The *Xantho* Exhibition Revisited at the Western Australian Maritime Museum

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A dissertation presented as part of the requirements for the award of the degree of Bachelor of Arts (Cultural Heritage Studies) (Honours) within the Research Institute for Cultural Heritage, Curtin University of Technology.

Report - Department of Maritime Archaeology
Western Australian Maritime Museum, No. 158

November, 2001

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Acknowledgements

Research direction for this project was provided by Dr. Michael McCarthy, Western Australia Maritime Museum, one of the co-supervisors of the project. The other co-supervisor, Professor David Dolan, Executive Director, Research Institute for Cultural Heritage at the Curtin University of Technology (RICH), provided much-needed encouragement and moral support, while Dr. Andrea Witcomb, Graduate Advisor, RICH, was an invaluable source of insight and perspective into the relevant museology concepts and issues. I am very grateful to all three.

Abstract

This dissertation is the product of a research effort under the auspices of the Department of Maritime Archaeology, Western Australian Maritime Museum, and the Research Institute for Cultural Heritage, Curtin University of Technology.

The project involved three phases:

1. Redesigning the *Xantho* exhibition to improve the visitor experience, based on observations and conversation with visitors, gallery staff, etc.

2. Studying visitor interactions in the *Xantho* exhibition while creating a 1/6-size mockup of *Xantho*. Building the mock-up was, in effect, a vehicle for spending several hours in the gallery observing and interacting with visitors.

3. Extensive research into the steamship *Xantho*, using limited original documentation and on sources on shipbuilding practices of the day.

The project suggested an approach to exhibition design, 'rapid prototyping', which can be useful in circumstances where an exhibition brief would be difficult to create and implement due limited or nonexistent funding and to the vagaries of design and conservation resources, new artefacts and discoveries becoming available, and unanticipated opportunities for new displays to be added.

Introduction

A continuing goal of the *Xantho* exhibition is to have museum archaeologists, conservators, and exhibit designers, both professional staff and volunteers, periodically working in the gallery during normal hours. This offers additional display value in the form of exposing the museum's processes to visitors, who thus can see what the museum staff does and interact with them. This is in contrast to the traditional museum experience, where visitors simply view the finished product of the museum's efforts.

Ultimately, the project involved redesigning the exhibition to provide a bi-directional narrative flow, required by the presence of a second entry to the gallery. This new entry permits visitors to enter the gallery at a point not contemplated when the exhibition first opened. The redesign incorporates the 1/6-size impression and other changes to enhance the visitor experience.

The redesign suggested the use of a 'rapid prototyping' process, borrowed from the microcomputer software industry, as either an alternative or a supplement to the traditional design approach, which relies on a lengthy and detailed process of planning, documentation, project reviews, etc. Rapid prototyping appears to be useful where exhibition design and conversation resources are scarce or uncertain, and the exhibition is intended to be a work-in-progress, subject to changes to

accommodate new objects, new themes, or physical alterations to the gallery itself which necessitate alterations to the exhibition.

The practical element of the project was to research the design of the steamship *Xantho* and construct a 1/6-size impression of the stern-end of the hull for display as part of the *Xantho* exhibition at the Western Australia Maritime Museum. The impression would illustrate the layout of machinery in the ship, and provide museum archaeologists with a heuristic tool for further research on the *Xantho*.

Because no photographs or drawings of *Xantho* are known to exist, designing the 1/6-size impression began with field work, surveying an iron steamship hull in Scotland thought to be of roughly the same dimensions as *Xantho*, and believed to have been built within about 15-20 years of *Xantho* in the same region of Scotland's west coast. Field data was adjusted to reflect what was known of *Xantho* and supplemented with research into ship design practices of the period. The results of this research and fieldwork were to be synthesized in the gallery itself, fulfilling the aims outlined above with respect to visitor interaction and enhancement of the visitor experience. Much of the work on the impression was undertaken in the gallery during July and August, 2001.

Chapter 1

Development of the *Xantho*/Broadhurst Exhibition

Historical and Social Background: *Xantho* and the Broadhurst Family

The North Gallery of the Western Australia Maritime Museum houses the *Steamships and Suffragettes* exhibition[1] built around field work and research by the museum's Dept. of Maritime Archaeology into the 19th-century steamship *Xantho* and the ship's owner, Charles Broadhurst.

According to information in the gallery, Broadhurst was an early pioneer in Western Australia. In 1865, Broadhurst, his seven-month pregnant wife, Eliza (nee Howes), and their two young sons, Charles and Florance, arrived at Nickol Bay in the Northwest after traveling from Victoria. They were part of the Melbourne-based Denison Plains Pastoral company.

The pastoral company failed not long after their arrival. Charles Broadhurst then pursued a number of enterprises, not always successfully, that took him away from the family home in Roebourne much of the time. While Charles was thus engaged, Eliza became something of a cultural centre for European society in the harsh north-west, well-known for her social graces, singing voice, and finesse on the

[1] This is the official title, although the exhibition is generally referred to as the 'Xantho Exhibition' and the North Gallery is usually referred to as the 'Xantho Gallery'.

piano.[2] As the headmistress of a boarding and day school she founded, she encouraged the education and social development of local young women and was a leading force in the colonial women's movement.[3]

By the end of the decade, Charles was involved in the pearling industry. In 1870, he traveled to Great Britain to attend family matters as well as to buy a ship for his pearling enterprise. While in Scotland, he purchased the *Xantho* from Robert Stewart, a Glasgow scrap-metal merchant.

Xantho was built in 1848 by the Denny Brothers of Dumbarton, Scotland. As originally built, the ship was a side-paddle steamer, intended for carrying excursion parties, passengers, and general cargo on the firth of Clyde. No drawings or photographs of *Xantho* are known to exist, but Figure 1 shows a similar Denny-built side-paddle auxiliary steamer, the *Jenny Lind*, built in 1847.

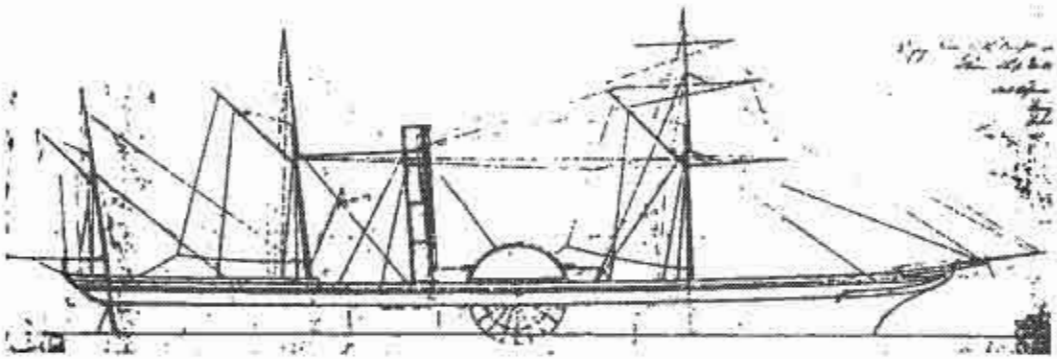

Figure 1. Denny-built paddle-steamer *Jenny Lind*[4]

[2] Michael McCarthy, n.d., *The Broadhurst Family: Owners of the SS Xantho*, attached as Appendix A.
[3] Elizabeth Parrot, 1999, *A study of the life of Elizabeth Broadhurst 1839-1899 and her interest in the Women's Movement of Western Australia*, draft report, Dept. of Maritime Archaeology, WA Maritime Museum.

Xantho changed owners several times in subsequent years. By 1870, the ship was in the hands of Robert Stewart, a scrap-metal merchant in Glasgow. Stewart also had in possession a fairly new marine engine. This was a two-cylinder 'trunk' engine, built in 1858 by John Penn and sons of Greenwich for a Royal Navy gunboat.[5] Stewart removed *Xantho's* worn-out engine, paddle-wheels, and other machinery, and installed the Penn trunk engine, modifying *Xantho's* hull to accept a screw, drive-shaft, clutch, thrust block, and other machinery.

About this time Broadhurst was in Glasgow, where he purchased the modified *Xantho* and such additional supplies, spares etc., as he could afford, and sailed the ship to Western Australia.

After a brief career making passages between Port Hedland, Fremantle, and Batavia, *Xantho* sank shortly after leaving Port Gregory on 16 November, 1872. The wreck event itself was unremarkable; overloaded with lead ore, plodding through heavy seas, the foredeck opened letting water into the hold. *Xantho* headed back toward Port Gregory, but before reaching safety, the ship's now submerged bow struck the shallow bottom of the channel and sank in approximately 5 metres of water. The crew was safely evacuated, but salvage efforts were largely unsuccessful, and were soon abandoned.

Broadhurst went on to other ventures and eventually found financial success in a fish cannery at Mandurah, exporting guano excavated from the Abrolhos

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[4] John David Lyon, comp., 1976, *The Denny List*, London: National Maritime Museum.
[5] Michael McCarthy, 2000, *Iron and Steamship Archaeology: Success and Failure on the S/S 'Xantho'*, New York: Kluwer Academic/Plenum Publishers.

Islands, and other enterprises. After handing over the family business to eldest son Florance, Charles and Eliza retired to England. Another son, Charles, enjoyed a distinguished career as a London heart surgeon. Youngest daughter Catherine Elime Broadhurst carried on Eliza's involvement in the nascent women's suffrage movement. Becoming an activist, she chained herself to the railings of Parliament during a demonstration and was imprisoned; while in prison she joined a hunger strike and had to be force fed.

Xantho, meanwhile, lay at rest under the waves, slowly dissolving in the corrosive salt water. The wreck was known to local fisherman as a navigation hazard. Requests were made to the state government, over the years, to dynamite the wreck or otherwise remove it, but nothing came of these. In time, the wreck was pretty much forgotten.[6]

Locating the Wreck: Maritime Archaeology

In 1979, divers from the Museum's volunteer diving unit, the Maritime Archaeological Association of Western Australia (MAAWA) located the wreck. The

[6] An interesting question to ponder about *Xantho*, or any shipwreck, is how the story of the wreck enters local folklore and evolves into legend, over time. Conceivably, so long as the hull remains visible, it serves as a reminder of itself, so the story remains somewhat vivid. As the hull deteriorates and is no longer visible above the surface, perhaps the story enters local folk-lore. By this time the witnesses to the wreck event are no longer living, but a number of people who remember seeing the remains are still around. In time of course even they are gone, the sight of the wreckage is no longer in living memory, so possibly at this time the wreck then enters the realm of myth, treasure stories, ghost stories, etc. While beyond the scope of this project, a systematic study of such 'shipwreck yarns' and how they become the stuff of folk history may yield up patterns and characteristics which would then be useful in locating other known shipwrecks that remain undiscovered.

presence of significant amounts of lead ore and various other artefacts recovered on this dive confirmed the identity of the wreck as *Xantho*.[7]

In 1983, maritime archaeologists from the museum, led by Dr. Michael McCarthy, began field work at the wreck site. At the time, the perceived significance of the wreck was it's reputation as the state's first coastal steamer. Research into the history of the ship revealed a number of anomalies which led to the realization that the Penn trunk engine was the last surviving specimen of its type in the world

On-site environmental analyses by museum conservators indicated that the ship's remaining iron would not survive another 25 years if left in place. The decision was made to remove the engine and conserve it for display. In 1985 the engine was removed from the wreck site and brought to Fremantle, where conservation and restoration work commenced.

The Exhibition

Soon after the engine was raised., Dr. McCarthy produced a Vision Statement[8] for a proposed *Xantho* exhibition. The original idea was to raise the stern section of the ship and the boiler, as well as the engine, and conserve the entire assembly for display. Visitors would see not only the early marine engine, but also the associated machinery – the drive shaft, clutch, thrust block, etc. – in their as-built proximity to each other and to what remained of the hull fabric. Figure 2 shows how this might have looked in the gallery.

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[7] Scott Sledge, 1980, *Report of Wreck Inspection: SS Xantho*, SS *Xantho* file 9/79, Dept. of Maritime Archaeology, W.A. Maritime Museum.
[8] Michael McCarthy, n.d., *The Potential Xantho/Broadhurst Exhibition: a vision statement*, attached as Appendix B.

Figure 2. Artist's conception of the *Xantho* stern on display (Chris Buhagiar-MAAWA).

While the engine was undergoing conservation, the Maritime Archaeology Dept. explored a variety of means for raising the stern section, estimated to weigh some 15 tonnes.

Shortly after the engine was raised, an exhibition of the Maritime Archaeology Dept.'s work on *Xantho* was presented in the entrance gallery of the Maritime Museum.[9] The exhibition focused on the ship's history and engineering technology, the archaeology field work, and raising the engine. This exhibition was demounted after some years and followed by another exhibition along the same lines, 'Colonial Wrecks and Maritime Sites', in the Wood Block Floor Gallery.

The museum accepted the *Mary Rose* traveling exhibition for display in the Wood Block Floor Gallery, so the *Xantho* exhibition was again demounted, and was

[9] This history of the *Xantho* exhibition was provided by Dr. McCarthy in various communications to the author, March – October 2001.

not replaced when the museum decided to mount the 'Hartog to de Vlamingh' exhibition in the space vacated by the *Mary Rose* exhibition. When it became evident that the Vlamingh exhibition was to proceed beyond its intended lifespan of 18 months, the North Gallery was allocated for the *Xantho* exhibition. At the time, this space was unused but had been earmarked for traveling exhibitions; the *Xantho* exhibition was installed with the proviso that it could be demounted whenever the North Gallery was required for traveling exhibitions. This stricture remains in place, adding a further constraint to the lack of funding and design resources available.

In following the program goals and gallery ethos of external volunteer involvement and enhancing the visitor experience by presenting a work-in-progress exhibition, Dr. McCarthy recruited museum volunteer Don Tulloch to reconstruct and conserve materials in the gallery itself. Similarly, visiting British researcher Elizabeth Parrott was enlisted to study the lives of the Broadhurst women from a feminist perspective while resident in the gallery, answering public inquiries on both her research and on the program itself.[10]

Parrott was followed in the gallery by a succession of young adults from the 'work-for-the-dole' scheme, and a number of mature adults made redundant in the restructuring of the State's public transport systems. According to Dr McCarthy, the results were varied and it was decided, in the future, to limit the presence in the gallery to specialists, such as Parrott and Tulloch.

[10] Parrott, op. cit.

Concluding that the gallery had become 'tired' in early 2000, Dr. McCarthy invited the Western Australian School of Art, Design and Media to become involved, which resulted in the development of a new design by students Julie Hobbs and Renato Jackovich.[11] Although impressed with the Hobbs/Jakovich design, Dr. McCarthy had to reject most of it as being beyond the financial resources available to the exhibition. However, the museum did implement much of the signage system proposed by Hobbs and Jakovich. Dr. McCarthy decided not to pursue raising the stern until conservation of the engine was an undoubted success.[12]

In due course, a new *Xantho* exhibition was created. *Steamships and Suffragettes* retained the earlier exhibition's focus on the ship and the unique trunk engine, but it also featured information about the Broadhurst family.

The original entrance to the gallery was from the North hallway, adjacent to the lifts. The doors from the Vlamingh exhibition were 'permanently' closed to prevent air circulation between the air-conditioned Wood Block Floor Gallery and the North Gallery which lacked air conditioning. Early in 2001, this door was left open when very little difference in air quality was observed between the two rooms. The arrangement of the exhibition as it appeared by July, 2001, is shown in Figure 3.

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[11] Julie Hobbs and Renato Jakovich, 1999, *Xantho Engine Exhibition Project*, SS Xantho holdings, Dept. of Maritime Archaeology, W.A. Maritime Museum.
[12] McCarthy, 2000, op. cit.

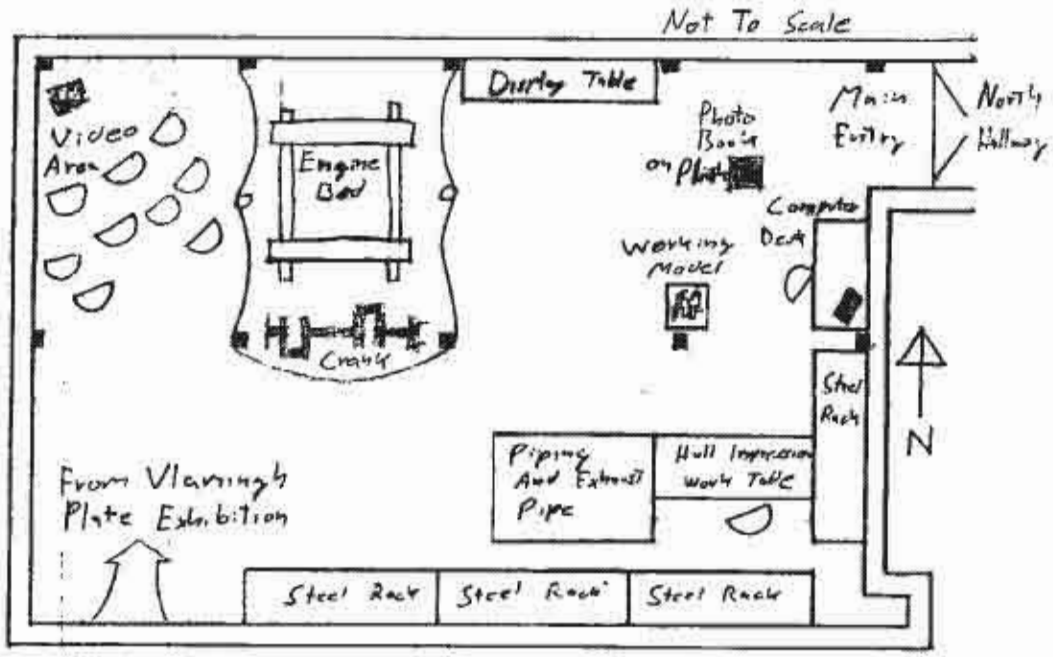

Figure 3. Original floor plan of the *Xantho* exhibition (Joel Gilman).

The conservation department also used the North Gallery to store conserved timbers from the *Batavia* and other artefacts. This is shown in Figure 3 as the steel racks along the south and east walls.

As engine parts came out of conservation, they were placed in the gallery in anticipation of reassembling the engine. An isometric line drawing of the engine indicated to visitors which pieces were ready for reassembly; as pieces were brought in, the corresponding piece in the drawing was coloured in. Several pieces of steam piping, valves, etc. were collected on a table in front of the steel racks against the south wall, where a volunteer conservator worked to restore a broken exhaust pipe.

Text panels described the Broadhurst family and their enterprises; the history and disintegration of the *Xantho*; and the history of the Penn trunk engine and it's

use in Royal Navy gunboats. Smaller panels with text and photographs explained the process by which the *Xantho* engine was recovered and its on-going conservation.

A television and VCR in the north-west corner continuously played a documentary about *Xantho's* life, death, and on-going resurrection. A final touch was a computer which displayed an automated slide-show about *Xantho*; users could also use it to browse the museum's web site for further information about the wreck-site excavation and engine restoration process.

Many of these features were proposed in the Hobbs/Jakovich design. In particular, most of the signage text and the sign-hanging system they proposed were used in the exhibition. Significantly, their design proposal also included a model, though this was not a feature of the original exhibition.

Chapter 2

Creating a 1/6-size Hull Impression

The primary goal of the hull impression project was to illustrate to museum visitors the layout inside the hull of the ship's machinery – the Penn trunk engine, boiler, coal bunkers, thrust block, clutch, drive shaft, stern tube – and the remaining space available to the crew for operating the engine, including tasks such as stoking the boiler, monitoring and controlling speed and direction, etc. This would serve the same purpose as displaying the actual stern of the ship.

A related goal was to permit the museum's archaeologists to study the available working space for the crew and the proximity of various components to each other within the confined space of the hull to learn, for example, more about the physical reality of operating the ship.

The 1/6 size was chosen because the exhibition already included a 1/ 6size mock-up of the engine, built by volunteer Bob Burgess from archaeological and engineering data, which was to be installed in the completed hull impression.

Ship Models in Museums

Maritime museums can use models to great effect, showing aspects of maritime history and development in a compact interior space for relatively little cost. A model can help museum visitors visualize how a given ship appeared.

The Maritime Museum currently displays a number of models and impressions. In the main floor gallery, an impression of the *Duyfken* and a model of the *Endeavour* mark the museum's participation in the construction of full size replicas of these historic ships. An impression of the *James Matthews* shows the unusual 'snow brig' configuration of this 19th-century shipwreck off Woodman point, originally built for the Atlantic slave trade. Near the stairway at the back of the main floor gallery, a very large model of *Le Geographe* marks the presence of early French navigators off Western Australia's coast. Upstairs in the Dutch Shipwrecks gallery, a 1/10-size impression of *Batavia* is under construction, showing how the ship is believed to have been constructed. This gallery includes a model of a Dutch fluyt, a ship typical of the 17th century East Indies trade.

Models can help archaeologists visualize how a ship might have looked, how it was built, whether it was sea-worthy, or how it sank. Such models are in the realm of experimental archaeology and are often based on wreck site or excavation details, conjecture, etc.[13] Another class of models are used to verify hypotheses on a variety of social history questions in conjunction with the construction or use of a ship.[14]

The *Xantho* 1/6-size engine mock-up was the first ever built from archaeological data and was of great importance to not only visualize the engine and its workings, but also to show visitors how it fit into the vessel. Burgess later built a

[13] J. Richard Steffy, 1994, *Wooden Ship Building and the Interpretation of Shipwrecks*, College Station, Texas: Texas A&M University Press, and London: Chatham Publishing.
[14] Cheryl Claasen, 1983, 'Answering Our Questions with Experiments' in Richard A. Gould, *Shipwreck Anthropology*, Albuquerque: University of New Mexico Press.

1/6-size working model of the engine, also on display, driven by an electric motor, allowing visitors to observe the engine's moving parts in action.

Researching the *Xantho* Impression

The *Xantho* impression represents a somewhat different use of a miniature ship in the Museum: a conjectural impression to illustrate the layout of the power train, where no drawings or photographs of the original are known to exist.

Taking lines from the shipwreck was impractical.[15] Existing documentation on *Xantho's* design is limited to the original contract,[16] the ship's overall dimensions in the builder's records,[17] and it's modified dimensions as re-certified.[18] Further clues were gleaned from photographs and survey data of the wreck site.

The original contract specified dimensions of 101.3[19] feet long between perpendiculars, 121 feet long overall, breadth amidships of 17.6 feet, and a depth below deck of 8.4 feet. The specifications provide a wealth of additional details, such as size and spacing of ribs, but for the purpose of establishing the ship's lines provide no other pertinent data.

The builder's records mention a 6 foot 'fore rise', a slope in the deck rising from amidships to the foremost point of the hull. They also contain the original registered dimensions of 106.8 feet long, 16.8 feet wide, and 8.4 feet deep.

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[15] McCarthy, 2000, op. cit., p. 165.
[16] ibid., pp. 49-52.
[17] Lyon, op. cit.
[18] McCarthy, 2000, op. cit., p. 53.
[19] Measurements in feet and tenths of feet were typically used by shipyards at the time.

The project thus involved creating an 'impression' rather than a replica or model, as the latter terms imply that the original vessel has been studied, either directly or through documents such as photographs and drawings, and authentically reproduced either full size or at a reduced scale. For this project, however, the lines and various details are arrived at through conjecture and mildly educated guesswork, hence the term 'impression'.

Hull Lines

To obtain a working drawing as a starting point, a survey was conducted of *The Rifle*, a steamship believed to share various characteristics with *Xantho*. The survey project is documented in Appendix C.

Comparing the dimensions of *The Rifle* with *Xantho's* 1848 registry dimensions, it can be seen that *The Rifle's* depth is close to *Xantho's*, but *The Rifle's* beam is much narrower than *Xantho's*. Adjustments to *The Rifle's* dimensions (Table 5 in Appendix C) increased the depth about 20% and the horizontal dimensions about 60%, yielding gross dimensions within 5% of *Xantho's* 1848 registered dimensions, as shown in Table 1. Length was not considered because the impression project only contemplated the stern-end of the ship.

Measurements Adjusted to Fit Xantho's Gross Dimensions

Water Line	24 ft.	20 ft.	16 ft.	12 ft.	8 ft.	4 ft.	Stern Post	Stern** Profile
Shear*	(4")	(3 ")	(2")	(3/4")	1"	3 1/2"	6"	10 3/4"
8' 9"	-	-	-	-	88 3/4"	83 3/4"	76"	0"
7' 6"	98"	94 3/4"	91 3/4"	88 1/2"	84 3/4"	75"	7 1/2"	27"
6' 3"	95"	93"	88 1/2"	83 3/4"	73 1/2"	29 1/4"	1"	28"
5'	93 1/2"	89 1/4"	81 3/4"	71 3/4"	46"	8"	1"	29"
3' 9"	86 3/4"	80"	66"	46"	20"	1"	1"	30"
2' 6"	63 1/2"	53 3/4"	39 3/4"	21"	8 3/4"	1"	1"	31"
1' 3"	22 1/2"	18 1/4"	13"	7"	1"	1"	1"	32"
Keel	1"	1"	1"	1"	1"	1"	1"	33"

*Dimensions in this row are the vertical distance from the shear line to the 8' 9" waterline.

**Dimensions in this column are measured foreword from a point on the centreline directly behind the sternpost.

Table 1. Projected Measurements[20] for *Xantho*.

Using the Table 1 measurements, a body-plan was drawn, showing the contour of the hull at four-foot intervals, starting at the stern post. From these contours mould sections were cut and mounted on a frame, shown in Figure 4.

Figure 4. The completed mould-frame for the *Xantho* impression (Joel Gilman).

[20] The process of obtaining these dimensions and of creating a lines drawing generally is detailed in Appendix C.

The next problem involved determining the exact shape of the stern. Figure 5 shows the stern end of a typical sail and screw-driven steamship of the mid 19th century.

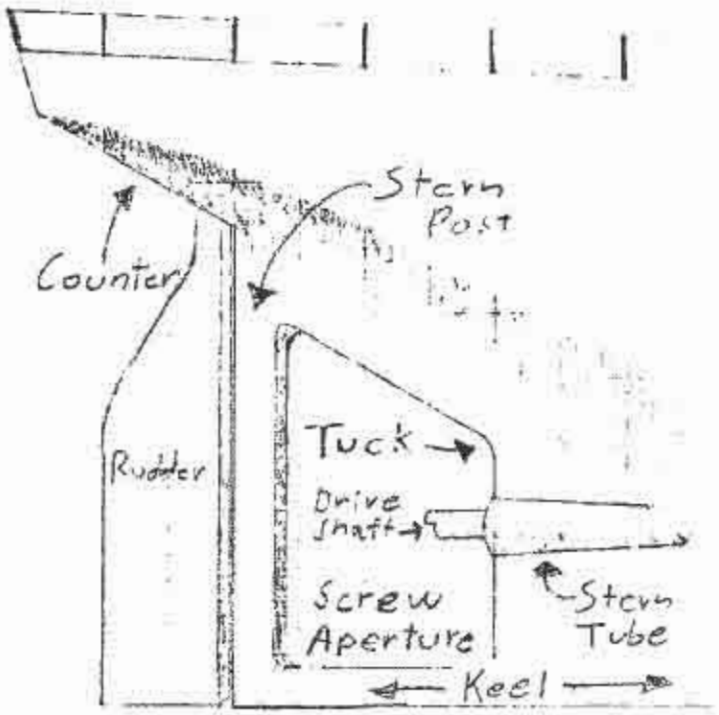

Figure 5. Deadwood and stern parts of a steamship (Joel Gilman).

Another Denny-built paddle steamer, the *Loch Lomond*, is mentioned in the original builder's contract as an example of the style of ship the owner sought.[21] That ship had virtually no deadwood[22] at the sternpost, as can be seen in Figure 6, a photograph of the stern-end of a model of *Loch Lomond* at the Glasgow Museum and Art Galleries.

[21] McCarthy, 2000, op. cit., p. 52.
[22] 'Deadwood' is the flat triangular area between the keel, the sternpost, and the bottom of the hull where is narrows at the stern. Peter Kemp, ed., 1988, *The Oxford Companion to Ships and the Sea*, Oxford: Oxford University Press.

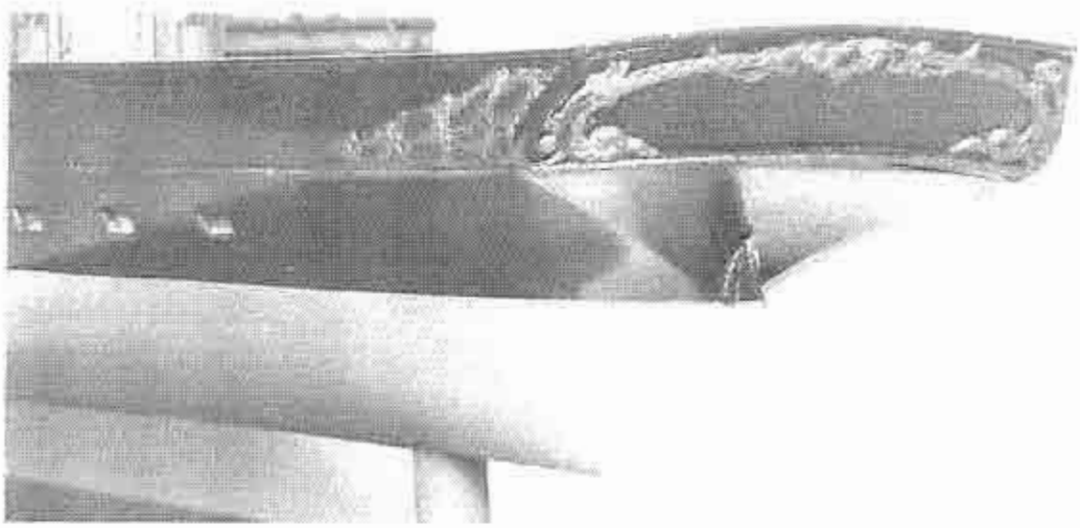

Figure 6. Stern of the *Loch Lomond* model (Glasgow Museum and Art Galleries).

If indeed *Xantho's* original stern resembled *Loch Lomond's*, the next question concerns how the stern was modified to accept a drive shaft and screw. Registration documents indicate that, at the time the ship was re-engined, the hull was lengthened by some 15 feet.[23]

Where the sides of the *Loch Lomond* model come together, a point known as the tuck, they appear in the photograph to form a fairly blunt angle, approaching 90 degrees, at the point where a drive shaft would protrude if it were a screw steamer. The tuck on *The Rifle*, by contrast, is essentially a knife edge.

Photographs of the *Xantho* wreck site, such as Figure 7, suggest that its stern was similar to *Loch Lomond*, though further on-site study would reveal the exact angle of the tuck at the drive-shaft, as well as the likely sharpening of the tuck below the drive shaft. Close examination of the remains of the screw-aperture frame might

[23] ibid., p. 53.

also suggest the angle of the tuck above the drive shaft, even though the metal sides at this point have corroded away.

Figure 7. *Xantho* wreck site, looking aft along drive shaft toward the tuck (Joel Gilman).

In 1846, the British admiralty commissioned a series of experiments with various stern configurations to determine whether the sharpness at the tuck, immediately in front of the screw aperture, had a significant effect on the efficiency of the screw.[24] It was understood or at least hypothesized that under various

[24] J. Fincham, 1851, *A History of Naval Architecture*, London: Whittaker and Co.; facsimile reprint, 1979, London: Scolar Press, pp. 356-360.

conditions the screw would have more or less bite into the water, which would effect it's ability to move the ship. The theory was that a sharper tuck, offering the screw a more direct flow of water, known as the 'run', would improve the screw's efficiency at a given shaft rpm, while fuller lines forming a more oblique tuck would impede the flow of water, creating a partial vacuum ahead of the screw blades causing cavitation, or slippage against the water. The experiments showed that, at the slower speeds (7-9 knots) expected of an auxiliary screw steamer, normally powered by sail and only on occasion by steam, the sharpness at the stern made little difference.[25]

These experiments may or may not have been known to the Denny Brothers during the construction of *Xantho* in 1847-1848, but as *Xantho* was originally built for side-paddles, the Admiralty's experiments would have made little difference. However, it is worth considering whether the experiments were known to Stewart in Glasgow when he rebuilt *Xantho* as an auxiliary screw steamer in 1870.

One possibility might be that he was aware of it, and so concluded there was little to be gained by altering the shape of *Xantho's* stern beyond the bare minimum required to accept the screw and drive shaft. Another possibility is that he did not know of it, but was not a naval architect anyway and so did not feel compelled to expend any more effort on the conversion than adding the screw and tube.

[25] Further experiments showed that at the higher continuous speeds expected of a vessel propelled only by a steam-engine and screw, the sharpness of the stern makes a significant difference. ibid. This may account for the unusually sharp stern of *The Rifle*, assumed to have been built in the 1860's by which time the Admiralty's experiments could reasonably be expected to have been widely disseminated in the British shipbuilding industry. If so, this would also suggest that the ship was in fact built originally as a steamer, instead of a sailing ship that had an engine added later on.

A third possibility is that Stewart was not aware of the experiment, but assumed the stern's sharpness would make a difference and so went ahead and modified the shape of the stern. This raises the question of how did he go about the alterations. The primary difficulty in any modification would have been to remove existing plates and ribs and altering the remaining plates and ribs at the point where new construction would start.

Portable cutting tools would be required to work on an existing ship, even in a dry dock or mud-dock, and a practical oxy-acetylene cutting torch did not exist prior to 1887.[26] Other tools for this purpose would include a hacksaw to cut iron plates and ribs, and a hammer and cold chisel for smaller, more intricate cuts, and to shear off rivet heads.

This last scenario seems the least likely of the three, given that it would have involved a significant amount of labour and time, whereas the likely purpose of the exercise was to have a working vessel to sell, which presumably would bring a higher price than would the vessel and/or trunk engine if sold as scrap metal.[27]

Construction Method and Materials

Another issue is material for the mock-up. After considering a variety of approaches, the preferred approach was to use shaped and formed steel bar for the ribs and either sheet metal or aluminium for the strakes, fastened together with pop-

[26] This information appears on the web at a sporadically-accessible site entitled *Welding Years: 1800-1900*, http://home.inet-east.com/sapp_m/wh_004.htm.
[27] It would be interesting and revealing to investigate Stewart's scrap metal enterprise further, to determine whether ship modifications were a common practice for scrap metal dealers. The various design anomalies in *Xantho* suggest that Stewart was something of a 'Saturday mechanic', i.e., a capable iron worker but not exactly a nautical engineer.

rivets. Despite the cost, this approach offered a number of advantages, not least of which is that it would result in a riveted metal impression of a riveted metal ship. Soft aluminium pop-rivets are available in a variety of sizes and one could be found that, when installed and properly finished with a ball-peen hammer, would look very much like a 1/6-size hot rivet, both inside and outside of the hull. Another advantage is that the construction process would visually resemble the construction process of a real iron ship, a feature that would add value to the gallery display as construction progressed.[28]

In the end, however, it was decided to use the plank-on-mould method. This uses a temporary wooden mould which represents the shape of the hull. The keel, stem-post, and bulkheads are then affixed to the mould frame, and planking is then attached to these parts, while conforming to the outlines of the model. When the shell is completed, the mould is removed, the shell inverted, and ribs and other interior details are added. This is much the same technique used by contemporary wooden-boat builders.[29]

The principal advantage is that the mould itself is fairly simple and inexpensive to build, and immediately adds display value because it reflects the general shape of the hull under construction. Because the mould sections are only

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[28] The demonstrative aspects of the impression project have not been fully explored. At the outset, it was hoped to create an interesting live-demonstration project. At the time of publication, the impression project had only just reached the stage where significant 'ship-building' techniques might be illustrated. This aspect of the exhibition raises some interesting issues as to the authenticity of the craft being demonstrated in the context of a museum. These and other issues are explored at length in Richard Bauman and Patricia Swain, 1992, 'The Politics of Participation in Folklife Festivals' in Ivan Karp, ed., *Museums and Communities*, Washington: Smithsonian Institution Press, pp. 288-314.

[29] Any number of books on constructing small wooden boats will describe the technique, such as Joel White, 1987, *How to Build the Haven 12 ½ Footer*, Brooklin, Maine: Wooden Boat Publications.

bolted to a frame, they can be replaced as refinements are made to the hull shape prior to adding the shell planking. For example, there remain one or two unresolved details about the fullness of the hull toward the sternpost. The existing mould sections can be replaced and adjusted, as required, to refine this aspect, prior to installing the keel, etc. Replacing and adjusting mould sections allows the mould frame to be used in the sort of hypothesis-based experiments that Claasen describes to determine a particular dependent variable,[30] such as the shape of the counter or the sharpness at the tuck, or how Stewart went about modifying the stern..

This technique also works independently of the materials selected for the actual hull. It can be used as the basis for a fiberglass hull, a wooden plank hull, or a metal plank hull. Because the mould sections determine the actual shape, ribs of any desired material can be added later and are purely for cosmetic effect. The end result could well be a metal impression

The wooden-boat technique is appropriate for a large impression; at 1/6 size the *Xantho* is about the same size as a canoe or rowing skiff, small craft that are readily built this way. The technique might not be practical for smaller impressions, given the difficulty of conforming planks to the compound curves of the mould.

Conclusions

The lines of *The Rifle* proved to be no more or less useful a starting point than any other 19th century steamer hull that might have been surveyed. A great deal of additional research would be required to validate the hypothesis that similar

[30] Claasen, op. cit., p. 192.

design characteristics might be found in two iron-hulled steamships (*Xantho* and *The Rifle*) built within a decade or two of each other (1848 and 1860's, respectively, assuming *The Rifle* was indeed built in the 1860's) in the same general vicinity (the west coast of Scotland, assuming – again – that *The Rifle* was built in that vicinity).

A great deal of research is waiting to be done regarding characteristics of individual designers, shipyards, shipbuilding regions, or the entire shipbuilding industry of a particular nation, over a particular period of time.[31] The Denny's List,[32] published by the National Maritime Museum, contains a substantial amount of original builder's documentation for ships built by the various permutations of the Denny family shipyards in Dumbarton. However, no comprehensive analysis of this material has been located, exploring the methods, trends, techniques, shop practices, or design philosophy of the Denny shipyards.

Other useful areas of research that appear to be non-existent would explore the practices and economics of ship repair, ship breaking, and scrap-metal handling in the Clyde region in the 1870's. *Xantho's* transformation from a side-paddle

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[31] Some of this research has been done, although it is far from comprehensive. For example, William L. Crothers, 1997, *The American Built Clipper Ship: 1850-1856*, Camden, Maine: International Marine/Ragged Mountain Press, provides an exceptionally well-research (the book jacket claims that over 30 years of research went into it), detailed look at a specific design - the clipper - as practiced by U.S. shipbuilders over a 7-year span. Jean Boudriot, 1988, *The Seventy-Four Gun Ship: A Practical Treatise on the Art of Naval Architecture*, trans. David H. Roberts, Annapolis, Maryland: Naval Institute Press, is the definitive work on the design, construction, rigging and armament of French warships of the 18th century. David R. MacGregor, 1980, *Merchant Sailing Ships 1775-1815*, Watford, Herts, UK: Argus Books Ltd., is a fairly narrow look at hull and rig design in a select set of British shipyards over a span of 40 years. Laughlan McKay, 1839, *The Practical Ship-Builder*, New York: Collins, Keese, & Co., provides an unusual look at the state of the art and design philosophy of naval architecture in the United States in the first half of the 19th century. Any number of fairly broad histories exist, covering the evolution of particular ship design features such as sail rigging, marine steam engines, hull shape, etc., but very few of these address the specific practices or design features characteristic to a specific vessel-type, time period, and locality to the extent that Crothers and Boudriot do.

[32] Lyon, op. cit.

coastal excursion ship to a screw-driven blue-water steamer, undertaken by a scrap metal merchant instead of a shipyard, seems apocryphal; the motivations, constraints, and technical trade-offs involved in the conversion would shed light on *Xantho's* actual design at the time it sank. Such research might also clarify Broadhurst's motivation in acquiring this ship instead of another one better suited to service in a region where coaling stations were not widely distributed, far from steam-engine repair facilities.[33]

As of this writing the 1/6 size impression is not complete. The mould is set up and ready for the installation of the keel and planking, awaiting resolution of various stern-design questions. In fact, continued research into the shape of the stern already indicates that the mould is incorrect, and that at least two of the section profiles need to be replaced. In this way, the mould itself can serve as an on-going display of the museum's work; interpretive labels can be updated to explain to visitors what particular detail the archaeologists are pondering that week or month, etc., and as design issues are resolved and construction progresses, the labels can be updated with the next problem, and so on.

Notwithstanding known inaccuracies in the shape of the impression mould, it will be adequate for its purpose in rendering a hull that provides a schematic illustration of the ship's machinery arrangement.

[33] A number of *Xantho's* features argue against her suitability for service on the Western Australian coastline. These are explored in McCarthy, op. cit.

Chapter 3

Visitor Interaction in the Gallery

Elaine Heumann Gurian argues, 'While we may be reluctant to admit it, the production of an exhibition is more akin to the production of a theater piece than any other form.'[34] One of the express goals of the 1/6-size hull impression project goals was to provide a bit of theatre to museum visitors by undertaking as much of the work as possible in the North Gallery itself, just as museum volunteer Don Tulloch was restoring the engine's broken cast-iron exhaust pipe at a worktable in the gallery. This was in keeping with the exhibition's goal of being a work in progress, exposing to visitors the museum's processes.

The brief for this project included an analysis of how visitors relate to the *Xantho* exhibition, with an eye towards improving the visitor experience. Thus, the not-so-hidden agenda in working on the impression in the gallery was to learn more about how visitors perceive the exhibition, an important task that is perhaps so obvious as to be overlooked. Gurian describes working with Frank Oppenheimer, director of the Exploratorium in San Francisco from 1968 to 1985:

> When I first met Frank Oppenheimer, he asked me how much time I spent on the exhibition floor watching the audience interact with the exhibitions. When I answered 'very little', he promptly escorted me to his own exhibition space and taught me how to observe the visitor. He personally

[34] Elaine Heumann Gurian, 1991, 'Noodling Around with Exhibition Opportunities' in Ivan Karp and Steven D. Lavine, eds., *Exhibiting Cultures*, Washington: Smithsonian Institution Press, p. 188.

> spent long hours prowling his own exhibitions, watching visitors struggle with his experiments; then he would modify them accordingly.[35]

While working on the impression project in the gallery , I followed in the footsteps of Gurian and Oppenheimer.[36] Through observation of visitors and conversations with some of them, a number of insights emerged.

Some People Do Read the Labels

A retired history teacher[37] pointed out a discrepancy between two text panels regarding the name of the second-oldest of the Broadhurst sons. One panel gave his name as Robert Broadhurst, while another said it was Charles Henson Broadhurst. She also said that the initials 'VOC' were not defined anywhere in the Vlamingh Plate exhibition next door.

This visitor did read the labels, quite carefully it turns out. This suggests that we can't be too careful in proofreading label text. As it turns out, 'VOC' is in fact defined in the Vlamingh Plate exhibition, just inside the gallery door, but it is buried in text. Even this visitor, very observant of detail, was unable to find it although consciously seeking it.

Is a Work-In-Progress Gallery Really Open to Visitors?

On several occasions, a visitor would poke their head into the gallery, take a quick look around, then leave. One visitor, while doing so, caught my eye and

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[35] ibid., p. 179.
[36] The ensuing discussion of visitor interaction is written in the first person to provide a less clinical-sounding description of conversations and interactions. Hopefully, the result more accurately captures the spontaneous and informal flavour of these interactions.
[37] Appendix D, *Project Journal*, p. 7.

gestured whether it was alright to come in. I enthusiastically waved him in.[38] Apparently, it was not clear to the visitor that this was an exhibition gallery and not a work room. The gallery's scruffy appearance is deliberate, as befits a work-in-progress, but perhaps it looked too much like a workroom and not enough like an exhibition. Or, perhaps it was my presence, wearing a museum ID badge, working on something.

The problem could be with the signage. The entry sign from the North Hallway explains the work-in-progress concept, although the sign contains a lot of text and it would be easy to miss this point. The visitor appeared to be Asian, and perhaps was not altogether fluent in reading English.

The appearance of the exhibition is clearly uninviting for some visitors. Two adolescent boys were in the gallery with their grandmother. She said the boys enjoyed the museum overall, but didn't like the *Xantho* exhibition. I joked that it wasn't finished yet, and one of the boys said that was what he didn't like about it.[39]

This suggest a major biggest pitfall in creating a work-in-progress exhibition. It may be a work-in-progress, but visitors still expect an exhibition.

Verbal Interpretation and Having Fun

This shouldn't come as a surprise, but some visitors enjoy verbal interpretation, not as part of a tour group, but simple one-on-one conversation. One visitor lingered near the hull impression worktable and struck up a conversation with

[38] ibid, p. 8.
[39] ibid, p. 12.

me.[40] She asked questions about the raising of the engine and its reassembly – questions that were amply answered in the video, as well as in the labels around the room. Apparently, she'd rather hear it from someone than read it.

Gurian suggests that we forget about the 'right' form of interpretation. If people want to be told what the exhibition is about, fine. 'Nor do we want to appear friendly, because we believe that informality would reduce the importance of our work. If the audience is having fun, we may be accused of providing a circus and not behaving in a sufficiently reverential manner.'[41] While I assembled the mould frame for the impression, a number of visitors stopped to watch, much as passers-by would at a construction site, and for the same reason: watching somebody doing something is inherently theatrical. As I bolted the pieces together, a woman paused on her way out the door to say 'We'll be back after lunch and I expect that to be finished!'[42]

Another visitor who stopped to watch that day wore an 'RCMP' logo on his jacket. When I asked if he was a Mountie (Royal Canadian Mounted Police), he replied that he had recently retired from the RCMP. As I continued assembling the mould, we talked about his work at various postings throughout central and northern British Columbia (a region I've spent some time in). He also asked a few questions about the exhibit, but I think he enjoyed more talking to someone familiar with his old haunts in Canada. I certainly did.[43]

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[40] ibid. p. 11.
[41] Gurian, op. cit., p. 183.
[42] Appendix D, *Project Journal*, p. 12.
[43] ibid.

Kids Will Touch Things

Invariably, parents with children admonish them not to touch anything in the gallery. Just as invariably, kids ignore this, especially when they see the computer in the exhibition.[44] The parents' instinct is normal, and understandable, as is the curator's instinct to discourage visitors from touching things. However, as Gurian continues:

> If we have a Calvinistic view of our purpose, we will not permit ourselves to be informal. But if we as exhibition producers begin to think that playfulness is a permissible part of learning (as learning theorists would have us believe), different exhibition strategies may take over.[45]

Much has been written about the design of computer interactives in museums[46], but perhaps a less engineered experience is preferable. If the computer is loaded with truly useful and relevant information in some ordered arrangement, then kids – or other visitors – could browse around and decide for themselves what's worth looking at. The slide show is fine, and so is the web site, but there is much to be said for letting a the user discover things on their own. The beauty of a microcomputer is that, with minimal programming, it offers an interactive, self-directed user experience that is virtually indestructible. Kids in particular have no fear of microcomputers and are instinctively drawn to them.

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[44] ibid., p. 11.
[45] Gurian, op. cit., p. 183.
[46] George F. McDonald, 1991, 'The Museum as Information Utility' in *Museum Management and Curatorship*, Vol. 10, pp. 305-311; id., 1992, 'Change and Challenge: Museums in the Information Society' in Ivan Karp, Christine Mulluer Kreamer, and Steven D. Lavine, eds., *Museums and Communities*, Washington: Smithsonian Institution Press.

Chapter 4

Rearranging the Exhibition

As work progressed on the impression, from observing visitors it became apparent that there was room for improvement in the *Xantho* exhibition. There were some difficulties with the signage, with the arrangement of displays, with the placement of the TV monitor, and in the general flow of the exhibition.

Problems with the Original Exhibition

The big problem seemed to be that the space was undefined. There was no obvious start and end to the exhibition, and while this is not always a drawback in an exhibition it seemed to work against the *Xantho* exhibition. There was no clear sense of narrative. The area immediately inside the entrance did provide an introduction to the *Xantho* and the Broadhursts, but as a visitor progressed into the room, they were quickly inundated: the model of the Penn trunk engine, labels explaining the history and demise of the ship; photographs of the engine's removal from the wreck site; a table covered with bits of pipe, valves, etc.; a roped-off area containing a large metal frame, and next to it the crankshaft; and in the far corner several chairs loosely arranged around a TV and video player, which constantly played a video about the recovery of the Penn trunk engine. Along two walls were big black steel racks, holding more bits of metal and timbers. The effect wasn't so much a work in progress as a store-room that had been adapted for exhibition space.

Some of this was anticipated in the Hobbs/Jakovich design. However, their design only expected two of the four steel racks. While their designs did anticipate the entry from the Wood Block Floor gallery, the exhibit had evolved with those doors closed. The flow was to enter from the North Hallway, study the introductory panels about *Xantho* and the Broadhurst family, then proceed through the other materials to the engine bed, where work was sporadically in progress, and finally – if they were interested – to the TV area. Leaving the exhibition, they went back the way they came in.

The second entrance to the gallery from the Vlamingh Plate exhibition was a major problem. Originally, the door connecting these two spaces had been kept closed, to isolate the air-conditioned environment of the Woodblock Floor gallery from the non-air-conditioned environment of the North Gallery. However, in March of 2001, it was discovered that the environment in the North Gallery was not significantly different from the Woodblock Floor gallery and so the door between the two was opened, allowing visitors to enter either from the hallway near the lifts or directly from the Vlamingh exhibition.[47]

Whatever narrative structure that may have existed prior to opening this door was lost. Visitors entering the 'wrong' way encountered the video area first, then the engine, the table of piping bits and pieces, and finally the introductory material just inside the 'normal' entrance. Worse, these visitors had just been in the well-executed 'Hartog to de Vlamingh' exhibition, which had the benefit of a substantial amount of

[47] Comments to the author by Dr. Michael McCarthy in a conversation on 23 August, 2001.

design resources; the transition from that exhibition to the scruffy, work-in-progress *Xantho* exhibition was abrupt. While the rough edges of the *Xantho* exhibition were deliberate, in its role as a work-in-progress, the contrast between it and the Vlamingh Plate exhibition was stark.

Although deemed a work-in-progress, a repeat visitor to the gallery would have noticed little progress. The assembly of engine parts was not happening, because the parts were not coming out of conservation on the anticipated timeline. This was because the conservation of submerged iron is still a relatively new area, and the conservation department was feeling its way along. Also, the conservation department was busy with the new Geraldton gallery of the WA Museum, as well as preparing materials for the new Maritime Museum facility on the South Mole. Thus, the conservation department's time estimates for delivery of *Xantho's* engine parts proved overly optimistic.

The pipe restoration work table was cluttered with bits of copper pipe, fittings, valves, etc., and a set of iron piston rings from one of the engine's cylinders. While it looked very much like a worktable in a conservation lab, it's authenticity detracted from its exhibit quality.

The video area proved fairly popular, though it did not appear inviting. Seating placed one's back to the rest of the gallery. There was no defined space. Sound from the video tended to dominate the entire gallery, and could have been annoying to visitors who were not watching the video. Conversely, conversation by other gallery visitors could interfere with the sound of the video.

The signage offered a pleasing visual design, although some of the signs were verbose, especially the sign at the entrance. The entry sign also made temporal references to gallery activities, such as 'Within a month, you'll be able to see…' with no indication as to when the sign was posted. Further, the sign promised visitors the opportunity to see activities that were not forthcoming, such as the assembly of additional engine parts still in conservation.

The New Layout

The solution, then, was to rethink the narrative to accommodate the second entrance, while remaining true to the original goal of a work-in-progress. All of the themes and objects were to remain. Existing signage was deemed expendable, although to the extent that it represented a sunk cost to the museum, it was to be retained wherever possible.

Accommodating visitors from either of two entrances posed the most important problem to solve. Obviously, a single, linear narrative would not work. Visitors entering at the 'wrong' end would be shortchanged, if not confused and bewildered. The solution had to offer a rational flow from either entrance.

A related problem was posed by the video. Some visitors want to watch the video; others, for whatever reason (time, personal preference, aesthetics, etc.) prefer not to. The video covered much the same territory as the entire exhibition; a visitor could skip the exhibition and just watch the video and probably learn as much,

though they might want to see the engine itself. The video needed to remain accessible, but not an inherent part of any narrative.

The new layout is shown in Figure 8.

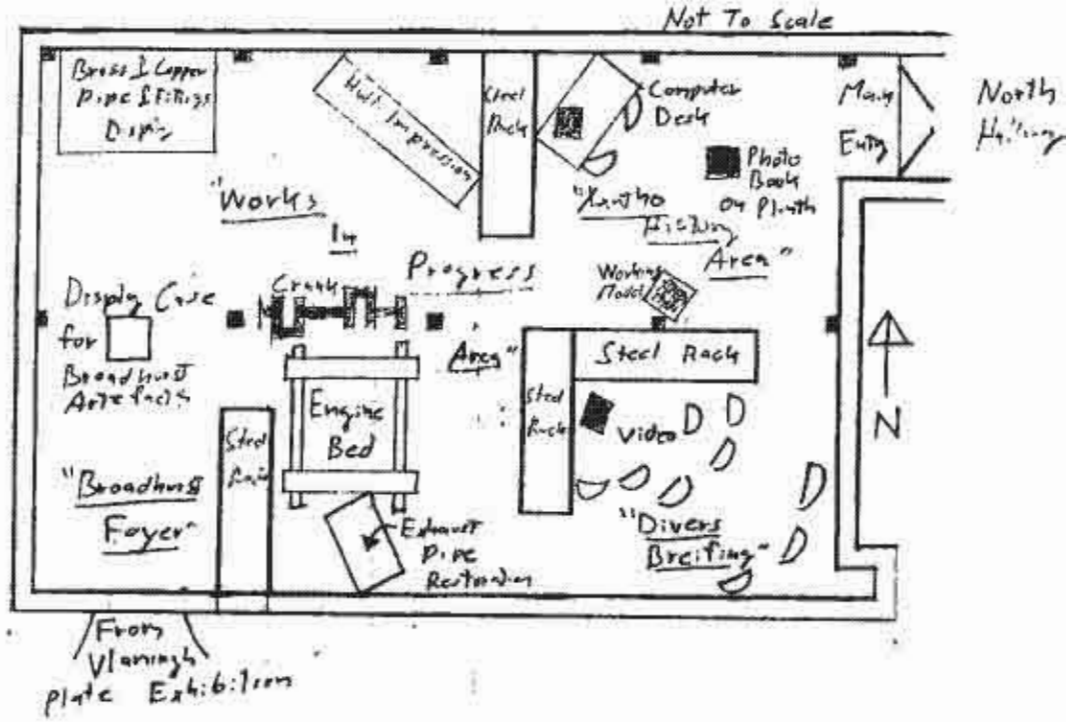

Figure 8. The revised layout of the *Xantho* exhibition (Joel Gilman).

The solution chosen was to offer completely different starting points at each entrance, and use the steel racks as room dividers to define thematic areas and direct traffic flow in support of the narratives.

The content of the original entry, from the hallway, has not changed much. It still contains the working model of the trunk engine and related signage, the computer terminal, the main entry sign, etc. This foyer still serves to introduce the story of the *Xantho* to visitors who come in this way. The differences are that this area is now somewhat smaller than it used to be, as it is enclosed by two of the steel

racks. The racks serve to obscure the rest of the room, holding the visitor's attention on the exhibits in the foyer, instead of being drawn by objects all over the room.

A second foyer was created just inside the entrance from the Vlamingh exhibition, formed by the existing west wall and one of the steel racks placed parallel to it. This area presents the Broadhurst family as an introduction to the exhibition. The original 'Remarkable Broadhurst Family' and 'Steamships and Suffragettes' signs are here. A case displaying artefacts of the Broadhurst family's activities (a suffragette badge, pieces of pearl shell, lead ore, etc.) will define the inner limit of the foyer and give visitors reason to stop and take in the signs hung to their left and right. Figure 9 shows this foyer from the Vlamingh exhibition.

Figure 9. The Broadhurst foyer seen from the doorway from the Vlamingh exhibition (Joel Gilman).

Beyond this foyer, a table displays the brass and copper piping, fittings, etc., awaiting reassembly with the engine. To their right, the 1/6 hull impression is angled against a corner, defining another work-in-progress area, formed by the north wall and another steel rack separating this area from the North hallway foyer.

In the center of the gallery, the engine bed and its reconstruction activities retain their prominence, as shown in Figure 10. The piping-restoration has been moved to a smaller table adjacent to the engine bed. This area marks the midpoint for visitors from either entrance. Continuing in either direction, visitors then pass through the other foyer and the remaining signs and exhibits in the gallery.

Figure 10. The crankshaft and engine bed (Joel Gilman).

The video area has received special treatment. It is now set off in its own corner, isolated by the remaining two steel racks set together forming an 'L' shape. The video area is easily accessible from either foyer, though much closer to the original entrance. Sitting behind the racks, the video sound does not interfere so much with the rest of the gallery.

The video area also features three mannequins dressed in scuba gear, 'watching' the video, as shown in Figure 11. The effect is humorous, and also makes the area more inviting[48] for visitors to sit down and participate in the 'Diver's Briefing' as the video area is now known.

Figure 11. Mannequin scuba diver and video monitor in the Diver's Briefing area (Joel Gilman).

[48] During the two weeks prior to being rearranged, the gallery was closed for use by the Museum Education department to conduct various activities for school children during their spring holiday. The scuba-diver mannequins were set up at that time as decoration for a school program on how the Museum's archaeologists do their work. The mannequins proved to be a big hit with both the students and the museum staff, so it was decided to keep them in the *Xantho* exhibition.

Some of the original signage has become misleading as the exhibition has evolved. A continuing task in the exhibition is to review the signage and be sure it remains accurate and readable with respect to the actual exhibition contents.

Staff Reactions to the New Layout

The museum's attendants conduct several daily tours the museum, including the *Xantho* exhibition. They also work with the museum's Education Dept. to organize special programs, such as for school holidays.

The response of the attendants to the new layout has been enthusiastic. According to attendant Jenny Gibbs, the new layout is

> a big difference. It's a lot more interesting. It leaves you wanting to look further. I've seen people start to come in [to the old layout of the exhibition] – they'd stand at the door and they weren't sure they could come in. They'd look at a few signs, then leave.[49]

Although making the exhibit more attractive to children was not an express goal, Gibbs notes the features of the new layout that are attractive to children: 'The scuba divers. The boat model. It's a maze. Kids love it. They can hide from mum and dad.' The scuba-diver mannequins are especially popular. Says Gibbs: 'The kids were fascinated because they see the equipment in use, instead of just gadgets in a case.'

Another attendant, Albert Featherstone, agrees that the maze-like quality of the exhibit is an attraction.

> Before, you could look in the gallery and see very little. A big open space. Now, you can look and see a bit going on. It's a maze, so it draws you in. You hear a TV, so you go have a look. You come out [of the Video area] and see the engine. A story unfolds as you go; you don't know what's

[49] Comments to the author by Jenny Gibbs on 29 October, 20001.

> around the corner. People are coming in and spending a lot of time. It draws them in.[50]

Dr. McCarthy's reaction was also one of delight with the new arrangement, echoing reaction from the attendants and from the museum's Education Dept.[51]

Accommodating Future Changes

The current configuration of the *Xantho* exhibition is by no means the last word. As parts of the Penn trunk engine come out of conservation and are assembled on the engine bed, the physical content of the gallery will change and may in fact require further adjustments to the layout, narrative, etc. Further, the gallery is expected to house additional specimens from the Museum's collection of marine steam engines, at least until the new facility on the South Mole is completed. The selection and placement of these objects may have an effect on the narrative themes in the exhibition that may require further adjustments to the physical layout. But that's part of the original idea. The *Xantho* exhibition was intended from the outset to be a work in progress, and clearly there is room for additional work.

For example, the foyer off the North Hallway can accommodate the additional marine engines, and they would mesh with the foyer's thematic focus on the history of the Penn trunk engine. If necessary, the steel rack separating this foyer from the impression work area can be moved toward the west wall to make more space in the foyer, as there is some free space on the impression side of the rack.

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[50] Comments to the author by Albert Featherstone on 29 October, 2001.
[51] Comments to the author by Michael McCarthy on 31 October, 2001.

As a work-in-progress, a critical issue in the exhibition will be to ensure the labels accurately reflect the state of affairs in the exhibition. The 'Within a month...' problem with the main entry sign has already been noted. Labels associated with the restoration and reassembly projects will need to be reviewed as these projects continue, to ensure that they remain accurate and meaningful.

Rapid Prototyping: An Analogy from the Software Industry

The *Xantho* exhibition has evolved, and continues to evolve as it was designed to, in response to changing circumstances. In such an exhibition, using the traditional exhibition planning techniques may be difficult, if not impossible.

The traditional process employs a series of planning and design documents, design reviews, and, for more sophisticated exhibitions, may include network analysis tools, such as PERT or the critical path method.[52]

By contrast, the *Xantho* exhibition has evolved through a series of adjustments, modifications, and random fortuities, with virtually no design budget. Maintaining any sort of consistent narrative structure will continue to be a challenge, but a workable process has evolved that lies outside the highly organized methodology described by Belcher. The conflict between Belcher's formal approach, embodied in extensive documentation, staff consultations, project reviews,

[52] Michael Belcher, 1991, *Exhibitions in Museums*, Leicester: Leicester University Press, pp. 79-95. The critical path method (CPM) was invented by project managers in the early 1950's. The US Navy adapted and improved it to manage the Polaris missile project in the late 1950's, naming the new technique PERT (Program Evaluation and Review Technique). CPM, PERT, and similar methodologies are collectively known as network analysis tools. The ultimate irony would be for these tools to be used in the development of an extensive museum exhibition of, say, a postmodern interpretation of the social side-effects of the Cold War and the degree to which the thought patterns of the military-industrial complex permeated the entire fabric of contemporary culture.

and process model diagrams, versus the practical realities of getting a meaningful exhibit put together on no budget, has a useful parallel in the software industry.

Up until the late 1970's, computer software was created following a process not unlike the exhibition development process described by Belcher, and in fact it relied quite heavily on PERT and critical path methods of network analysis. There were reasons for this. Computing resources – such as disk space and CPU time – were expensive. Development of program code on a computer was an expensive proposition. Instead, a series of linked documentation processes evolved to design, test, and write code in the abstract, without using the computer. The project would start with a concept paper, reviewed by project managers and others in an oversight role. From there, a requirements document would summarize all the features and functionality of the new application. This would be reviewed by the expected users, or by marketing and sales if for a commercial product. The next steps would produce detailed design documents, such as a partition specification, detailing how functions and features would be apportioned into individual code modules. A test plan would be developed, specifying each test case, based on the requirements document. The final step was to actually code the program, perform the final acceptance testing, and the project was complete.

The drawback to this approach was that it was time consuming. Even relatively simple programming tasks required significant advance time to research, write, review, and update the various design documents. A related problem was that

the documents all too often became an end in themselves, causing further delays in project completion while documentation issues were sorted out and resolved.

With the introduction of the microcomputer, the situation change radically. Computer time was so cheap as to be virtually free. Programmers realized that their time could be spent better by tinkering with code, and learning the actual contours of the programming problem by trying out and discarding a variety of approaches. This had the advantage of accommodating new ideas or better features that occur to the programmers as they are working on the initial problem. This approach became known as 'rapid prototyping',[53] a term coined in the mechanical engineering field in the late 1950's.

Design documentation was reduced to a minimum: a requirements specification, a high-level design document, and a test plan. The detailed design documents, critical path analyses, flowcharts, pseudo-code, and other planning documents became superfluous.[54]

In the museum context, a similar minimal documentation approach can be employed under certain circumstances, where design resources are scarce or unavailable and the exhibition itself is intended to be a work-in-progress. Belcher suggests that the exhibition brief, in particular, is primarily a communication tool between the curator and the designer.[55] It can serve other purposes as well, but

[53] Lowell Jay Arthur, 1992, *Rapid Evolutionary Development: Requirements, Prototyping and Software Creation*, New York: John Wiley & Sons, Inc.
[54] This brief analysis of practices in the software industry is based on the author's 20-plus years in that industry, writing documentation.
[55] Belcher, op. cit., p. 83.

where an exhibition is to be created without the participation of a designer, the importance of the exhibition brief is attenuated.

By a fortunate accident, the *Xantho* exhibition lent itself quite readily to the concept of rapid prototyping. All the heavier objects in the gallery are on casters, including the four steel racks used to store *Batavia* timbers and other items. The engine bed, on which the Penn trunk engine will be reassembled, is also on wheels. Everything else is on lightweight tables or plinths. Rearranging the gallery was completed in half a day; any number of other configurations could be tried and evaluated in the course of a month or two. Of course, this could only be done where the gallery space is available for an indefinite length of time; where the space is tightly scheduled, or where an exhibition must remain open to visitors, this approach is less attractive.

Nothing here is intended to detract from the importance of an exhibition brief and proper documentation, where circumstances afford them. Even with the opportunity to experiment, determining what is an 'optimum' exhibition design requires a prior understanding of the purpose of the exhibit. In the *Xantho* exhibition, that is described in the Vision Statement, as well as in Dr. McCarthy's Master's and Doctoral theses on the *Xantho* and the Broadhursts. A formal exhibition brief might have helped create a consistent and comprehensive labeling scheme, for example.

However, regardless of the original envisioned purpose of an exhibit, visitor reaction to a particular gallery configuration might suggest a narrative idea or theme

not originally contemplated. The scuba diver mannequins in the *Xantho* exhibition started out as something of a joke; had they been suggested in an exhibition brief, they most likely would have been rejected, absent an extensive exegesis on their purpose. But trying them on a whim was a bit of serendipity that proved successful.

Conclusion

Richard Gould suggests that shipwreck archaeology needs to proceed beyond the current norm of particularist inquiries into the details of a ship, how it was built, and how it wrecked, and begin to explore the broader historical, industrial, and economic contexts that determine *why* the ship was built the way it was.[56] *Xantho* offers a particularly rich case study for such questions. Much research has already been done into the motives and aspirations of the ship's owner, Charles Broadhurst.[57] The anomalies and design compromises evident in the shipwrecked *Xantho* invites further research into the techniques, motivations, and aptitudes of Robert Stewart, the Glasgow scrap-metal merchant and sometime ship repairer. Was he in fact a competent shipwright, or was he merely a 'Saturday Mechanic' who dabbled in ships?

The lack of original design drawings and photographs of *Xantho*, as well as the lack of drawings or documentation about Stewart's modifications, present some difficulties in this line of inquiry, though in fact the lines of the hull are merely clues to Stewart's modifications and his reasons for making them. These obstacles can be partly overcome through conjectural experiments that attempt to replicate the ship's original design and subsequent modifications. Use of a flexible sectional mould allows an experimenter to study different hull shapes to consider their likely

[56] Richard A. Gould, 2000, *Archaeology and the Social History of Ships*, Cambridge: Cambridge University Press, p. 2.
[57] McCarthy, 2000, op. cit.

approximation of the original. The more interesting experiments would go on to consider how Stewart made changes to the original hull, and thus why.

As Gurian points out, museum professionals need to spend more time observing and interacting with museum visitors.[58] It's all well and good to expound at length on various theories of didactic narrative or semiotic texts, but it's something else again to ponder whether in fact any of this makes a difference to visitors. At the risk of suggesting that 'objects speak for themselves', there does seem to be a lot of anecdotal evidence to suggest that, with or without interpretation and regardless of the quality of interpretation, visitors continue to be attracted to museums exhibits, at least in the maritime/industrial history genre.

Perhaps this is because maritime and industrial artefacts of a bygone era present unusual and attractive sculptural qualities that draw visitors. There is something interesting about looking at the *Xantho 's* steam engine, regardless of whether the associated interpretation accurately places this object in its historical or economic context. Such objects may more akin to an exhibit in an art gallery, visually interesting, or not, on its own. Perhaps social history museum curators can learn something from art museum curators in this respect.

The rapid prototyping concept is not exactly new. A small art gallery exhibit, for example, is typically 'designed' the week before it opens, when the artwork to be displayed arrive at the gallery.[59] Only then does the curator know what they have to

[58] Gurian, op. cit.
[59] Comments to the author by Jo Darbyshire, Perth artist and Art Instructor at Edith Cowan University, in a telephone conversation on 25 October, 2001.

display and what it looks like, and so only then can they begin to decide where and how to display each piece in the context of the other pieces. While this approach is probably not appropriate for larger 'blockbuster' art exhibitions, it is easy to see it's appeal to smaller galleries and art museums with limited staff and time resources to plan out an exhibition in detail in advance of the actual opening.

Given the uncertainties of government funding for public museums, rapid prototyping offers a powerful tool in the production of ongoing exhibitions where funding is limited, particular funding for design resources. Of course, the more comprehensive, brief-based exhibition design approach should be retained where funding and circumstances permit it. It is not suggested here that the traditional approach be discarded in all cases, but rather that a different approach be considered in appropriate situations.

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Appendices

Appendix A:

The Broadhurst Family: Owners of the SS *Xantho*

Appendix B:

The Potential *Xantho*/Broadhurst Exhibition: a Vision Statement

Appendix C:

A Report on *The Rifle*: Documenting an Iron-Hulled Steamship

Appendix D:

***Xantho* Exhibition Project Journal**

The Broadhurst Family: Owners of the SS *Xantho*

The SS *Xantho*, one of Western Australia's most significant shipwrecks, is only a small part of a fascinating story that centres on the Broadhurst's an extraordinary and diverse family.

In the mid-nineteenth century the 17-year-old Charles Broadhurst left his wealthy Manchester cotton manufacturing family for Victoria where he joined his elder brother who was already a well-known squatter occupying vast areas of land near Kilmore north of Melbourne. Later, at age 34, Charles married Eliza Howes the 21-year-old daughter of an Irish schoolteacher. After successfully establishing their own farm they became victims (or proponents) of north west land speculation schemes, where large amounts of land could be secured merely by landing stock and by paying a small annual 'rent'.

As part of one of these schemes Charles and Eliza and their two young sons Florance and Charles left Melbourne in 1865 with the Denison Plains Pastoral Company. Under Broadhurst's leadership, the little band had intended to make the near impossible trek from Camden Harbour (in what is now the Kimberley region) to the Denison Plains that lie near present-day Halls Creek. Forced to land at Nickol Bay (present day Cossack) instead, Eliza and the rest of the Denison Plains Company women created quite an impression when they landed, for they are recorded being dressed in Victorian finery similar to that found in the fashion catalogues. Eliza was also seven-months pregnant and being strong-willed and determined to make the best of her decision to follow Charles, she had her piano with her.

The Broadhursts then became prominent north west pastoralists, basing at Miaree Pool (now an oft-visited stop-over on the North West coastal highway) and starting what is now the Karratha Pastoral Station. Around this time, Eliza gave birth to Sarah, the first European girl born in the north of Western Australia. Later the family moved into the growing settlement that in August 1866 became the town of Roebourne. As an educated and elegant couple in the harsh north west, they formed a recognized focus for European society there.

The Europeans in the district flocked to the Broadhurst's hut (one of the first built in the town), for Eliza was well known for her social graces, singing voice and finesse on the piano. Charles also maintained his flocks and went exploring, became the first Justice of the Peace at Roebourne, and for a while was acting Resident Magistrate. While Eliza looked after the family and also gave birth to another son Percy, Charles left his pastoral interests in the hands of his shepherds and went pearling. There he utilized the services of local Aboriginal people in an industry noted for its brutality and for the subsequent decimation of the indigenous population through disease and maltreatment. A year or so later, a severe drought, famine and the disastrous loss of the trading schooner *Emma* with over a third of the entire European population of the north on board, saw Eliza and the children depart the north, never to return. Soon after her arrival in Perth in 1867 Eliza gave birth to another daughter Katherine.

From this time on, Charles was away from his family almost continually. After unsuccessfully attempting to use Aboriginal convicts from Rottnest Island as pearl fishers in the north and after also failing in his attempt to introduce diving apparatus in the form of the 'hard hat' to pearling, he left for Britain in 1871 with intentions of introducing new technology to the industry. Late in that year he travelled to Glasgow and bought a second-hand iron-hulled steamship the *Xantho*, primarily for use as a 'mother ship' in pearling. When not needed in that industry he also intended to use it in the carriage of passengers and goods

between Fremantle, the north west pearling beds and Batavia (now Jakarta). It was to become the first steam ship to operate on the north west coast

In order to replace the diminishing number of Aboriginal people in the pearling industry Broadhurst also recruited over 100 divers from the islands to Australia's north. At the time these men were generally, but incorrectly called 'Malays'. Unfortunately for Broadhurst, while they proved satisfactory under other employers, his 'Malay' divers proved almost singularly unsuccessful in his service. Why we don't know.

Charles received much public acclaim in bringing the *Xantho* to Fremantle, but also arrived to the sad news that their next son Ernest had died at just 12 months of age. Charles stayed home for just a few days, and in that time posed for the photograph that appears above. Eliza appears with the rest of the family and with their 'Malay' servant in mourning dress. A few days later Broadhurst then set off back to the pearling grounds in the *Xantho* and, as intended, used it to carry shell, labourers, passengers and goods up and down the coast. Unfortunately the ship sank beneath him at Port Gregory after only two coasting voyages. Having forgotten to renew his insurance, Broadhurst was ruined, losing both his ship and a cargo of lead ore that came from the Geraldine mine near Port Gregory. He then apparently abandoned his crew and left a number of his 'Malay' divers wandering destitute around the streets of Geraldton. It became a great scandal.

Broadhurst then took the rest of his 'Malays' to the Shark Bay for work in the pearling industry there. Obtaining over 200 ounces of pearls in one season , Broadhurst was eulogized as a 'man out of 10,000 for his successes at Shark Bay and was appointed to Parliament as a result. He and Eliza were at the peak of their colonial careers after years of hard work and many financial setbacks. Within weeks of taking up his appointment, however, Broadhurst was forced to resign in disgrace after failing to pay and repatriate his men as required by their agreements. The costs of this exercise combined with the loss of his ship threw him and his family into bankruptcy. For Eliza it was another devastating blow, for at the time a married woman's social standing was reliant on that of her husband!

Many of the 'Malays' stayed on in Shark Bay. Others found employment on sheep stations throughout the northwest as cooks and general hands. Some of the cosmopolitan population at Denham in Shark Bay can trace their roots to the 'Malay' pearlers there, for example. The famous Walga Rock painting below is believed to be a depiction of *Xantho* that was produced around 1920 by a former Shark Bay pearler called 'Sammy Malay'. Was he one of the men abandoned by Broadhurst? We are not sure.

After the Shark Bay and *Xantho* debacles and after many summonses for non-payment of debt, Charles went back south and unsuccessfully applied for a position in the public service. Undaunted he opened a fish cannery at Mandurah employing almost half the town's population and operating it quite successfully. Unsatisfied, he left that enterprise and went to the Abrolhos Islands off Geraldton where he found thousands of birds and in recognizing the value of the thick organic deposits under their nesting grounds, commenced guano mining. Broadhurst was 57 years old, an age when most modern men are reaching for their super-annuation agreements. There was no 'social security' in those days and the Broadhurst's had to keep working having suffered so many severe financial and social setbacks. Eliza also struggled to keep the family finances together, working at Bishop Hale's school as a teacher and eventually opening a day and boarding school of her own. Despite these heavy demands on her time Eliza still had time to be a mother, to sing and play the piano and to become a

force in the Perth 'Musician's Union', a theatrical group that staged numerous plays. She was a hard working and very talented woman.

Her often-distant husband had remarkable flair, with innovative ideas and a proven ability to obtain financial backing, and in that respect could rightly be considered a forerunner to those of the modern era like Laurie Connell and Allan Bond. He was apparently hopeless at running a business, however and things again started to go wrong and his debts steadily mounted. The situation reversed in 1888 when his 26-year-old son Florance Constantine Broadhurst who had mercantile training took control of the company and its trade—transforming it into a successful forerunner to Western Australia's export mining industries. He became fabulously rich and bought out his Charles' and Eliza's share in the business for $10,000 at a time when the annual wage of a mid-level government servant was around £100-150. Finally successful, Charles and Eliza then retired to Bournemouth in England and established their family home *Karrakatta,* which still stands today. She died in 1899 aged 60 and he died in 1905, aged 79.

Florance Broadhurst became fabulously wealthy as a guano merchant, and in excavating the deposits on one the Abrolhos Islands found the camp of the survivors of the Dutch East India (VOC) ship *Zeewijk* (1727). He collected the remains, made a catalogue of them and presented them to the Royal Geographical Society. In thinking they were from the VOC ship *Batavia* (1629) he had a copy of their story *Ongeluckie Voyagie* translated into English. One of his daughter's playmates was the young Henrietta Drake Brockman, and after coming to learn of the story and reading the translation, later conducted her own research and published a book also entitled *Unlucky Voyage*. Her work led directly to the finding of the wreck many years later.

After losing the Abrolhos Islands guano monopoly, Florance Broadhurst suffered a broken arm while conducting a search for guano on the islands off Esperance. He drowned in 1909 while fishing on the Swan River after apparently deliberately taking an overdose of laudanum; an opium based medication that he had been taking for his continued pain. After a brilliant career as a London heart surgeon and accomplished violinist, Charles Henson Broadhurst suicided over an affair of the heart. Katherine Elime Broadhurst (the youngest girl) carried on Eliza's interest in the growing women's movement. She also went to England where she became a suffragette. There she tied herself to the railings of Parliament House, was imprisoned at Holloway Gaol, went on hunger strike and had to be force-fed to keep her alive. We know from her scrapbook that Eliza was also interested in the Women's Movement and it may be that here experiences influenced Katherine. The other siblings, Sarah, Percy and Reginald remained in Western Australia, where they later married and some of their children's children can claim a link with this extraordinary family even today.
To put it all in a perspective, we have a photograph in the *Xantho* gallery taken in 1987 of the late Marjorie Darling, Florance Broadhurst's daughter. She was the last person to have a direct link with her grandparents Charles and Eliza and at 93-years-old she appears in the photograph holding the *Xantho* engine-maker's name-plate, a tangible link to her past.

REFERENCE:
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See the Museum on the Website: http://www.mm.wa.gov.au
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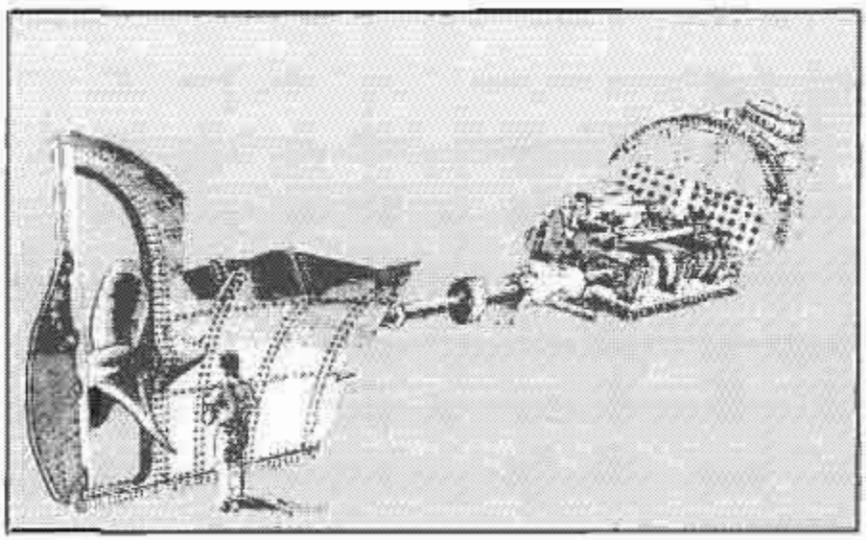
The potential Xantho/Broadhurst Exhibition

a vision statement



#The raising, refurbishment and archaeological examination of the Xantho engine and other fittings represents a major new direction in maritime archaeology and maritime archaeological conservation. As such the exhibition of the engine will celebrate those two major events.

The proposed exhibition, which will centre on the engine and the wreck, will provide a necessary counterfoil to the Dutch East India Company (VOC) and colonial wreck exhibitions currently in the galleries. With an Aboriginal element already in place, *Xantho* will see all the major phases of maritime activity on this coast that can (or should) be illustrated through the products of maritime archaeology i.e., Aboriginal-VOC-Colonial wooden wrecks/ Colonial iron and steam shipwrecks.

The *Xantho* /Broadhurst story has much more to offer than the archaeological and conservation breakthrough that it represents. From it we are led to an extraordinarily wide range of relevant issues, as will be seen.

In accordance with modern maritime archaeological thought, the exhibition will also lead into the main people involved. These are the owner Charles Broadhurst and his wife Eliza. Because the Broadhusts were such a wide-ranging family with many interests, represents a unique opportunity to briefly address some major themes in maritime Colonial Western Australia through maritime archaeological remains:

The process of European settlement

Sea transport in the colony

The pearling industry

Aborigines and the sea

The introduction of Malay labour

Steamship owning and operating

The wreck of *Xantho*, and its contemporaries, i.e., that of the ill-fated *Emma* (1867), which was lost with one third of the entire European population of the north-west on board, and the wreck of the barque Stefano,(1876) which involved an epic story of Aboriginal/European interaction, post shipwreck, will be used to highlight the problems of:

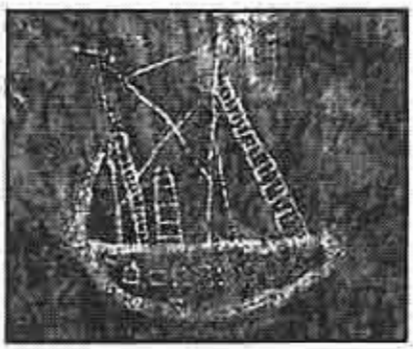
The north-west pastoral industry

Women and children in the north

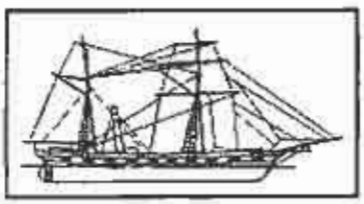
Travel at sea

Shipwreck on a hostile coast

The subject of 'contact paintings' will also be covered. Recently, Dr Ian Crawford (author of Art of the Wandjina) raised the possibility that the Walga Rock painting may not be a representation of either the *Zuytdorp* (1711) or a pearling lugger, as once thought. He was struck by the possibilities that it represents the *Xantho*. There appears to be some strength to his proposal



The Walga Rock Painting



An examination of this possibility in the proposed exhibition would lead also into an examination of the incorporation of the wreck of the pearling steamer SS *Sunbeam* (1892) into modern Aboriginal legend. Aboriginal convict illustrations of the *City of York* (1899) at Rottnest could also be touched upon. This could be considered under a broader theme

Aboriginal legend, art and the shipwreck

The exhibition will also lead into:

The mining industry

The finding of the Batavia

The Zeewijk story

This will be accomplished through attention to Broadhurst's son Florance, doyen of the Abrolhos Island Guano Industry, the fore-runner to our present-day mining policy. In the course of his mining activities, he uncovered, catalogued and donated much of the Zeewijk (1727) material currently on exhibition (Our State's first maritime archaeological catalogue). In believing the material was from the Batavia(1629) he acquired and had translated a copy of Pelsart's Ongeluckige Voyagie (Unlucky Voyage). This is the Sebenhaar translation. By this means, his children and their playmate Henrietta Drake Brockman were exposed to the Batavia story, leading to her research and the eventual finding of the wreck as an adult.

From there Xantho leads away from the material remains into Social History. Thus material in the form of historical notes, information sheets, backdrops or by links with Social History offerings will take us a step further, utilising material donated by the Broadhursts family and associated material from the collection thus:

In noting that Broadhurst was continually bankrupt and socially in disgrace for most of his entrepreneurial career, and like most seamen and entrepreneurs of the time he was away from home most of the time, this left his wife Eliza to cope as best she could as a musician, teacher and principal of a day and boarding school. Thus we are briefly led into

Society on Colonial Western Australia

Education in Colonial Western Australia

Entrepreneurial behaviour

Because Eliza Broadhurst was so well known, yet her life was so difficult, but she coped through the difficulties and hardship, the young married women of Perth gravitated to her Musician's Union and Women's Gatherings for support. As a forceful, talented, and well-educated woman, reader of the works of the German Feminist Frau Minna Carr and clear

believer in women's rights (her daughter Katherine, was gaoled and later force fed in Holloway Prison as a suffragette), we are led through Eliza Broadhurst to

The women's movement in Colonial Perth

Music and drama in Colonial Perth

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