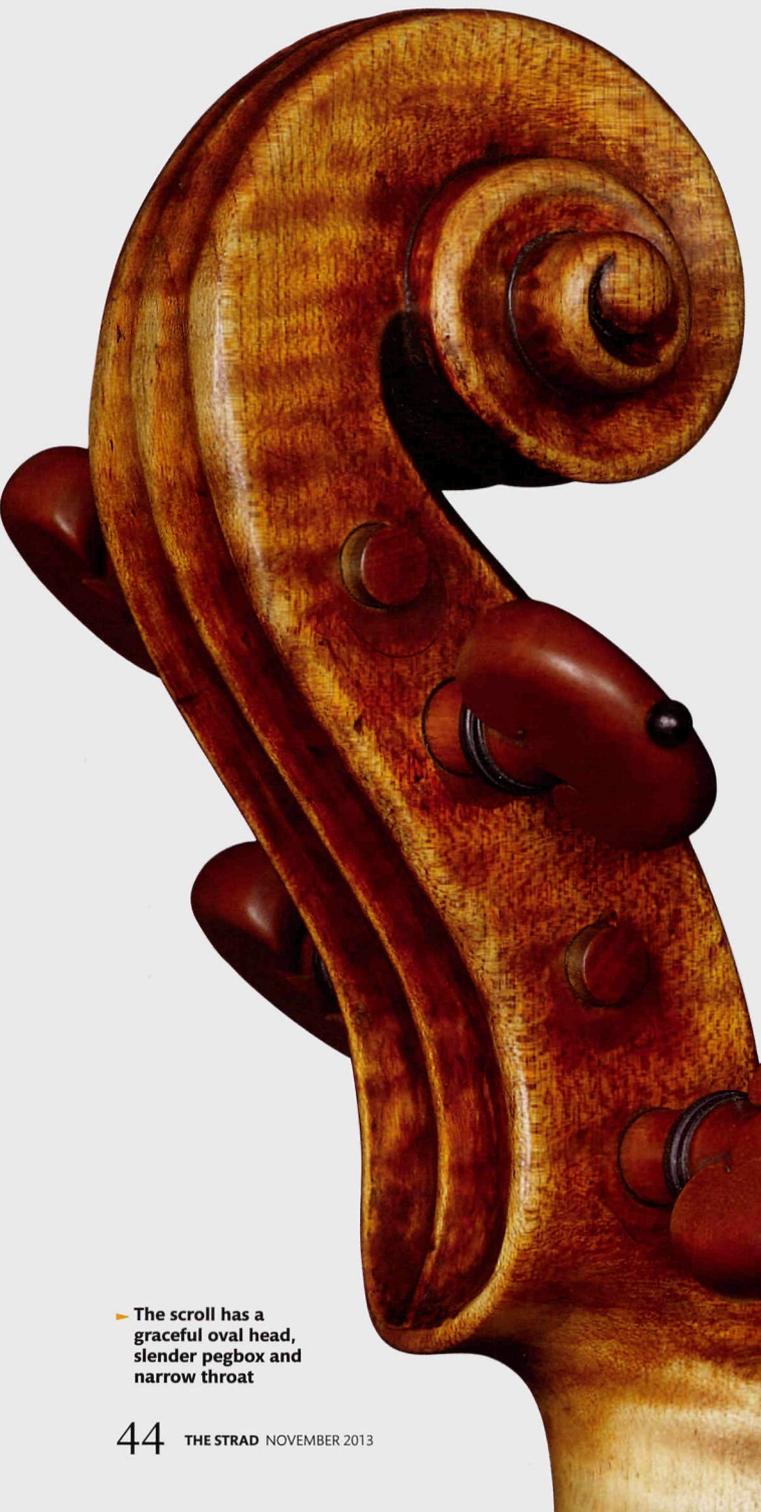
Made exactly 300 years ago, the 'Huberman' Stradivari is one of the finest-sounding violins in existence. **SAM ZYGMUNTOWICZ** explains how studying its tiniest minutiae can shed light on its tone quality

THE 'HUBERMAN' STRADIVARI OF 1713 IS perhaps the most widely heard violin of our time, and has a long history as a virtuoso's concert instrument. Originally named after British violinist George Alfred Gibson, it was the chosen violin of Bronislaw Huberman, Norbert Brainin and now Joshua Bell. It is also a visually stunning example from Antonio Stradivari's golden period.

I first encountered this violin in 2003 and have studied the instrument over time, as well as performing a variety of small modifications. It is intriguing to track the subtle changes in tone and response, as the instrument reacts to even quite small changes in its set-up. These changes can give some clues as to the violin's underlying behaviour.

Antonio Stradivari was one of the most consistent makers of all time, and a close description of yet another fine example of his work runs the risk of repetition and overused superlatives.

His basic techniques and materials varied little across his entire career, and produced a recognisable Stradivari style. But is there a characteristic Stradivari sound? The best examples of his instruments often share similar tone qualities, particularly in the relative brightness and shimmer on the E string, but the individual differences are marked. With so many possible variations, the near-uniformity of many aspects of Stradivari's work provides a remarkably stable and consistent framework, which can make it easier to isolate and analyse the effects of small variations in arching, wood choice, thickness and model. >



▶ The scroll has a graceful oval head, slender pegbox and narrow throat

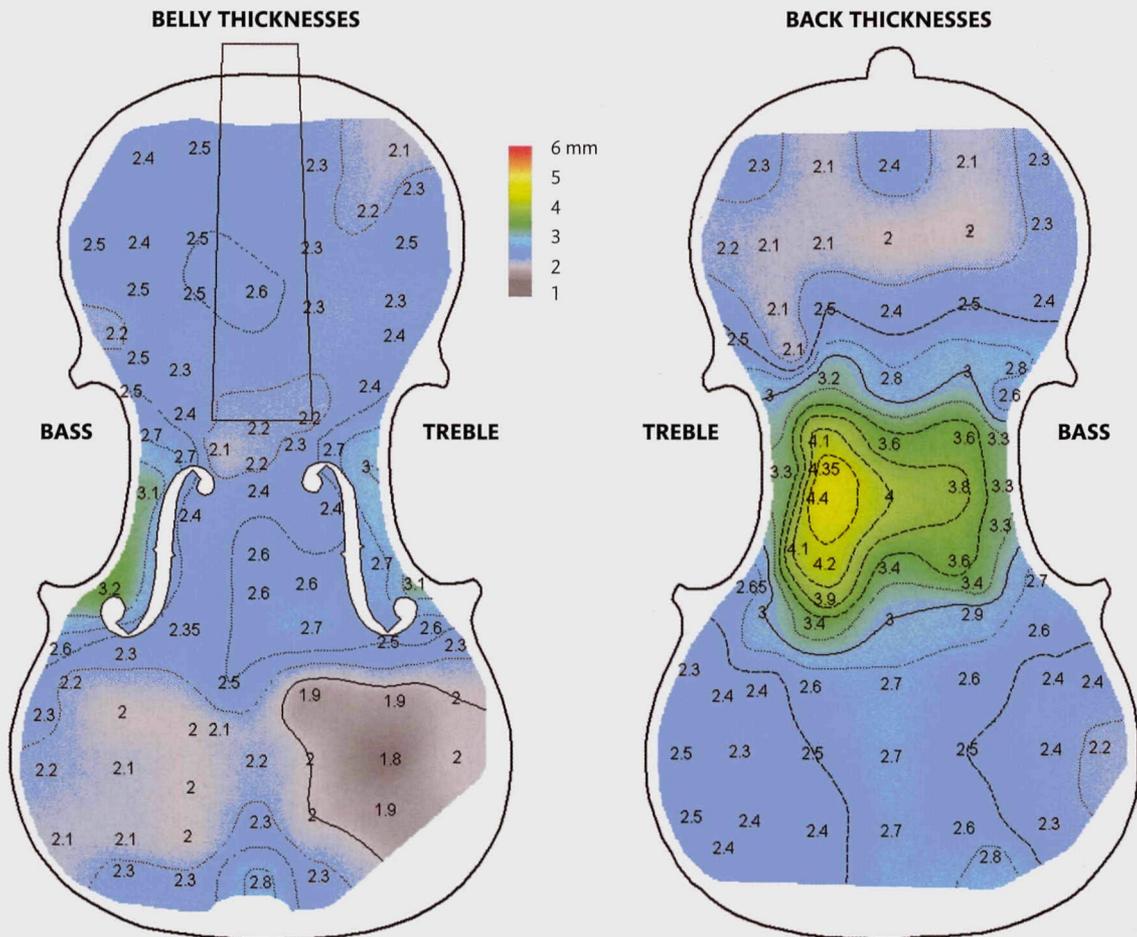


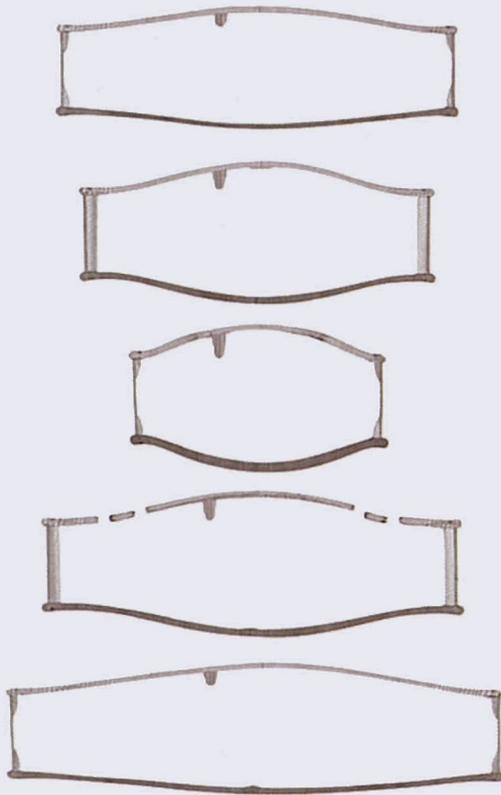
► The f-holes are slanted so that the lower eyes are kept close to the C-bout edge



▲ CT scans of the 'Huberman' front and back

▼ Contour maps showing the relative thicknesses of the belly and back





▶ Above: cross-section images reveal the flow of the arching
 Right: CT image of the 'Huberman' back,
 superimposed on the original P-form mould



To view the hidden details of the 'Huberman' and find links between its structure and the resulting sound, I was able to draw on the expertise of some of those involved in the 2006 Strad3D project, a comprehensive study of three Cremonese violins using cutting-edge technology. We can also suggest comparisons with other Stradivari violins, particularly the 1715 'Titian', part of the original Strad3D study, and which I documented in *The Strad's* February 2009 issue. Although the measurements and imaging presented here are accurate to the best of my ability, my personal observations are of course subjective, and my theorising is by nature speculative, and does not represent scientific conclusions of any sort.

Thanks to radiologist Alexander Baxter, we were able to give the 'Huberman' a computerised tomography (CT) scan composed of 1,250 cross-sections. The images shown here nicely reveal the flow of arching and graduation, the rib outlines and hidden details of construction. Radiologist Steven Sirr performed additional analysis to give the density information presented below, and his studies have also uncovered deeper internal relationships in the designs of classic Cremonese instruments. Tabulating the mass of each individual CT 'slice', he calculated the lengthwise centre of mass for the 'Huberman' back plate, which he found corresponds exactly with the position of the soundpost.

Similarly, he calculated the corpus internal air volume, finding the centre of the internal volume again corresponds with the soundpost position. The lengthwise centre of mass for the top plate falls nearly at the mensur. He has found similar exact correspondences in many classic-period violins, indicating deliberate design principles. I find it strangely compelling that CT imaging can illuminate an earlier vision of proportional harmony in instrument design, reaching back to Pythagoras and beyond.

In a similar vein, François Denis, who had previously analysed the proportional design of the 'Titian' Stradivari for the Strad3D project, examined the 'Huberman' rib outline. He suggests that both violins were made on the P form (identified in Cremona's new Museo del Violino as MS44). However similar, these two violins still present distinct visual impressions.

The relatively deeper curvature of the 'Huberman' outer corner lines is easily seen in the CT scan of the ribs. The corners are lithe and slender, with a longer purfling mitre to match. The mitres are elegantly curved and drawn out, and the wide poplar centre strip contrasts stylishly with the thinner dyed pearwood outer strips, which show a calligraphic variation in thickness.

The 'Titian' corners, cut two years later, are comparatively strong and wide, due to the flatter cutting of the corner-blocks' outer curves. This difference seems to be echoed in the choice of wood, with the relatively narrow flames of the 'Huberman', and the broad, soft flames of the 'Titian'. To see the progression in style, we also looked at the 'Betts' Stradivari, made nine years earlier in 1704, and found the shaping of the corners to be a very close match, only a little longer, leading to the very extended purfling mitres of the 'Betts'. Still, the underlying proportions of the model are virtually unchanged, which gives these violins an architectural coherence.

THE ARCHING is one of the most significant factors in tone colour and projection, and Stradivari varied his arching considerably as his work progressed. Similar to the back, the top arching rises smoothly, with long, flat lines, relatively low in height. The top spruce used here has even, narrow reed lines, widening quickly in the flanks. CT analysis indicates a top density of about 0.35g/cm^3 , similar to that of the 'Titian'. ▶

Violin by
Antonio Stradivari
Cremona, 1732
"Red Diamond"

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The arching appears to have been a large factor in the placing of the f-holes. Stradivari violins with high, broad archings often have f-holes set more widely apart, 40mm or more, with some full-arched examples such as the 'Kreutzer' set at 44mm. To complement the streamlined, flat arching seen here, the placement of the upper eyes is close-set at 37.5mm. The treble f-hole is placed slightly higher on the body. The f-holes are also rather slanted, so that the lower eyes are kept close to the C-bout edge.

In my view, this narrow f-hole eye spacing loosens the connection between the relatively stiff upper bouts and the more flexible central section, and the f-hole body is placed to separate the convex profile of the central cross-section from the concave section of the channel leading to the edge. I would expect this setting to add flexibility to the structure, and in fact

The ribs are cut from the same maple as the back and are a generous 32mm in height at all four corners

the 'Huberman' has a warm and resilient response that I associate with flexibility, contrasted with the crystalline sound of some other Stradivari violins with higher arching or stiffer wood. Streamlined arching and a close setting of the f-holes are also seen in some later-period violins of Guarneri 'del Gesù', and seem to create more flexible and thus darker-sounding instruments.

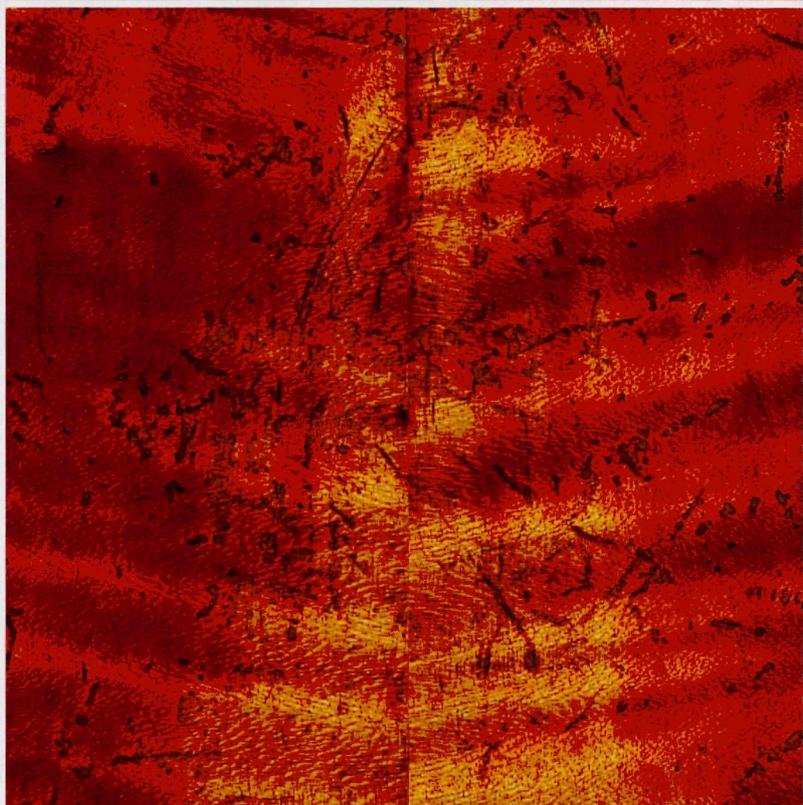
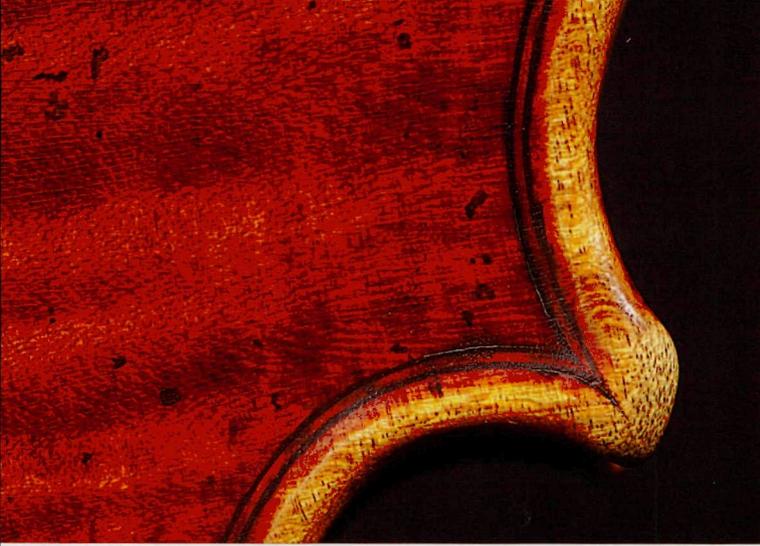
The back arching is similarly sleek and taut, gently rising from the minimal channel, with a well-rounded peak across the middle bouts. The back maple is highly figured with medium-width flames, slanting up from the centre joint at a jaunty angle, which matches the light, curvaceous cutting of the corners. Stradivari was typically shrewd in maximising the beauty of his materials – and minimising the flaws. Traces of a pin knot are just barely visible in the channel of the C-bouts. In the CT scans, this pin knot is clearly visible on the under edge. On the 'Titian' Stradivari a similar pin knot is quite visible in the upper bout – another triumph of both acoustical quality and thrift.

CT ANALYSIS often shows the maple used in Cremonese backs to be of comparatively low density, circa 0.57g/cm^3 . Whereas the 'Huberman' scroll and 'Titian' back plate are consistent with this density, the back plate of the 'Huberman' indicates a more robust density of 0.65g/cm^3 . This is similar to much of the maple currently available.

The top plate is relatively uniform in thickness, though a little thinner in the upper bouts, and it is reinforced with a patch in the central section. The back, given the probable stiffness of its wood, is a healthy 4.4mm in its central area. This thickness pattern is quite asymmetrical, notably thicker on the soundpost side.

The scroll is made of typical fine-grained maple, with only minimal figure, allowing for very fluid carving. The profile is sleek, with a graceful oval head, slender pegbox, and narrow throat, echoed in the tight cutting into the eye. In contrast, the front and back views are quite substantial, with the pegbox nicely open, and the back of the pegbox remaining wide, with strong, straight lines. Although many Stradivari scrolls are overcut on ▶

▶ It is likely that the ribs started at near-equal height at the corners and end-block



Clockwise from top left: the corners are lithe and slender; the scroll's fluid carving is echoed by the tight cutting into the eye; the back displays marks, textures and wear patterns; the back flames slant up from the centre joint at a jaunty angle; and the windings of the scroll are undercut in places



the windings, here the windings are quite straight, even a little undercut in places. The finishing is quite refined, even on the bevels of the throat. Despite the high level of finish, the hand is apparent, with fresh chisel marks visible in the final turns of the eye, and toolmarks on the back of the scroll highlighted by varnish wear.

The ribs are cut from the same maple as the back and are a generous 32mm in height at all four corners. The lower bout is 0.5mm lower, and the height at the upper corner-block drops to just about 30mm. Even allowing for resurfacing of the blocks, this differential indicates that the ribs likely started at near-equal height at the corners and end-block, with a significant cant downwards beginning at the upper corners. Opinions differ as to whether Stradivari placed this cant on the upper or lower rib surface, but at this point any cant appears basically evenly distributed, with slightly more on the back.

THE INTERNAL BLOCKS APPEAR ORIGINAL, and offer some glimpses of Baroque construction methods. The neck-block still has four holes in a diamond pattern, from the nails that ▶

HISTORY OF THE 'HUBERMAN'

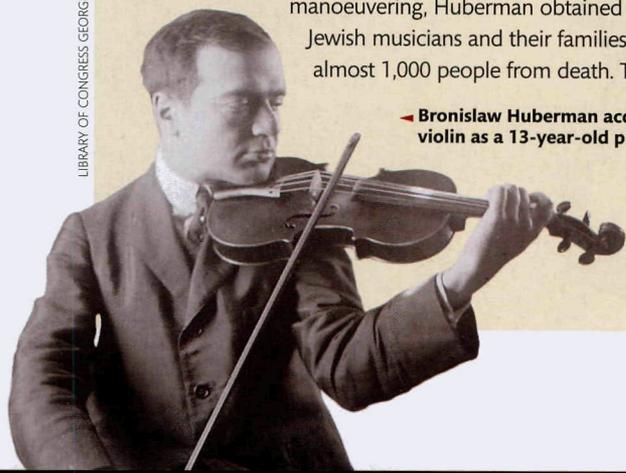
IN 1882 A POLISH COUNT presented this violin to Bronislaw Huberman, then a 13-year-old prodigy born in Czestochowa, Poland, who was studying with Joachim in Berlin. A year after Huberman received the instrument, his performance of Brahms's Violin Concerto was praised by the composer himself.

In 1916 the violin was stolen from a hotel room in Vienna, but it was quickly recovered. Twenty years later it was taken again, this time in New York by aspiring violinist Julian Altman – and it remained hidden in plain sight for 50 years, until Altman's death in 1985.

The tale of the theft was widely reported in the press, though the details varied throughout the many retellings. In one account, Altman left his engagement at a Russian nightclub, wearing a Cossack outfit and a large overcoat. While Huberman was on stage at Carnegie Hall playing a Guarneri 'del Gesù', Altman talked his way into his dressing room and slipped the Stradivari under his Russian shirt. He disguised the varnish with shoe polish, and for the next half-century he nonchalantly played this hidden treasure at orchestra section engagements, nightclubs and parties.

For Huberman, the loss of this treasured violin must have been a traumatic personal blow, but it was dwarfed by the increasingly desperate situation across Europe as the Nazis gained ascendancy. Earlier in the 1930s, Huberman had anticipated the coming disasters and left Vienna for Switzerland. He began to organise an orchestra in what was then Mandatory Palestine, administered by the British. With tireless and deft manoeuvring, Huberman obtained visas for Jewish musicians and their families, saving almost 1,000 people from death. The same

▶ **Bronislaw Huberman acquired the violin as a 13-year-old prodigy**



▶ **The varnish on the top shows a bubbled texture**

year that his violin was stolen, the Palestine Symphony Orchestra gave its first concert, with Toscanini conducting. The orchestra he founded continues today as the Israel Philharmonic Orchestra.

AND WHAT DID THE THIEF GAIN? The violin did not make him a soloist. Ironically for a young violinist, he had a Stradivari of his own but could tell no one about it. He couldn't talk fiddles with his stand partner, or walk into a reputable shop for a clean and adjustment. Instead of the pride of ownership and the responsibility of stewardship, it must have been a rueful satisfaction. Many years later Altman was jailed for molesting his second wife's granddaughter, and died soon afterwards, confessing to the theft on his deathbed. His widow collected a reward from Lloyd's of London, and she and his daughter fought in court to divide the unearnt windfall. A petty coda to a sad story.

Long neglected, the violin was consigned to J.&A. Beare for restoration. The shoe polish was painstakingly removed to reveal the intense red varnish. The instrument was again ready to take the stage, in the hands of Norbert Brainin, first violinist of the Amadeus Quartet. Fittingly, like Huberman, Brainin had also fled Vienna, in 1938.

Joshua Bell acquired the violin in 2001. Eight years later, he played the Brahms Concerto in Huberman's home town of Czestochowa, symbolically completing the circle.

► The varnish is almost shocking in its intensity



JAN RÖHRMANN

once secured the neck. CT images show the angling of two side nails, while the nail closest to the back is angled down towards the back. In the lower corner-block, the hole for the locating pins can also be seen, made by a tapered drill of some sort.

The blocks' annual rings are not cut on the quarter, but rather at almost a 45-degree angle, which might help increase their resistance to splitting. The corners appear to be cut on the slab. The willow of the end-blocks has a measured density of $0.39\text{g}/\text{cm}^3$, whereas the corner-blocks show a lower density: $0.28\text{g}/\text{cm}^3$ (± 0.03). Was stronger wood chosen for the end-blocks, which are subject to stress, and lighter wood used in the less stressed corner-blocks? If these seemingly trivial choices were deliberate, it indicates the sophistication of the makers of that time in maximising the properties of the available natural materials.



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Read Joshua Bell's thoughts on performing on the 'Huberman' at The Strad's website: <http://goo.gl/cCFI9s>

ADJUSTING THE 'HUBERMAN'

Sam Zygmuntowicz describes the process of modifying the violin's sound and response

WHEN JOSHUA BELL first brought the 'Huberman' Stradivari to me, he described the singing sweetness on the E string that had first attracted him to the violin. After documenting the set-up, we were able to improve the shimmer and ringing quality further, with a slightly shorter soundpost.

Afterwards, a new fingerboard with a higher bridge enhanced the fullness, but at some cost to the brilliance. I made several bridges, each adjusted and tuned with the aid of computer analysis, which then restored and even increased the brilliance. Later, re-planing the fingerboard added flexibility to the response. Each little change is a chapter in an ongoing story, with both risk and reward.

Adjusting a violin with a great player is a three-way process of discovery, which depends on curiosity and mutual trust. I focus on perceiving the reactions of the player, listening to the violin itself, and analysing the function of each specific violin. I also need to try the violin myself, to track the tactile changes and connect my personal impression with the subjective experience of the player. When I later adjust my own new violins, I will try to recreate these same qualities.

The wood preparation and ground on Stradivari's violins show a variety of effects, often with the appearance of rich colour soaked into the wood, sometimes with the wood itself a bit darker. Here, the ground colour of the back is a light gold, and the wood appears relatively fresh, with traces of colour penetration in the flames. With this clean under-layer, the plum-red varnish is almost shocking in its intensity.

THE COLOURED VARNISH is highlighted by a varied patina of marks, textures and wear patterns, from the characteristic chipped pattern of the central area of the back, the smooth but mottled wear from hand contact in the upper bouts, and a fine craquelure in areas where the varnish is slightly thicker. The top also shows a bubbled texture, especially on the treble side near the f-holes. This bubbling is more commonly seen on the varnish of 'del Gesù', emphasising the similarity of varnishes at the time.

Tonally, this violin is robust and warm, with a singing brilliance in the treble range. Working closely with Joshua Bell, we have tried a variety of ongoing modifications to the soundpost and fingerboard, as well as experiments with the bridge weight and tuning, to maximise the brilliance and clarity on the E string. The basic character persists with changes to the set-up, but there is considerable latitude to shift the balance towards intensity of sound and resilience, or to emphasise greater fullness and flexibility.

Perfection is an ongoing process, not a static condition. Within the collaborative process of adjusting a great violin with a great player, we can discover which aspects of sound are truly a part of a violin's character, and which are more mercurial and subject to change. And in turn, the instrument can draw out qualities from the player that still remain to be discovered. ■

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