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Geomorphological Evolution of the Solent Seaway and the Severance of Wight: A Review

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EARLY QUESTIONS CONCERNING THE SEVERANCE OF WIGHT

It was more than 400 years ago when the first historians and geographers began to enquire into the nature and origins of the Solent as an open east-west seaway and the date at which it had precipitated the severance of the land of Wight. The first recorded questions are those of William Camden, whose first edition of *Britannia* (published in 1586) included the mischievous speculation that the Isle of Wight, with its Roman name of *Vectis*, might perhaps be equated with a prehistoric island, otherwise known as *Ictis*.

A British island called *Ictis* had been cited in the 1st century BC, by the classical writer *Diodorus Siculus*; however, we should note that in describing Britain or "*Prettanike,*" this classical historian commonly used the expressions "we are told" or "they say". The style of *Diodorus* indicates that he was relating the accounts of others and, unlike the earlier Greek explorer *Pytheas*, who had visited the Cornish coast in the 3rd century BC, it seems that he could offer no personal experience. His gatherings tell of an island close to the shore of southern Britain where the natives could cross at low tide whilst drawing wagons loaded with tin ore or ingots. These consignments were loaded into visiting ships bound for the Atlantic seaboard of Gaul (Rivet & Smith, 1979). *Diodorus* added that it was people dwelling near the promontory of *Belerion* (Land's End) who prepared this tin and transported it to the tied island of *Ictis*.

Archaeologists are mostly agreed that the most credible claimant for the island of *Diodorus* is St Michaels Mount, near Penzance. This granite islet is accessible at low tide; it is very close to the tin stream deposits at Marazion Marsh and it has even yielded scattered fragments of tin ore (Skinner, 1797; Hencken, 1932; Maxwell, 1972; Herring, 1992; and Penhallurick, 1997). A less convincing contender has been the rock promontory of Mount Batten, in Plymouth Sound. This area once served as an Iron Age port and it is sited not far from the spot where a prehistoric tin ingot was found on the seabed (Cunliffe, 1988).

Since Camden's day, the Ictis-Vectis theory has claimed many champions, but it has remained a specious argument, readily flawed by the restriction of tin lodes to the Cornish peninsula. The best that might be postulated is that, whilst *Diodorus* was gathering descriptions of all islands on the south coast of Britain, he applied the name used in Wight to a trading post in Cornwall. Indeed, he reminds us that he is speaking of "the neighbouring islands lying between Europe and Prettanike". Such a fusion of accounts permits *Vectis* to be *Ictis*, whilst excluding the impracticalities of a Vectensian tin trade.

A very different attempt to pursue historical explanations for the severance of Wight was made in the 18th century by Dr Thomas Short, a physician of Sheffield. This author produced an extraordinary and unsubstantiated classical reference to a great earthquake which had allegedly severed the Isle of Wight from the mainland, in the year AD 68 (Short, 1749). The source of this claim has never been substantiated. It has been observed, however, by Charles Thomas (1985) that where near-shore islands are concerned, folklore and credulity have always favoured a catastrophic event, rather than a slow processual one.

THOMAS WEBSTER AND THE WIGHT-PURBECK RIDGE

The first scientific enquiries into the configuration of the Solent began in the early 19th century. Thomas Webster opened the discussion in 1816, when examining the Chalk stacks, including Old Harry Rock in the Isle of Purbeck. Here, he observed that "the Chalk at Handfast Point which being in a line with that of the Isle of Wight appeared like the continuation of the same strata" (Englefield, 1816). He considered that these stacks "like those of the Needles had resisted, longer than the rest, the destroying effects of the waves" and he concluded that "these two places were once united".

Unsettled by a contemporary regard for biblical time-scales, Webster demurred over the means by which the Chalk ridge had been lost or submerged. In 1840, however, such reservations were confidently expelled. Charles Lyell now announced that the severance of the Chalk at Handfast Point, together with the present shape of the Isle of Wight, was due to encroachment and continued action of the sea. Lyell cited Hurst Spit as proof and product of long incremental coastal processes. He drew persuasive comparisons with other British examples, including Chesil Beach. In each case, he argued that the beach shingle was derived from the slow and on-going erosion of flint-bearing cliffs. This argument was reinforced in 1852, when Redman observed that the deep-cutting of the Hurst Channel was further evidence of protracted coastal processes.

The mid-19th century was a time when the processual history of the Earth and the antiquity of man were subjects of hot contention, in both public bar and pulpit. A progressive figure in this debate was the Rector of Brighstone, the Reverend William Fox. Fox had been an ardent investigator the remains of the fossil reptile in the cliffs of his parish. Consequently, his tea parties had become highly scientific events. More eminent guests had included Sir Charles Lyell, the palaeontologists Gideon Mantell and John Owen, and the poet and philosopher Alfred Lord Tennyson.

It was William Fox who was first to pose the direct question "*when and how was the Isle of Wight separated from the mainland?*" This was the title of his short and perceptive paper published in the Volume 5 of the new journal, the *Geologist* (1862). Fox first considered the old historical Ictis-Vectis explanation currently championed by his non-conformist contemporary, the Reverend Edmund Kell of Newport. He then applied his geological knowledge, to calculate where the Island's last overland connection or umbilical may have been. Kell, meanwhile, was postulating a fanciful overland staging route which could enable Iron Age people to carry Cornish tin to the Isle of Wight, so that it might be laden on to ships which would return past the Cornish coast, en route for the Atlantic seaboard of Gaul (Kell, 1866).

Fox used the observations of Webster to advocate a lost Wight-Purbeck ridge. He then applied the case presented by Lyell and Redman, to demonstrate that the Solent seaway was sufficiently old to allow for the slow accumulation of shingle deposits at Hurst Spit and Shingles Bank. Fox now challenged Lyell's intimation that the severance of Wight had been an incremental event. For him, the Wight-Purbeck had formerly been a continuous range of Chalk hills; its breaching by the sea had been a catastrophic event, leading almost directly to the severance of Wight.

WILLIAM FOX AND THE SOLENT RIVER THEORY

For Fox, his Wight-Purbeck ridge was a protective wall of Chalk, sheltering the Dorset and Hampshire lowlands from the sea. If this had been the case, however, then an earlier seaward exit seemed necessary to allow the substantial Dorset rivers of Frome, Stour, Piddle and Avon to reach the ocean. Fox developed the ingenious idea of a lost *Solent River* that might formerly have passed behind the land of Wight to drain the river catchments of east Dorset. The exit of this river might lie somewhere off the Bembridge Ledges whilst its inland tributaries, including the Test and the Hamble, could also include a *great westward arm* passing beneath the present Western Solent to serve the east Dorset catchment (Figure 1).

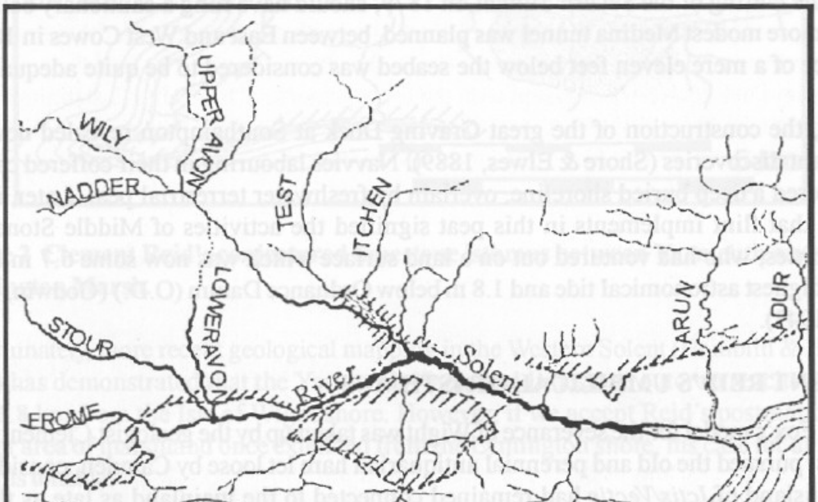

Figure 1 The supposed configuration of the Solent river and its Dorset headwaters. As perceived by William Fox (1862) and illustrated by Clement Reid (1905).

Some twenty years later, the implication of such changes for the Ice Age geography of north western Europe were ably summarised by the pioneer of Pleistocene landscape studies, James Geikie.

> *..The Solent is an old land valley. At what particular point the ancient river discharged into the sea, or whether or not it really joined the Seine can only be conjectured.*

Geikie's ensuing comment confirmed that he largely supposed the formation of the Solent seaway to be a Holocene event.

> *But that Palaeolithic man saw the Isle of Wight as part of the mainland, there cannot be any reasonable doubt (*James Geikie, 1881).

Despite Fox's predictions, the presence of buried river channels or *palaeovalleys* gained little interest during the 19th century. When engineers and investors gathered in the year 1900, to propose a plan for an Isle of Wight railway tunnel, the dangers of encountering a buried channel seem to have been entirely disregarded. Civil engineering experiences gained during the cutting of the Severn Tunnel, in 1879, should have rung a cautionary bell. Yet, when a more modest Medina tunnel was planned, between East and West Cowes in 1892, a clearance of a mere eleven feet below the seabed was considered to be quite adequate.

In 1889, the construction of the great Graving Dock at Southampton revealed new and significant discoveries (Shore & Elwes, 1889). Navvies labouring in their coffered caisson encountered a deep buried shoreline, overlain by freshwater terrestrial peat. Later, it was realised that flint implements in this peat signified the activities of Middle Stone Age communities, who had ventured out on a land surface which was now some 6.7 m below present highest astronomical tide and 1.8 m below Ordnance Datum (O.D.) (Godwin, 1940; Oakley, 1943).

CLEMENT REID'S UMBILICAL OR ISTHMUS

In 1905, Fox's model for the severance of Wight was taken up by the geologist Clement Reid. Reid first pursued the old and perennial antiquarian hare let loose by Camden, considering how the island of *Ictis/Vectis* had remained connected to the mainland as late as the 1st century BC. Camden had observed that "*we may well think this Vecta* [Vectis] *to be that Icta which as Diodorus Siculus writteth, seemed at every tide to be an island but when it was ebbe, the ancient Britaines were wont that way to carry tinne thither by carts.*" (Camden [English ed.], 1637). With this seed implanted, there was much fruitless ground to be repetitively harrowed.

Clement Reid wished to consider how the land of Wight might remain connected to the mainland after the sea had breached the Wight-Purbeck ridge. For this, he was prepared to accept the date offered by *Diodorus*. Reid rightly dismissed Hurst Spit as a possible umbilical, for he required firm ground on which to set the groaning carts, the heaped tin ingots and the sweating Britons.

Reid identified his potential umbilical in the region of Hamstead and Yarmouth, where hard outcrops of the Bembridge Limestone Formation led offshore in the direction of Lymington (see Figure 2). On the Hampshire shore, no trace of the limestone could be found, but Reid suggested ingeniously that such an outcrop had since been eradicated by coastal erosion, prior to the formation of the Lymington salt marshes.

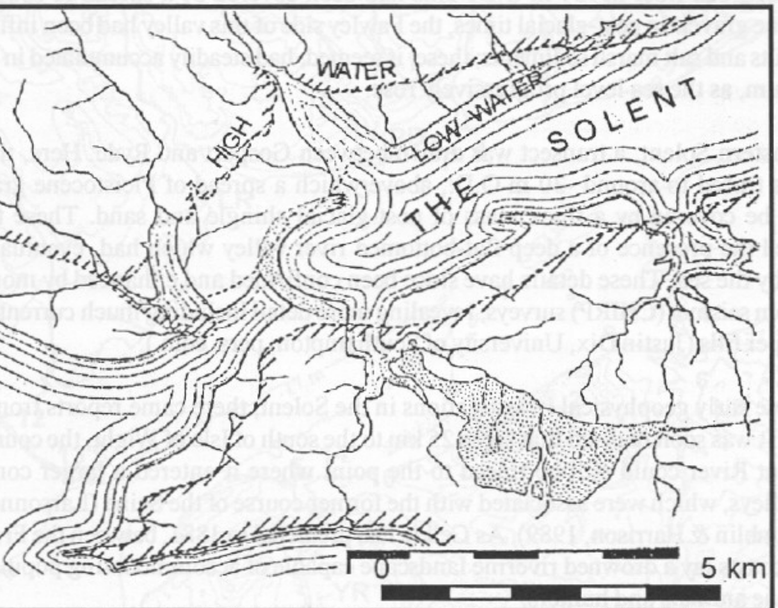

Figure 2 Clement Reid's conjectured limestone isthmus between Yarmouth and Pennington Marsh.

Unfortunately, more recent geological mapping in the Western Solent (Hamblin & Harrison, 1989) has demonstrated that the Yarmouth-Hamstead limestone outcrop reaches no more than 1.8 km from the Isle of Wight shore. However, if we accept Reid's postulation that a greater area of marshland once extended from the Lymington shore, his case for an isthmus remains tenable.

MARINE GEOPHYSICAL PROSPECTION

During the 1970's, marine geophysical surveys were commenced by the University of Southampton over the site of Fox's lost Solent River (Dyer, 1972 & 1975). A sparker sonar unit, towed behind a boat, soon revealed the course of Fox's deep and elusive channel as it passed beneath the Eastern Solent. A tributary channel was also detected on the floor of Southampton Water. In the Western Solent, the results obtained were less rewarding. Here, the supposed 'great western arm' of the Solent River remained elusive; however, the seismic signal had been dissipated by the presence of sand and this left the matter unresolved (Dyer, 1975).

Contemporary with these early geophysical explorations were interpretations of the raised and submerged gravels and sediments of the Solent region (Curry *et al.*, 1968; Hodson & West, 1972). These were later summarised in a masterly synthesis, in which bore-hole records and sonar traces were used to compile two basic cross-sections through the floor of the modern Solent (West, 1980). At Fawley, the floor of Southampton Water was transected to reveal a bedrock floor at -24 m O.D. This had been covered by a spread of some 5 m of Pleistocene gravel. In post-glacial times, the Fawley side of this valley had been infilled with marine silts and salt marsh sediments; these, it seemed, had steadily accumulated in dynamic equilibrium, as the sea level progressively rose.

In the Eastern Solent, a transect was drawn between Gosport and Ryde. Here, the valley floor was traced to around -30 m O.D., above which a spread of Pleistocene gravel was found to be covered by a thick mass of post-glacial shingle and sand. These transects confirmed the presence of a deep flat-bottomed river valley which had, eventually, been invaded by the sea. These details have since been confirmed and enhanced by more recent sub-bottom seismic (CHIRP) surveys, revealing more detail including much current bedding in the upper fills (Justin Dix, University of Southampton, pers. com.).

After these early geophysical investigations in the Solent, there came reports from farther offshore. It was soon realised that some 25 km to the south of Isle of Wight, the course of the lost Solent River could still be traced to the point where it entered a larger complex of palaeovalleys, which were associated with the former course of the Seine (Larsonneur, *et al* 1982; Hamblin & Harrison, 1989). As Geikie had predicted in 1881, between the French and English coasts lay a drowned riverine landscape capable of accommodating populations of Pleistocene animals and hunters.

THE LOSS OF AN ARM

During the 1990's, a new generation of sub-bottom profilers has enhanced the stratigraphical knowledge of Fox's Solent River in the floor of the Eastern Solent. These studies have also largely discredited his case for a 'great western arm' extending throughout and beyond the length of the Western Solent. In 1986, a palaeochannel was reported beneath Hurst Spit and Pennington Marshes (see Figure 3, locations 11 & 12), but Nicholls was quick to observe that its depth of -7 m O.D. seemed insufficient to provide a downstream outlet for the Fox's Dorset catchment. This, he observed, had already attained a depth of -15 m O.D., in a deep palaeochannel at Hamworthy (Nichols & Clarke, 1986; Nichols, 1987).

In 1994, a new study of the terrestrial and submarine gravel terraces of the Solent region was presented (Allen & Gibbard, 1994). This investigation demonstrated how an earlier Pleistocene valley or lowland could form in the area that was, eventually, to accommodate the Western Solent. This study proposed a fluvial history, which generally endorsed the original model proposed by Fox. Unfortunately, this work did not embrace the new seismo-topographical research being conducted by the University of Southampton. A crucial omission was the palaeovalleys, which the oceanographers were discovering in the Wight-Purbeck ridge (Velegrakis, 1994).

Figure 3 Bathymetric and sub-bottom indications of a submerged West Solent land-bridge or umbilical (1) at -17O.D. Other numbered sites are cited in this and related text. P-P Sub-bottom transect after J. Dix; YR Western Yar River; NR Newtown River; BR Beaulieu River; LR Lymington River; PD Pitts Deep.

The completed seismic study of the submerged topography of Bournemouth and Christchurch Bays was soon to confirm the suspicions raised by Nichols (Velegrakis, 1994). This revealed seven major palaeovalley complexes cutting through the submerged Wight-Purbeck ridge and escaping across the floor of the English Channel (Velegrakis *et al.*, 1999; Velegrakis, *this volume*). It was now apparent that well before the close of the Pleistocene, the East Dorset catchment had no need for an exit route to the north of the land of Wight. Moreover, it now seemed that the Hurst-Pennington palaeochannel was probably part of a westward-flowing

PRESENT KNOWLEDGE, OUTSTANDING LACUNAE

With a southward pattern of drainage now identified in Christchurch Bay, there arises the possibility that prior to the formation of the Western Solent, a similar southerly exit was provided by a single river formed by the Lymington River and the Western Yar. This possibility has yet to be fully explored, yet sub-bottom profiles examined by the present writer across Freshwater Bay seem to exclude the presence of a discernable palaeochannel in the sandstone bedrock of this embayment.

Meanwhile, the relationship between the catchments of the lower Yar and Lymington rivers, together with that of the Newtown river, has become critical to our enquiry. Between these two ancient catchments, at Bouldnor, the Island's cliff line rises as high as 50 m OD but the opposing topography along the Hampshire coastline remains low and offers ready opportunity for past river capture. This might be easily affected between the lower and lost pre-inundation courses of the Lymington and Sowley rivers. Such capture may have been the triggering mechanism for the severance of Wight.

Recent sediment cores extracted at Yarmouth and Newtown seem well-placed to explore this issue. Some marine influences are evident at Yarmouth prior to 7000 *cal*. BC but there follow two episodes of peat accretion which attest the persistence of fresh or brackish conditions in the river Yar (Scaife, pers. comm.). It seems most unlikely that these peat-forming conditions could occur during a process of marine inundation or during the genesis of an open West Solent seaway. After an hiatus in the 6th millennium BC, a second episode of peat accretion commences at Yarmouth and this persists until the mid 4th millennium BC when it terminates at a height of -5.50 m OD. It is after the cessation of this peat, around 3650-3360 *cal* BC (GU-5419), that marine conditions seem to make an unremitting appearance.

At Newtown Spit, east of the supposed Reid isthmus, diatom and palynological evidence has yet to be fully collated but here, as in the Yar river, there is evidence of marine conditions after 3500-3040 *cal* BC (OXA-4778). It is after the close of the 4th millennium BC that the construction of Neolithic intertidal wooden trackways is evident on the Isle of Wight shore and these seem to attest a human response to worsening tidal conditions. At Newtown, 'platform B' was constructed around 2920-2500 *cal* BC (GU-5341) when flooding seems to have been occurring at -1.60m OD. At Yarmouth a somewhat similar structure has been dated at 2920-2620 *cal* BC (GU-5260). We might speculate that it was around this time that the sea was first able to advance on the high land at Bouldnor. Having weighed this information, the speculative might wish to postulate a severance event during or after the mid 4th millennium BC but the wise will await the results of further study and the emergence of a more definitive picture. Some of these possibilities are further discussed in the research agenda, which is presented separately in this publication (see Biodiversity and Conservation Workshop Findings: Archaeology).

This short review has shown that past studies of the geomorphological history of the Solent seaway were largely driven by antiquarian curiosity and by early interests in processual geology. Marine geophysical survey, as demonstrated by Dyer (1972 & 1975), offered a geology. Marine geophysical survey, as demonstrated by Dyer (1972 & 1975), offered a major advance in the investigation of this topic, yet this was to be followed by a comparative dearth of follow-up activity during the 1980's.

At the close of the twentieth century, fresh needs and new opportunities have emerged. These include a new generation of geophysical instruments, which have been used so successfully in Christchurch Bay (Velegrakis *et al.*, 1999). New archaeological and palaeoenvironmental investigations have begun to trace the later history of Holocene sea-level rise, as it is attested in the intertidal zone of the Solent shore and creeks (Tomalin, 1993; Allen *et al.*, 1993; Loader *et al.*, 1997). Concurrent with these investigations is a demand by coastal managers and planners for an understanding of long-term coastal processes and the severity of regional sea-level change. Behind these requirements lurks a disturbing and outstanding lacuna. Before we proceed to coastal development strategies, environmental management plans and predictions of coastal change, we have yet to resolve just how old is the Solent seaway and just how young are its channel-forming processes? Some contributions to a research agenda, addressing these problems, are outlined separately in this volume.

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