

# THE CASE FOR CASEIN

## Roger Hargrave proposes a casein link with Stradivari

Recipe: `To make a glue out of lime and cheese. There is a glue used by woodworkers; this is made of cheese. After putting it

to soak in water, work it over with a little quicklime, using a little board with both hands. Put it between the boards - it joins them and fastens them together well' (taken from *IL Libro dell Arte* by Cennino d'Andrea Cennini, written in Florence in the 15th century).

Some years ago, while I was working with W. E. Hill & Sons, it was necessary to remove the top rib of a David Tecchler cello (1666 -1743, Henley). The removal of the rib from the top corner block was a nightmare. I tried water, spirit and several other solvents without success it was stuck fast. The process, long and slow, eventually took me more than a day. The rib and block had never been previously apart, thus ruling out the possibility of a modern glue. The joke was that the joint itself was roughly made with the block still showing clearly the gouge marks.

I contacted a friend working for J. & A. Beare Ltd who was equally surprised at the story. On enquiry he found out that to the more experienced restorers at Beare's it was well known that classical ribs and blocks will not easily separate. Later, on consulting Arthur Jeffreys, at that time Hill's oldest and best-loved restorer, I learned that the same trouble may be expected when removing any classical Italian ribs from their blocks.

Some considerable time later I was playing around with Stradivari's method of fixing the ribs to the blocks, on the mould, as described by Sacconi.' This operation involves binding the counter blocks to a dowel through the mould, while jiggling the rib into the correct position. It is not at all easy when using hot glue which quickly gels.

A further observation which eventually provoked some action concerned a violin which had been slightly flood damaged. Although the studs, several patches, neck and top block (a later replacement) had soaked loose, the ribs, linings and corner blocks and,

most importantly, the centre joint remained intact. What then was this glue which was so strong and impervious to water?

### 15th-century woodworking cement

Casein glue has been known since the earliest times as a woodworking cement and recipes exist well into antiquity. It is notably recorded in treatises on painting techniques as an excellent glue for jointing the panels on which the paintings were to be executed in oil or tempera. The so-called 'Bolognese Manuscript' (15th century) and manuscripts of 'Jahan Le Beque', also 15th century, recorded the making of glue in this way. Still further back, the craftsmen of ancient Egypt, Greece, Rome and, inevitably, China, are considered to have used it,' although proof for these earlier users would be difficult to find.

Casein is one of the strongest glues known. It is made from milk solids (casein) in the form of dried cheese. Nowadays, the dry casein used is a byproduct of the butter industry. This casein powder is broken down by the action of an alkali into a creamy paste. The alkali used originally was quicklime. Bonding firmly, this glue eventually becomes horny, hard and waterproof. It is extremely long-lasting and has the advantage of being a cold glue (no heat is required in its preparation), with a longish working time, from two to eight hours. This makes gluing the ribs to the blocks in the Stradivari way much easier.

In its various forms casein is still used in much modern work, particularly good quality laminates and plywoods. These commercial caseins are now made mainly with ammonia solvents (unknown until after the classical period). Ammonia is used for ease of mixing, and resins of various types are added for strength. However, the older method, using quicklime, although more difficult, nevertheless results in a stronger and more waterproof cement than that

which can be normally bought as 'casein glue', from your woodworking supplier.

Let us consider for a while that Stradivari and his contemporaries used casein glues. What evidence do we have? Not a great deal. To the three observations at the beginning we can add the following. Compared to later period instruments the classical centre joint is less likely to 'spring'. This is a feature also quite well known to restorers. (Here it is worth mentioning that casein is a slightly better gap filler than animal glue.) We know too that Stradivari hung his instruments out in the hot sun of Cremona, in what must have been a high humidity atmosphere due to the presence of the River Po. This information comes from various letters of Stradivari.<sup>3</sup> Many modern Cremonese makers practise 'sunning' (the fierceness of an Italian summer sun and the humidity of Cremona cannot be compared to our English summer where animal glued joints will perhaps hold). Cremonese makers today overcome the problem of loosening joints by using modern PVA type white glues. No-one seems to be asking about Stradivari's answer to the problem. Equally, no-one seems to worry that we do not know how long these modern plastic glues will hold.

### Unadulterated casein likely solution

At first, I thought that a mixed use of glues might be the answer, with perhaps animal glue for reversible work, such as belly to rib and back to rib joints. However, experience has suggested that the more likely answer is that all the work on a classical instrument was carried out with casein. It is noteworthy that similar problems of removal are also evident where backs have never previously been taken off the ribs, mainly at the block areas.

So the evidence is quite slim. No analysis of joints can clearly state that casein was used. Raymond White, senior scientific officer at the National Gallery, London, carried out an analysis of a Dominicus Montagnana cello back joint in August 1980. The joint, taken from an instrument made in Venice in 1730 and cut down at some time during the later part of the 19th century, was analysed as follows: 'As to the adhesive of the joint, this is clearly protein-like. There is some ambiguity as to the source. Some hydroxyproline would suggest a proportion of animal/fish glue, but in addition a quite marked glutamic acid

component would also suggest some casein. Whether a mixture or whether the joint was later re-glued with one or the other component cannot be determined'.

However, if one is prepared to accept the possibility, a key appears which could open many other doors. This key is of particular importance for the study of Baroque constructional methods. This is in itself a minefield of if's, buys and maybe's. I tend to agree with Max Moller's letter to THE STRAD (October 1981, p.426) that few if any modern makers have fathomed the depths of Baroque methods with any success whatsoever. The subject of Baroque construction is however not for this moment.

### Emulsifying agent

The real interest probably lies in varnishing. Here casein becomes a slow fuse. Not only was casein used to joint the panels on to which the paintings were to be executed, it was also used as a ground to seal the panels and as a painting medium to carry and bind the pigments themselves. Casein emulsifies splendidly with almost any painting medium, be it simple glues, gums, oils and resins, or complex varnish recipes.

Its uses in industry are also interesting. It is used for the surface hardening of special papers and card, for the lining of beer barrels (the wooden sort) as a protection against alcohol corrosion and mould attack, as a 'plastic' for electrical insulation etc. The list is endless. There is only one circumstance in which I would not like to see casein being used and that is in restoration work. Particularly with regards to cracks etc, its irreversibility could prove disastrous.

Having no further wish to influence the way in which individuals may or may not wish to pursue these ideas, I will end here. The list of books may help with technical data or painting methods, but the real information lies in works difficult to obtain and translated mostly from the German originals. Here a good librarian is a necessity.

## Notes

1. S. F. Sacconi: The Secrets of Stradivari (Cremona, 1979)
2. Gettens and Stout: Painters' Materials (London, 1967)
3. see W. H., A. F. and A. E. Hill: Antonio Stradivari.- his life and work (1644-1737) (London, 1902, 2/1980); also E. Doring: The Guadagnini Family of Violin Makers (Chicago, 1949)

## Book list

Perkins and Everest: Monographs on Industrial Chemistry, 17 vols

R. Scherer: Casein: its Preparation and Technical Utilisation

Clark and Dougall: Cabinet of Arts (1817)

E. H. Pinto: Wood Adhesives

N. Heaton: Outlines of Paint Technology

M. Dorner: The Materials of the Artist (London, 1979)

W. Jaxtheimer: How to Paint and Draw (London, 1982)

R. Mayer: The Artist's Handbook of Materials and Techniques (London, 1951, 4/1982)

C. Eastlake: Methods and Materials of the Painting of the Great Schools and Masters, two vols (London, 1967)

Theophilus: On Divers Arts, translated by Hawthorne and Smith (London, 1980)

## Warning

Care should be taken when working with casein since it is an irritant and can cause dermatitis.