Types of explanation in maritime archaeology: The case of the SS XANTHO

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The central aim of this paper is to open up debate about different theoretical approaches which can be used to provide explanations in maritime archaeology (see recent papers in Underwater Archaeology 1996, 1997). We use the example of the wreck of the iron steamship SS Xantho (1848-72) to explore the utility of processual and post-processual approaches, as commonly used in terrestrial archaeology (cf. Lamberg-Karlovsky 1989; Shanks and Tilley 1992), to provide 'explanations' in maritime archaeology. While fully acknowledging the need for, and role of, historical particularist perspectives in any form of archaeology (e.g. Bass 1983), in this paper we argue that maritime archaeology may be well served by research which aims to create both general and predictive models about nautical behaviour (i.e. the functional/systemic processual approach) and to characterise the motivation and meaning behind strategies adopted by maritime societies and individuals (i.e. a critical/deconstructionist post-processual approach) (cf. Carrell 1990; Gould 1983a, 1983b; Hodder 1991; Trigger 1991; Watson 1983).

We can summarise the tension between the two approaches, on the one hand, as a search for a credible past which is independently testable (cf. Gould 1990a) and, on the other hand, as a search for multiple interpretations (of the past), which may be equally plausible depending on the cognitive/symbolic frameworks used (cf. Spencer-Wood 1990). Discussion of the approaches and their potential benefits to maritime archaeology is important given current predictive models about nautical behaviour (i.e. the explicit theory in maritime archaeology). It should be noted, however, that there is a growing body of literature on the role of critical archaeology in maritime studies (see recent papers in Underwater Archaeology 1996, 1997). We can summarise the tension between the two approaches, on the one hand, as a search for a credible past which is independently testable (cf. Gould 1990a) and, on the other hand, as a search for multiple interpretations (of the past), which may be equally plausible depending on the cognitive/symbolic frameworks used (cf. Spencer-Wood 1990). Discussion of the approaches and their potential benefits to maritime archaeology is important given current predictive models about nautical behaviour (i.e. the explicit theory in maritime archaeology). It should be noted, however, that there is a growing body of literature on the role of critical archaeology in maritime studies (see recent papers in Underwater Archaeology 1996, 1997).

More explicit definitions of theory in maritime archaeology are clearly warranted if we accept Muckelroy's (1978) early challenge that maritime archaeology is essentially the study of all aspects of maritime societies and their material culture. Here we interpret these studies to include a wide variety of investigations ranging, for example, from particularist studies of construction techniques in naval architecture and port-related structures through to the characterisation of global trade networks and the nature of maritime frontiers. Although Muckelroy's challenge has been met by several North American workers (cf. Gould 1990; Murphy 1991; Souza 1991, 1996) we believe that Australian practitioners have been slower to recognise the need for explicit theory in maritime archaeology. It should be noted, however, that there is a growing body of literature at least around the subject (e.g. Effenberger 1987; Henderson 1986; Hosty and Stuart 1994; Nash 1987; Stanbury 1983; Staniforth 1993; White 1995).

One vital component of any maritime archaeological reconstruction of the past must be clear and explicit statements of how specific nautical behaviours and belief systems can be reliably correlated with patterns in the material record; regardless of whether we are dealing with assemblages of artefacts, vessels, or indeed, coastal ports and settlements. Here we deliberately employ the notion of middle range theory (cf. Binford 1967; Raab and Goodyear 1984; Schiffer 1976).

Viable maritime archaeology should aim to provide insights into the past that are not necessarily available through other means, such as archival sources. At the very least it should act as an independent test of histories created through other sources. It should have its own status as a reconstructive science.

Background to investigations of the wreck of the SS Xantho

The excavation of the wreck of Charles Broadhurst's iron steamship SS Xantho (1848-72) and the recovery of its unique engine began in 1983 following a pre-disturbance study of its biological and electrochemical properties (McCarthy 1988). Recording and excavation on the site was concluded in March 1994. The 'excavation' of the recovered engine in the laboratory (cf. McCarthy 1989), resulting in the opening of all internal spaces and the removal of marine concretions from all working parts, was completed in 1995 (Garcia in press).

The SS Xantho lies at Port Gregory, Western Australia, and sank due to overloading and structural failure barely a year after its heralded arrival as the Swan River Colony's pioneering coastal steamer. Xantho's owner and operator, Charles Edward Broadhurst, has been characterised as one of the most innovative yet controversial colonial entrepreneurs in the Colony's history (cf. McCarthy 1990). Broadhurst was a pioneering pastoralist, pearler, merchant and guano collector and in 1871 travelled to Glasgow to purchase a suitable steamer for his diverse business interests and needs. It can be assumed that he would have tried to choose a vessel capable of withstanding the rigours and privations of the long and perilous Western Australian coastline.

From both archaeological and historical evidence it appeared, at least initially, that the choice of vessel was extremely poor (e.g. McCarthy 1985, 1986). The purchase was that of a 23-year old, clinker-plated smooth-water paddle steamer refitted with a 10-year old Royal Navy gunboat screw (propeller) engine. The engine mounts were frail and all of the pumps were located aft, therefore providing no means to clear water in the forward compartments. The engine had been designed for operation in a naval context, with emphasis on strategic rather than economic considerations. It was energy-expensive and lacked a condenser. On an extensive coastline with minimal and very expensive coal supplies this was a considerable economic factor. To exacerbate the

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problems, the lack of a condenser forced the ship's operator to use salt-water feed in a high pressure boiler. This resulted in excessive precipitation within the boiler itself, another source of thermal inefficiency. An incorrect propeller was also fitted requiring the engine to run in reverse, thereby dramatically increasing engine wear and presenting considerable risks to the engineer. Further, the boiler was fitted with a weighted relief valve rather than a spring-loaded type, posing obvious problems for a vessel used in rough as opposed to sheltered seas. The refit had, however, substantially increased the carrying capacity of the vessel.

We are faced with a critical question: was Broadhurst flawed in his ability to take counsel and select an appropriate vessel for the tasks required (it should be noted his brother-in-law was the famous engineer Joseph Whitworth) or did he consider these negative elements, yet still proceed with an affordable, large capacity vessel which could be used for a plethora of highly diverse activities, that is a non-specialised craft?

Given these competing possibilities, it is appropriate to explore (in a summary fashion) different approaches that might be used to explain the material patterns found at SS Xantho. These examples illustrate that explanations and predictive statements aim to build upon, and go beyond, the descriptive domains of historical particularism.

A processual interpretation

From a processual perspective the SS Xantho may be seen as a component of entrepreneurial expansion on a major frontier, underwritten though sometimes impeded by imperial bureaucracy. The vessel spearheaded an ambitiously broad range of economic enterprises over a vast geographic area ranging from Fremantle on the Western Australian coast to Batavia (Jakarta), including pearling, whaling and fishing and the transport of lead, oil, wool and passengers.

A testable hypothesis would be that such a diverse endeavour required a non-specialised craft capable of optimising returns on any potential commodity, as opposed to a specialised craft. The test-implications would be that such a craft would be robust (i.e. overbuilt), have major cargo accommodation, be low maintenance with available spare parts and be capable of operation, repair and refit with a minimum of resources. That is, its use-life might potentially be extended with a minimum of infrastructure.

The archaeological evidence can be argued to support this interpretation. With the refit of a compact screw (propeller) engine the cargo space was considerably increased. Cargo space was also facilitated with changes to the internal partitioning and by the absence of a condenser. The lack of condenser, although requiring the use of salt water, may actually have been an advantage in that weight and capital costs were significantly reduced and the need for fresh water, a rare commodity indeed on the northwest coast, was removed. Although the engine system would have been thermally inefficient, it was essentially simple and robust. More importantly, the entire engine assembly was coded and numbered and interchangeable spare parts were actually found on the site. It is clear that such parts were carried in some number on the vessel.

Finally, a considerable number of very crude running repairs were discovered both on the vessel and from the internal inspection of the engine (McCarthy 1996). The fact that such repairs had been effected on the craft and that it had continued to operate attests to the ability of the vessel to continue performing in less than optimal conditions.

Broadhurst's choice of vessel is therefore not unexpected if we consider the geographic and technical parameters known to exist on the Western Australian coast and the limited means available to this particular entrepreneur.

A post-processual interpretation

An alternative critique might view the numerous anomalies identified on the wreck of the SS Xantho as symbolic of the unorthodox and possibly idiosyncratic approaches adopted by Charles Broadhurst in solving tensions between investment, greed, distance and profit in a frontier setting. It is known that at this stage of his entrepreneurial career Broadhurst had unsuccessfully applied a number of innovative techniques to ventures in the northwest which had resulted in serious financial and social losses (cf. McCarthy 1992). It is possible that these cumulative pressures exacerbated his risk-taking behaviour, in that he desperately needed a major income-producing business with the means available to him at the time.

Clearly a number of ambiguities and tensions would have confronted Broadhurst. It is likely that economic constraints would have reduced the number of technological options available to Broadhurst; certainly to the extent that a newly custom-built vessel designed to operate on a distant coast and carry diverse cargoes was beyond his reach. He was aware of the lack of coaling and watering ports on the western coastline. As a consequence, the ease of maintenance of the vessel and the need for interchangeability of parts would have been foremost in his mind. Yet once again his strategy was a repeated pattern of behaviour - the overcoming of a lack of capital through 'budget' innovations which, by definition, involved a high degree of risk taking behaviour. While historical sources show that most of his innovations failed in the short-term, the industries he pioneered (such as coastal freight, pearling and pastoralism) when properly capitalised, by others, became highly profitable in the longer-term. Further mitigating factors, in the case of the Xantho, may also have been his lack of detailed knowledge and understanding of what was actually required given that the second half of the 19th century saw rapid changes in iron shipbuilding, steam technology and the perceived merits of paddle wheel versus propeller propulsion.

The curious marriage of a mass-produced, non-condensing, high-pressure, energy-expensive steam engine with an incorrect propeller on a former paddle steamer can only be understood if we see the ship as a product of Broadhurst's eccentricity (an unsatisfying explanation to many) or, instead, his ambitious vision and his unorthodox solution in the form of an affordable yet easily maintained, multi-purpose carrier capable of capitalising on all manner of profitable loads.

Broadhurst was well aware of industry-specific iron steamships used in freight, passenger and pearling domains yet this is not manifested in his choice of craft. His choice is so out of the ordinary that we might well look for cognitive explanations. While we can acknowledge the reality of the archaeological record, we can also explore motivational...
factors that may explain Broadhurst's behaviour within a suitable cognitive framework.

The major limitation of the cognitive approach is that there are no mechanisms available to challenge and test the accuracy of this scenario. Simply, how do we test its credibility? We can only say that it is reasonable and seems plausible. This conclusion is clearly culturally conditioned and requires a vast leap of faith in terms of how archaeological evidence is linked to past belief systems. We do not accept, however, that this limitation renders the approach fruitless or unworthy of further exploration.

Conclusion

Behavioural approaches to the study of the SS Xantho, as advocated in this paper, have the advantage in that they can generate a number of general propositions which may be tested on other wrecks. Importantly, the propositions may help direct future research. A current proposition might state:
1. Vessels used by entrepreneurs in frontier contexts were often non-specialised, multi-functional and robust.

A number of subsidiary propositions follow from this observation and might include the following:
2. In such frontier settings engines and general mechanical fittings were selected for low maintenance and ease of interchangeability of parts, rather than for efficiency.
3. The 'robustness' of such vessels is a reflection of solidness and also of deliberate redundancy in that numerous aspects of machinery, with the engine of Xantho as one example, were aimed towards replication and interchangeability. The vessel (and therefore the system) is less likely to fail should a single component fail.
4. The frontier craft were designed in such a way that they could be used for a wide range of carrying functions and specifically for a variety of functions that might not be envisaged at the time of initial use of the craft. For example, the layout of the interior of the Xantho hull allowed for radical re-configuration of the cargo space. The location of the compact, high-pressure engine on the Xantho allowed for maximum use of cargo space.
5. When vessels are owned by individual entrepreneurs there may be a greater potential for innovation and, therefore, discard of inefficient features following failure. The opposite case might apply to larger institutions where the continuing presence of obsolete features occurs as the organisation becomes locked into what has been described elsewhere as 'trend innovation' (cf. Gould 1990a:170).

In summary, we do not argue for the innate superiority of one paradigm over another in providing explanations for maritime archaeology (see also Blintiff 1991). Instead, through the example of SS Xantho, we aim to draw attention to the advantages and possibilities available to maritime archaeology, in the development of appropriate theory and method and specifically the controlled and systemic study of behavioural processes.

References


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