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An Introduction to Basic Cello Construction

Care & Repair of Cellos

An expert explains your instrument from the inside, out

- How is the wood selected?
- What is the purpose of purfling?
- What is a bass bar?
- How is a fingerboard maintained?
- Can scratches be fixed?

By James N. McKean

Know Your Instrument from the Inside Out

All string players should have at least a basic understanding of their instrument's construction

By James N. McKean

Fig. 1

The sides of your cello are susceptible to wear and tear.

Knowledge of how cellos are made can offer insight into buying and caring for them. It may help you understand what instrument dealers are telling you when you go shopping, give clues about how to look for and recognize trouble before it turns into a costly repair, and help you to describe what you see to the repair shop.

The cello is made up of separate pieces of wood held together with hide glue, which is made from horse bones and tissue. The wood is specially selected, for only the very finest and well-seasoned wood will make a good sounding and stable instrument. The back, ribs, and scroll are almost always made of maple cut "on the quarter," and with the distinctive figure known as "curl" or "flame," caused by a slight twisting of the grain as the tree grows. Some cellos have backs made of poplar, which is a somewhat softer wood than maple, and which produces a mellower, less edgy sound. The older Italians experimented with a variety of other wood, such as beech, pear, and willow, but by the mid-17th century were relying primarily on maple and poplar.

The backs can be of one or two pieces; the latter is called "book-matched," for it is split open like a book, and then joined down the middle.

The sides—also called the ribs, or bouts—are usually from the same piece of wood as the back, and are formed by bending on a hot iron (**Fig. 1**). The arching of the back and top is chiseled out, and then finished with small brass thumb planes and a steel scraper.

The inside is then hollowed out and finely graduated in fractions of a millimeter, a process that will have a great effect on the final sound.

The top is virtually always made of spruce that has been split from the log to ensure the straightest possible grain. It is usually two pieces, with narrower grain in the center for strength.

The pieces of the body are held together by the blocks and linings, made of either willow or spruce (**Fig. 2**). They provide support and rigidity to the rib structure, anchor the neck and end button, and reinforce the top and back. There are six blocks—an upper and a lower, and one in each of the four corners. The linings are attached to the ribs, and provide extra gluing surface where they meet the top and back.

Glued to the inside of the top is a vitally important piece of wood: the bass bar (**Fig. 3**). You can see it by looking in the left f-hole—it runs almost the full length of the top and is positioned under the bass foot of the bridge. It serves a dual purpose—it supports the top, and it distributes the sound produced by the movement of the bridge. It is also made from spruce, either from the same wood as the top, or as close a match as possible. The fitting and shaping of the


Fig. 2

These small blocks of wood are the support system of the cello.


Fig. 3

The bass bar, plays an important role in the sound of the cello.


Fig. 4

A peek at the neck of the cello.

bass bar can have a very strong effect on the sound and response of your cello.

The black-and-white strip inlaid around the edge of your instrument is called purfling. The Italians usually used dyed pear wood for the black and poplar for the center; most makers use maple these days. As with every other part of the cello, it serves a dual role of decoration and function—it acts as a binder to hold the edge together and helps prevent cracks from developing on the top or the back if your cello is bumped. Some of the old Italian and English makers just scribed these lines on, rather than inlaying real purfling.

The neck and head of the cello are carved from a single piece of wood, usually maple, selected to match the back and sides. When the neck wears out, it is cut off and a new one grafted to the scroll, as it is important to keep the original scroll with the cello it was made for. The neck is dovetailed and glued into the upper block of the body *(***Fig. 4***)*, and the angle at which it is set is very important for the sound of your instrument, as is the shape, for the ease of playing.

The rest of what goes into your cello comes under the heading of setup; these are the parts that are easily removable for replacement and refitting—the bridge, soundpost, fingerboard, and fittings.

RETOUCHING

Certain areas of the varnish on your instrument will wear down as you play it, and it will inevitably pick up nicks and scratches. Some varnishes wear much faster than others or show the effects of bumps and scrapes more. Perspiration contains a lot of salt, and it can act as a corrosive on the varnish, the wood itself, and even the strings; some musicians perspire quite freely while playing and can wear through the varnish quite swiftly.

The area that tends to wear fastest is the upper right rib and edges, where you shift into higher positions, and where it is natural to hold a cello when you aren't playing it.

New varnish is frequently applied to each of these places and to any other where the wood has been laid bare; this is done even on the most valuable instruments. However, the proper varnish must be used—one that is easily removable—and the wood underneath has to be thoroughly cleaned of all dirt and oil, and then smoothed, or the new varnish will not adhere. It is, of course, better to attend to this before you get to the bare wood, as it is a lot easier to replace lost varnish than wood. If you do wear through the new varnish on the shoulder and edges quickly, you might consider having a very thin piece of plastic tape put over the varnish to protect it. It is frequently put on the ribs, particularly on valuable instruments where it is important to preserve as much of the original wood and varnish as possible, and can even be put over the parts of the edge that are most susceptible to wear. The plastic is hardly noticeable, if done correctly, and has no effect on the sound. It is easily removed, without any damage to the varnish or wood underneath. An important note of caution: this process should only be done by a professional.

As for nicks and scratches, they happen all the time, and you can console yourself with the thought that they always look a lot worse than they are. They can be filled and retouched so that they are hardly visible, if at all; the important thing to remember is to keep the area clean. Do *not* put tape over it to protect it; this can be a disaster, as the adhesive on the tape will get into the bare wood and also might be hard to get free from the varnish.

Another area that tends to show wear is the outer edge, as musicians tend to leave their cellos resting on their sides. Again, it is an area frequently retouched, and some color and varnish will take care of the problem.

These scrapes and scratches are most noticeable on new instruments,


Fig. 5

Like the lines on a face, the surface of a cello ages gracefully.


Fig. 6

The deep grooves in a fingerboard are caused by strings; hollows are from finger wear.

where they really stand out. They can be retouched, but it is best just to relax and let them accumulate; after all, it is the wear that contributes to the beauty and allure of older cellos (**Fig. 5**). Like lines on a face, they add character, and they are an inevitable part of aging. Retouching on old instruments only gets to be a problem when too much of it is done—a state of affairs that is becoming all too common. Current taste calls for an evened-out look that requires extensive over-varnishing and polishing, in the process destroying the texture and patina of a great old varnish. The result is a glassy, monochromatic finish that has effectively robbed the instrument of its warmth and individuality. If you are lucky enough to have a fine old instrument, do not let an overzealous repairer sell you on the idea of no imperfections and a high shine; once there, you can never go back, and you will have sacrificed one of the most valuable aspects of your instrument. But make sure to keep your cello clean at all times so the nicks and scratches don't fill with dirt and sweat.

THE FINGERBOARD

The fingerboard is a part of the cello that requires regular attention. It is made of ebony, which is a very hard and dense wood, but it will wear down with use. The fingerboard is shaped so that there is a slight dip (called the "scoop") planed in it lengthwise—from the nut to the lower end. This is done to provide additional clearance for the strings and help prevent buzzing. The fingerboard will gradually develop grooves worn by the strings and hollows where your fingers rest (**Fig. 6**); these have to be planed out, after which the board is scraped and polished to a mirror smoothness.

The length of time between planings depends on several factors—the density of the wood, the amount you play, and the abrasiveness of your perspiration; it can be anywhere from one year to several. Good ebony is getting very difficult to find, so it is a good idea to go as long as you can between planings. At some point the fingerboard will be too thin to plane any more and will have to be replaced, but if the instrument you have purchased has a healthy one made of good, dense wood, this should not be necessary for many years. You might also keep in mind that making a proper fingerboard, and with it the neck, is one of the most difficult parts of setting up an instrument, and the one most often done poorly.

The shape of the neck and fingerboard can have quite an effect on your perception of the instrument's response and "ease of play." Many times the problems one encounters with the sound are actually due to the setup.

THE PEGS

Well-fitted and maintained pegs are a joy; those that aren't are a nightmare. The irony is that fitting them properly is not that difficult. As with the rest of the working parts of the setup, make sure that the pegs are fitted before you put down your cash. If done properly they should hold easily, without your having to press them into the pegbox, and turn smoothly, without binding or squeaking.

The pegs are originally cut with a tapered shaper that matches exactly the taper of the reamer used to cut the holes in the pegbox. If the tapers do not match exactly, the pegs won't hold. After fitting, the pegs are lubricated with peg dope, a commercially available product that paradoxically helps the pegs to both hold and turn freely. If the pegs squeak, they may just need more dope. If it persists, the indication would be that the pegs are binding on one side and need fitting. You should try to avoid using the peg dope with too much abandon, as it does build up and harden, at which point it all has to

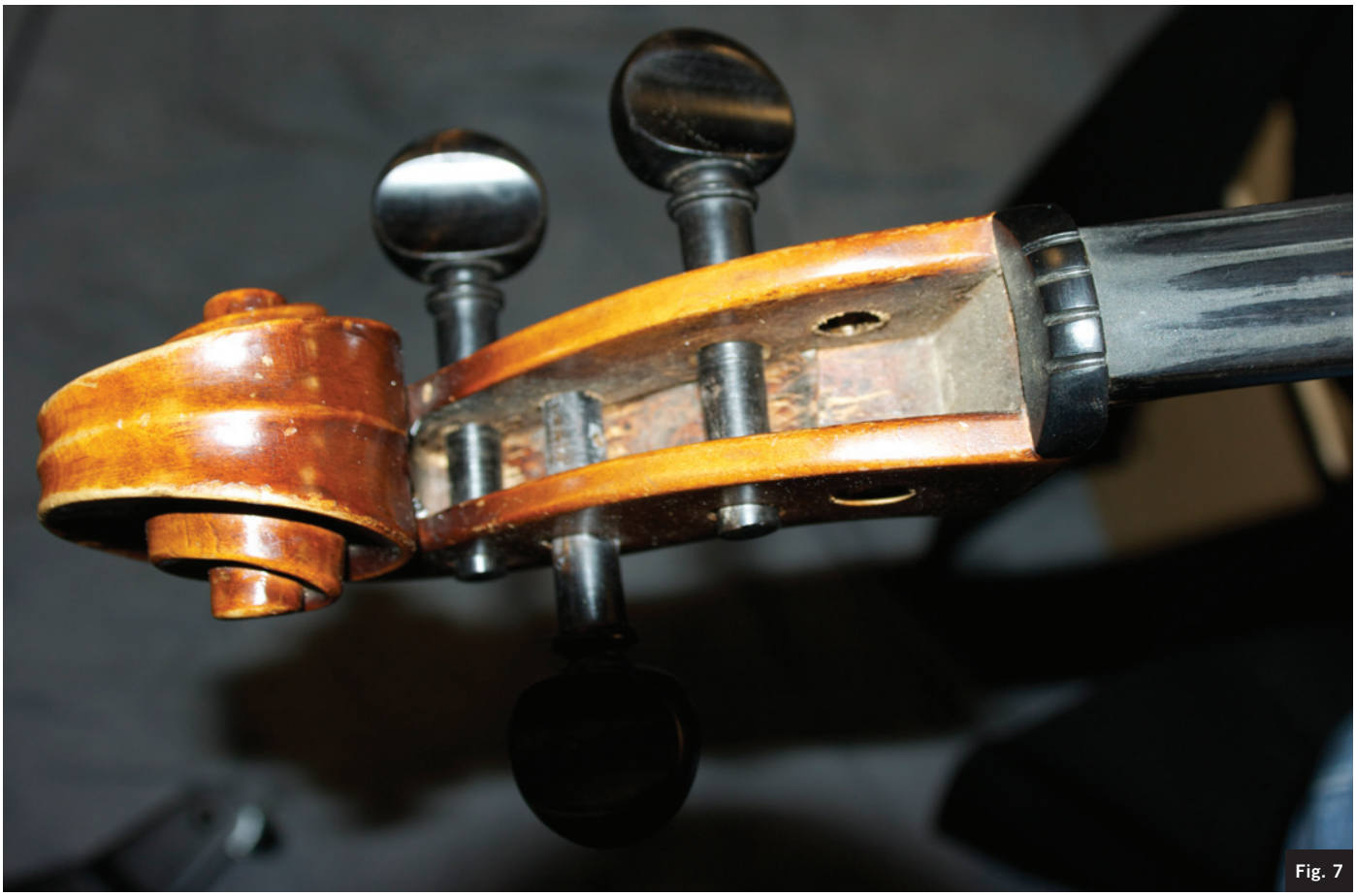

Fig. 7

Weather can cause pegs to bind or slip.

be cleaned out and the pegs refitted.

The weather can cause your pegs to bind or slip. Excessive humidity will cause them to swell; they can also bind in the fall as they dry out, necessitating a sparing application of the lubricant. You should never have to force your pegs to hold, or resort to such remedies as chalk. When you have come to this pass, the red light should be on to have some remedial work done. You run the risk of cracking the pegbox by leaving the pegs ill fitting. This can be a very serious problem, as these cracks are hard to repair and can reopen, due to the stress placed on them; in any case, they require bushing (filling) the hole with wood and refitting the peg.

Peg holes have to be bushed and recut when they are too worn and big to have pegs fit to them any longer. The holes can get just so big; beyond this point the shaft of the peg gets too large and exerts too much pressure on the walls of the peg box, in addition to making it very difficult to fine tune the instrument just with the pegs.

Pegs are made in ebony, rosewood, or boxwood. The boxwood currently available bears little resemblance to that found in the fine old English or Hill-style fittings. It is much softer, and will compress easily as the peg is used, with the result that you will be faced with frequent refitting or replacement. A replacement wood, mountain mahogany, is now available in some fittings—it is every bit as tough, dense, and durable as boxwood once was.

Be sure when you wind the strings around the peg that you do not let them bunch up against the pegbox wall (**Fig. 7**). Some people are taught to do this as a trick to help the pegs to hold; it is actually an easy way to cause a crack in the pegbox. With its taper, the peg is like a wedge, and winding the string in this manner just forces it deeper into the hole, eventually forcing the wood to give way.

You might find with a new instrument that the pegs need more frequent lubrication and that the pegs seem to wear into the holes much faster. This is because the wood of the pegbox is fresh and will both absorb more of the dope and also compress more. This is natural, and will soon cease.

Excerpted from *Commonsense Instrument Care: How to Look After Your Cello, Violin, or Viola and Bow*

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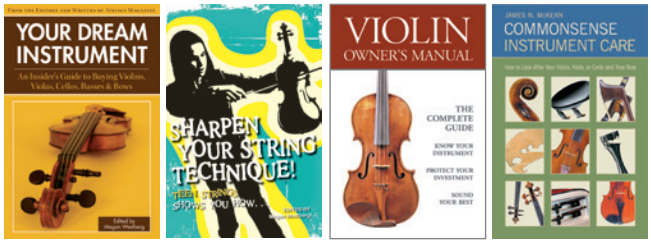

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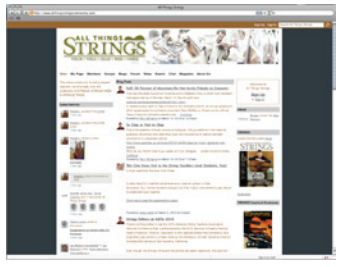

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