Technique and the laws of leverage

A powerful way to discover the truth about many aspects of string technique is to look at them in terms of fulcrums, levers and pivots. These are matters of natural law and physics, and are not a question of opinion. There are countless examples to choose from, of which the following are only a few.

Experiment in leverage

Any downward pressure from the first finger on the bow has a greater effect the further away from the thumb it is. A simple experiment illustrates this clearly:

The teacher or assistant

- Hold the violin in playing position with the middle of the bow resting on the D and A strings (so that the bow is horizontal). Support the bow at the other end with only the thumb and first finger. Place the tip of the first finger on top of the bow, opposite the thumb, to help steady the bow and prevent it from falling (Fig. 1).

The student

- Pressing at the place where the bow is resting on the string, press the assistant's bow slowly down towards the hair until the wood touches the hair; then slowly release it again (Fig. 2). Repeat several times, pushing and releasing very slowly, noting exactly how much weight is necessary to make the wood touch the hair (which is not much).
- Do the same thing a few centimetres lower, i.e. push the bow down until the wood in the middle of the bow touches the hair. Note how a little more weight is now required. Repeat lower and lower in the bow until the pressing finger is right next to the thumb.

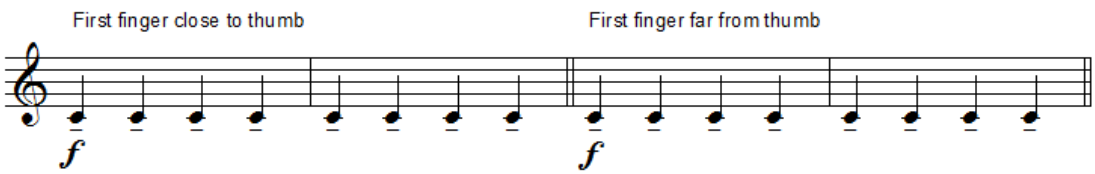
  More and more weight is needed as you press lower and lower on the bow until, when your finger is right next to the assistant's thumb, an enormous amount of weight is required to make the wood (in the middle of the bow) touch the hair.

  Naturally, downward pressure directly above the supporting thumb has no effect at all, and any pressure to the right of the thumb lifts the bow away from the string.

  This experiment makes it clear that the further away from the thumb downward pressure is applied, the less pressure is needed to produce the same effect.

Therefore, a bow hold that positions the first finger one side of the thumb, and the second finger the other side, is bound to cause the player a great deal of extra work and effort, compared to one where the first finger is placed much further from the thumb. Yet many players use a bow hold that positions the second finger well to the right of the thumb – so many, in fact, that such a setup in the bow hand is unremarkable and even considered the right way to do it.

Again, a simple experiment proves the point: playing forte in the upper half, play a few repeated strokes with two extreme bow holds: try the strokes holding the bow with the first finger very close to the thumb (so that both the second and third finger sit on the actual frog of the bow); and then repeat the same strokes with the second finger to the left of the thumb, so that the first finger is several centimetres away from the thumb. Note how much easier it is to produce the tone:

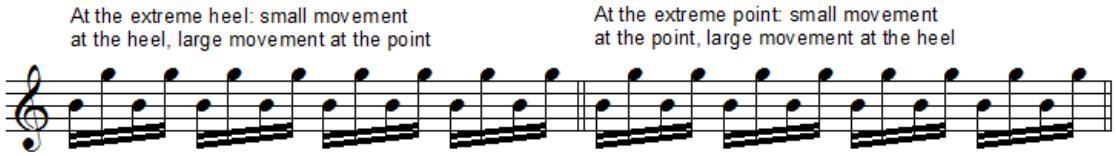


So how should you hold the bow? If the first finger is too far from the thumb, with the second finger too much to the left of the thumb, tension is created in the big wodge of muscle in the base of the thumb. For most hands the best position of the second finger is basically opposite the thumb but very slightly to the left of centre (Fig. 3).

BASICS

'V' shapes and triangles

The shape of the V is an intrinsic element of levers, with the point of the V acting as the fulcrum. Think of a pendulum, where the sideways movement at the top is slight compared to the swing of movement at the bottom, making an overall shape of an upside-down triangle. You can see the same effect in rapid string crossings using little bow at the heel and then at the point:



At the heel, the movement of the bow is small while the point moves in large arcs, like the centre of a record which spins at a slower speed than the speed of the outer rim. Playing the same pattern at the point, the movement at the tip of the bow is small and the bow hand moves a wide distance.

The bow pivots from one string to another at the point of contact with the string: its plane on one string, and then on the other, are like two sides of a triangle with the lines meeting at the contact point with the string; and the length of the third line of the triangle depends on how wide apart the two lines of the bow are.

Choosing the right part of bow in which to perform complex string crossings is therefore of course essential; and part of the art of smooth string crossing in legato passages is in keeping the bow as close to the new string as possible.

Holding the violin

Thinking of the lines of a V can even help in understanding how to hold the violin. Consider cutting with a pair of scissors: the most effective place with which to cut, in the V of the scissors, is naturally as close as possible to the place where the blades connect, and the weakest part of the scissors is at the tip. Applying this to the contact of the chin with the chin rest, imagine that one line of the V of the scissors is the line of your jawbone and chin, and the other line your collar bone; imagine that your neck is the place where the two lines meet. The closer in to your neck you place the instrument, the less effort there is in keeping it there; but if there is any gap between your neck and the instrument it is like cutting with the end of the scissors, and you have to press down hard with your chin (which of course leads to great tension in the neck and shoulders).

The position of the left hand

Another V can be seen in the angle of the neck of the violin to the knuckles of the left hand in first position. Naturally the knuckle of the first finger is very close to the neck – often brushing against it – while the base knuckle joint of the fourth finger is a considerable distance away from the neck. Again, the place where the vortices meet is the strongest area, so that the easy feeling of dropping the first finger is completely different from that of dropping the fourth.

This is one of several reasons why the hand must not be allowed to sit angled out too far from the violin. Bring the base joint of the fourth finger as close to the neck as you can (without, of course, going to an extreme where you start to feel uncomfortable.)

Height of the right elbow

While the normal height of the right elbow in usually level with the bow, or a bit above or below it, for extra power when playing in the upper half it is often helpful if you raise the level of the elbow slightly higher. This causes a feeling of leverage into the string without any extra effort: the plane of the forearm when it is lower is one of the lines of the V and the place when it is higher is the other line. Due to the laws of leverage the elbow movement of many centimetres translates into a tiny movement at the other end of the forearm.

Rocking the finger in vibrato

The line of the finger one side of the vibrato movement, and the line the other side, forms another V, joining at the point of contact with the string; and of course while the movement of the hand in vibrato may be centimetres wide, at the point of the finger's contact with the string the movement is very small. For the narrowest vibrato, keep the movement at the other end of the finger as slight as possible, and this will translate into the tiniest, easiest movement at the fingertip end of the finger.

Next month:
Regaining muscular freedom