

Lowering in peal – what happens in the transition?

When lowering bells in peal, the aim is to produce good striking all the way down. Part way down, there is a transition between two stroke ringing and single stroke ringing as successive bells stop striking on one side. ‘Good striking’ should also be maintained during this transition, but there are conflicting views about what this means, and how close it is possible to approach the ideal of completely even blows throughout (assuming well behaved bells and motivated, skilful ringers).

When the bells are up, correct striking requires the same interval between all blows (with or without handstroke gap, as appropriate). When the bells are chiming at the end, correct striking again requires the same interval between all blows, but now each bell strikes only once. The question relates to what is optimum striking during the transition, as bells progressively stop striking on both sides.

The ideal

The perception of an ideal transition is that as each bell drops out on one stroke, the Treble moves progressively earlier to close the gap that would otherwise open up (and the following bells adjust to maintain equal intervals), so that the resultant sounds continue to form an evenly spaced sequence (neglecting the tiny discontinuity as each hole is formed and filled).

Thus on six say, snapshots on the way down would give:

...123456123456123456123456123456...
...12345612341234561234123456...
...123456123123456123123456...
...1234561212345612123456...
...12345611234561123456...
...123456123456123456...

The implications

In the sequences above, the intervals between successive blows of the Treble become progressively more uneven. The ratio between the hand-back and back-hand intervals, which is initially 1:1 progressively becomes 5:6, 4:6, 3:6, 2:6, and 1:6. Is it physically possible for the striking of a bell to change in such a dramatic way as it lowers?

(At least) two factors can affect the ratio of the two intervals:

- Just before the second blow disappears, it sometimes becomes a bit hesitant. That would alter the ratio between the two intervals a bit, but only just before the second stroke drops out, not for most of the above sequence, where the Treble is securely striking on both sides.
- The ringer can force the bell’s swing by the action on the rope. That will make the timing asymmetric, quickening the blow at the top of the swing with respect to the other one, and a more aggressive action could make the timing more asymmetric. But is it possible to achieve the dramatic ratios needed for the above sequences?

The problem can be illustrated in diagrammatic form using a series of concentric circles, where time is notionally distance round the circle, so as the bells ring more quickly, they fit on a smaller circle. The diagrams below both use this convention. Note that the circles are not to scale, nor do they show every blow (which would require a very closely spaced spiral). The circles in the diagrams are snapshots at intervals through the process.

Figure 1 represents the sequence described above. Each circle is a snapshots after another bell has dropped its second stroke. The changed timing needed to absorb the gap and maintain even intervals requires the relative position of the blows around the circle to change, resulting in a series of curves. For convenience, the Tenor’s position is taken as a datum on each circle (so the Tenor’s line isn’t curved), but that is arbitrary. The red curves show the blows getting earlier (with respect to the Tenor), and the blue curves show blows getting later (with respect too the Tenor) before they drop out.

The green and orange sectors illustrate the extreme ratios between the back-hand and hand-back intervals of the Treble needed to maintain this ideal spacing just before the Treble stops striking twice.

Is this physically possible, and if so, what is the mechanism that causes it?

Coping with perceived reality

Let us suppose that the extreme asymmetric timing, as assumed above, is not possible. So what happens during the transition? How can it (striking including non-even intervals) be related to the perception of a 'perfect lower'?

For simplicity, let us assume that while each bell is securely striking on both sides, and that its timing is even. In terms of the concentric rings, that means that each bell's two strokes must be diametrically opposite each other as long as both are present. If the Treble is striking twice with an even rhythm, then moving one stroke into the gap vacated by the Tenor's missing stroke will also move the Treble's other stroke towards the Tenor's remaining stroke. So during the transition when some bells are striking twice and others only once, there must either be a stage when there is a gap or there must be a stage when there is some overlap, or possibly both.

Given that constraint, the practical question is what is the best compromise. It seems reasonable that gaps may sound less unacceptable than overlaps (clipping). On that basis, the Treble should not close up to fill the emerging gap until it too loses its second stroke. The outer part of Figure 2 shows this, with the gap (green arcs) increasing. The inner part of Figure 2, when all bells are striking single sided, shows the gap closing again, as the bells progressively spread forward to restore even spacing. (NB – there is not a snapshot every time a bell drops out.) The maximum gap during this process would thus be equivalent to five blows, and it could last for a quite while. Would it be perceived as 'a perfect lower'?

Something in between?

Figure 1 and Figure 2 both take purist positions: one that there must be no uneven gaps between successive blows overall, because a 'perfect lower' is possible, and the other that there is no significant asymmetry in the striking of individual bells, because there doesn't seem to be a mechanism to produce it.

In fact there are several other possibilities:

- It may be possible to introduce some significant asymmetry (but well short of the extreme values of Figure 1) so the gaps would not be as big as shown in Figure 2, though they would still be there. Would that render them sufficiently unobtrusive that they do not undermine the perception of a 'perfect lower'?
- There could be a compromise, where the Treble closed up before its second stroke stopped, thus trading a very large gap for some slight overlap. The overlapping blows (which are soon to drop out) might be less strong. Would that make them appear less prominent, and thus not compromise the perception of a perfect lower?
- The Treble could initiate an accelerated (but still smooth) descent once the Tenors stop striking on both sides. That will cause the remaining bells to drop their second strokes more quickly, and make the transition shorter. It may even make the light bells drop out together, thus greatly reducing the maximum gap, providing the gap closure can be co-ordinated with it.

So the key questions are:

- How much asymmetry can be induced in 'normal' bells as they approach the transition?
- What compromise between gaps, and overlaps produces the best perception of 'perfection'?

Diagrams

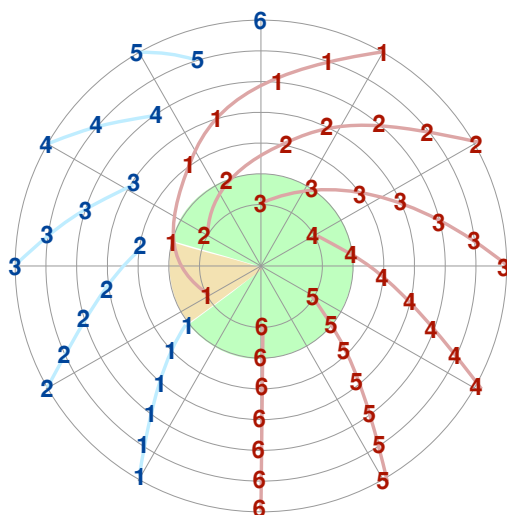


Figure 1: All blows constant interval

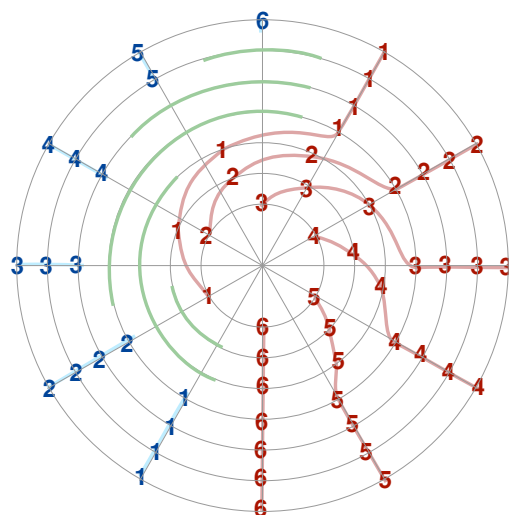


Figure 2: Even striking no overlap