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A musical instrument fit for a queen: the metamorphosis of a Medieval citole

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Summary The British Museum's citole (1963,1002.1) is one of Britain's earliest extant stringed instruments. Dating from around 1300–1330, its survival can be attributed to three factors: the quality of craftsmanship with its richly carved decorative elements, its association with Elizabeth I of England (1558–1603) and her favourite Robert Dudley, Earl of Leicester, and its modification to keep pace with changing musical fashion. The refurbishment of the Medieval galleries at the museum during 2007–2008 allowed an opportunity to re-evaluate past treatments of the instrument and investigate its present form scientifically. Throughout its history the instrument has undergone periodic repair, including the replacement of soundboards, fingerboards, strings and other fittings, but its magnificently carved boxwood (*Buxus sempervirens*) body, neck and headpiece remain virtually intact.

Detailed examination of the citole components prior to and during conservation revealed previously suspected but unseen alterations. Radiography has been used to study features of the original construction as well as internal alterations which show that it could have been played with a bow. The metal elements have been identified by X-ray fluorescence analysis, while microscopic analysis enabled the identification of the wooden components.

Interpreting past restorations and modifications allowed for informed judgements to be made about conservation treatments, while making more accessible important information about the instrument's past.

INTRODUCTION

The British Museum's citole (1963,1002.1: Figure 1) is an object of extreme rarity. A virtuoso example of the Medieval woodcarver's craft, it is one of perhaps only four stringed instruments of comparable quality to have survived from the Medieval period. It is, however, a confusing hybrid. Part citole, part violin, it was described as a gittern by Francis Galpin in 1910 [1], and the term stuck until 1977 when Laurence Wright extensively revised the terminology surrounding the gittern and related instruments [2]. It was described as a 'gittern' (in inverted commas) by Mary Remnant and Richard Marks when they published their authoritative work on the instrument in 1980 [3; p. 83]. The inverted commas reflected Remnant's reluctance to accept Wright's recent judgement, which she expressed in the following way: "While Wright's reasons for changing the terminology certainly carry weight, and have been readily accepted by a good many organologists, there are others who feel the need for greater time in which to consider the

matter before changing the long-accepted terminology" [3]. After an extensive period for reflection, the British Museum co-hosted an informal seminar on the subject with the New Metropolitan University of London in 2003 and took the decision to adopt the term 'citole'. The details of which characteristics precisely define the respective instruments remain subject to a degree of scholarly discussion. However, the citole is a precursor of the modern guitar and is characterized by its flat back made from a single piece of wood, while the gittern is the precursor of the lute and has a rounded back achieved by the use of several jointed flat pieces of wood. Although the back of the British Museum citole is slightly vaulted, it is constructed from only one piece of boxwood (*Buxus sempervirens*). Indeed, the head, neck and the entire body of the citole are carved from one piece of boxwood; the vaulted back is a design variant rather than a difference in construction.

Alterations have been made to the citole at several times in the past, including its conversion into a violin. Among the changes is the insertion of a silver plate above the pegbox,



FIGURE 1. The British Museum citole (1963,1002.1) after recent conservation treatment: length 610 mm, height 147 mm and width 186 mm

engraved with the arms of Elizabeth I (reigned 1558–1603), together with those of Robert Dudley, Earl of Leicester.

The citole will take a prominent place in the new Medieval gallery due to open in 2009; this has provided an opportunity to improve the display of the instrument and – during the intervening period – permitted both organological study and an assessment of its aesthetic qualities. To these ends conservators, curators and scientists have re-evaluated this unique object, building on previous studies that revealed significant information about the instrument and its conversion, as well as highlighting areas that require further investigation.

The conservation of the British Museum citole allowed a multi-faceted approach involving arresting further deterioration and preparation for display in tandem with the scientific investigation of the materials, original methods of construction and later conversion. X-radiography was used to clarify the internal structure, particularly the evidence for alterations. The X-ray films were scanned using an Agfa RadView digitizer with a 50 μm pixel size and a 12-bit resolution, to allow digital enhancement of the images. To emphasize edges and discontinuities, the images were subject to greyscale manipulation. Tiny wood samples (c.1 mm^3) for species identification were taken from as many component parts of the citole as could be sampled unobtrusively. Their anatomical structure was characterized by optical microscopy using a Leica Aristomet biological microscope with a range of magnifications from $\times 50$ to $\times 800$. The other materials were identified by non-destructive X-ray fluorescence analysis (XRF) using a Bruker Artax XRF spectrometer with a molybdenum target X-ray tube rated up to 40 W and operated at 50 kV and 800 μA .

MEDIEVAL MUSICAL INSTRUMENTS

Musical instruments are made to be played; they have active lives that can see injury, loss or replacement by a

finer model. Each of the known surviving extant Medieval stringed instruments has been highly treasured in its day and by successive generations. All except one, however, has seen alterations reflecting the changing needs of musicians or owners. A violeta from the Convent of Corpus Domini in Bologna dates from the fifteenth century and is preserved there as one of the precious relics that furnish the shrine of S. Caterina de' Vigri. Its relatively obscure location and sacred context account for its preservation, which has left it largely intact with little or no alteration [4]. Two fifteenth-century Italian instruments, a mandora (64.101.1409) at the Metropolitan Museum of Art in New York and a rebec (sam. inv no. 433) at the Kunsthistorisches Museum in Vienna, bear some comparison with the citole, particularly in their elaborately carved surfaces decorated with emphatically secular subject matter and in their handles, which terminate in dragons' heads. Neither functions convincingly as a musical instrument but they have long been valued as works of art. Both testify to the association between love and music. The back of the mandora is carved with a courting couple beneath a tree that contains a figure of cupid; the back of the rebec is carved with the figure of a naked woman, possibly Venus. The citole's romantic connotations are firmly fixed in the later period of its existence when it was converted to a violin and exchanged as a gift between Elizabeth I and her favourite, Robert Dudley.

The royal connection is documented in the form of a silver plate covering the pegbox, engraved with the arms



FIGURE 2. The tailpiece button, plate and screw

of Elizabeth and Dudley, which was introduced in 1578 when the citole was converted into a violin. The year 1578 is provided by a small silver plate, which carries the initials 'I P' and the date, Figure 2. The plate is positioned at the back of the citole, above the trefoil where a threaded screw-fixing passes through, securing a lion-headed button on the front. Both were inserted as part of the restringing of the instrument and are essential for keeping the tailpiece in place. The metal of the engraved plate and the lion-headed button was identified by XRF as a silver-copper alloy with trace levels (less than 1%) of lead occurring as an impurity in the silver. Both are gilded by the mercury (fire-gilding) method, and both this and the alloy composition are consistent with the date on the button plate.

The British Museum citole dates from the period around 1300–1330 and is the earliest of the four survivals. Abundant representations of citoles in the visual arts show that the instrument was in use from the late twelfth century in Spain and Italy and from the thirteenth century in northern Europe. The gradual movement of the instrument from south to north may well reflect the influence of Islamic musical instruments on the development of the citole. The culturally mixed communities of southern Spain and Italy, which saw dialogue between Christian, Jew and Muslim, enjoyed a pivotal role in the transmission of ideas during this period. Knowledge of music, mathematics, science, medicine, art and literature was promulgated along the same routes through translated manuscripts, migrant physicians and exported goods. Spain was undoubtedly important in establishing an awareness of the citole; it was connected to the rest of Europe by the vast number of pilgrims who visited Santiago de Compostela, and through the various dynastic marriages that saw royal brides moving to and from Spain with all the diplomatic gifts that attended such transactions. When Eleanor, the daughter of Henry II, married Alfonso VII in 1169 it can only be imagined how the international courtship was conducted, but music, the language of love, must surely have played its part. By the time that Eleanor of Castille married Edward I in 1254, the citole was probably well established in England [5]. A solitary citolist, 'Janyn le citoler' performed at the ceremony to celebrate the knighting of Eleanor's son, the future Edward II, at Westminster in 1306 [3; p. 89], although the musician probably did not play solo, as the citole was most frequently used to accompany other instruments. Revealingly, at the ceremony at Westminster there were 19 trumpeters and 16 harpists, instrumentalists of sufficient stature for an event of national importance.

The citole was regarded as a soft or *bas* instrument and was most usually played in a domestic or courtly setting [6; p. 4]. It was designed to be plucked with a plectrum and most of the depictions show it being played in this way, although other illustrations show it being strummed without a plectrum. Undoubtedly capable of carrying a tune, as modern replicas of the British Museum citole have demonstrated, citoles may have performed a limited repertoire and were probably used mainly to keep time by playing the same few notes repeatedly [7]. This understanding is supported by



FIGURE 3. A fourteenth-century Parisian ivory panel (1971,0501.1) that illustrates a citole/gittern (top left) being played with other instruments: this instrument has been described recently as both a gittern and a citole; a gittern would normally have a characteristic pear-shape with a sickle-shaped pegbox

representations of musicians playing citoles, the majority of which show the player's hand coming up from under the centre of the instrument. This approach would allow adequate movement only to play the drone chords satisfactorily [3; p. 88]. It is not surprising, therefore, that the citole is usually depicted with other instruments, principally fiddles, Figure 3.

The gifting of the citole between Elizabeth and Dudley and its conversion to a violin demonstrate how the instrument was held in high regard some 250 years after it was made. The value placed on it was not inspired by the expense of the raw material nor by its virtue as a musical instrument (the citole was distinctly out of date by about 1400) but by the extraordinary richness and quality of the carving that covers its neck and sides.

THE CARVINGS

The fine, dense structure of boxwood (Figure 4) is ideal for intricate, detailed carving and can be highly polished, Figure 5. There is no narrative to the design of the carvings,

which seem to develop in a gravity-defying, proportion-denying mass that emerges from the mouth of a dragon. In general the scenes are intimately connected with the dense, dark forest which was an important feature of Medieval life. Pastoral scenes such as a swineherd tending to his hogs (Figure 6) and a woodman at work with his axe are juxtaposed with vigorous hunting scenes (Figure 7) that dominate much of the composition. Each of these topics had great resonance for a Medieval audience since they signified specific occupations for particular months of the year. The swineherd knocking down acorns to feed his hogs was used to illustrate the months of November or December in the Medieval calendar; the woodman chopping branches was chosen as an appropriate activity for March; while the hunt was regarded as a suitable pastime for May, the month for lovers. The character of the carving contributes enormously to the citole's popular appeal today; careful scrutiny is rewarded by the discovery of creatures of the forest within a thicket of mulberry, hawthorn, oak and vine leaves in a mysterious world occupied by men and hybrid monsters, Figure 8.

The magnificent carved dragon headpiece can be identified as a wyvern, an ancient variety of the imaginary species 'draco' (dragon), Figure 9. The wyvern was originally thought of as a forest-dwelling creature more akin to a snake than the fire-breathing monster normally envisaged as a typical dragon. The four-legged dragon of popular renown seems to have been introduced around 1400 by the English heralds [8]. A wyvern has two wings and only two legs, and is sometimes depicted in manuscripts, carvings and heraldry with a knotted tail known as 'nowed' or sometimes *noué* (from the French for 'knotted'). A smaller example of the creature

is carved on the side panel of the citole doing battle with a half-man, half-bird, Figure 10. The green eyes of the creature are leaded glass and each glass eye is set into metal foil or a cell made of brass (copper-zinc alloy). The orientation of the wyvern headpiece on the citole is that of a wyvern *regardant* (looking back over its shoulder) with its body and long tail (which trifurcates toward its end) coiling around beneath the fingerboard and around the neck aperture.

Visible through an openwork panel on the side is a somewhat worn, golden-coloured material, tinged green in places. This proved to be a sheet of flax fibre paper with a coating of gold-coloured brass paint, Figure 11. It is by no means certain that it is original; the openwork panel is removable, presumably for the very purpose of accommodating an attractive coloured backing material, which would not have been difficult to replace at any stage.

There is a detached element of carving from the back of the neck panel, an owl, also carved from boxwood. Although its location has been identified, it could not be secured back in place.

ETHICAL CONSIDERATIONS FOR RESTORATION

The conservation of historical musical instruments raises many ethical considerations. To arrest deterioration of what was once a playing object often requires an interventive approach. Caple states that: "restoration can be seen as covering the scars and damage of the past, and thus distorting the past by beautifying it, and denying part of

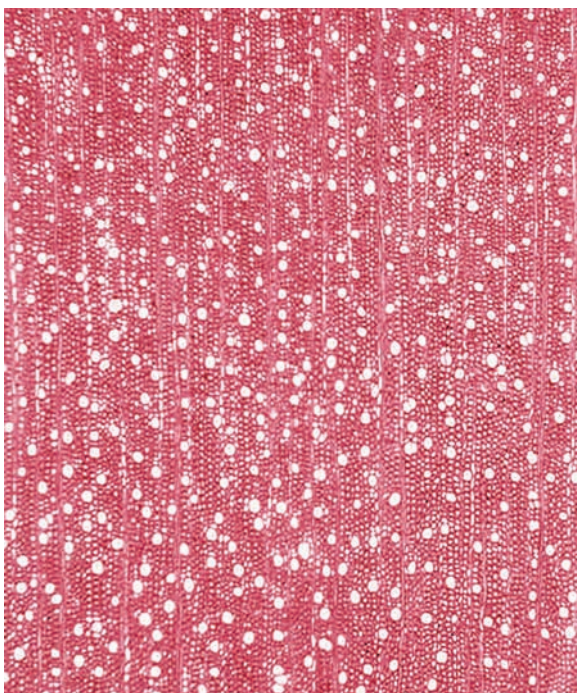


FIGURE 4. Thin section of boxwood (*Buxus sempervirens*)



FIGURE 5. A carved gargoyle figure from the back of the citole



FIGURE 6. Carving of a swine herder and hogs



FIGURE 7. Carving of hunting scene including a man, hound and fox



FIGURE 8. Carving of a hybrid archer and rabbit



FIGURE 9. Carved head of the dragon or wyvern



FIGURE 10. Carving of a hybrid creature battling a wyvern



FIGURE 11. Detail of the brass-coloured paint on the paper beneath the pierced wood panel

the history of the object. Equally, avoiding restoration leaves every object looking broken or damaged” [9; p. 128]. Musical instruments, by their very nature, have continually been repaired and it is often expected that these objects can be picked up and played even when hundreds of years old. In reality, the overwhelming majority are of course not played; continued use would inevitably lead to the wearing out of parts, and also put many important instruments at considerable risk. Stringed and bowed instruments, particularly violins, have been described as: “almost unique in the way they have lent themselves to continued use, repair, restoration and conservation” [10; p. 98]. The museum as custodian offers the instrument a new life, one of display and interpretation. Barclay identifies three options for care of instruments namely:

Currency, or maintenance in a working state possibly with modifications or alterations to sustain functionality. Conservation or preserving the physical integrity of an instrument using minimal intervention and scientifically based investigation and documentation methods. Restoration or recreation of a known earlier

state of an instrument using craft intervention and substitution or addition of materials [11; p. 22].

Barclay’s approach to the care of instruments further argues that it is desirable that treatments should, where possible, encompass combinations of two, if not all three, of these options.

Watson highlights two approaches to the treatment of historical musical instruments, describing the “two voices” of instruments: the musical voice, its musical quality and the experience and emotions that it evokes, and the historical voice, by which the instrument reveals its past through the historical evidence therein [12; p. 15]. The retention or recreation of the musical voice for the citole was not considered a viable option because of the vulnerable condition of the instrument and its uniqueness. The need to protect this ‘historical voice’ was judged to be of paramount importance. It was, however, felt that with minimal intervention, a balance could be struck between the two ‘voices’, by displaying the citole so it appears in a condition that closely resembles a playable instrument. This in turn helps to fulfil an important aim of museums – to enhance understanding and interpretability without compromising historical value. Watson, although referring specifically to organs, suggests a need for urgency that applies to all historical musical instruments: “... that we collaboratively discover ways we can perform restorations of historically significant organs using methods that will respect and protect this non-renewable resource of historical information” [12; p. 23].

The conservation of instruments will often require a restorative approach; likewise restoring an instrument will require consideration of the conservation impact of the chosen techniques. Historical significance, the removal of original material, maker’s intent and the requirements and expectations of curator, owner and other stakeholders must all be taken into account. It is important to consider that objects change over time and this evolution becomes part of their significance and character.

CONSERVATION ASSESSMENT

To assist in identifying the features of the citole referred to in the following sections, an illustrated glossary is provided in Figure 12. Prior to conservation, a number of past repairs and replacements were discussed by conservators, curators and musical instrument specialists and judged to be not in keeping or historically correct for the instrument and its context within the new Medieval gallery. The instrument was dusty, both within the recesses of the carving and below the bridge and strings. There were greasy marks and fingerprints on the soundboard as well as surface dirt. The citole had been strung with a mismatched set of gut strings, which was further confused by the winding of the four strings onto three pegs (one peg head had snapped and the head is lost), Figure 13. Pye states: “poor condition may mask significance” [13]; failure to remove the mismatched strings – which were not, of course, original – and to run each string to an individual peg, would prevent a correct inter-

pretation of the object. The option of retaining the existing strings would serve only to highlight a poorly executed past repair.

The abraded and scratched condition of the varnish layer on the soundboard was considered unsightly and could be misconstrued as evidence of lack of care. If the instrument were in use the varnish might be repaired and, equally, an item of furniture within a collection or museum might have this protective finish retouched to aid correct interpretation. The *National Trust manual of housekeeping* recommends that the finish and appearance of an instrument may “require attention” depending on the context in which it is to be viewed [14]. For the citole this context was as a central focus within the new gallery.

A length of copper alloy wire twisted at the end secured the tailpiece in place, Figure 14. This old repair was judged to utilize a material that was unsuitable for the purpose and would not have been used on a citole or a violin. Furthermore the sharp ends of the wire were abrading the finish

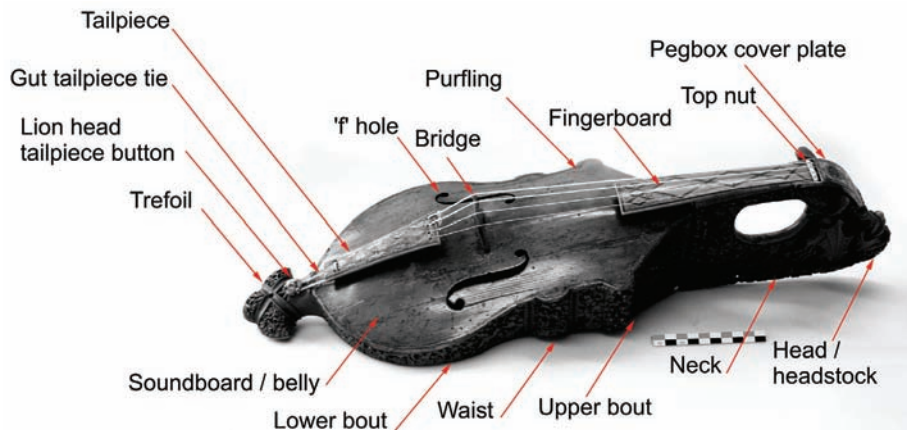


FIGURE 12. An illustrated glossary of the parts of the citole



FIGURE 13. Detail of the broken peg head before conservation



FIGURE 14. Detail of the copper wire tie from the tailpiece to the button before conservation

below the tailpiece button, so that retaining the wire would lead to further deterioration.

The broken peg end revealed evidence of a previous repair in the form of old proteinaceous glue residues around the break. It is likely that the (now lost) peg head had snapped at the point where it emerged from the pegbox and was adhered in position with this glue. End-grain gluing is prone to failure and once this join failed part of the peg became lost. For future preservation it is important to spread the tension of the strings evenly over the bridge, particularly as the bridge is not fixed but is held in position by the string tension. To continue to secure strings to three pegs would put the bridge at risk of misalignment and possible collapse. However, if the shaft of the existing peg were retained, it would be necessary to drill into it to dowel or splice on a new head in order to offer sufficient purchase to take the strain of the string. These options would involve unnecessary loss of original material. The alternative removal and replacement with a replica peg would allow tensioning of the fourth string while improving the appearance of the instrument. The broken shaft could be archived for future study.

The glued joint or seam between the body and soundboard had begun to open up and fail on both sides and above the top block near the neck of the instrument, Figure 15. It is important to re-glue failing joints as this “restores the natural integrity” of the instrument preventing further opening up along the seam [14]. This is particularly impor-



FIGURE 15. Detail of the seam between the body and the soundboard showing the opening of the join

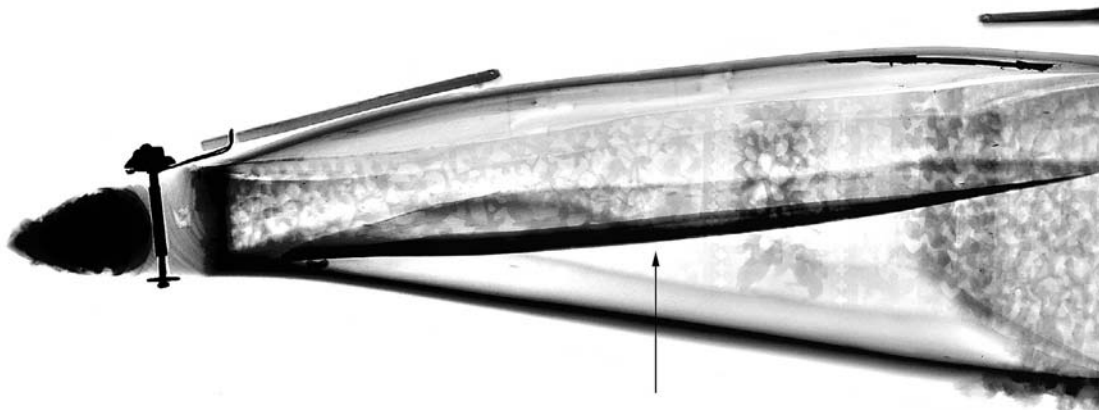


FIGURE 16. X-radiograph through the side of the citole revealing the internal false back (indicated with an arrow), parallel to the soundboard

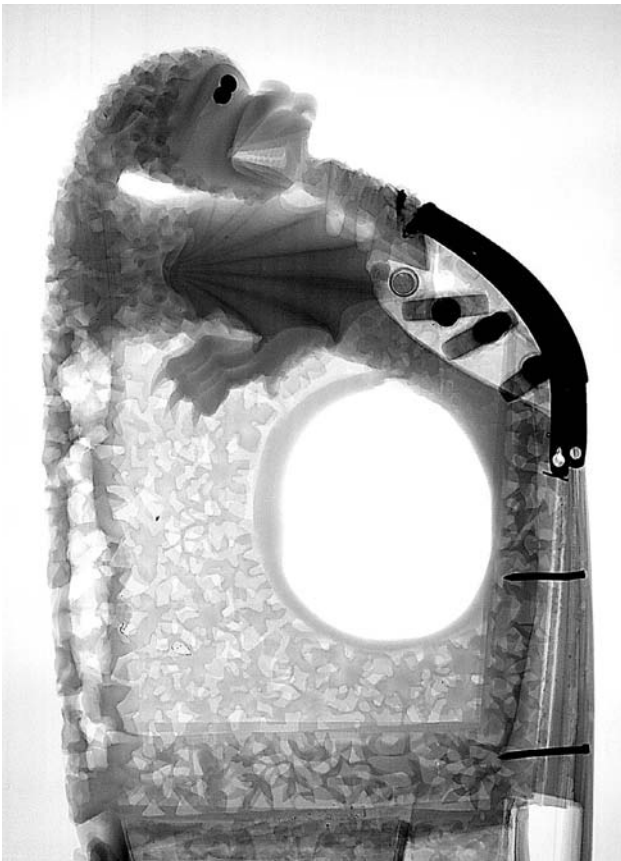


FIGURE 17. X-radiograph through the side of the neck revealing a pin and two large nails that were used to fix the latest fingerboard. The features that appear darker in the image are more dense. The four pegs can be seen end-on behind the dragon, with the broken peg at the top; the edge of the internal false back is the dark feature seen at the bottom, right of centre

tant if the instrument is strung. Old animal glue will become brittle over time and can often deteriorate further due to microbiological attack in incorrect environmental conditions. Stresses induced by tuning the instrument will also cause glue lines to open up. These stresses are accentuated by the differing materials that are chosen for their acoustic values. For example, the soundboard is made of a softer and more pliable wood (spruce; *Picea abies*), which will vibrate and move under compressive and tensile forces. The option of complete removal of the soundboard to reveal the alterations during the violin conversion was considered. X-radiographs (Figure 16) showed clearly the internal method of conversion, with a false back let into the body of the instrument. It was felt to be too risky to remove the soundboard as the edges were planed or chamfered off to a thin section where they were joined to the body making them extremely vulnerable to breaking. Furthermore, there would be inevitable damage to the finish when large areas of sound glue were softened. The X-radiographs offered sufficient information for the study of the interior and the former state of the instrument, rendering soundboard removal unnecessary.

A number of small inlaid pieces of wood along the fingerboard had lifted and had accumulated dirt underneath. It is essential with all inlays that they be securely re-laid to

prevent snagging and subsequent loss. Modern nails had been used to secure the fingerboard to the neck and were visible in the X-radiographs, Figure 17. Although these nails are also evidence of a poorly executed older repair, their removal would have jeopardized the delicate inlaid fingerboard. The heads of the nails had been punched below the surface of the fingerboard and the indentation had been filled with a wax-like substance that now stood out against the colour of the wood.

The fingerboard is made from wood from the wayfaring tree (*Viburnum lantana*), a tree that was sometimes coppiced to produce straight wood. The fingerboard is wedge-shaped, consistent with sixteenth-century stringed instrument design and construction. Beneath it is another wedge (Figure 18) made from yew (*Taxus baccata*) of uncertain date. It is likely that the surface of the original neck has been planed down in a previous attempt to modify the citole, resulting in the loss of part of the original carving,



FIGURE 18. Detail of the additional citole fingerboard wedge



FIGURE 19. Detail of the truncated carving on the neck of the citole

which now appears truncated, Figure 19. The pegbox has been hollowed out and reshaped, changing the original configuration and removing c.25 mm of the neck length. All these modifications have been variously interpreted and constitute a record of this instrument's historical evolution. Preserving this very early, possibly unique evidence intact is essential for future research.

SUMMARY OF JUSTIFICATION AND EXTENT OF TREATMENT

The approach to the treatment involved restoring the physical integrity of the instrument, prevention of further deterioration to the finish, and allowing the instrument to be correctly interpreted. The securing of the soundboard to the body was required to prevent further opening up of the joint. A broken peg head was preventing the tensioning of the strings and so unbalancing the bridge. Movement or collapse of the bridge would further damage the area of finish below the bridge feet. It was therefore decided that a fourth working peg would give an even tension across the bridge, and that the remaining broken shaft should be archived after the wood had been identified. The wire attaching the tailpiece to the tailpiece button was also damaging the surface of the trefoil where it was twisted together; the use of wire showed a lack of understanding of the correct method of attaching these components, i.e. with tailgut. The inlay on the fingerboard was lifting and in danger of becoming lost; the re-laying of these inlays was also vital to restoring the physical integrity of the instrument.

Attaching the strings to too few pegs was confusing and misleading for both visitors and organologists. This misleading configuration of the instrument raised a further consideration; that is, should the instrument be seen to be in a playable condition (although obviously not playable) to allow a better understanding of the instrument and the maker's intent? This consideration was balanced with the aesthetic requirement of providing an appropriate level of care to this important instrument. The modern bridge was not in keeping with the style of an early instrument and it was considered a poor replacement. An electrotpe dating from 1869 (discussed later) shows a different – equally historically incorrect – bridge, while a photograph of the citole from 1903 showed that the strings were then no longer attached and no bridge was present [15]. On balance, it was felt that making a new replacement in a more suitable form was appropriate, as it would restore the instrument to an earlier state and allow a better appreciation of its form.

The top nut of an instrument elevates the strings above its fingerboard by an amount that allows clear vibration of the strings without hindrance. The citole fingerboard is curved convexly along its length, causing undesirable string contact along the surface. Any instrument in this state would not be playable because the strings could not vibrate freely. The unusual visual appearance of strings

lying on the fingerboard would confuse many of those who have some understanding of functioning instruments and how they should look. Furthermore, allowing the strings to remain in contact with the fingerboard would exert uneven forces on the bridge. As discussed above, the bridge must be held by an even, controlled downward force from the tensioned strings to avoid potential collapse or movement. It was therefore considered necessary to raise the nut on this instrument (to lift the strings off the fingerboard) for two reasons: to allow the bridge to be held by tension alone and to enhance the understanding of the citole as a playing instrument.

TREATMENT

The old gut strings (made from sheep intestine) were removed and archived. The surfaces of the soundboard, fingerboard, body and carving were dry cleaned by brushing with a soft (sable) brush and vacuuming with a low-suction vacuum cleaner with nylon net filter. Smaller brushes were required to remove dust from the recesses of the carved areas. Chemsponge® (vulcanised rubber) was used to trap and further remove surface dirt.

The failing glue seam between the soundboard and instrument body was investigated. A thin metal spatula was inserted into the open seam and run along it until it met with resistance. The gap was held open with metal spatulas at intervals along the glue line and microcrystalline wax (Renaissance wax) was applied to protect the finish (varnish) on the areas above and below the glue line. (Renaissance wax is used to protect varnished surfaces from moisture [16, 17] and to act as a final protective layer or polish.) A 5% solution of Laponite RD® (a synthetic colloidal thixotropic gel-like clay) in water was inserted into the seam on top of the residual glue and covered with Clingfilm® (low-density polyethylene) to slow down evaporation. After 30 minutes, the Laponite was removed and the glue surfaces cleaned with moist cotton wool swabs. Fish glue (gelatine, water and <1% phenol) was applied to the glue line within the seam and both soundboard and body were clamped in position. When partially gelled, the excess glue was removed from the surface.

Pegs

It was necessary to soften the old glue on the broken peg end to enable removal. The surrounding area of wood on the pegbox cheek was coated with Renaissance wax to protect the finish. Laponite was applied and covered as described above. After 20 minutes the Laponite had softened and partially absorbed the animal glue, permitting its easy removal with a moist cotton wool swab. It is advisable to remove tight pegs from their peg holes by rotating and applying a light pulling pressure to prevent damage to the

cheeks of the pegbox. However, as the peg head was missing a piece of wood of the same diameter was placed against the narrowest end of the peg and lightly tapped; this freed the broken shaft from the pegbox. A complete peg was removed and a mould was taken for a cast to be made with coloured resin. As the resin proved too brittle to use for the whole peg, a turned wooden shaft was grafted to the resin replica peg head to improve its functional strength. The material of the now-archived broken peg was identified as boxwood.

Bridge

The modern bridge made from maple (*Acer platanoides*) was removed and archived and a period design maple bridge was made and colour matched to the soundboard, Figure 20. The bridge was 'fitted' to the curved soundboard surface by carefully sculpting and trimming away its feet using a scalpel, until a good fit with the curvature was achieved. Many modern luthiers use abrasive papers to fit bridges, but Weisshaar and Shipman state "that a bridge should be fitted entirely with a knife" [18]. The correct height and curvature of the top edge of the bridge were determined by fitting the two outside strings temporarily and measuring the heights of the strings above the fingerboard. A working height was estimated and the bridge was trimmed and shaped accordingly.

Top nut

Setting up the citole as an ostensibly playable instrument required the ivory nut to be raised by approximately 2 mm by means of a balsa wood block of the same dimensions glued underneath. The ivory nut was then glued into position with cold-setting fish glue, a treatment that is considered to be fully removable. The combination of the raised



FIGURE 20. The new bridge fitted to the citole after conservation

nut and a replacement bridge of correct height lifted the strings completely clear the fingerboard surface. The only other option of raising the strings would have been by using a much higher bridge, but the resulting appearance would have been strange and outside the normal range of bridge heights. Adjustment of the top nut was the key factor that permitted the instrument to appear playable while allowing it to remain stable when on display.

Tailpiece and fixing

The copper alloy wire tie was cut away to prevent the twisted ends of the wire from damaging the finish. The tailpiece button fixing was removed, photographed and replaced after the application of Teflon (polytetrafluoroethylene; PTFE) tape to the thread to take up slack/play between the screw thread and the barrel nut end. The tailpiece was removed and cleaned. It was measured and photographed, as it is believed that originally the tailpiece terminated in a point, as illustrated in an eighteenth-century engraving, Figure 21. The tailpiece, if contemporary with the initial conver-



FIGURE 21. Engraving of the citole 1776 (published by Sir J. Hawkins): British Library C.45.f.4-8. Reproduced by permission of the British Library Board. All rights reserved



FIGURE 22. Detail of the tailpiece after conservation

sion, is a very rare example of an early violin tailpiece and it is interesting to note that it, too, is made from boxwood. At the bottom edge of the tailpiece (the end tied to the button) are two grooves that are likely to be vestiges of the two original holes through which the tailpiece was secured to the button with the tailgut, Figure 22. At some point in the instrument's past, perhaps because this area of the tailpiece had become weak or damaged, it has either broken away or was removed. The tailpiece was remounted using a new natural gut tie in a position suggested by Hawkins's engraving, Figure 21.

Restranging

Gut strings were used on early violins and a modern replica set, equivalent in type and thickness to early strings, was obtained from a specialist string supplier. The strings were tied to the tailpiece employing a loop-tie method commonly used with gut strings. The string tension used for set-up was approximately one third of full tension, which was sufficient to hold the freestanding bridge in position under pressure without placing undue strain on the soundboard and exerting undesirable forces on the instrument structure as a whole. No supporting sound post exists; this would sit below the underside of the soundboard at the bridge foot position (on the treble side) and reach to the back of the instrument, in this case the false back. Within the limits of the evidence available and while following the principles of sustainable conservation, it might be considered that the instrument now closely resembles its playing configuration and overall appearance around the time of Elizabeth I.

INTERPRETING THE MODIFICATIONS

Interpreting the evolution of a musical instrument from its repairs and modifications is not an exact science. In the case of the citole, however, there are some features that can assist this process. First, the instrument was clearly converted

from a plucked, guitar-like instrument into a bowed instrument, a violin. By the time of Elizabeth's ascent to the English throne in 1558 the violin was a fashionable instrument used mainly for dance accompaniment in consort with other string and wind instruments [19].

The eighteenth-century engraving mentioned above (Figure 21) clearly shows the low wedge fingerboard, the pointed tailpiece and the modified headstock. The playing configuration of the instrument in the engraving is that of an early violin, fitted with a low bridge and a low wedge fingerboard. Remnant has pointed out some apparent inaccuracies in the engraving [3; p. 96], and we note in addition that the engraving has been laterally inverted and that the fingerboard also appears to be much shorter than in reality. Inaccuracies and distortions are common in early representations, and caution is needed when drawing conclusions from such sources.

Exactly when the citole was first converted is uncertain but in order to accomplish the conversion the flat fingerboard had to be replaced and a new tailpiece added. The received opinion from an examination made by Charles Beare and Robert Graham in 1979 was that the present soundboard made of spruce, which has characteristic 'f-shaped' sound holes and a vaulted profile, dates from the mid-eighteenth century [3; p. 105 (endnote 40)]. It should of course be noted that these informed opinions are based on experience and knowledge rather than arrived at through scientific dating. The surface of the neck and part of the ribs were planed down to make the conversion to a bowed instrument, as can be seen from the truncated carvings, Figure 19. The original flat citole soundboard may have been retained in the earliest conversion and only 'upgraded' to the present, arched violin-type soundboard at some later date. The planed-down neck surface would only have been necessary to obtain correct bridge and string height if still using the original flat soundboard.

Inside the body of the instrument there is a false back inserted to give the appropriate depth for a violin [3; p. 95]. The false back is housed or let into the neck and upper bout; it rests just short of the end of the citole body and is glued at the sides, Figure 16. There is no sound post, but there is a mark and evidence of glue on the underside of the soundboard near the foot of the bridge. The presence of glue here does not reflect a conventional procedure for fitting a sound post, but is occasionally found. There was a loose piece of yew that had become dislodged and fallen through one of the 'f-holes'. Whether or not this is from the false back cannot be established with certainty. In addition there is a bass bar planted below the underside of the soundboard as expected in a conventional violin set-up. The citole's pegs had originally been frontal and wooden plugs can be seen inserted into the cavities from which the pegs once protruded below the dragon's mouth. The boxwood pegbox was hollowed out deep enough to accommodate a set of conventional violin-type tuning pegs and given its ornate cover plate advertising the royal link.

An X-radiograph (Figure 23) reveals that the tailpiece,

possibly the earliest violin-type tailpiece in existence (extant early tailpieces are rare because they are lost or replaced over time), seems to be the result of adapting a 'pointed' design similar to those depicted frequently in book II of *Syntagma musicum* by Michael Praetorius, published in 1619 [20].

The current wedge-shaped fingerboard is constructed from a wooden core, inlaid with a geometric pattern on its upper surface, in a way consistent with late-sixteenth-century stringed instrument-making practice. An additional wedge that has been fitted beneath the fingerboard seems to serve two purposes: to obtain both the correct bridge height and working height of the strings above the fingerboard surface. In the case of the citole, the material removed from the surface of the neck during an earlier conversion was, in effect, replaced by the new wedge along with a further slim insert to achieve the correct string/bridge height. A second wedge that has been fitted beneath the fingerboard seems to serve two purposes. First, it is a means of adjusting the angle of the fingerboard so that the strings are at the correct playing height above its surface. The required angle depends on the bridge height, so the thickness of the wedge on the citole would have been chosen in conjunction with any changes to the bridge height. The second function of the wedge may have been to mimic the modernization of violins in the late eighteenth century. At that time older, straighter necks were being replaced with 'backward canted' necks that allowed greater playing fluency [21]. These changes in neck angle, coupled with higher bridges and greater string tension, improved the acoustic response of the instruments. It is also possible that the alterations to the citole were a direct result of the fitting of a new arched-top violin soundboard, which would have required the adjustments discussed.

It is evident from examining the silver pegbox cover plate that the second wedge was not in place when the cover plate was originally made and fitted. The arms of the plate were originally hinged at the sides of the neck at a position that would only allow the fingerboard to be in place. Hawkins describes a plate "... that turns upon a hinge and opens from the nut downwards" [22; p. 342]. Original hinge-pin holes and the carved-out neck areas accommodating the arms can be seen in Figure 24. It is suggested that the current cover plate arrangement, with the hinge-pin set in the pegbox, was configured after the introduction of the additional wedge and that this wedge and arched soundboard were fitted together. The cover plate would presumably have been reoriented after the engraving was rendered. Since the citole was reported as having poor sound quality and playability problems [22; p. 343, 23], these modifications may have also included the introduction of the inner false back in an effort to control and improve the sound.

The magnificent carved dragon headpiece has also been modified. At some point the round neck aperture was roughly carved out to make it larger and crude tool marks are evident, Figure 25. This was probably an attempt to give more hand room for the player, as the original hand-hole of the citole would only have been large enough to accommo-

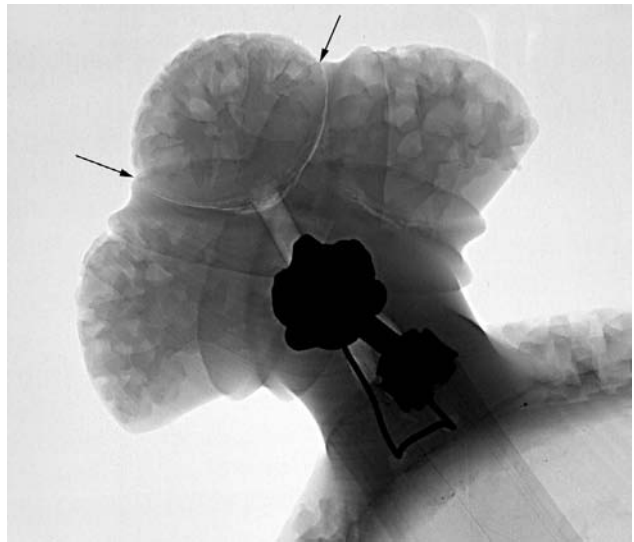


FIGURE 23. X-radiograph of the trefoil (see Figure 14). The join to the central lobe appears as a fine white line in the image (arrowed) and the 'dowel' of a less dense material (broad pale line) can be seen running from the central lobe into the body of the trefoil



FIGURE 24. Detail of the position of the cover plate hinge arms before the additional wedge was fitted



FIGURE 25. Detail showing the cut-away thumb hole

date the player's thumb with space for some limited hand movement. This enlargement could date from as late as the late eighteenth or early nineteenth century, when playing styles for the violin demanded more movement of the left hand along the fingerboard. Part of the tail and body of the wyvern carving may have thereby been lost and it is possible that the carved tail was originally nowed, as seen on the small wyvern carved on the side below the proper left 'f-hole', Figure 10.

The trefoil has also been altered and reconstructed. The lobe farthest from the soundboard may have been broken, although this is unlikely as boxwood is a strong, dense wood. The lobe may have been worn away, but such extreme wear is not evident elsewhere on the citole. A more plausible reason for its alteration is that it was deliberately 'rounded over' to facilitate a conventional violin playing position with the instrument at the shoulder or breast; a flatter trefoil end is illustrated in Hawkins's 1776 engraving. The trefoil appears complete in an 1874 engraving by Engel and in an electrotpe at the Victoria and Albert Museum that is referred to by Buehler-McWilliams [6; p. 15]. An X-radiograph of the trefoil reveals a clear join line around the whole of the bottom lobe and what appears to be a dowel-type fixing to hold a 'new' lobe in place, Figure 23. The replacement lobe is finely carved but there are subtle differences in the style of the carving that would indicate it was fashioned by a different hand to the rest of the original carving. It might be, therefore, that a bottom lobe was partially removed or rounded over in the earlier conversion and that this truncated lobe was later cut away completely to allow a well-carved complete replacement lobe to be 'let in' to the trefoil. Other elements of carving elsewhere on the citole also lack the fluidity of the original carver's hand and appear darker, indicating that they could also be replacements by the carver of the trefoil lobe. These include acorns and leaves in the tree above the swine herder and the head of the woodman.

Comments from those privileged enough to play the citole in its adapted state suggest that the experiment failed; Charles Burney stated that it sounded like a 'mute' violin (a practice violin), and that "the hand is so confined that nothing can be performed but that which lies within the reach of the hand in its first position" [23]. The density of the boxwood deadened the sound while the thickness of the neck and the constraint of the neck aperture rendered any dextrous manipulation of the strings impossible. That the new violin could not be played satisfactorily probably contributed to the subsequent indifference that surrounded the state of the soundboard and the stringing of the instrument. It should be noted, however, that the soundboard was made from spruce, a wood commonly selected in violin making for the soundboard, sound post, and corner/top/bottom blocks and linings, so it is possible that genuine efforts were made to render it playable. At some point prior to its acquisition by the British Museum in 1963, the citole was given a modern bridge and strung with gut without any attempt to sustain it as a potentially playable instrument.

CONCLUSIONS

Among Remnant's concluding remarks in the 1980 study was the comment: "So far we have considered the external appearance of the instrument; the inside will remain largely a mystery until there is an opportunity to investigate it" [3; p. 95]. As a result of its imminent redisplay, that opportunity has now arisen. The treatment of the citole has been prompted partly by aesthetic considerations: the shabby, deteriorating state of the soundboard; the inappropriateness of the bridge; the broken peg head; and the visual confusion of the pegs and stringing. The accompanying examination has responded to Remnant's desire to see inside the instrument and has offered long-awaited insights into its construction. These investigations have not only offered an insight into how the false back was fitted, but have also provided an opportunity to re-evaluate the build up below the fingerboard and make some considered judgements as to the reasons for this sequence of alterations. In addition, the original orientation of the citole pegs and the final reconstruction of the trefoil have been verified through X-radiography, shedding light on the stages in their evolution.

The use of X-radiography, coupled with knowledge of early musical instruments, has allowed the best possible explanation of the sequence of alterations throughout the citole's long life to be pieced together. It is clear that the citole was converted to a violin in c.1578 when a fingerboard, tailpiece and dated tailpiece button plate were fitted. The frontal plugs and X-radiographs of original peg holes suggest that the neck of the citole was hollowed out to take a violin-type pegbox and peg configuration. The original peg configuration and its subsequent alteration have been discussed in great detail by Buehler-McWilliams [24]. The cover plate, hinged from the top nut down towards the bridge (described by Hawkins), has been reoriented. As can be seen from the truncated carving, the neck was planed flat and the wedge-shaped fingerboard fitted to allow a violin bridge to be set up at a height that would accommodate bowing of the instrument.

It has been suggested that the additional wedge is a repair to account for a gap between the fingerboard and the neck caused by the warping of the fingerboard [6; p. 12]. It seems more likely that the wedge was inserted to raise the strings in order to facilitate the fitting of a higher, convex soundboard. The date of this putative second modification is not known, but must have been after the initial conversion in 1578 and prior to Engel's 1874 engraving. It is also evident from Hawkins's description of the cover plate that, between 1776 and the production of the electrotpe in 1869, the cover plate hinging was reversed. Hawkins's 1776 engraving also shows a rounded-off trefoil which was reconstructed by the time the Victoria and Albert Museum's electrotpe was made in 1869, as noted by Buehler-McWilliams [6; p. 88].

There are still questions left unanswered; the precise sequence in which other alterations took place, including the opening up of the aperture within the neck and the insertion of the false back, have still to be determined. One

suggestion is that the neck aperture modification is likely to date from the late eighteenth or early nineteenth century when playing styles changed, demanding more access to the fingerboard. The insertion of the false back could have been carried out with the initial conversion or at the time the convex soundboard was fitted (or indeed at any time up to the late eighteenth century). As no method – scientific or otherwise – is available to date the soundboard, it cannot be ascertained whether the existing soundboard is contemporary with the original conversion, or is a later modification that might explain the additional wedge.

A reassessment of past restoration and modification allowed more informed judgements to be made about conservation treatment. Although, after treatment, the citole now appears in a playable condition, this has not been achieved without further modifying the citole. The top nut has been raised, the broken peg replaced, a new bridge modelled and new strings attached. These alterations have been carried out in consultation with curators, scientists, organologists, musicians and musical instrument makers. Unlike some of the earlier modifications and alterations, these changes are completely detachable and can be removed, should new information come to light or the aesthetic of future display or conservation demand.

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