PERIOD of ADJUSTMENT

Although the basic violin set up has changed little from Baroque times, many of its parts have altered radically. In the second of two articles, ROGER HARGRAVE tracks the development of strings, fingerboards and the neck root.

MODERN AND BAROQUE COMPARISONS

(Figure 1) shows a violin set up in the modern style. The stop length is 195mm. The neck length is 130mm from the top nut to the belly edge. The neck is set 6mm above the belly edge and the fingerboard edge thickness is 5mm, making a total of 11mm. The fingerboard curve is 41mm. The elevation of the neck and fingerboard is 27mm If all of these measurements are accurate, when the neck is set, the neck angle and the top nut position find themselves. And allowing for some minor variations the same will apply to any modern or antique violin set up in this way.

The tailpiece is of the modern variety. The tail gut passes through the end of the tailpiece over a bottom nut or saddle that is 3.5mm high. The strings are usually set about 3.5mm to 5.25mm above the board. Together these factors fix the string angles as they pass over the bridge.

If we then make a Baroque violin using similar measurements, we achieve the result illustrated in **(Figure 2)**. The stop and neck lengths are the same as the modern violin: 195mm and 130mm respectively. The edge height of the board at the top nut is 5mm. The wedge thickens to 11mm above the belly edge, virtually the same as the modern board. The board curve is also the same. The elevation is the same. Consequently, if all these measurements are

FIGURE 1: A violin setup in the modern style

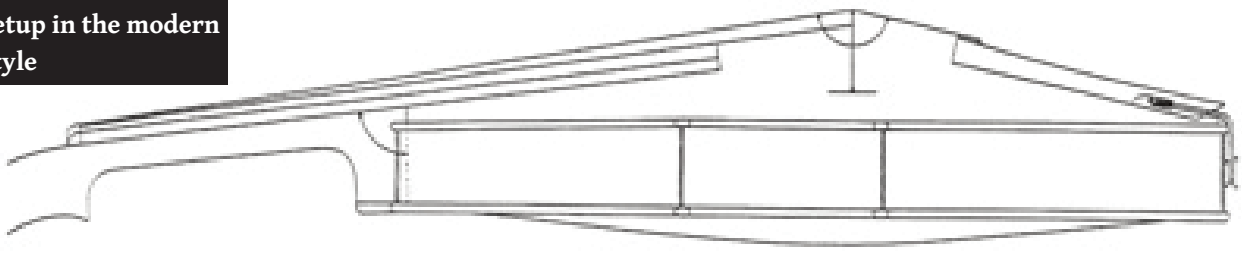
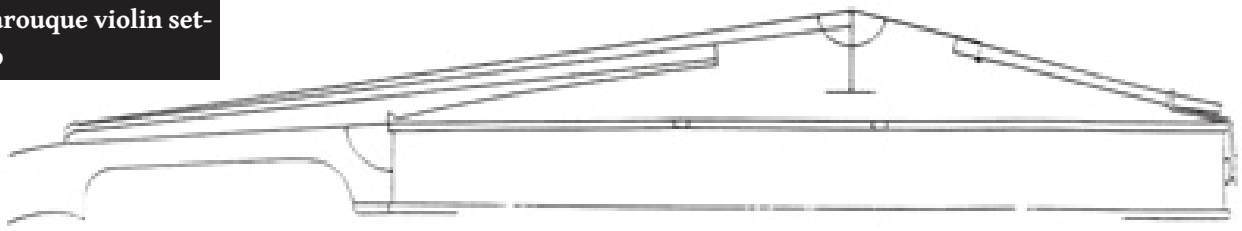


FIGURE 2: The Barouque violin set-up



accurate, the neck angle and the top nut position must also be the same or very similar (**Figure 3**).

BAROQUE TAILPIECES varied considerably, from flat inlaid maple to slightly arched solid ebony. However, in most cases the tail gut passed over a bottom nut or saddle that was initially no higher than the belly edge. The gut entered the tailpiece from below, effectively lifting the tailpiece to the height of the modern saddle. Making and mounting a Baroque tailpiece in this way creates a string angle at the bridge that is entirely similar to the modern angle.'

Apart from allowing the bow to do its work, the combined neck and fingerboard angle (or `elevation) is critical because it establishes the angle of the strings as they pass over the bridge. This angle creates the downward pressure on the bridge that in turn will either generate or mute the instrument's sound. Although opinion about the degree of this angle will vary from maker to maker, I believe that within normal parameters, the Baroque string angle was more or less identical to that of the modern violin.[2]

So if, as I am now suggesting, there were no serious differences between the basic set up of Baroque and modern violins, it is necessary to explain how and why so many drastic alterations were made.

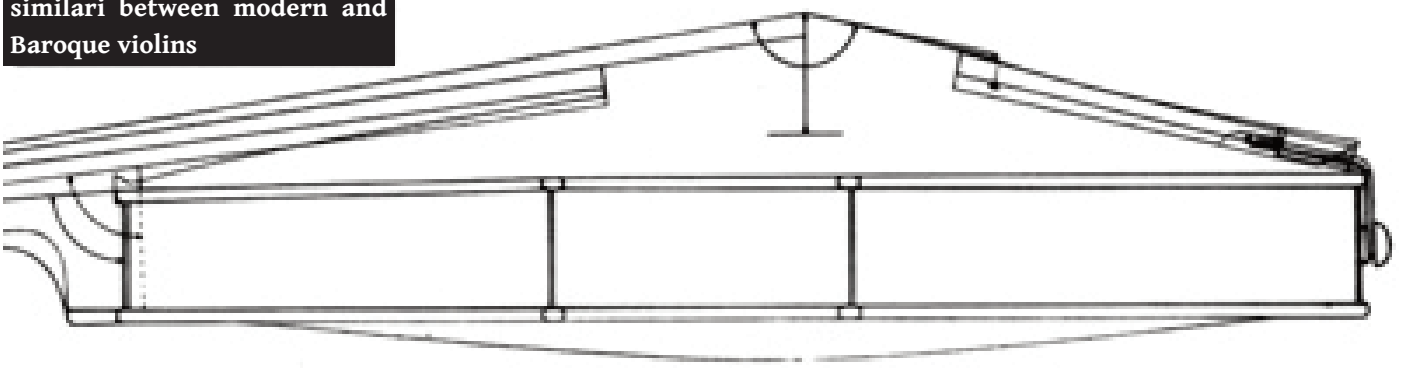
STRING DEVELOPMENT

The most obvious changes occurred as a result of improvements in string quality. From the time of Andrea Amati to the present day, advances in string technology have always preceded improvements in playing, composition and instrument design. As with other technologies, advances in string technology moved swiftly, generally carried by musicians, who were often international travellers. Although plain gut strings were reasonably successful in the upper registers, and continued to be used for the violin until the second half of the 20th century, problems occurred in the lower ranges. The only available bass strings were either excessively thick or extremely long. Several members of the lute family utilised the option of long, thin bass strings, but this was not a practical solution for instruments of the violin family.

From several sources, we are informed that at least some early violins had only three strings. Count Cozio di Salabue mentions one such violin by Andrea Amati, and it is possible that the c.1566 Amati cello known as `The King' also had three strings. This may well have been because both players and makers experienced difficulties with the excessive weight and thickness of the earliest pure gut bass strings. In relation to their length, they were difficult to bow, requiring excessive pressure, which in turn created problems with intonation.

On a related note, a lot has been said about the gradual increase in pressure on the modern bridge, but it is possible that the heavier gut strings of ear-

FIGURE 3 Superimposing Figure 1 on Figure 2 shows the basic similari between modern and Baroque violins



lier times, coupled with the need to increase bow pressure, actually placed a greater load on the Baroque bridge. Although modern strings may be tuned to a slightly higher pitch, which may increase bridge pressure, this is unlikely to have raised the load to the level of the earliest Baroque bridges. Moreover, modern strings are generally much thinner: they vibrate more easily and they require less bow pressure, especially when a modern bow is being used.

THE LIMITATIONS of these early gut strings obviously limited the repertoire. They were probably the main reason why Andrea Amati designed at least two sizes of violin, two of viola, and one very large cello. It seems likely that the repertoire was split between alto and tenor instruments, possibly using the same tuning. From the beginning, cellos appear to have caused particular problems and in view of what followed, Andrea Amati may have made two or more sizes of cello. Possibly to help alleviate problems caused by pure gut bass strings, Andrea's two sons, Antonio and Hieronymus Amati, did many experiments. This resulted in a large variety of instruments, especially cello related instruments, with differing string numbers, string lengths and body sizes. However, after the introduction of woven gut and ultimately metal wound gut strings, it eventually became possible to provide the entire violin family with serviceable bass strings.

Compared with the age-old tradition of using gut strings for musical instruments, the technology for creating metal strings is almost new. Nevertheless, as early as the 15th century, harpsichords and related instruments were using metal strings. The making of fine wire from different metals had been introduced into Europe several centuries earlier, probably from Persia. From the 16th century onwards, alloys of gold, silver, copper and iron were in use for stringing an assortment of instruments. Documentary evidence suggests that violins were strung with metal before 1600, but for whatever reason the practice fell out of favour. In spite of this, before the third quarter of the 17th century, the only practical choice for instruments of the violin family was the pure gut string.

Metal wound strings were probably introduced in the second half of the 17th century. As a result, by the early 18th century, of the original five instruments designed by Andrea Amati, only two remained in the Cremonese catalogue. These were the larger violin and the smaller viola, the larger cello having been replaced by a smaller, more manageable design. There can be no doubt that these changes to the violin family were directly related to improvements in string technology.

THE EFFECT OF METAL WOUND STRINGS ON BAROQUE FINGERBOARDS

As far as I am aware, there is only one known unaltered instrument of the violin family from the earliest period of violin making. It is the 1613 'piccolo' violin by Antonio and Hieronymus Amati. This instrument was probably tuned a 3rd, 4th, or possibly even an octave above the violin. It has a tailpiece and fingerboard fashioned from maple with matching crisscross inlay. This inlay is made from the same three ply purfling that the maker inserted around the back and belly edges.

There are also three violas in the Ashmolean Museum in Oxford that have tailpieces finished in a similar manner. They were made by Andrea Amati in 1574, by Hieronymus and Antonio Amati in 1592, and by Gasparo da Salo (Brescia) in the late 16th century. It seems certain that their inlaid fingerboards are either early or later replacements. Although the Gasparo viola is also said to have its original board, the inlay is made of different material from that in the instrument's body, indicating that it is probably an early replacement. It seems likely that the tailpieces were spared because they continued to be useful even after their matching fingerboards had been replaced.

Advances in string technology have always preceded improvements in playing

In addition, several contemporary paintings depict similar inlaid fingerboards, tailpieces or both. Two typical examples are

The Boy Violinist (1626) by Hendrick ter Brugghen and Aminta's Lament (1614-15) by Bartolomeo Cavarozzi. There is even a paper template in the Stradivari Museum in Cremona.

From the onset of the Baroque revival, these instruments were copied by enthusiastic makers until their inlaid fingerboards and tailpieces became the enduring image of the Baroque violin. However, although it seems likely that the earliest Cremonese and Brescian instruments would have been fitted with inlaid fingerboards similar to the 'piccolo' violin,once the metal wound string was introduced around 1660, such fingerboards were almost certainly abandoned or replaced with considerable haste.

FOR PLAYERS, THESE new metal wound strings were a tremendous evolutionary step forward, but for makers they caused considerable problems. Metal string windings rapidly eroded both the softer maple fingerboards and their inlays. In Italy this development led to the introduction of hardwood veneers. The 1690 tenor viola by Antonio Stradivari known as the'Medici' has a fingerboard covered with a hardwood veneer, and is also inlaid with ivory. Both of these are capable of withstanding the abrasive action of metal wound strings. The two Stainer violins that retain their original necks (1668 and 1679) referenced in the previous article have fingerboards veneered with ebony. Both are similar to the surviving tenor violas by Andrea Guarneri made in 1664. Although the Andrea Guarneri neck is original, at some time this neck was removed and refitted. Consequently, it is possible that the present fingerboard is an early replacement. This viola is now housed in the National Music Museum in Vermillion, South Dakota.

Conversely, countries like the Netherlands and England had access to supplies of ebony via their colonies. Therefore, although they continued to use wedge shaped fingerboards, with the advent of the metal wound string, these boards were now mainly fashioned from solid ebony. Both systems provided simple practical solutions to the problem of wound strings, but the introduction of solid ebony fingerboards became the first phase in the next evolutionary process.

THE BAROQUE NECK ROOT

Cremonese Baroque necks were originally butted against the top rib and fixed with glue and forged iron nails. The fuller curvature of the neck root provided additional structural strength, as did the thicker wedge shaped fingerboard. In contrast, the modern method of setting the neck deep into the top block made it possible to remove more wood from the neck root without compromising its strength. In turn, this created space for the thumb to travel further up the neck, providing easier access to the higher positions. The gradual introduction of solid ebony boards with their inherent rigidity also strengthened the neck, allowing further removal of wood from the root. However, although this development was distinctly helpful, it was a bonus rather than a necessity.

The introduction of metal wound strings created possibilities that revolutionised violin playing. In their 1902 publication Antonio Stradivari: His Life and Work, the Hills state the following:

Before 1700 the available repertoire and the fact that Cremonese and other makers were producing several sizes of instrument, made reaching beyond the fourth position largely unnecessary. But with the advent of the metal wound string, it was not long before some players began pushing boundaries. Although the music of Vivaldi occasionally reaches the fifth position, the violinist Pietro Locatelli, known as 'the father of virtuosity', was stretching a long way beyond, apparently to the 22nd position (wherever that is).

Although we do not know who made the instrument he was using, Locatelli must have been doing this on a Baroque neck, somehow circumnavigating the thicker root. Undoubtedly, in those days this kind of virtuosity was rare, but Locatelli's must have had imitators, and certainly by the second half of the 18th century there were an increasing number of

virtuoso players, especially of the French school. Some time later, even the great Nicolo Paganini was apparently undaunted by the thick Baroque style neck root on his beloved 1743'Cannon' Guarneri'del Gesu

The truth is that long before Baroque necks were replaced on a large scale, players were already reaching far beyond the third and fourth positions. And although each stage in the development of the modern neck and fingerboard offered advantages, as Locatelli, Paganini and others demonstrated, the shape of the neck root was not necessarily a hindrance to virtuosity. All of this indicates that Baroque necks were not replaced simply to alter the shape of neck roots. Reaching the higher positions may have been easier for players as a result, but it is unlikely that virtuosos' demands were the primary reason why these changes were introduced.

THE INTRODUCTION OF THE MODERN SYSTEM

If, as I have surmised, thicker neck roots were not a hindrance for early virtuoso players; if neck and fingerboard angles (elevations) were much the same; if the neck length was of little consequence or was already identical to most modern violins; and if the angle of the strings over the bridge was basically the same, then why were Baroque necks so systematically replaced? Apart from the introduction of new materials such as metal strings and ebony, it seems likely that the answer lies in the gradual emergence of a new profession that of the restorer or repairer of violins.

Any neck, whether Baroque or modern, will eventually become lower with the passage of time. Initially, as with the'Medici' tenor viola (see Figure 5 in the previous article), the fingerboard could be modified to compensate for this shallower angle. However, if for some reason a Baroque neck needed to be replaced or reset, it was the start of a long and difficult process.

In the past, in the various towns and cities of Europe, several methods had been used to attach Baroque

Within normal parameters, the Baroque string angle was more or less identical to that of the modern violin

necks. Most of these involved nails or screws, or a combined neck and top-block (Figure 4). A modern neck can be removed and replaced without opening the main body of the instrument. However, to remove a Baroque neck it was necessary to remove the wedged fingerboard, remove the belly, remove or cut through the iron nails or screws, and occasionally even remove the top block. Although this process was relatively simple, the process of refitting the old (or new) neck was a different proposition.

THE COMPARATIVE EASE with which Baroque violins could be assembled was the secret beauty of the Baroque system. Its downfall was its virtual irreversibility. Reassembling or replacing a Baroque neck is exceptionally stressful. All the various angles, tilts and directions must be addressed and the nails reinserted with the belly (and possibly even the back) off the instrument, since it is impossible to insert the nails with the belly in place. And then, around the beginning of the 19th century, some bright spark came up with the idea of grafting a new neck into the pegbox, fitting a new top block and mortising the neck through the ribs into this new top block. This process was probably developed when one or more broken necks required repair work, rather than simply raising a low elevation.

During Stradivari's lifetime no violin player went beyond the third or fourth position... It was only when players recognised the greater scope afforded them for more varied methods of execution by extending the compass of the instrument, that the makers realised the necessity of adapting the neck and fingerboard to the altered circumstances, thus facilitating the shifting into higher positions.

Readers might be forgiven for thinking that grafting a new neck would be a far more difficult process than simply refitting a Baroque neck and fingerboard, but they would be wrong. Refitting a Baroque neck and fingerboard is a seriously difficult job.

Apart from making repairs of this nature so much easier, this new idea produced long term rewards that quickly became obvious. In particular, this solution made all future repairs much easier. And once this process had begun, it is not difficult to see why this method of repairing antique violins rapidly developed into the modern system of construction. It is also the reason why the old systems were so quickly forgotten. Nevertheless, although this was a radical departure from the ancient methods of construction, it was still just another stage in the evolutionary process.

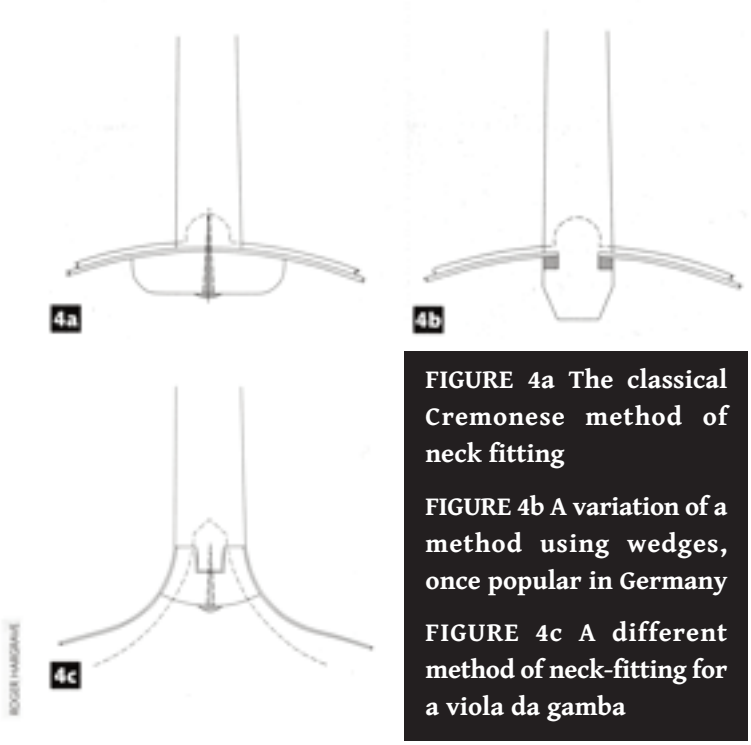


FIGURE 4a The classical Cremonese method of neck fitting

FIGURE 4b A variation of a method using wedges, once popular in Germany

FIGURE 4c A different method of neck-fitting for a viola da gamba

ONCE AGAIN, PROCEDURES that were already being applied in different places and on different instruments were simply adapted and adopted. Certainly, construction techniques employed by non Cremonese makers helped to pave the way for these changes. For example, various instruments of German or Austrian origin had their necks set through the ribs and into the top block without nails or screws to hold them. Meanwhile, although still nailing and gluing their necks to the ribs, several makers were already raising the neck root several millimetres above the belly edge. This latter development eventually led to the modern style solid ebony fingerboard replacing the wedge.

Although the process of mortising the neck had ancient precedents, once mortising the neck into the top block became the basic method of construction, a line was crossed.

Throughout Europe, instrument makers switched from aligning the body and soundholes to the neck, to aligning the neck to the soundholes and body. Although this method had no discernible effect upon the violin's overall function, this simple system change subtly altered the appearance of the entire violin family, and incidentally the path of violin expertise (for more details on this, see my article 'The Cremonese Key to Expertise' in the June 2011 issue of The Strad).

In spite of this significant new development, makers were still required to work within the parameters that govern the successful construction and set up of any violin, be it Baroque or modern. Clearly there are differences, but they are largely differences of approach rather than fundamental differences in the instrument's concept. Moreover, although all violin makers strive to achieve a better sound in the instruments that they service or build, as far as I can ascertain, in the entire history of the violin family no one has ever taken an active decision to alter these instruments in any radical way simply to improve their power or their tone. Indeed, in this respect I am not totally convinced that the modern set up is a genuine improvement. It may have improved playability, and it certainly solved a few repair headaches, but using high quality modern strings I have heard several 'Baroque' instruments that can match the carrying power and tonal qualities of similar instruments, set up in the modern way.

I have not touched upon the effect of overall weight, bass bars, bridge designs, soundposts, chin rests and shoulder rests, all of which must exert their influ-

The detail of this c.1760 English pochette, housed at the Ashmolean Museum in Oxford, UK, illustrates both a solid ebony fingerboard with a wedge shape, and a fingerboard that is raised above the belly edge

The neck of this 1868 Enrico Ceruti violin is fixed to the top block with a screw, in a late variation of the Cremonese method

No one has ever decided to alter these instruments in a radical way simply to improve their power or tone

ence. Nor have I said a great deal about the development of strings. This is in itself the subject for a book. But as I see it, both makers and players are faced with a simple question: just how authentic do we want to be? The so called 'Baroque period' covers two and a half centuries. If musicians wish to play period music on period instruments, will they require several instruments, to cover each place and period? And will they also require several sizes of violin, viola and cello to cover the various periods before 1700? If so, is the necessary historical evidence actually available to make such copies? And do we really want to go back to those days when gut bass strings were so thick and unwieldy that they were barely playable? Or are we prepared to use the best wound gut strings of our modern era on a Baroque set up, knowing that strings of the 16th, 17th and 18th centuries were never as good?

1 Assuming the neck was fitted at the same angle, the shorter necks of Stradivari and others would have required a wedge shaped board with a greater angle. in turn, this would have resulted in a slightly steeper string angle over the bridge.

Z Because of the need to allow more clearance for thicker Baroque strings, this angle may even have been slightly higher.