

## 2 THE RIGHT ARM

### 2.1 HOLDING THE BOW

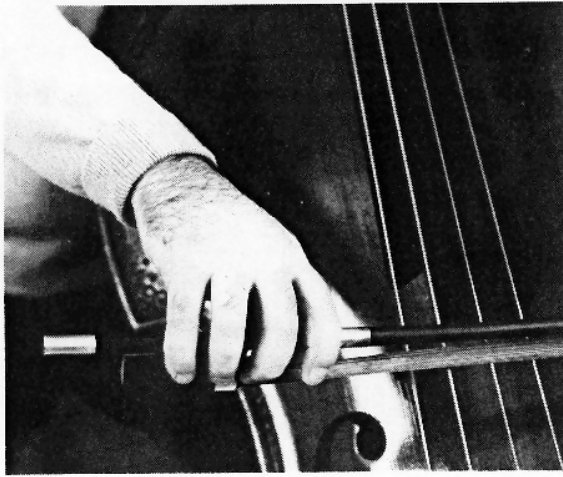
The bow should be held in a way which can comfortably transfer arm weight through the bow to the string while maintaining flexibility of the fingers. Normally the full width of hair should make contact with the string when playing.

Holding the bow has been a much-debated subject among players; different teachers have found very different solutions. I have arrived at a rather untraditional bow hold, which gives me a considerable advantage. I do not claim that this suits everybody, but it should be tried, especially if one feels the need for more weight at the point of the bow. Bow pressure should always be achieved by means of arm weight rather than muscular force. Figure 2.1(i) shows a 'traditional' way of holding the bow. The fingers are spread evenly on top of the stick. The thumb is placed either on the point of the frog fig. 2.1(iii) or in its opening fig. 2.1(iv).

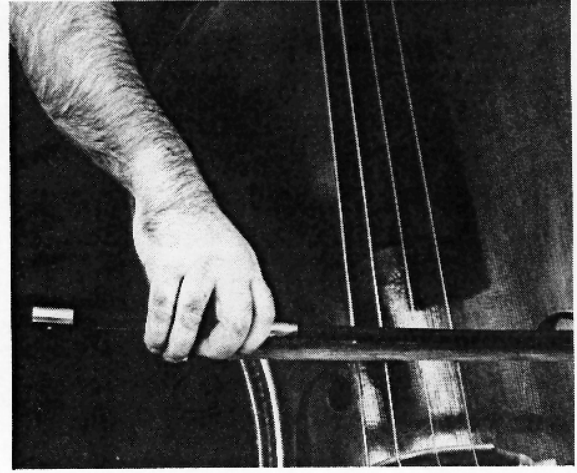
In both these cases the middle finger has minimal effect, being placed so near the thumb that it has very little chance of helping to transfer arm weight to the bow. One can prove this to oneself by lifting the index finger from the stick and noticing how little power remains in the bow when the middle finger (with the thumb) has to transfer the weight by itself.

The index finger, which traditionally transfers most of the weight to the bow is not by nature created stronger than the middle finger, but it is better placed on the stick (further from the thumb), and can therefore contribute considerably more power. (From physics we can perhaps remember the formula "force x distance").

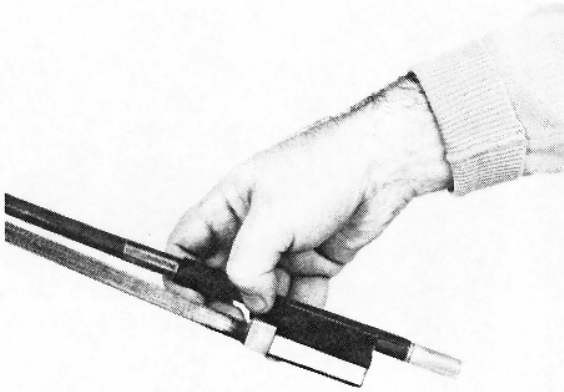
I also wish to exploit the muscle-power of the middle finger effectively - and therefore move it further from the thumb and place it close beside the index finger, as shown in fig.2.1(ii). N.B. The middle finger is now leaning against the index finger, but hardly touching the stick. In this way it becomes almost as powerful as the index finger, and I no longer use the muscles of the middle finger in vain.



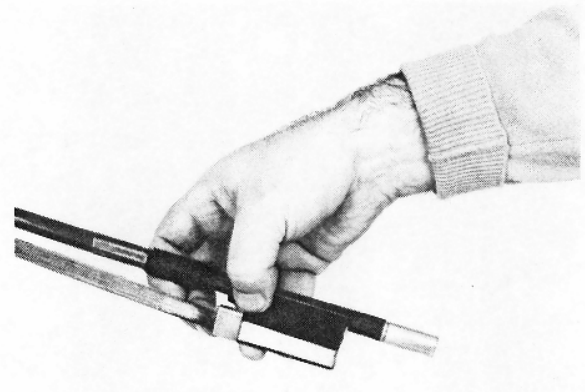
*Fig.2.1(i): 'Traditional' bow hold.*



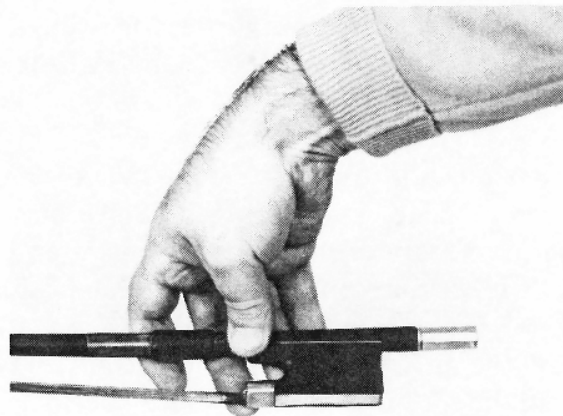
*Fig.2.1(ii): The author's bow hold.*



*Fig.2.1(iii): Thumb on point of the frog.*



*Fig.2.1(iv): Thumb inside the frog.*



*Fig.2.1(v): Incorrect "outward" bend of thumb.*

It could be said that I would have achieved the same result by stretching the index finger further forward, thus spacing the fingers wider. But by doing so the fingers would lose a great deal of flexibility. Flexibility is important because I use the fingers more actively than the wrist, when changing bows, when crossing strings, and when articulating.

I place my thumb as shown in fig. 2.1(iii), but have no objection to placing it as shown in fig. 2.1(iv). However, it is extremely important that the end joint of the thumb should be bent inwards, as in fig. 2.1(iii) and 2.1(iv) - and not outwards, as in fig. 2.1(v).

The reasons for this are:

- 1: Bending the end joint inwards gives considerably more mobility.
- 2: Movement of the thumb joint is necessary to ensure adequate blood supply to the large muscle in the hand. If this muscle remains static, waste products liable to cause fatigue will be removed by the blood too slowly, leading to tiredness much sooner. (See also section 1.4 "A Little Physiology".)
- 3: Any joint which is bent to the maximum in one direction or another gives little or no elasticity. The resulting stiffness will transmit any inconsistent, jerky movement which may occur in the arm. (See bowing exercise in section 2.6.)

The index finger should be placed so that the stick lies high on the centre joint (phalanx). (This is somewhat further from the fingertip than the bow hold usually chosen by cellists.) The index finger must however not be placed in such a way that the stick can only be moved by the innermost joint of the finger.

Notice that both the hand and the whole arm are turned slightly inwards, so that the knuckles form an angle of about 30° – 45° with the bow. (See photographs, fig. 1.2(i). This angling permits good transfer of arm weight and allows greater flexibility when bowing.

It is no disadvantage if the elbow is raised a bit when playing loudly near the point, **but take care to relax the right hand every time you play near the frog**, where the arm weight is so much more easily transmitted to the bow. Very many players grip the bow unnecessarily at this point, and therefore tire quickly. The more one relaxes at the frog, the more power remains for playing near the point. (See exercise fig. 2.1(vi); practice this at various dynamic levels.)

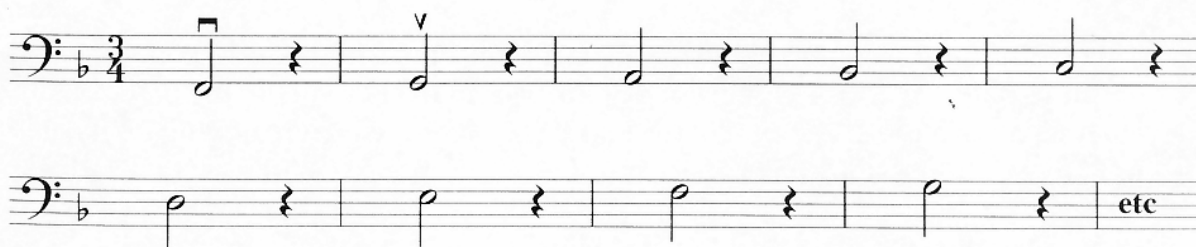


Fig. 2.1(vi): Exercise for "départ": Bow remains on the string with full weight during the rests.

## 2.2 ACTION OF THE BOW – “DÉPART” – RESIN

The stroke is begun by laying the bow on the string with an appropriate amount of weight. Next, one allows the bow to draw the string very slightly sideways (just like the finger in pizzicato) **without any change of weight**. Now we are ready to begin the note. We can feel the resistance in the string and we need only a very slight additional movement of fingers and wrist to release the sound. (The index finger **pulls** to start a down-bow, and **pushes** to start an up-bow.) The speed of the bow must be perfectly even, from the very moment when the string releases the bow hair. By watching the string's vibration it will be possible to see whether the “départ” is correctly executed. If it is, the amount of sideways vibration of the string will be constant from the first moment. If the string takes some time to “stabilize” itself, it is because at the outset the bow speed was too fast, resulting in an unclear (fuzzy) sound without focus. If bow speed is too slow, the string is “strangled”, and the pitch slightly flattened.

On the double bass, the bow speed will not necessarily be the same as on smaller stringed instruments. Specially on the lower strings a slow bow is needed to produce a first-rate sound. (The relationship between speed and pressure is explained in chapter 10.)

Practice the “départ” at all points along the length of the bow, and at different points on the string. Remember to feel the **resistance** in the string (drawing it sideways) **before** the sound begins. When we put pressure on the string, we begin with the largest muscles first. That is to say, those of the back and of the upper arm. Then we add those of the forearm and finally release the string with the aid of the wrist and fingertips.

This may seem a rather detailed description, but it is vital that everything takes place in this sequence if one is to attain a relaxed way of playing. When playing a series of very quick up and down bows, however, one has no time to engage the larger muscles in the movement. In this case we manage with the lower part of the arm, but the rule is still valid: **Begin with the larger muscles – complete the movement with the smaller ones!** The more powerful the sound is to be, the more we must rely on the muscles of the back and upper arm while keeping the rest of the arm, and the hand, rather taut.

Try a powerful up-bow from the point. Place the bow fairly close to the bridge with quite a lot of weight. Then start the string – i.e. the sound, by simply bending the torso forwards, with a slight twist to the left, keeping the arm taut. (Take care that bow speed is even from the very beginning of the stroke. Students often make the mistake of using more speed at the “départ”: this should be avoided!)

This is the most ‘economical’ way of starting a powerful sound from the point and employs one of the strongest groups of muscles in the body. Had the bass been held in such a way that the upper part of the body was prevented from moving freely, it would not have been possible to use these muscles (c.f. Playing Posture, section 1.1).

Remember, **it is the weight of the arm which should press the bow down**. There is no point in using one group of muscles, working upwards, to support the arm in the air, while at the same time attempting to press the bow down on the string with opposing muscles, working downwards! Groups of muscles working in opposite directions

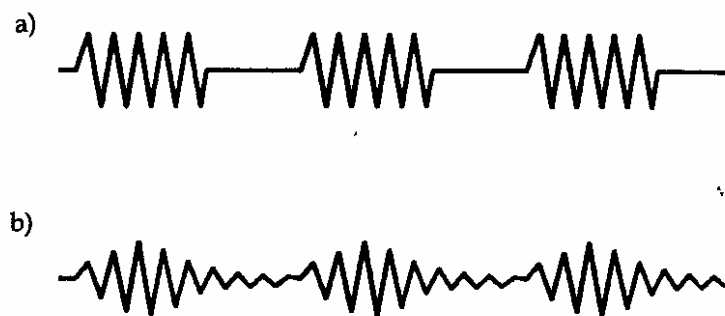
encourage stiffness. To illustrate: place the bow on a string, at the frog, with a completely relaxed arm; the natural 'heavy' arm weight can be felt. (In fact we very rarely need so much weight on the bow.) When playing at the point of the bow, this arm weight is not so easy to transfer. (See also section 2.1.)

**Choice of resin** is very important. A rather hard resin, which does not stick to the string, more completely meets my musical demands. If a resin sticks, playing without exaggerated attack becomes difficult. The widespread use of soft sticky resin among players is unfortunate, since it is likely to interfere with the practice and even the understanding of weight usage. For example, a student not yet able to predetermine accurately how much weight to apply, practises a bow stroke, in this case "départ", and attempts to start a note which is to have a full and equal sound throughout. Difficulty is encountered because the soft resin characteristics immediately 'dig into' the string, and the arm weight produces an accent. With a harder resin, frictional force is more directly proportional to the applied arm weight, and 'sticking' does not occur. Hard resin permits a freer sound, but greater accuracy is required in stroke preparation. In addition, as stated in section 10.9, it permits more variety of tone colour.

Figure 2.1(vi) gives an exercise for "départ". The bow should remain on the string (with the amount of pressure required by the next "départ") during the crotchet (quarternote) rest on the third beat of each bar. Later, this rest is shortened by degrees, until the scale consists of dotted minims (half-notes) without intermediate rests. This should be practised with different dynamics, at different places on the bow, and above all at different distances from the bridge.

The completion of one note belongs to the beginning of the next. If a note is completed by releasing the bow from the string, one has to allow for a certain amount of time to establish new pressure with the bow **before one can start the next note**. At quicker tempi, both time and energy can be saved by letting the bow remain on the string with applied weight between notes.

As regards short notes in quick succession (as in section 4.2) one should practise stopping the bow abruptly after each note, so that the vibration of the string is stopped immediately. This must be done as quickly as possible so that the end of the note does not sound choked. Figure 2.2(i)a shows how the string should vibrate during a series of firm short strokes, while fig. 2.2(i)b shows what should not happen.



*Fig. 2.2(i): Oscillating patterns of the string when playing 'staccato on the string'.  
a: Correct. b: Incorrect.*



- 3: The change must be achieved as quickly as possible, to avoid a 'gap' in the sound. (But this does not imply a fast bow!)

The last two factors seem to be in conflict with one another.

Let us first examine the first condition.

Keeping constant weight on the bow during a bow change is difficult, especially when using the French bow. One has to concentrate on feeling the pressure of the stick against the index finger, taking care that this pressure feels equally strong the whole time. How it feels to the other fingers is less important. As an exercise it helps to slacken the hair of the bow somewhat, in order to see more easily whether the bow stick moves up and down, in time with possible variations in pressure. It is recommended to practise this alone at first, without paying special attention to the smoothness or speed of the change.

(The usual mistake is that the index finger is released from the stick and slackens its pressure when changing from an up-bow to a down-bow.)

As one gradually learns to control weight, one can transfer one's attention to the legato. When the bow changes direction, many muscles on one side of the arm have to contract; a corresponding number on the other side must then relax. This does not mean that these activities happen simultaneously; on the contrary, it is an advantage if these 'transfers' can take place in sequence, at different times in the individual joints of the arm.

We must also take care that no part of the arm, at any time, has muscles pulling in opposing directions so that the joint becomes rigid. A rigid joint very easily transmits twitching movements, while a more elastic one absorbs them. The elbow joint in particular, when used in the right way, can be an excellent shock absorber.

As previously stated: **the change of bow should always start from either the torso or the upper arm.** In other words, the upper arm has to change its direction of movement **before the bow change.** To make this possible the lower arm, and particularly the fingers must continue to direct the movement of the bow until the upper arm's 'new course' is properly established. This movement can be compared to casting a fly rod, where the rod can be moving in one direction, while the fly and the furthest part of the line are one their way in another direction. See also fig.2.3a to e, where the arrows show the directions of movement of the different joints of the arm and torso at different moments during a change from down-bow to up-bow.

When the bow is moving fast (for example when playing high up on the G string with the bow a fair distance from the bridge) we need great flexibility in the elbow, hand and fingers. At a slower bow speed (in the case of a low note, with the bow near the bridge) the wrist can be allowed to be almost motionless during the change of bow. Flexing the wrist would in this case only result in the arm's weight (mass) being less efficiently transmitted to the bow, and the result might well be that the bow slipped on the string.

One should practise the change of bow in two different ways: first, using only the fingers and wrist, while the upper arm and forearm remain more or less motionless, and afterwards, with almost rigid arm and hand, so that the upper arm and body control the

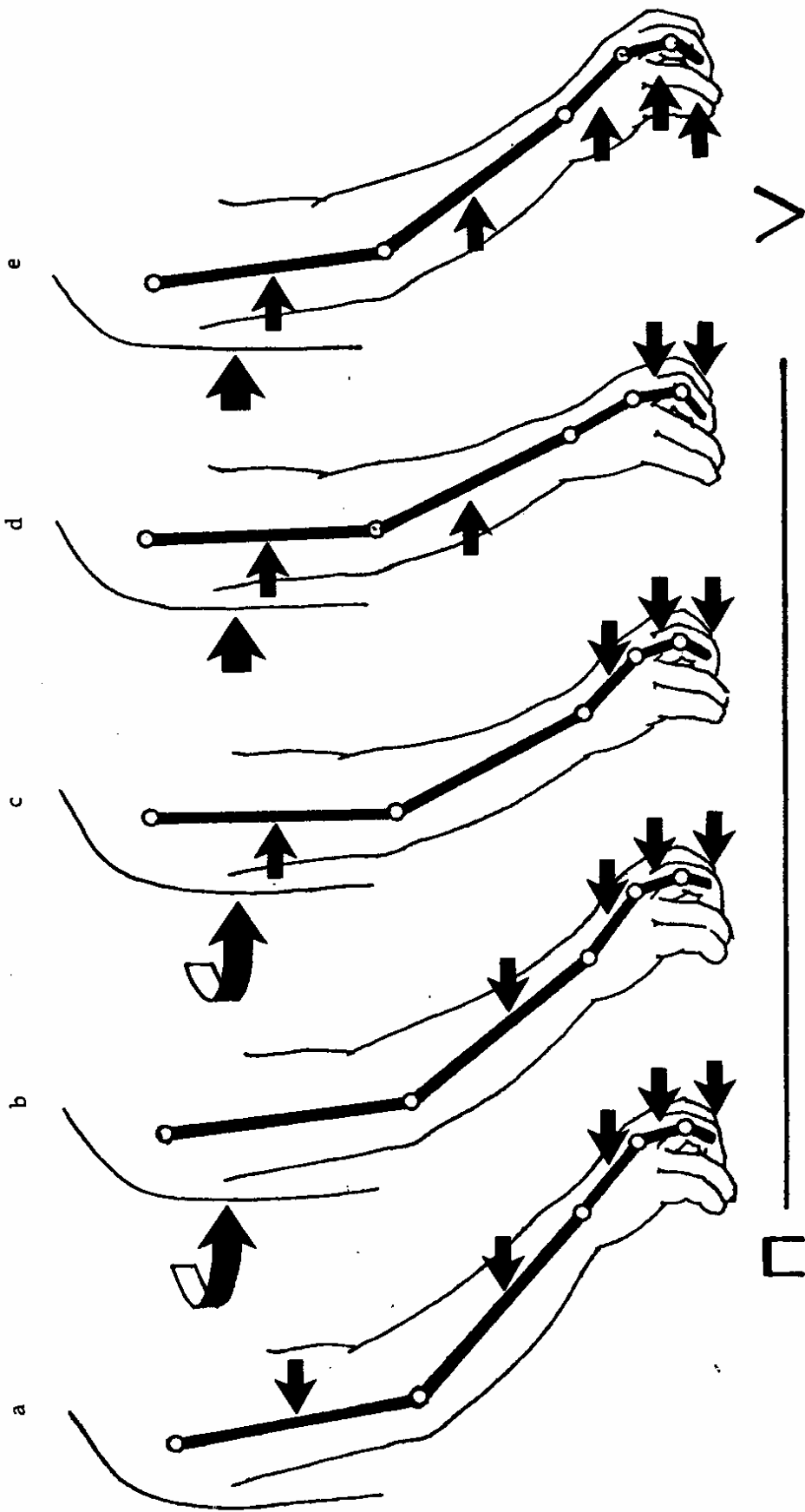


Fig. 2.3: Direction of movement in the various joints during the change from down to up bow.



change. When doing this, be careful not to thrust the shoulder forward, because this will only lead to a reduction of support from the upper body.

Support from the upper body (and the back muscles) has nothing to do with the pressure of the bow against the string: the weight of the arm alone is sufficient. But the support of the upper body assures constant bow speed from the very beginning and prevents the bow from running away too fast at the “départ”, at the moment when the string releases the hair of the bow for the first time. The reason for this is that the upper body with its relatively large mass is unable to accelerate quickly.

**The support of the upper body is essential when the bow is moving slowly - i.e. on the lower strings or near the bridge! Remember, the back muscles are among the strongest in the body.**

**Note:** The concept ‘mass’ is a key to understanding which part of the arm should be flexible when executing different types of bowing.

A motorcycle can accelerate faster than a car of the same horsepower. The reason is principally that the motorcycle has considerably less mass. In a similar way, less energy is needed to stop the motorcycle than the car, if they are travelling at the same speed.

The use of the upper body to assure constant bow speed and thus attain optimum control of the vibration of the string (as mentioned earlier in this section) presupposes that all joints between the upper body and the bow are kept comparatively taut in relationship to each other. If the wrist was completely flexible, the total moveable mass would only consist of the bow and the hand. But at the same time if faster, accelerating movements of the bow are required, a mobile wrist or elbow joint may be the best solution as this calls for less energy - i.e. muscle power.

**Changes in bow speed** will, to a great degree, determine how much mass is used in the movement. The quickest changes of speed are attained with the fingers, because these have little mass and are in direct contact with the bow stick. In particular, the active use of the fingers at “départ” or at the change of bow will yield the greatest choice of articulation (“consonants”) at the beginning of a note, precisely because pressure and velocity can be varied quickly.

## **2.4 EXERCISES FOR CHANGE OF BOW**

Fig. 2.4(i)a - d. Practice exercise a; the bow change must be nearly inaudible. Play it in all keys and at different points on the bow. Keep the bow speed constant, so that four times as much bow is used for the minim (half-note) as for a quaver (eighth-note). Use vibrato the whole time, and take care that it isn't disturbed by the bow change.

In exercise b, the bars with separate (tenuto) quavers should sound as nearly as possible like the legato bars.

Exercise c, involves position shifts and changes of string. Play this in different keys.

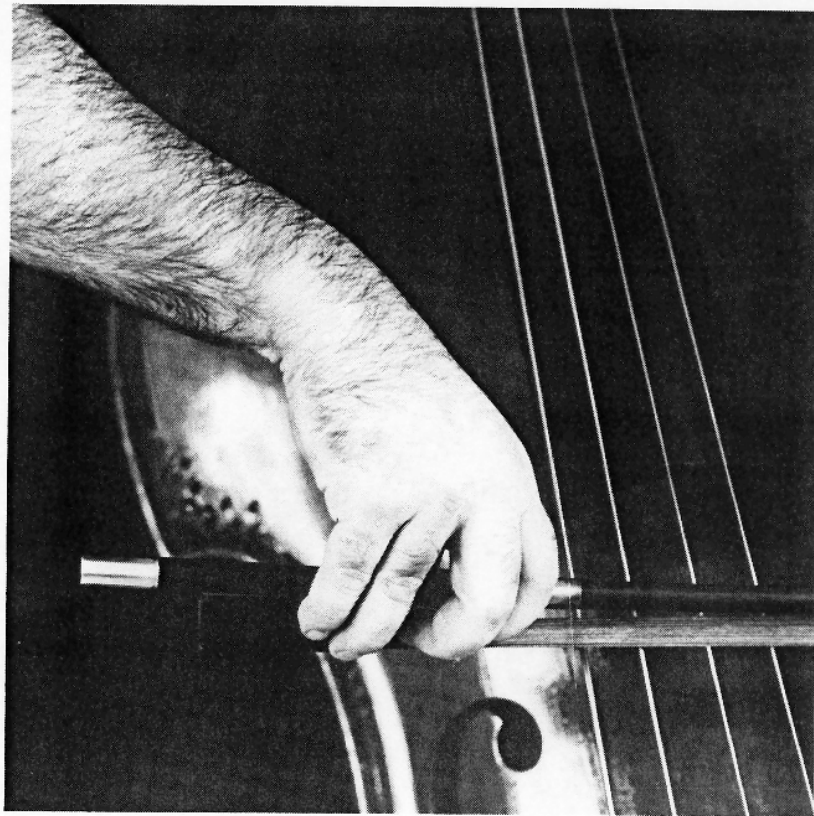
In exercise **d**, the change of bow should be completely inaudible during the trill. Keep bow pressure constant.

“Inaudible” bow changes are essential for good legato. Bad bow changes can be compared with a singer’s short-winded breathing technique, which breaks up the phrases.

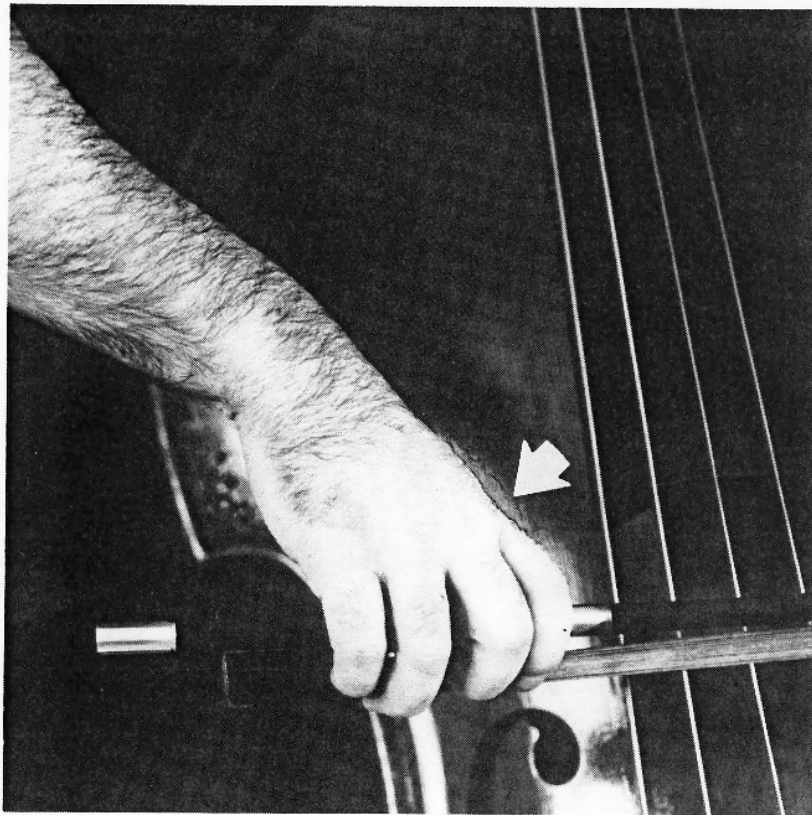
The figure contains five musical staves, each representing a different exercise for 'inaudible' bow changes.   
**Exercise a)** is in 3/4 time. It starts with a quarter note, followed by two eighth notes with a bow change 'v' above the first. This is followed by another quarter note, then two eighth notes with a bow change 'v' above the first. The exercise continues with a 'sim.' (simile) marking and ends with 'etc.'.   
**Exercise b)** is in 2/4 time. It consists of a sequence of eighth notes grouped into pairs, with bow changes 'v' above the first of each pair.   
**Exercise c)** is in 4/4 time. It starts with a quarter note, followed by a sequence of eighth notes. A 'tenuto' marking is placed below the first eighth note.   
**Exercise d)** is in 4/4 time. It features a trill exercise, indicated by a 'tr.' marking and a wavy line above the notes. The exercise is shown in both bass and treble clefs, with a repeat sign at the end.

Fig. 2.4(i): Exercises for 'inaudible' bow changes.

The photographs, fig. 2.4(ii)**a** and **b**, show an exercise for gaining flexibility in the innermost joint of the index and middle fingers. Figure 2.4(ii)**a** shows the position of the hand during an up-bow **before the change**, while **b**, shows how these **finger joints yield and 'collapse'** after the bow change. Note that this movement more or less replaces flexibility of the wrist, so that the latter is enabled to maintain the angle which gives optimum weight transfer. We do not usually play with quite so much flexibility in the fingers as is shown here, but it is important that flexibility should be developed, so that the joints do not remain rigid during the bow change.



a



b

*Fig. 2.4(ii): Exercise for developing flexibility in the innermost joints of the fingers. a: Up-bow, b: Down-bow.*

## 2.5 STRING CROSSING

Study the three photographs in fig. 2.5(i): a shows a normal hand position when playing on the D string; b and c show two different positions at the moment the bow reaches the A string.

In b the hand position is very similar to that shown in a. The only difference is that the wrist has been turned slightly outwards, while the arm has brought the bow down to the A string.

In c the wrist has maintained its angle in relationship to the body, while the arm by means of the **index finger** has directed the bow down onto the A string.

This is the best way to execute this change of string. The index finger (which is always the weight-transferring finger) 'goes on ahead' - thereby assuring that the 'new' A string immediately receives full weight. Note that the thumb and the third and fourth fingers must flex to permit this movement.

In b, one loses the weight on the index finger by turning the wrist outwards - and a little time elapses before the index finger can once more transmit sufficient weight.

When changing between adjacent strings (for example, G and D), there must be the **smallest possible amount of movement**, and no accent! Before the change itself, the bow hair must have approached the 'new' string as closely as possible, so that the change can be made with the minimum change of angle of the bow in relation to the strings.

Practise the string changes in fig.2.5(ii).

By allowing the two strings to sound simultaneously at the beginning of the second bar, we can check the exact bow angle at the moment of string change and we avoid beginning the D (in the second bar) with an accent. Practice this in all parts of the bow and using other strings.

Another variant is shown in fig. 2.5(iii).

Note too, that the bow hair approaches the 'new' string before the change occurs. This also happens at the end of the second bar, even if the bow is going to move in the other direction afterwards.

These exercises are essential in mastering the art of 'inaudible' string-changes.

Common mistakes:

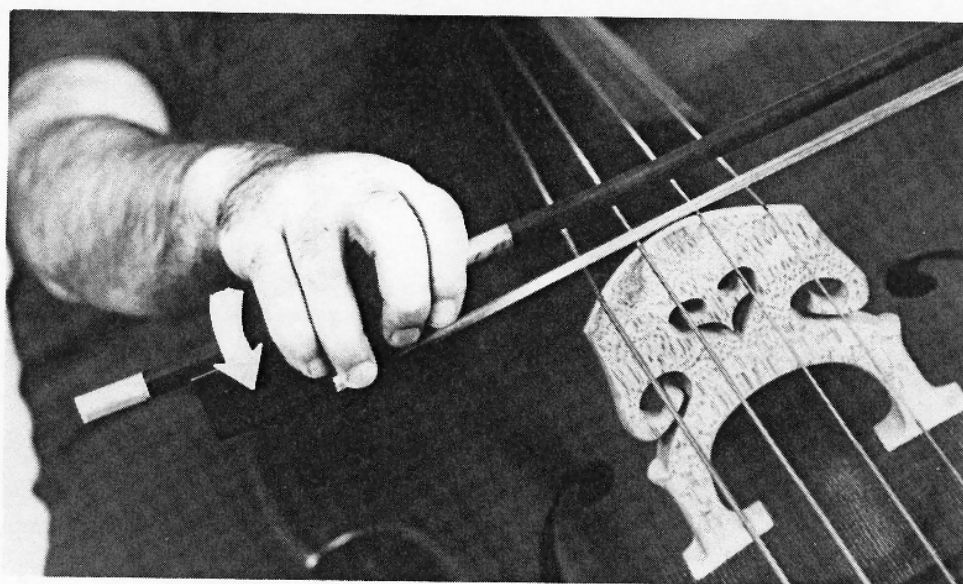
- An accent as the hair meets the new string.
- The bow stops or loses speed as it changes string.
- The fingers of the right hand remain rigid, and the movement is executed by the arm alone.

Practise also changing to a higher string, by using the fingers as shown in fig. 2.5(v). (Pay special attention to the thumb!)

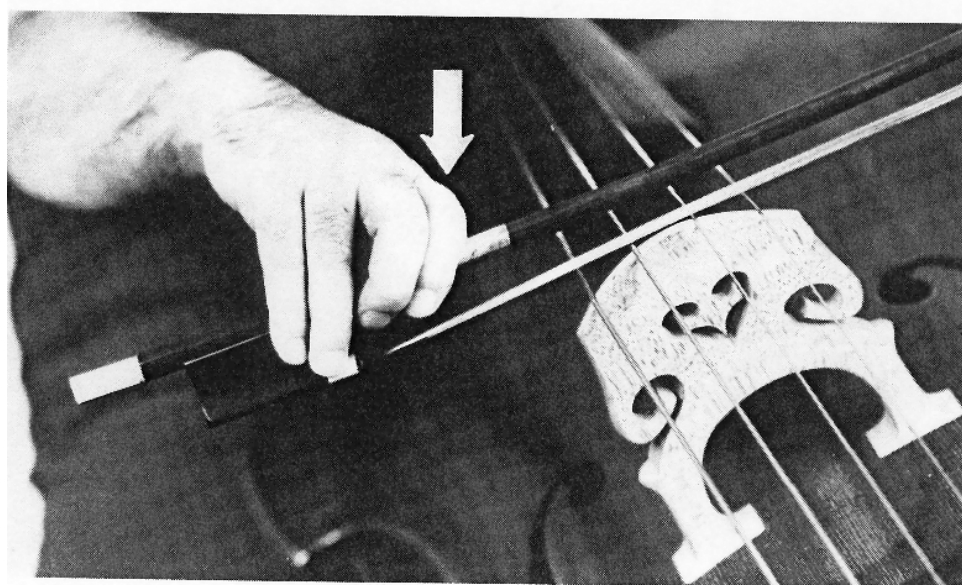


*Fig. 2.5(i): Positions of the hand when crossing from D to A string.*

*a: Playing the D string.*



*b: Approaching the A string with an unflexed bow hold.*



*c: Approaching the A string with a flexed hold, which permits faster weight transfer to the 'new' string.*

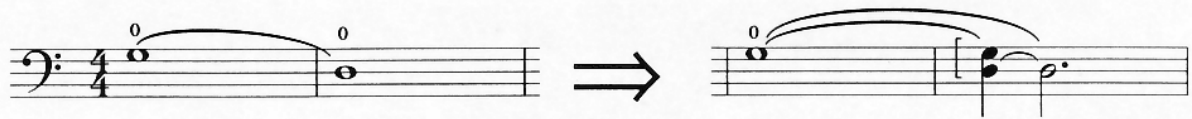
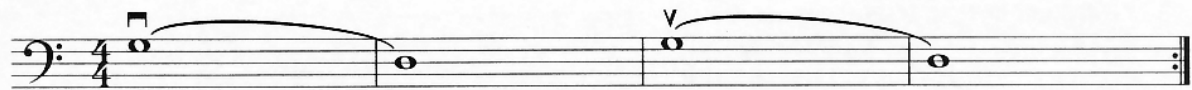


Fig. 2.5(ii): Exercise in unaccented string crossing.



Fig. 2.5(iii): Exercise in string crossings combined with bow changes.



FROG

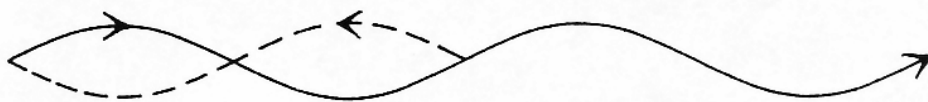


Fig. 2.5(iv): The frog should describe a figure of eight during the course of four bars.

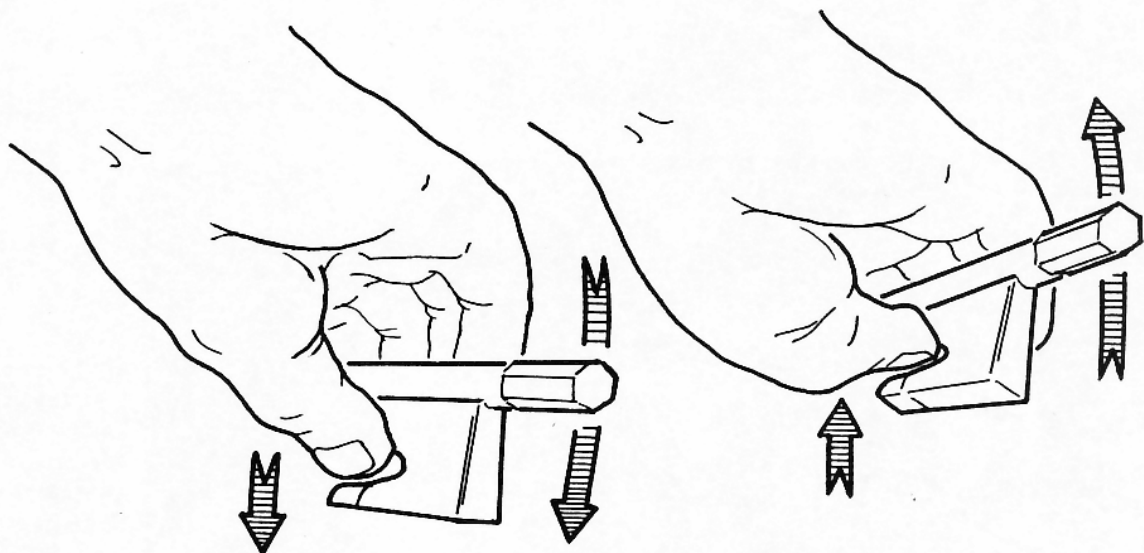


Fig. 2.5(v): Hand position when approaching a lower or higher string. By moving the eyes back and forth between the two drawings, one gets an impression of the movement.

It is very useful to practise moving the bow as far as possible in both directions (↔ and ↕) without moving the forearm. This can be done entirely by means of the fingers and wrist. String crossing can also be achieved. (One can keep the forearm still by holding it with the left hand.) Naturally, movement is limited, but the exercise is none the less valuable.

## 2.6 THE ROLE OF THE ARM IN STRING CROSSING

I have hitherto only described the role of the fingers in string crossing. The role of the arm is somewhat more dependent on conditions at the moment of crossing. As a rule, the whole arm should follow the movement of the bow, up or down – from one string to another, but this is **not always** the case.

Look at fig. 2.6(i) The upper arrows show how the elbow should move, the lower arrows show incorrect movement. In both examples it is desirable for the elbow to 'think ahead' and establish itself in the position required to play the highest note. The upper arm thus moves into the highest position **independently of the bow**.

This enables us to cross strings very quickly, which is essential if we are to avoid hearing the intermediate (D) string (which we have to pass over on the way to the G string). The D string should be damped with one of the left hand fingers. The bow passes over this string with full pressure, both when playing the two notes legato (tied) or detached.

(It is absolutely essential not to lift the bow over any intermediate strings, but to maintain full weight – even if we do not want to hear the slightest sound from them! In this way we save the time which would be needed to re-establish pressure on the new string. This is vital in attaining a rapid technique.)

The upper arrow in fig. 2.6(ii) shows how the elbow should move to achieve 'flow', when playing a more complicated passage. Note that the upper arm **does not** accompany the bow down to the E string (to GG on the second quaver) but 'smooths' out the intervals of this figure to a calm, even line. **It falls to the fingers and the wrist to look after the details, while the upper arm 'thinks in larger terms'.**

It is important to develop a certain amount of independence of the elbow in relation to the hand and shoulder. Practise long notes while moving the elbow up and down independently of the bow, and without variation in the sound! (See fig. 2.6(iii).)

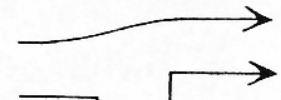
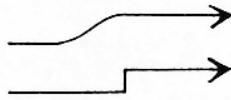
The well-known Russian-American violin teacher Ivan Galamian recommended a similar long note exercise; one rolls the bow up and down on the string, so that the stick almost touches the string alternately above and then below the hair.

Another exercise is recommended by Gary Karr. This is to be played on the open D string as shown in fig. 2.6(iv): the down-bow is to be played as near the G string as possible. The bow is lowered during the rest (with full weight loading) and the up bow is played as near the A string as possible. Then the bow is raised once more during the rest, etc.

The frog thus describes a square in the course of each bar. The movement is carried out with the whole arm taut. Tempo should be increased gradually. This is good training for back, chest and shoulder muscles.



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ELBOW (bad):

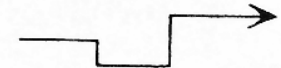
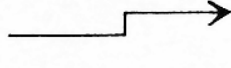
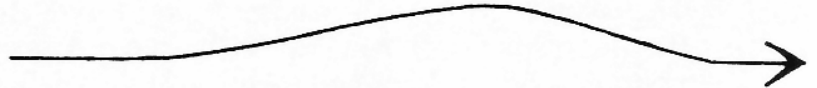


Fig. 2.6(i): Examples of elbow independence during quick string crossings. (Upper arrows correct.)



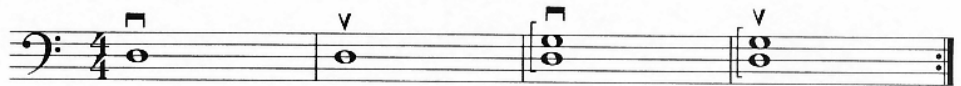
ELBOW (good):



ELBOW (bad):



Fig. 2.6(ii): Examples of elbow independence during quick string crossings. (Upper arrows correct.)



ELBOW:



Fig. 2.6(iii): Exercise for developing elbow independence.



FROG:



Fig. 2.6(iv): Exercise for developing strength and control of the back, shoulder and chest muscles. To be executed with a taut arm and wrist.



## 2.7 QUICK REPEATED STRING CROSSINGS

When playing passages such as fig. 2.7(i), it is most important that string crossing is achieved **with the greatest possible economy of movement**. Keep the bow so near the other string that it **almost touches it**. (The left hand fingers are of course, holding it down all the time.) In rapid tempo, it pays to keep the bow near the bridge – partly because it is easier to keep control if bow speed is slower, and partly because articulation will be better nearer the bridge.

Passages such as fig. 2.7(ii) should also be played with the bow near the bridge, for the above reasons. (See also section 4.9 – “Arpeggio”.)

Passages such as 2.7(iii) whether played quickly, *détaché*, *martelé* or *spiccato*, should first be practised very near the frog, **with very little bow**, to clarify the pattern of the right hand finger movements. Later, it may feel more natural to play them further from the frog, and with more use of the forearm: by then the small auxiliary movements of the fingers will have become natural.



Fig. 2.7(i)



Fig. 2.7(ii)



Fig. 2.7(iii)