

# The music of changeringing – 1

It's music Jim, but not as we know it. That misquotation from Star Trek is a pretty good way to introduce change ringing to more orthodox musicians. Just imagine:

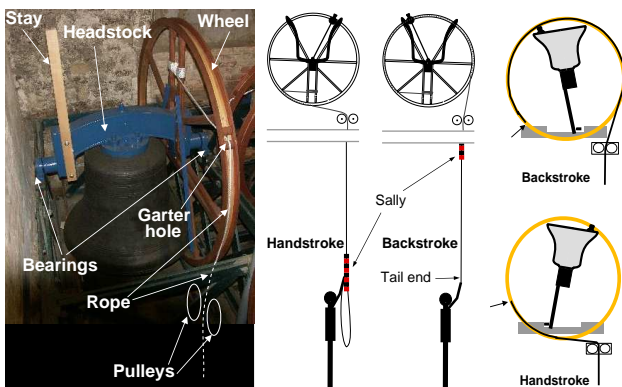
- An instrument whose moving parts weigh a ton or so
- An instrument with a delay of over a second between your action and its sound
- Playing an ensemble of such instruments to a precision of a few hundredths of a second
- A form of music constrained to play every note before repeating any of them
- Composing a piece to last several hours in which no bar must be the same as any other
- Performing such a piece without any music

Change ringing on tower bells presents some special challenges and has a special fascination, both of which I will try to explain in this series of 4 articles.

Handel called England 'The Ringing Isle' when he heard bells ringing everywhere he went in London. We take the familiar sound for granted, but behind it is something unique and special. Change ringing evolved in England around 400 years ago. It has spread to other parts of the world, but of some 6000 towers with bells hung for English style ringing only about 400 are outside England – in Wales, Scotland, Ireland, the Commonwealth and America.

Ringing in synchronised sequences evolved along with a special way of hanging bells that makes it possible. Each bell is mounted on a 'headstock', supported by bearings that allow it to turn through 360 degrees.

When ringing, the bell swings from mouth up to mouth up and back again. The bell is controlled by the rope, which wraps alternately each way round the wheel. Varying the height of swing varies the time of swing, and hence permits accurate speed control and synchronisation between bells. Near the top of the swing, the bell is almost balanced, and the wheel gives considerable leverage, so that only modest force is needed to exert precision control over bells weighing up to a ton or more.

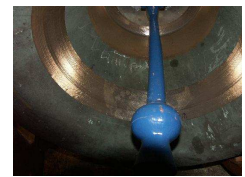
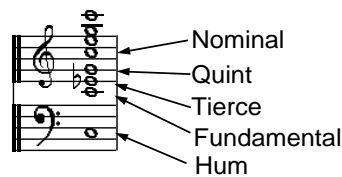


Mechanics of a bell hung for full-circle ringing



Bells mouth-up, ready for ringing

A bell vibrates in several different modes at once, so its sound contains many frequencies, but they aren't 'harmonics' (related by precise numerical ratios) like an organ pipe or violin string. The bell shape evolved to give tones that more or less relate to each other, and bells are tuned by selectively removing metal at different positions to put the first five partials into the correct relationship.



(L) Main partials of a bell in C, (R) Retuned old bell

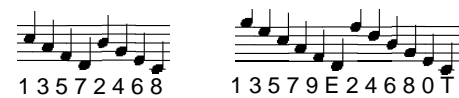
The sound of a bell rung full circle is further richened by a slow vibrato – the Doppler effect slightly changes the pitch heard, as the bell moves towards or away from you.

Bell music is very different from conventional music, since physical constraints limit what is possible with swinging bells. Each swing takes about two seconds, and although the timing can be varied, it can't be varied a lot. The notation is different too. Bells are numbered down the scale, starting from 1, regardless of the actual note.

The most basic pattern is Rounds – ringing down the scale. By progressively swapping adjacent pairs, other sequences can be produced. Those that sound attractive tend to have an obvious visible structure when written as music, and often have names. Queens was once called 'Thirds' (the notes descend in thirds). Whittingtons was allegedly heard as 'turn-a-gain-Whitt-ing-ton'. Tittums can be seen either as an up-down pattern that slowly descends, or as two interleaved descending scales, one of high notes and the other of low notes. The significance of that pattern will become clear in the next article.



Rounds on 6, 8 & 12 bells



Queens on 8 & 12 bells



(L) Whittingtons on 6 bells, (R) Tittums on 8 bells