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Bow Creek and Some Mental Arithmetic

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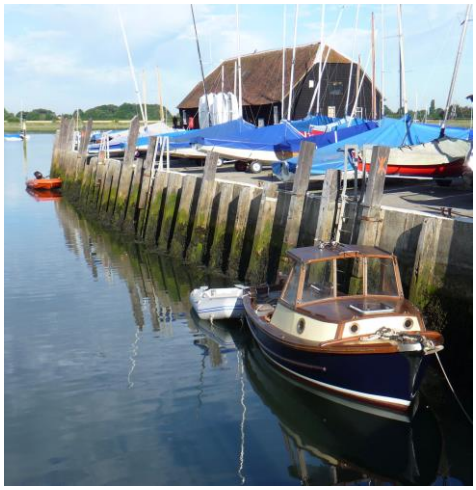
I have a small boat that I enjoy poddling about with in estuary waters, and my favourite is the Dart estuary in Devon, between Totnes and Dartmouth. It is all tidal and at low tide throughout the whole length of the estuary there is an uninterrupted view of mud. Whether this is preferable to high tide seems to vary depending on my mood at the time. In relaxed and reflective mode there is something deeply soothing about vistas of mud – with wading birds, moored boats sitting, beached, beside their unnecessary anchor cables, and with the occasional tree-root and other flotsam half embedded in its squishy embrace. At high tide of course it is all quite different; full of life and energy and action.

One of the inevitable truths of estuary boating is that you cannot mess with the tides. As King Cnut discovered in the 11th C, they are not open to negotiation. They go up and down like clockwork, just as the tide tables predict. So its good advice not to explore on a falling tide. If you sail up a side creek on a falling tide – and stick on the mud – you are there for many hours until the falling tide reaches the bottom and then the returning tide lifts you off. So my exploration of new creeks and by-ways is always conducted on a rising tide. Then if you get stuck … you wait 10 minutes and the boat just lifts off again. I was planning to sail into Bow Creek – which is notoriously shallow but with a winding deeper water channel. And as I approached the entrance I knew there was not enough water to attempt the passage. I can't say that it was too much of a problem however, because all I had to do was drop anchor and break out a beer while I read a book and waited for the flooding tide. An hour later I was astonished to read on my echo-sounder that I had risen 2.5 ft (its an old machine) and there was more-or-less enough water to make the trip. What took me by surprise was partly how quickly it seemed to have risen but mostly that it had happened almost surreptitiously … in complete silence, lifting my ton and a half of boat without so much as a quiver.

It was at that point that I started to do a little bit of mental arithmetic. Bow Creek is more-or-less 2km long and (say … on average) 100 m wide. So the water area is something like 200,000 sq metres. If I had waited just a few minutes more, the rise would have been 1m, so in that time 200,000 cubic metres of water flowed into Bow Creek. There are more-or-less 200 gallons in a cubic metre, so the flow in an hour amounted to 40,000,000 gallons. All in silence … and all free. What would the world be like if we had to pump it?

When I got home I did a bit of Googling and discovered that the Guinness world record water pump (Pentair Fairbanks) can move 60,000 litres /sec, which is 13,333 gallons / sec, or 800,000 galls / min, or 48,000,000 gallons / hour. So this mega water pump could have just about filled Bow Creek at the same rate that the tide achieved. The only snag being that it needs a massive engineering infrastructure to make it viable and it won't do anything at all unless fed by 4,000 kW of power. Neither of these requirements is entirely compatible with the tranquillity and the sheer delight of Bow Creek.

Whilst huge engineering infrastructures can be made to harness tidal forces, the current trend seems to be towards smaller-scale, user-centred power generation. It's a slightly different take on one of my Mum's favourite sayings … look after the pennies and the pounds take care of themselves. So I started to wonder about using the power of the tide locally – on my boat. The force of it is really fearsome. As the rising tide sweeps up the English Channel (and floods into the Dart at Dartmouth and hence up into Bow Creek) it flows at a prodigious rate … 5 or 6 knots … faster than you can walk. Then it flows back again into the Atlantic at the same frenetic pace. East-bound, west-bound, back and forth, endlessly. If you fell overboard, only an Olympic swimmer could hope to get back aboard. Most of us would just be swept away. There must be a way to harness such power from on board the boat – if only to top up the batteries that are so important to life on board. It's just a matter of 'how-to', and surely we are good at that in design and technology?



But of course this would only work when anchored out in the channel flow. When moored at the quayside the tide provides very little flow – just lots of up and down movement. But grandfather clocks are driven by just a chunk of lead – maybe 2 or 3 kgs – falling over a distance of about half a metre. And they can keep all that clever clockwork ticking over for a week. My boat – about 1.5 tons – travels up and down by 4 metres every 6 hours. The photo is of my boat at Bosham quay at mid-tide, having fallen by 2m and with a further 2m to go down to the mud. Once again, just imagine the power that could be generated if a suitable arrangement could allow the boat to rise and fall within the constraints of an energy-extracting harness. And just a few miles down the coast in Southampton, the Queen Mary 2 is going up and down at the same rate. The big difference being that it weighs in at 150,000 tons. No-one could persuade me that there is not a significant amount of energy to be harvested from such colossal forces.

All of this thinking about things that don't yet exist – but could - reminded me of projects that I once examined as part of the old Oxford exam board (now absorbed into OCR). It was not uncommon for schools in sea-settings, where the students were often sailors of fishers, to produce sea-based projects. A lobster pot was the focus of one such, since it is typically marked by a floating buoy and the lobster can so easily be illegally lifted by any passing boat. The imaginative solution involved a system that enabled the buoy to pop to the surface just as the owner came around to check the pots. Another – in Cornwall – was by a sailor who

had a boat moored off-shore that always had to have rain-water bailed out before he could use it. His solution was to build a pump powered solely by the rocking of the boat; a really clever solution that kept the boat constantly dry. Both were entries in the Schools Design Prize, a sadly lost competition that used to be run by the Design Council. One of the reasons that those projects provided such good examples of designing was, I suspect, due to the matter of context. Activities on the sea provide a very particular context with some very special requirements and limitations. And most of the customs and practices in that environment are driven by tradition. This is rich territory for a design-eye.

Teachers commonly note that their most critical job is to help learners to find the right project, and some have developed variants of an approach that might be called *contextual shift*. This involves deliberately placing learners in contexts that are unfamiliar – and allowing them to wallow in them for a while to see what their design-eye can discern. A school specialising in teaching blind children …. or a fish-farm for raising salmon/trout fry…. or a travelling theatre company. Each has so many special requirements – and it's a pound to a penny that no designer has ever spent time observing in detail what goes on, and thinking about how life might be made better for them.

The challenge of *context* as the source of good design tasks is so critical to the success of projects, that D&TA has produced a set of resources to help teachers to manage it. The approach - broadly – is to see the engagement with context as existing at three levels. At the fully open level, being submerged within a context may produce insightful project opportunities. At a more constrained level, learners' attention might be focused on a particular aspect of a context, for example the *storage* issues for a travelling theatre. And at a yet more specified level, particular tasks can be proposed that can be seen to emerge from a context. There are of course pros and cons with each, and the D&TA resource is a valuable guide to help teachers to navigate the territory. (https://www.data.org.uk/shop-products/iterative-design-in-action/)

Meanwhile, back in Bow Creek, the tide has flowed out again and I'm stranded on a mud-bank. Wouldn't it be good if I could walk across all this mud without sinking in? Hmmm… I wonder if….