

# BY AN OLD HYDROGRAPHER

## As it Was

Among XVII century astronomers, Halley (of 'comet' fame) was unique in his attraction to working at sea. Nobody quite knows how he acquired his training in seamanship, but from 1698 to 1701 he was given command of a naval 'pink' to make pioneering measurements of compass variations in the Atlantic Ocean, and to survey the tidal currents of the English Channel. Halley's voyages made cartographic and scientific history.

Edmond Halley (1656-1742) is best known for predicting the periodic return of comets, especially the bright comet which bears his name, but for an astronomer and mathematician he was unusually fond of the sea. Whenever he saw that physical measurements were needed from remote places, he would find means of going to sea and taking the measurements himself. His first such exploit - at age 21-22 - was to map the southern stars from the island of Saint Helena for the benefit of navigators. He later learnt enough of navigation and seamanship to persuade the British Admiralty to allow him to sail around the whole of the Atlantic Ocean in command of a 'pink' named Paramore, a 60 foot long, 10 foot draft, square-rigged schooner, to chart the variations of the magnetic compass. Soon after return from his two Atlantic voyages Halley was given a further four months in summer 1701 for another assignment in the Paramore, to survey the course of the tides in the English Channel.

High Water Times (HWT) at the principal ports on both sides of the Channel were already wellknown, but this was the first time anyone had thought of making comparable measurements offshore. The measurements actually recorded by Halley and his crew in the Channel were the times when the tidal streams swung from an up-channel, (roughly easterly), flow to down-channel flow. This could be done from an anchored ship, but in bad weather it was sometimes necessary to repeat measurements by waiting for another complete tide, after which it would be 'anchor aweigh and sail on to the next station', (weather permitting). Turning-times are not the same as HWT, which are 1-2 hours earlier in that region, but they could with correction be taken as an easily charted proxy. Halley himself had had direct experience of the significance of turning-times, when in charge of operations to salvage treasure from a wreck off Selsey in 1691, for which he invented an early form of diving-bell.

Most of the resulting chart, published by the Admiralty in 1702, is shown here in a necessarily reduced scale. Among the direction-lines and soundings made on the voyage, one can discern occasional bold roman numerals (some with arabic fractions) and short arrows denoting the main up-stream direction. The roman numerals are the times of fastest turning of the tide, adjusted to apply to days of Full or New Moons, according to the age of the moon when recorded. Between mid-June and mid-September the crew of the Paramore managed to complete 56 such stations, fairly peppering the chart with roman numerals from Dover to The Lizard and from Calais to Ouessant (Ushant). The results have been shown to compare favorably with the modern tidal current atlas; they were certainly the first of their kind made in any sea area.

Between Rye and Etaples one can make out the legend: Here the two tides meet. This refers to the tide advancing up the Channel meeting the tide which advances southwards down the western coast of the North Sea. The idea of a definite meeting-place for tides is rather vague, but it may be shown to be consistent with the rate of advance of the tidal currents.

Tidal charts have of course come a long way since Halley's day. As described in the article by H.A. Versteeg (vol.4, no.6, Sept., 2000), they now use sophisticated measuring techniques and computation to map the contours of tidal elevation and phase. But 130 years were to pass before anything comparable to Halley's enterprise was even attempted. It was then found how difficult it is to do better than Edmond Halley had achieved in four months at sea.

### Further Reading

- Edmond Halley - Charting the Heavens and the Seas, by Alan Cook, Clarendon Press, Oxford, 1998
- Halley's Tidal Chart, by J. Proudman. Geographical Journal, vol.100, 174-176, 1942
- Paramore Pinks Journal, Anno.1701, In: The three voyages of Edmond Halley in the Paramore, edited by N.J.W. Thrower, Hakluyt Society, Ser.2, vol.156, 1981. (A transcription of the ship's log, with full-scale charts as separate folders.)