dition that Dwarka, was submerged by the sea, the present investigations have yielded data of scientific value for study of sea level fluctuations in the Gulf of Kutch. Computing the working levels of the *in situ* protohistoric and early historic structures with the present high water line, it can be postulated that the first town was built when the sea level was about 9·6 m below present level, and the next one when the sea level was about 6 m below present.

It is also likely that the second urbanization in India took place in the 15th century BC since both Dwarka and Bet Dwarka are found to be large fortified settlements. Dwarka extended up to Rupen nearly 3 km on shore and Bet Dwarka was about 4 km long. Dwarka is said to have been built by Lord Sri Krishna, and Bet Dwarka (Shankhodhara) was a pleasure resort where his consorts lived.

The major industry of Dwarka and Bet Dwarka was shell-working. Pearl-fishing must have been another source of revenue. It is, however, overseas trade which brought wealth to these ports.

The reference in the *Harivamsa* to the use of seals for identification is indirectly attested by the discovery of a Late Indus-type seal from Bet Dwarka. The inscription on a votive jar from the same site confirms that the Late Indus script of linear form was in use in the post-Vedic period also. This inscription referring to the Sea God is unique in the sense that the script used provides the missing link between the Late Indus and Brahmi scripts. Its importance is highlighted in the Presidential Address of the XII Annual Congress of the Epigraphical Society of India held at Jabalpur in February, 1986.

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Excavations at the Classical/Hellenistic harbour of Phalasarna, Western Crete, Greece

The Department of Classical Antiquities of Western Crete organised in June and July 1986 an expedition of archaeologists and scientists to study the Classical/Hellenistic harbour at Phalasarna, the coastlines of which have intrigued so many distinguished geomorphologists.

The project was sponsored by the Governor of Hania, Dr Monolis Badouvakis, and lasted for two months.

Ancient Phalasarna lies in Western Crete at the north-west extremity of the island by the neck of Grambousa promontory in the Bay of Livadi. Cape Koutri, upon which the ancient town was built, is of strategic importance as it guards a large part of Western Crete, past which sail ships trading with North Africa and Italy.

The rocky promontory is dominated by an acropolis and several other buildings overlooking the town and sea. The rest of the city is built along the slopes and is surrounded by 600 metres of fortification walls, containing four square towers in situ, built of ashlar sandstone blocks in the pseudoisodomic and isodomic styles. The harbour of Phalasarna was more frequently mentioned by ancient geographers (Strabo 10.4.2, Skylax 47, the Anonymous *Stadiasmus* 336, etc.) than any other feature in the city. It was called *'kleistos limen'* (closed harbour) and was encircled by the city walls. Its quadrangular shape was enclosed by four towers, no quays, and two canals to the sea, all now on dry land 6·6 m above water level, due to the well-known geological uplift of Western Crete.

However, the above description of the harbour was highly speculative, all based on the 1865 account of the English explorer Captain T. A. B. Spratt, who first identified the harbour on dry land and drew a map. Few archaeologists in the world believed his theory, doubts being based on the erosion and deformation of the site as a result of earthquakes.

In 1986 a geophysical survey was conducted to provide a map of buried features throughout the whole harbour area. The data collected by electrical, magnetic, and seismic studies defined the shape of the harbour, almost as precisely as Spratt had described it. A small section dug in the middle of the dry harbour, demonstrated the

port's existence by the discovery of ancient silt and marine deposits. Furthermore, excavation on one of the 4 structures previously thought to have been square towers, produced unique information about the architecture and engineering of the ancient Greeks. The south-east hill uncovered part of a beautifully constructed round fortification tower preserved to a height of 4·50 m and 8 m in diameter. It was built of large sandstone blocks in an isodomic style without mortar (Fig. 1).

About 1·65 m from the base of the tower there was a carved rounded projection above which the diameter of the tower decreases by 40 cm. Up to 1 m above the base of the tower the stones are badly eroded, suggesting the effect of wave action. Two thick sea walls running parallel to one another come out of the tower and seem to continue towards a second tower. The space between these two walls seems to have been filled with water, on the evidence of the erosion of the stones and the analysis of the sea deposits (Fig. 2).

Thus, this year's study has taught us about the ancient harbour of Phalasarna:
(1) the ancient harbour is located where Spratt proposed;
(2) the geological uplift which has raised this corner of Crete by 6·6 m above ancient sea level, either had not begun or was not far advanced when the tower was constructed;
(3) if the base of the tower was underwater, the ancients either drained the area to build it or built it underwater;
(4) the harbour was landlocked and its shape seems to have been quadrangular, and no shallower than 1·85 m. Its architecture as well as the fact that everything discovered so far is artificial, suggests a Phoenician influence similar to the *cothons* in ancient Carthage and Motya.
(5) The date of the original harbour remains uncertain, but the construction of the tower and the pottery found in it date to *c.* 4th century BC.
(6) Finally, a second harbour is suspected to have been behind the present heavily fortified one, which is a typical feature of the classical

Figure 1

Figure 2

period: that is, a commercial and naval port found together, examples of which occur at Piraeus, Thasos, Rhodes, etc.

A detailed article on the above excavation will be published shortly.

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References

Flemming, N. *et al,* 1973, Archaeological evidence for vertical earth movements in the region of the Aegean Island arc. *Science Diving International*: 51–4.

Laborel, J., Pirazzoli, P. *et al,* 1979, Holocene raised shorelines in Western Crete, Greece. *Proc. of the 1978 International Symposium on Coastal Evolution in the Quaternary*, Sao Paolo, Brazil: 475–501.

Pirazzoli, P. *et al,* 1976, Les variations du niveau marin depuis 2000 ans. *Mém. Lab. Geomorph. Ec. prat. Hautes Et* 30: 51–4.

Spratt, T. A. B. 1865, *Travels and Researches in Crete,* vol. 2. London, pp. 227–35.

Fine and common ceramics from the Palamos wreck

At this site there have been found sherds, and also one complete vessel, of fine and common ceramics, which are now being studied by Jose Barbera i Farras. They were concentrated mostly in two areas; at the base of the rocks, where the port side of the bow section had come to rest and, on the same side, at the stern, near a rock, but on the slope, outside the wreck area, mixed with pieces of wood and remains of iron tools. All were within a hollow in the rock,