The marine scientist
No.9 4Q 2004

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Evidence suggests ancient Indians were aware of a submarine volcanic structure in the Arabian Sea, off the country's NW offshore region, and deduced a little, at least, about its physical features and hydrothermal system. Ancient manuscripts contain

Research of medieval and ancient Indian manuscripts dating as far back as 1500 BC has unearthed extraordinary descriptions of a submerged volcanic edifice and associated hydrothermal vents. Moreover, the location is precisely where geophysicists would point to today: India's northwestern continental margin. **Sanjay C Patel*** reveals the results of his research

Who really discovered deep-sea volcanoes?

descriptions pertaining to its submarine location, volcanism, 'plumbing', dynamics, chemistry and appearance.

A single parallel description might be discarded as a fluke coincidence, but 17 parallel descriptions become much harder to ignore (see Panel).

The descriptions of a 'Submarine Fire' and 'Volcano' located in oceanic waters unearthed in this research should not be disregarded because they have been found in what were previously interpreted to be purely 'mythological' texts. The large number of real patterns and parallels to be found in these texts are clear and obvious and suggests the existence of authentic discoveries that must later have been mixed with mythology, or vice-versa.

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The task, now, is to untangle and separate the two — the original discovery from the mingled mythology — to reveal what ***was*** known about the world and its oceans by the ancients.

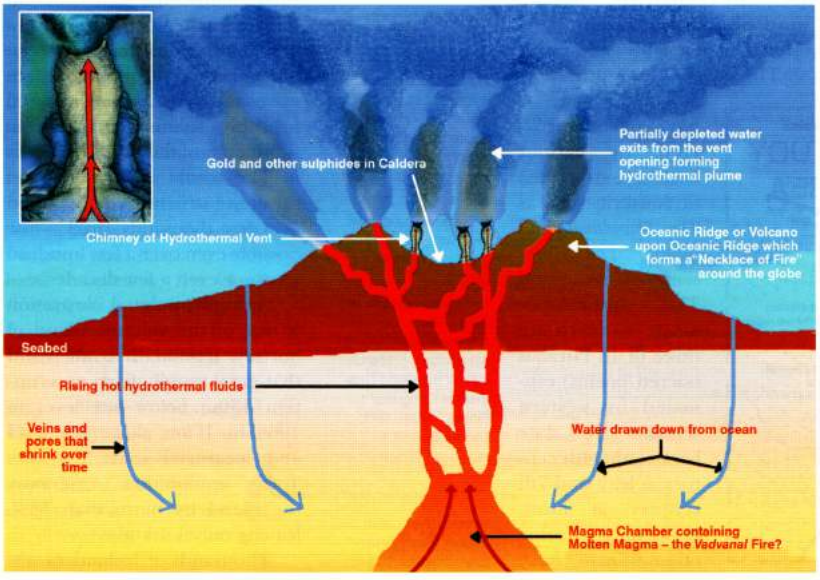
If, indeed, these ancients were describing submarine volcanic structures, the repercussions for history could be vast.

Remarkable history

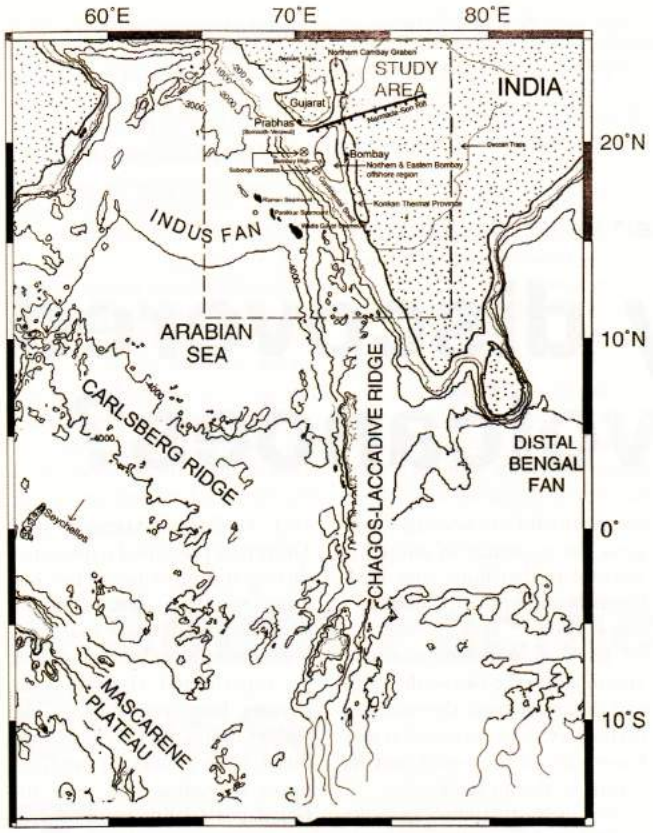
In 1971, Clive Lister of The University of Washington and Jack Corliss of Oregon State University published papers predicting the presence of hot seawater springs at oceanic ridges. Their postulation was that some seawater must enter the seabed, get superheated, rise and again emerge from openings in the seabed. Later, in 1977, scientists dived down 2500m on the Galapagos spreading axis near the Galapagos Islands in the Pacific Ocean, in the submersible *Alvin*. They discovered warm hydrothermal solutions gushing out from the seafloor.

Later discoveries revealed that vents can also occur in much shallower waters on the tops of rising submarine volcanoes such as around the hot spot islands of Iceland and the Azores. They have also been found at the Kurile Islands, Russia. It must be assumed that such springs exist, and have existed, above all the oceanic hot spots around the world.[1] This includes India's northwestern continental margin — which has had a remarkable history of volcanism — maybe more than any other place on earth.

Indeed, medieval and ancient scholars in India have described in detail what appears to be a deepsea structure they called the 1) *Vadvanal* 2) *Vadava* 3) *Jvalamukh* 4) *Jvalamala* and 5) *Agni*. The first two words unequivocally mean 'Submarine Fire' (Sir M Monier-Williams,



Schematic representation of deep sea hydrothermal processes



Map of Indian Continental Margin, Arabian Sea and Indian Ocean indicating the study area (see enlargement)

Enlarged map of study area along India's Western Continental Margin

Sanskrit-English Dictionary, Revised edition, Oxford University Press, 1989). The third and fourth words clearly mean 'Volcano' (Monier-Williams) and 'Chain of Fire' (Monier-Williams) respectively. The fifth word also clearly means 'Fire' (Monier-Williams).

The above descriptions — and many more — have been discovered in various ancient texts written in Sanskrit, such as *The Skandamahapuranam*, *The Brahmamahapuranam* and *The Sivamahapuranam* — which are three of 18 Puranas (sacred poems) estimated by western scholars to date back to the 4th century at least and 7th century at most. However, some other estimates have put them between AD 500 and AD 1000. Other astonishing descriptions of the 'Submarine Fire' have been found recorded in Gujarati language such as in *The Vachanamritam* texts that date back to AD 1819-1829.

More surprisingly, references to the 'Submarine Fire' have also been found in even more ancient Indian epics (in Sanskrit) — *The Mahabharata* —which dates back to at least 300 BC, and *The Shri Valmiki Ramayana* — which dates back to a similar period, if not earlier. Most astonishingly, references to the 'Submarine Fire' can also be found in The Rig Veda, which dates back to 1500-1200 BC.[2]

A compilation of what the ancients described is detailed in the Panel.

Mind blowing

It is mind blowing to think that medieval and ancient scholars were aware of submarine volcanoes and hydrothermal processes in the deep oceans as far back as 1500 BC.

However, on the basis of the extraordinary evidence presented in this article it is most probable they must actually have seen such a structure several thousands of years ago, in the Arabian Sea, towering above sea-level. How else could they have given such an involved and coherent picture?

The structure they had seen must then have undergone sea wave and weather erosion and probably, submergence due to subsidence of the seabed beneath it. This would have submerged the entire structure over a period of a few thousands years — or possibly even over a few hundred years, or even a few decades.

A simple, pointed illustration is that of the volcanic island of Surtsey, Iceland. It is an island that grew rapidly from an eruption 130m below sea level in 1963 to 170m above sea level and measured some 2.7 km². Today, erosion has worn away the island by more than 50%, leaving only 1.4 km².

Thousands of Icelanders wit-

References

1 Rachel Carson, *The Sea Around Us*, Oxford University Press, 2003, xxxv

2 Smith, Noel W, (1990), *The evolution of psychophysical dualism in ancient India: from the Rig Veda to the Sutras*, Mankind Quarterly, 0025-2344, September 1, Vol 31, Issue 1/2

3 R. Nigam (1988), *"Was the large rectangular structure at Lothal (Harappan settlement) a 'dockyard' or an 'irrigation tank'?"*, Marine Archeology of Indian Ocean Countries, 20-21

4 G.C. Bhattacharya, G. P S. Murthy, K. Srinivas, A.K. Chaubey, T. Sudhakar, R.R. Nair (1994), *"Swath Bathymetric Investigation of the Seamounts Located in the Laxmi Basin, Eastern Arabian Sea"*, Marine Geodesy, 17, 169.

5. Sastri, V.N. (1981), *Observations on age of the Deccan Traps and related trap activity in India*. In: K.V. Subbarao and R.N. Sukheswala (Eds.), *Deccan Volcanism and Related Basalt Provinces in Other Parts of the World*, Mem. Geol. Soc. India, no.3, pp.296-299.

6. Negi, J.G., Agrawal, P.K. Singh, A.P. and Pandey, O.P. (1992), *"Bombay gravity high and eruption of Deccan flood basalts (India) from a shallow secondary plume"*, Tectonophysics, 206: 341-350

7. O.P. Pandey and P.K. Agrawal (June 2001), *"Nature of lithospheric deformation beneath the western continental margin of India"*, Journal Geological Society of India, 57, 499

8. Negi, J.G., Agrawal, P.K. Singh, A.P and Pandey, O.P. (1992), (Ref. 6)

9. Pandey, Agrawal and Negi (1995), *"Geothermal fields of India: a latest update"*, Proceedings of the World Geothermal Congress, 1, Florence, Italy, 18-31 May 1995, 163

Note: BCE denotes 'Before the Common Era,' same as BC.

nessed the natural event with their own eyes. After the formation of the hot, lava island, various scientists have visited it regularly, since it lies only 33km south of the Icelandic coast. Another 55-60 volcanic islands in Surtsey's vicinity have been completely weathered away and already disappeared beneath the water surface.

Conclusion

The scientific research described shows that similar volcanic events ages ago must indeed have occurred near the northwestern continental margin of India — with the probable emergence of volcanic islands from beneath the sea and subsequent erosion of the islands by ocean waves together with subsidence of the seabed.

Other new discoveries have also revealed the expertise and passion for sea travel of ancient Indian mariners, as supported by the recent discovery[3] of the legendary Lothal Naval Dockyard — probably the world's first — at the head of the Gulf of Khambhat (Cambay) (21 N; 74 E), dated 2500 BC, close to the south coast of Gujarat, along India's northwestern continental margin.

As the ancient descriptions suggest, Indians inhabiting the area must have witnessed the birth of a volcanic island and later its erosion and submergence — like Icelanders witnessed the birth and erosion of Surtsey. India's ancient mariners (and scholars) could have travelled to the island (like scientists today to Surtsey from Iceland) from Lothal when it was above sea level and even later, when it was only slightly submerged. Thus, they were in a position to make first-hand the earliest recorded observations of deep-sea volcanic activity and its detoxifying effects on the ocean's waters.

Compilation of the descriptions of a volcanic submarine fire given in various ancient texts

Submarine location of fire

1. *The fire is located in the ocean ("agnim samudra vaasasam" — The Rig Veda, Book 8, Hymn 102/4).*
2. *The fire was elongated and arose from the ocean ("uddyannityut yan samudrat" — The Yajur Veda, Taittiriya Samhita, Hymn 4/6/7)*
3. The fire is not just submarine, but submerged in the ocean *("addrashyaha sagare krutaha" — The Skandamahapurana,* Chapter 29 Verse 93), ie, it had once grown above sea level, but then submerged or disappeared later due to subsidence of the seabed, or erosion by waves, or sinking under its own weight, or all three.

Volcanism

4. The (submerged) submarine fire is clearly stated to be a *gentle volcano ("saumya jvalamukham" — The Sivamahapuranam,* Chapter 20 Verse 7), and not a *fiery ("abhidipitaha" — The Sivamahapuranam*, Chapter 20 Verse 21) one, like when it was above sea level.
5. The fire did not exist at just one spot, but is described as a *chain of fire ("jvalamala" — The Sivamahapuranam,* Chapter 20 Verse 21), somewhat spread out like a coalesced, volcanic ridge.
6. It is a structure that *vomits ("udgirad" — The Mahabharata,* Pratham Khandh, Verse 22) fire. The verb 'vomit' is extremely appropriate for emerging liquid magma under hydrostatic pressure.
7. The structure has a *fire chamber ("agnikundam" — The Skandamahapurana*, Chapter 29 Verse 93), like all volcanic structures.
8. The fire is identified to be *primordial ("aditaha" — The Brahmamahapurana,* Verse 201), ie, from the earliest origins of the earth.

Plumbing

9. The object is accurately described — amazingly — to be a structure that has TWO other types of openings related to its plumbing: From where it *takes in* water and another from where it *ejects* water! The process by which the water enters the object is accurately described as being *drawn in ("pibate" — The Skandamahapuranam,* Chapter 29, Verse 96), rather than merely percolated into.
10. The process by which the water leaves the object is also accurately described as being *ejected ("kadhi nakhe chhe" — The Vachanamritam, Vartal* section, sermon No. 3), rather than just exiting.
11. The openings through which the structure draws in water are accurately described to be the size of a *pinpoint mouth ("suchi vaktraha" — The Skandamahapuranam*, Chapter 29, Verse 96), ie, minute pores in the basalt seabed or in the flanks of the oceanic structure.
12. The oceanic structure is accurately described as drinking water *very slowly ("shanaihi, shanaihi" — The Brahmamahapurana,* Verse 211).
13. The openings through which water is drawn into the structure are accurately described to *shrink ("krutam ghatika puranam" — The Skandamahapuranam,* Chapter 29, Verse 95 - 96) to the width of a needle-hole or the neck of an hourglass ie, the constriction of capillaries and veins due to precipitation of minerals from the seawater and sedimentation from above.

Chemistry

14. The progression of the seawater through the hot oceanic structure is also accurately described — amazingly — to *remove certain salts and pollutants ("pani mithu thai chhe" — The Vachanamritam, Vartal* section, sermon No. 3) from the water, making it depleted to some extent, as is known to happen when magnesium salts, amongst others, react with the hot rocks in the seabed and when the vent plumes react with the cold seawater above.

Appearance

15. The oceanic structure is described as having an *enormous body ("mahakayaha" — The Skandamahapuranam,* Chapter 29, Verse 96 and *"evo moto chhe" — The Vachanamritam, Gadhada* section 1, sermon No. 72), as volcanic edifices usually are.
16. The oceanic structure is described as appearing *golden and glittery ("shaata" — The Skandamahapuranam,* Chapter 29, Verse 95), ie, covered with shiny metal sulphides and pyrites.

Location in the Arabian Sea, off India's Northwestern Continental Margin

17. The submerged volcano(es) and associated vents were close to India's northwestern continental margin, south of Prabhas, Gujarat (*"Prabhase" — The Brahmamahapurana,* verse 210, and *"shri-someshad dakshinataha" — The Skandamahapuranam,* Chapter 29 Verse 97). Indeed, there is enormous geophysical evidence to suggest their past existence in the area stated:
    1) Seamounts and guyots have been discovered south of Gujarat such as the Raman and Pannikar Seamounts and the Wadia Guyot.[4]
    2) Subcrop volcanics[5] (volcanic structures now buried under deep sediments) have been discovered on the Arabian Sea bed, just south of Prabhas (today known as 'Somnath-Veraval'). The subcrop volcanics infer the presence of active hydrothermal vent systems there in the past. The area has also undergone significant subsidence which would account for the submerging of the volcano as described.
    3) The presence of melt accumulation has been indicated beneath a sheared and thinned out lithosphere. This is due to India's speedy journey northward after it split from Gondwanaland and collided with Eurasia. India's lithosphere has thus become exceedingly weak, faulted and fractured.[6]
    4) Volcanic up-warping of India's western continental margin has been shown to be due to the accumulated melt beneath the lithosphere.[7]
    5) The passing of western India over a massive plume in the mantle known as the Reunion Hotspot, 65 million years ago, caused massive basaltic, volcanic floods known as the Deccan Traps.
    6) The separation of Seychelles from India about the same time implies there existed a spreading ridge between the two landmasses — today identifiable as the Carlsberg Ridge.
    7) The volcanic (but aseismic) Chagos-Laccadive Ridge running far north, right up to the south coast of Gujarat, India.

It can be seen clearly that the seabed south of Gujarat has had a truly remarkable history of volcanism in the past and extending up to Bombay High, still has a high heat flow anomaly even today.[8]
Observed geothermal gradients in these areas are still high (36-78°C/km), indicating high crustal temperatures (eg, 890-1060°C at 30km). The entire Bombay offshore region is associated with moderate seismicity and in large sections, uplifting and vertical/lateral motions are still taking place.[9]