

The Mary Rose sank during the battle of the Solent, 16th July 1545, out of the 500 crew of the mighty vessel only 34 survived

suggesting the presence of many artefacts at the wreck due to the horrific deaths of these men. The reason for the capsizing has been debated, with many factors being blamed, however this does not change how sudden the ship sunk leading to its breathtakingly preserved remains. In terms of the discovery of the wreck the first evidence to its location comes from the Cowdray Engravings which shows the ship going down during the battle, this was then used to discover the remnants by the pioneering John and Charles Deane who then went on to create watercolours of their findings, most of which was unfortunately auctioned off these finds including several guns, with one being a bronze demi cannon [1]. After this the site was reported destroyed and its approximate position marked on Admiralty charts. In 1965 Alexander McKee then by using a combination of these materials and sonar found the wreck under the title Project Solent Ships, what followed was the first detailed underwater excavation [2] spanning 17 years. In 1968 the first volunteer divers arrived and were used to explore the area, with dredgers, water jets, airlifts, paintbrushes, explosives and later even a donated water hose from the Portsmouth fire department. The decision to fully excavate only came after a trench was dug showing how much had survived then a year after the Mary Rose Trust was formed. The Trench was dug due to the assessment data from sub-bottom profiling revealing the shape of the wreck under the sediment layers, the first time this technique had been used to locate a history wreck [3] and as such has added to this project's prestige. Over 4 years a total of 28,000 dives were undertaken with mostly volunteer divers which may have led to some confusion of the data as communication could fall short on either end, "you have to brief a volunteer beforehand and rely on him remembering the brief"[4], "he has to tell you exactly where he's worked and what he's done so you can brief the next diver"[5] these two quotes show how not only would accurate communication of data be obscured by the conditions but also reveal the difficulties of relying on divers with no previous archaeological training or experience, however this historic piece of nautical archaeology may not have been excavated without these volunteer divers as the limited time a diver would be able to spend underwater would have only exacerbated the time it took to complete the excavation. Due to time and funding constraints a full 'as found' plan of the site was impossible, instead the focus was on surveying, using the direct survey method of three-dimensional recording of structures and objects [6], and in situ recording and sketching [7], which made up the backup system of excavation records. Some 23 guns were recovered from smaller carronades to larger 2.5 ton cannon, some made of bronze and others made of wrought iron (a porous and spongy metal which cannot be condensed equally throughout the mass of the gun and therefore makes it unstable [8]) this resurfacing of the guns due to careful excavation has therefore revealed much about Tudor gunnery as little was known about the different material, type and size of their guns before the excavation [9], and in 1982 the entire wreck was lifted via hydraulic jets which manoeuvred the material into a purpose-built frame, this was handled by the Royal Engineers as the site had acquired royal interest.

These finds were spectacular in their preservation, with the most extreme example of immaculate preservation would be the finger indents in the ointment found in the barber surgeon's quarters [10] allowing for equally detailed post-excavation documentation and analysis, After the ship arrived in the museum Andrew Fielding along with his colleagues drew up the ship in an attempt to record what remained however since no in situ master drawings were made which would make later reconstruction difficult, these recordings were further made difficult by the PEG spraying thus recording could only be done in small periods of the day, when said spraying was off. Also, during

these periods, the environment, being cold and wet, was not ideal for drawings and measurement and neither were the poor illumination which was employed to prevent the development of biological life upon the hull form. In addition to this was a photographic record of the ship undertaken by Christopher Dobbs. In an effort to document as much of the remaining timbers as possible and to work towards a reconstruction. More documentation occurred with the development of new technology, namely laser survey equipment which was allowed to be test run on the Mary Rose, this 3-D scan of the entire remnant took only one day to complete [11] and thanks to its fine detail on any scale these scans were used to by Douglas McEluogue to create large scale construction drawings. The reconstruction drawings show that her hull shape was precisely defined- designed, even, on a drawing board- in a similar fashion to her sister ship the Peter Pomegranate, these features show that the Mary Rose was of carvel construction, this conclusion is also supported by her carvel outboard planking. Multiple forms of analysis were undertaken with the wreck of the Mary Rose being the first underwater project to incorporate environmental sampling and DNA sampling [12]. Microscopic analysis was also undergone recording fleas, textiles, and plant matter. Further analysis is seen in the employment of dendrochronology, along with Osteoarchaeology. This Osteoarchaeology revealed that the age of the crew ranged from 12/15 to 40, with injuries interpreted as that gained from breech loading the cannon (2004). Lastly Isotope analysis of tooth enamel of the crew- showing many being west country Englishmen, with some being from western Europe.

In terms of conservation efforts, the labs to house the artefacts were built first, even before the complete excavation of the site. The plan being to spray the wreck with cool water within a large glass room then PEG 200 until 2013 whereby the wreck would then be housed in a 'hotbox' to dry the ship out and allow for it to be put on open display. However, some of the artefacts, started to be scarred by salt like deposits caused by the oxidisation of reduced sulphur species known as the 'sulphur problem', this reduced sulphur is produced by anaerobic conditions this therefore concentrate the wood with said reduced sulphur these bacteria were shown to be *Alicyclobacillus*, *Acidiphilium*, and *Thiobacillus Prosperus*[13] and so therefore the sulphur imbedded within the Mary Rose's timbers could be caused by both the oxidisation caused by acidophilic bacteria and abiotic oxidisation. This effect is also observed in the Swedish Vasa, Kronan and the Dutch Botevia. Through multiple studies [14][15] it seems that in order to combat this a solution of SrCO_3 may be needed, this however would come with its own drawbacks particularly the costs, and by extension how to raise money for said costs, there is also issues with the technique itself as the PEG solution would need to be removed before SrCO_3 treatment could begin which, the PEG has already stopped and so this is a non-issue what is an issue however is the fact that due to the large presence of iron sulphates some strontium nanoparticles would not react [16] making it unreliable and wasteful. Furthermore, some sulphate species are not harmful to the wood, only those that react to produce sulfuric acid pose a threat to the timbers, SrCO_3 must also neutralise the free acid already present in the wood and remove the reduced sulphur species to provide protection from immediate and long-term degradation. However if this technique is shown to be successful then it could have a huge array of applications on smaller artefacts including, but not limited to, silk tapestries, ancient texts and parchments since these are written by iron-gall ink which is in of itself acidic [17]. Furthermore there is still elements of the wreck on the sea floor including the forecastle and assorted timbers, in 2014 specialist equipment that monitored the exclusion site stopped working, perhaps due to damage dealt by fishing gear which may have also damaged the remains of the site, which could mean the 300m exclusion zone isn't working to conserve what remains on the sea bed.[18]

In terms of publication a four-volume series was released in an attempt to contextualize the findings within the history of the ship, however the first edition which sets out to be an introductory piece and the most "authoritative statement published at present time" is not up to scratch. Instead being "thoroughly unsatisfying, neither answering questions or providing enlightenment"[19], the presentation being the major problem of this publication as it has poor editing, a lack of proofreading and an offhand structure-for instance "there is one chapter that is a one and three quarters long"[20]. The figures used seem to be confusing and don't reveal much to the reader as Jeremy Green continues to elaborate the figures 1.2, 3.3, and 2.1 being picked out as the major felons of this. Figure 1.2 being indicative of the journey from Portsmouth to London, with these two being the only landmarks on the map. Figure 3.3 a one column image of the Mary Rose rising from the shallows. Figure 2.1 being a non-defined image of the Isle of Wight and the only landmark being the Mary Rose, not only this but some of these images are even covered in pattern blur this may be indicative of a lack of resources as the printing costs would be staggering. Trevor Kenchington, a nautical archaeologist that focuses on fisheries in the Northwest Atlantic, from Musquodoboit Harbour agrees with Jeremy Green saying that Sealed by time is "little more than an initial summary of field notes"[21] with much more scathing critique calling it a "serious dereliction of professional responsibilities"[22]. However, the 1st volume has been much more well accepted by the general population as an introductory piece with a 75% community rating of 5 stars on goodreads[23] and so may not be valuable as an academic piece rather as one for the museum going audience. The second volume of this publication series, Mary Rose Your Noblest Shippe: Anatomy of a Tudor Warship. Puts the ship between the differing naval combat tactics used in 1510 and the 1560's as the refitting would suggest the upgrading to a more stand-off style of warfare due to the inclusion of more heavy guns and sealable gun ports, developed in the early 1500's, although during the battle of the Solent much more manoeuvrable vessels were used in the ensuing battle. Ian Friel an associate of the Mary Rose Trust and ex-employee even says that this volume "makes an important contribution towards understanding the chronology and practicalities of this invention, but do not,.....offer a complete explanation for it"[24]. Written by 13 contributors all to a high standard of practice, perhaps even changing up their style to address the critique of the previous edition. The 3rd volume (Weapons of Warre: the Armaments of the Mary Rose) also shows signs of improvement over its predecessors as, according to Brad Loewen, it has excellent illustrations.(These illustrations being made up of film photography and hand drawings) The sheer amount of people listed as aides to Hildred sheds light onto the "huge professional and scholarly impact of the Mary Rose project"[25], this volume also includes experimental archaeology with replica cannons being test fired and measured for range, projectile speed, powder composition and quantity this provides excellent in-depth knowledge on its subject matter, however a physical edition of this book has reached £175[26] and as such is priced out the majority of the general public who may only have a slight interest in the subject matter to begin with. This edition also has a perfect 100% 5-star rating from the Amazon community with a plethora of praise, "a must have for any library on Sea Armaments of the time", "cornucopia of information"[27] etc. So maybe this indicates the price increase was a more recent change. The final volume, For Future Generations: Conservation of a Tudor Maritime Collection, much like the rest of the volumes has an intent to appeal to professionals but also can appeal to the general public, historians or students. This edition is more of an introduction to the concepts and methods of conservation than a publicised detailed study of the methods employed, with the book being "well edited", "well illustrated", and in "simple and comprehensive terms"[28] according to John R Bratton. In terms of the communities' view on the volume it's split between a 5 star review and a 2 star review, with the latter calling it "another example of Charitable Trust Folly"[29] and the former

proclaiming it "excellent for anyone involved in object conservation"[30] so this volume clearly strays away from the established pattern in terms of communal response and with little of it, suggesting it may not be the most popular of the set. Furthermore, on a tour of the dockyards these volumes are listed as suggested reading by the tour lecturer, Christopher Dobbs, suggesting these were intended for a broader audience. [31]

In regards to dissemination the £32 million museum on the Portsmouth dockyard is doing well for itself in terms of prestige, receiving 57 rewards since 2013[32] and having 3,938/4704 excellent reviews on Tripadvisor[33], which is overwhelmingly positive. However amongst the poor and terrible reviews four common themes are present amongst them the first being the crowd that thinks that an "obscene amount of money [has] already[been] spent on what is after all a Prince Charles Folly"[34], or the complaints stem from a confusion as to the new ticketing system which seems to not have been communicated clearly enough, e.g. "there was no warning of this change on their Facebook or twitter"[35] this change being the added ticket price for entry to the museum atop the ticket price for the dockyard which does add up to a significant amount of money, which is also where a load of complaints come from, e.g. "entrance to the dockyard good value at half price £19.50 each however MR wants another £17 each ON TOP"[36]. Some leave negative reviews due to how the staff interact with the public "the staff seemed so cold....."[37] and the final common complaint was that the exhibit was "downright awful for photography"[38] these are issues that need to be addressed in order to improve the public image of the museum, and to make this information more available to those with less economic means, however the high price is understandable considering the amount of money that went in to the conservation effort and may yet still need to go into it. In terms of New media, its Facebook account deals mostly with ticket offers, but also keeps up to date with annual celebrations keeping them in a Tudor theme, these posts usually get 20-30 reactions on average so there's little interaction between the museum and the public. This may not be due to lack of trying however as the Facebook page shows with a post from the 21st of February which sent an open invitation to visitors to talk with researchers from the University of Southampton and Traditional boats of Ireland Project. The page has 13,101 likes, and as such is much better at engaging with the public via new media than HMS Victory (6.2k) and even the Portsmouth museum(4.5k), if we move to Twitter the Mary Rose has 17,800 followers and is more active due to its larger community. As a further point to modern integration as of the 27th of February the Mary Rose museum now has two pokestops for the online phenomena pokemon go. Seemingly aiming at a younger demographic, with ads for children's activities on their Facebook and Twitter feeds also.

In terms of replica, some 4,000 bricks were found in the rubble reveals much about the galley of the ship looked and functioned, the rebuild of the replica shows that they were able to cook up a wide variety of foodstuffs for the crew [39], and the wealth spent on the ship itself as each of the crew had rations of pepper [40] a luxury commodity in the Tudor period.

[1]MaryRose.org The History of the Mary Rose

[2]BBC The Rise of The Mary Rose documentary "The Mary Rose a Timewatch guide"

[3]BBC The Rise of The Mary Rose documentary "The Mary Rose a Timewatch guide"

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