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A closed case: safely displaying 1140 spirit preserved marine animals for a new permanent public gallery

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Abstract

Plymouth City Museum and Art Gallery (rebranded as The Box) began a 5 year redevelopment project in 2015. As well as a new public space outside, and a large extension to the main museum building, there would be 7 new permanent galleries. The new natural history gallery would display a range of different natural history collections, including over 1140 spirit preserved animals. This paper outlines the design process for the specialist case to safely hold this large number of specimens preserved in hazardous fluid. With no equivalent in any UK museum, the design relied upon several experts working closely throughout the whole process, and clear communication between different teams. The resulting case not only displays newly conserved spirit specimens, but has built in mechanisms to ensure that any hazardous fumes are removed from the case and not let into the gallery. This new display case allows visitors to see marine animals that they have never seen before.

Keywords: Display case, spirit preserved specimens, marine life, Conservation, health and safety

Introduction

In 2015, Plymouth City Museum and Art Gallery began work on a large project to expand the museum and redevelop the entire site. Combining the collections of the museum, the Plymouth and West Devon Records Office, the South West Image Bank, and the South West Film and Television Archives, the new building would be three times as large as the original museum. As part of the redevelopment, the museum was rebranded in 2018 as The Box, Plymouth to reflect the design of the new building (Freedman, 2021).

The new redevelopment includes 7 new permanent galleries, and 6 galleries for temporary exhibitions. The permanent galleries were designed using the collections from The Box, displaying art, film, archives, archaeology, social history, ethnography, and natural history. The new permanent exhibitions focus on Plymouth and the surround area linked to more global stories.

The completed natural history gallery displays 6948 specimens, including fossils, minerals, entomology, taxidermy, herbaria, skeletal material, and spirit preserved specimens (Figure 1). The key focus of this gallery is the environmental challenges that face our planet today. Sub fossil specimens discuss our recent past and extinctions. Entomology

Figure 1. The new natural history gallery at The Box, Plymouth. Displaying 6948 specimens, the gallery focuses on current environmental issues facing our planet today. (Photo Jan Freedman)

collections display the unique biodiversity of our planet, and how fragile this is. Herbaria specimens show the importance of plants to the entire ecosystem, whilst taxidermy and skeletal specimens focus on habitat loss. The mineral collections were used to discuss the geological history of the South West and the important mining heritage of the area. The spirit collections display the unseen diversity of marine life, looking at climate change, ocean acidification, and marine pollution.

Displaying such a diverse range and number of specimens required the construction of specialist showcases. Several individual cases were built into the walls to display collections, and two large cases were built in the centre of the gallery: one to display taxidermy, skeletons and minerals; and one designed to display 1140 spirit preserved specimens. These two large cases in the centre of the gallery were side by side, giving the appearance of one large case. This paper outlines the development of the spirit case, from conception to completion, and how to safely display such a large number of hazardous material for the public.

The spirit collection

The Box cares for over 4000 spirit preserved specimens. When the museum opened in 1910 it had acquired approximately 500 marine specimens preserved in specialist cuboid glass jars for display, known as battery jars (see Figure 6) (Freedman, 2012). The majority of these were local marine species that can be found off the Plymouth coast, along with a number of foreign amphibians and reptiles. In 2000, the museum was donated a substantial collection of approximately 3500 jars and associated archives, from the Marine Biological Association of the United Kingdom (MBA) (Freedman, 2012). Preserved in mainly Kilner jars, the majority of the specimens were local species which were collected to complement the study of species found in and around the Plymouth waters, known as the Plymouth Marine Fauna (Marine Biological Association, 1904; Marine Biological Association, 1931; Marine Biological Association, 1957). The collection includes many historically and scientifically important specimens as part of ongoing research at the MBA since it's opening in 1888. There are several collections from surveys, and a review of the collection in 2011 found one type specimen and two co-types (Freedman, 2011; Freedman, 2012). As well as the research potential with this collection, it offers a unique view into the rich marine life off the coast of the South West.

Gallery concept

The gallery was divided into three sections: Life in the Past (fossils and sub-fossil specimens), Life on Land (entomology, herbaria, taxidermy and skeletal specimens), and Life in the Sea (spirit preserved specimens). The focus of these sections was to use the collections to present the key messages of extinction, biodiversity loss, climate change, pollution, and habitat destruction. For the Life in the Sea section of the gallery, the history of marine science research through to modern day research was developed to present the history of marine science in Plymouth, and how marine scientists today are working on global environmental issues. The spirit collections were identified as a key part of this section.

With a large number of spirit preserved specimens in the collections, we wanted to display as many as possible, for two reasons. Firstly, we wanted the public to see these specimens on display rather than keep them in storage in order for them to appreciate the vast scale of the museum collections. Secondly, we wanted visitors to see the enormous diversity of life which is normally hidden beneath the waves, and how fragile it is. With adjacent displays highlighting the important marine science research that has, and is, being undertaken, the large display of marine creatures marries this section together: the visitors are able to see the animals that are affected by anthropogenic issues.

The cases for the redevelopment were designed by Meyvaert. Over 1000 spirit specimens would be displayed in the new spirit case, the largest jar holding 10 litres of fluid, and the smallest holding 10ml. This would be the largest number of spirit specimens on display in a museum in the UK. The design of this case required close collaboration between the curator, the conservator, Event Communication, Meyvaert, and an external consultant, CCTech. Colleagues at the Natural History Museum, London were consulted, based on their knowledge of cases for spirit collections which were built into the new Darwin 1 and Darwin 2 redevelopments.

The original designs for the case included shelving that was not fit for purpose. This early concept included glass shelves which were held by wires connected from the top of the case to the floor of the case. This would have not held the weight of the specimens so was changed to a strong aluminium frame with glass shelving placed in position.

There were going to be a large number of specimens displayed in this case. However, the intention wasn't just to fill the case with as many specimens as possible. The key message of this case was to show the variety of life that can be found under the coastal waters of the South West. This was planned using the case designs (Figure 3). Shelves were divided into sections to highlight main groupings of marine animals and a number of specimens within these groupings had their own individual labels to introduce the group of organisms (Figure 4). Using this process, specimens in the store were identified for display in each section based on the shelf height.

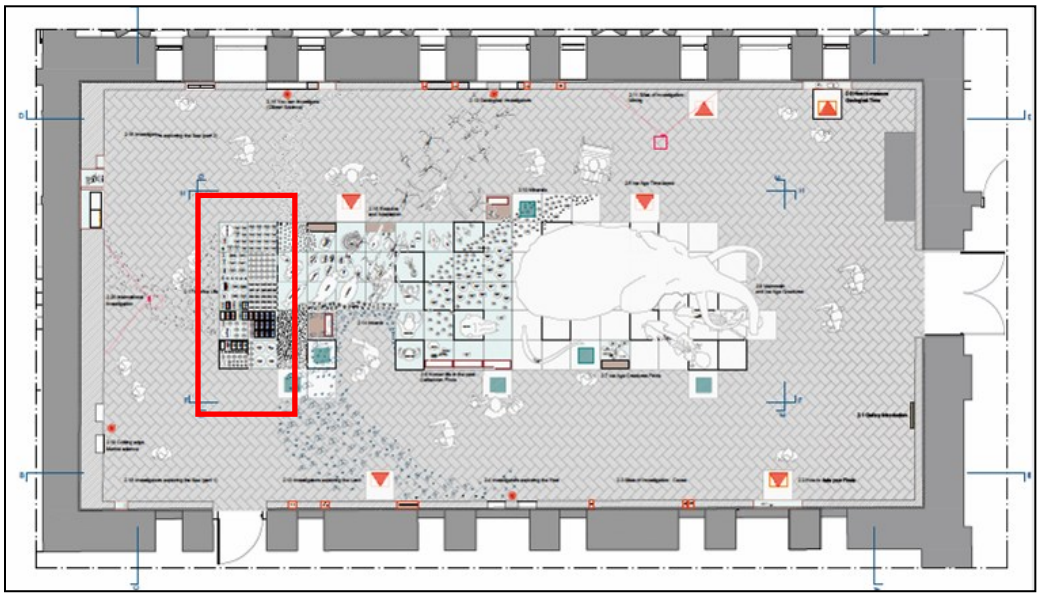

Figure 2. The gallery design from above, by Event Communications for the new natural history gallery in The Box, Plymouth. The case for the spirit specimens can be seen in the centre towards the left (highlighted in red).

Figure 3. The case design by Event Communications, showing the shelving layout which was used to create areas for different groups of marine organisms.

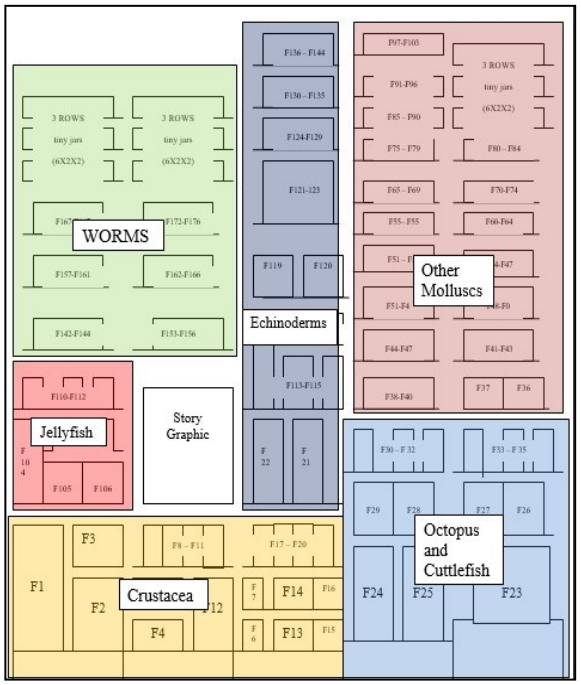

Figure 4. The sections for the front of the case showing the main groups of marine animals. The 'F' numbers were the curators' codes for the specimens which would be placed on the shelves. (Image Jan Freedman)

Spirit specimen conservation

The majority of the specimens in the collection are preserved in 4% formalin, with a smaller number in 70% Industrial Denatured Alcohol (IDA) in varying states of condition. All specimens that would be on display were to be stored in 70% IDA to reduce the risk to staff, and potential risk to visitors from any fume leakages. With the poor condition of the fluid, and being preserved in formalin, this meant that each specimen that was to go on display needed to undergo conservation treatment. The conservation work for each specimen was carried out in a fume cupboard, with staff wearing lab coats and disposable gloves. A risk assessment for the conservation work was undertaken prior to the work beginning.

Three types of conservation treatment were required for the specimens: rehydration, transferring from formalin to IDA, and changing specimens in discoloured alcohol into new alcohol. Dehydrated specimens were washed with 3% decon90™ and 97% deionised water to remove old and discoloured chemicals (Moore, 2006, *pers comm*). They were then washed with deionised water and fixed in 4% formalin for 24 hours, which ensured that the tissue within the specimens were held together (Stoddart, 1989; Moore 1999). Specimens were then placed into 30% IDA for one hour, 50% IDA for one hour, and finally 70% IDA as the final preserving fluid (Moore, 1999; Moore, 2006, p*ers comm*).

Formalin preserved specimens were washed with 3% decon90™ and 97% deionised water to remove the old and discoloured formalin (Moore, 2006, *pers comm*). They were then washed with deionised water, and placed into 30% IDA for one hour, 50% IDA for one hour, and finally 70% IDA as the final preserving fluid (Moore, 1999; Moore, 2006, p*ers comm*). Specimens which were in discoloured IDA, were washed with 3% decon90™ and 97% deionised water to remove any discoloured fluid (Moore, 1999). Specimens were then rinsed with deionised water, and then stored in 70% IDA (Moore, 1999; Moore, 2006, *pers comm.*).

The conservation for each specimen was carried out individually; each specimen was conserved in its own jar, there was no bulk conservation with several specimens in one jar. The majority of the conserved specimens were restored in new ground glass jars (Figure 5). These were sealed with petroleum jelly (Moore, 1999).

Although the majority of the jars were originally in Kilner jars or Danish jars, a number of square battery jars were also included in the display. These were not transferred into new ground glass

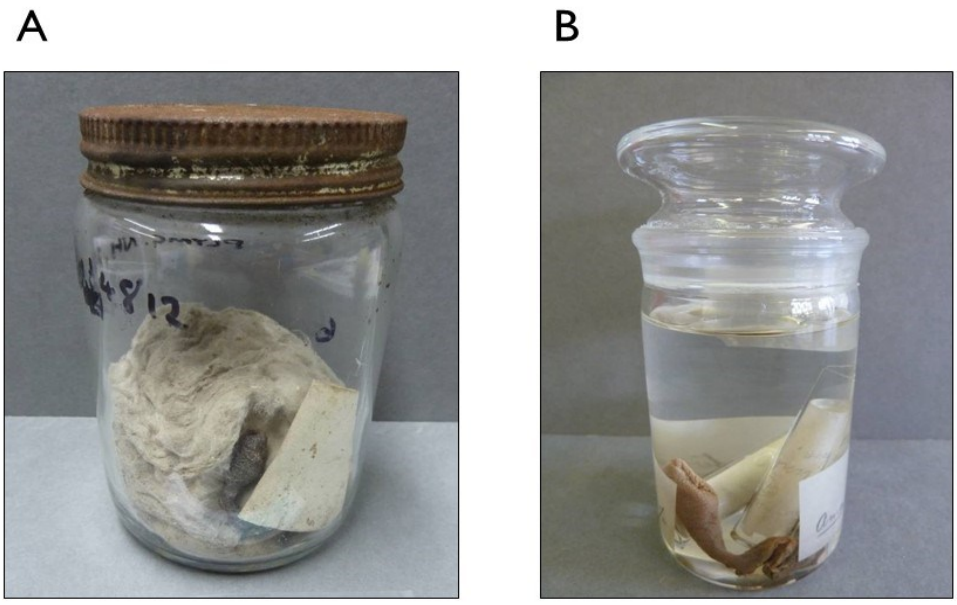

Figure 5. The type specimen of Amalosoma eddystonense Stephen, 1956 (PLYMG.NH.2000.1.4812) conserved prior to this conservation project. This example shows the standard that all the specimens on display would be from old Kilner or screw-lid jars to new ground glass jars. A. Specimen before conservation. B. Specimen after conservation treatment. (Image Jan Freedman)

jars, because of the display quality of the battery jars. The majority of these were particularly deteriorated with seals broken and paint on the back of the jars peeling off. All specimens were transferred into 70% IDA using the process above, and the jars were cleaned fully and any paint residue removed.

The decision to remove the paint was made by the authors after discussions about how the jars would work in the new case. The case was lit from the back, so any paint would have prevented the LED lights from lighting up the specimens. The lids were sealed with petroleum jelly, and white linen tape, moistened with deionised water, was used to seal the lids securely in place (Figure 6). Gelatine is normally used to provide a seal for battery jars (Moore, 1999), however, the time constraints on the conservation work made this method unmanageable. The case will be visually checked once every three months to monitor any dehydration within the jars and to monitor the seals around the battery jars.

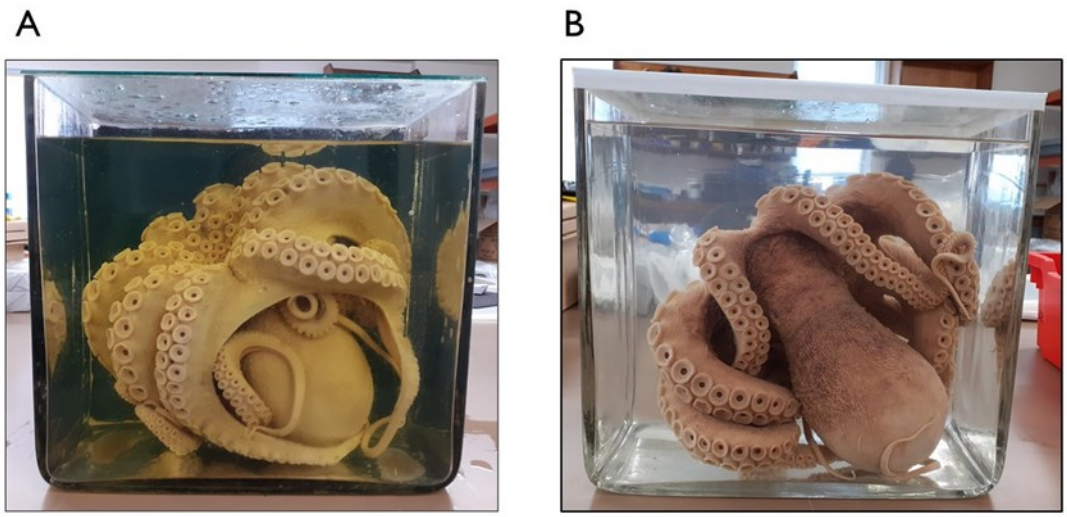

Figure 6. The common octopus (Octopus vulgaris Lamarck, 1798) in a square 'battery' jar (PLYMG.4601). A. Specimen before conservation. B. Specimen after conservation treatment. (Image Jan Freedman)

As the conservation work was carried out, all the information was recorded from each specimen, and updated onto the museum Adlib database. New labels were added to some of the jars, where the old labels had deteriorated, using cotton fibre Resistall paper and Pigma Micron permanent ink pens. A small label noting the conservation date and the preservation fluid was also added to each jar. A total of 1140 spirit preserved specimens were conserved for the new display.

A case for hazardous chemicals

The majority of the specimens in the collections at The Box were stored in 4% formalin. However, due to the hazard to human health associated with formalin, all specimens on display were transferred into 70% IDA and 30% deionised water prior to being installed. This would reduce the risk to staff installing and accessing the specimens, and reduce the risk to visitors in the event of any fumes being released.

IDA is a highly flammable liquid, with a flash point for 99% IDA of 14°C (MSDS, 2015), so several measures were taken to mitigate any fire risk. LED lighting was used within the large case which would light the specimens through the glass, with the power source safely outside the case. Plug sockets in the gallery floor were originally designed to be directly under the spirit case, and these were removed due to concerns of potential leaks and the fire risk. A small extractor fan was installed within the case. The fan is powered by a motor at the bottom of the case, which is raised above the floor and covered to protect it from any spillages. The extraction ductwork makes its way to the roof of the building where a larger fan extracts and expels fumes above the roofline. Small air openings with filters were included at the bottom of the case doors, to allow the fan to pull air in from the gallery and prevent the creation of a vacuum. A bund tray at the bottom of the case was also added, which would capture any fluid if any of the jars were to break. The tray is 30mm deep, and is angled for fluid to move to the centre where there are taps to safely empty the bund tray.

At the time of writing there is no environmental monitoring in the spirit case. The case is checked visually daily for any spillages, leaks, evaporation, or broken seals. The Building Monitoring System (BMS) monitors the environment within the gallery (a stable 18-20°C and 53-59% RH), and as the air supply to the spirit case is drawn into the gallery we expect that the conditions are the same. The extraction fan within the spirit case, along with the exhaust end of the ductwork are monitored during regular gallery and building checks. The Box is currently undertaking a project to develop a new store for the spirit specimens, and within these plans, a Volatile Organics Monitor with an alarm will be installed in the spirit case, as well as in the new spirit store.

Figure 7. The instillation of the aluminium frame carried out by staff from Meyvaert, with the completed shelves for the back and side of the case. (Photo Jan Freedman)

Installation of the case

Labels for the specimens were attached on the inside of the glass, and these had to be positioned and installed prior to any specimens in the case. The exact positioning of these labels was worked out by placing the specimens in the position on the shelves, and a copy of the label attached in the correct position on the outside of the case. The labels were then installed in the empty case, on the inside of the glass by Leach, the procured graphic design printers.

The case has two large glass doors at the front, which open fully outwards and to allow access. The design of the case meant that the shelving at the back and sides had to be installed first, and this was set up onsite by Meyvaert (Figure 7). Specimens were then transported from the store in lidded crates (Really Useful Boxes), with each specimen sealed in clear zip lock bags in case of any fluid leakage. A safe access route through the museum was created to ensure no obstacles or staff were in the way. Tables were laid out near the case, and the gallery was closed off to everyone except the curator and colleagues installing the specimens. The specimens were installed onto the glass shelves, with the extractor fan running. A ladder was used inside the case to install the higher shelves first.

The central shelving was installed once the rear specimens were on the shelves, carried out by Meyvaert under the supervision of the curator. The floor to the case was made from Corian tiles, which had to fit between the shelves. This was done alongside the installing of the next row of shelving. Specimens were then installed into the middle shelves. The final front floor panels and shelves were installed by Meyvaert, and the final specimens installed (Figure 8).

Summary

This new case designed for the spirit collections was not without complexities. It required close collaboration between the museum staff, the design company, the display case makers, the graphic installation team, and outside colleagues. This was vital because there were several challenges with such a large case with an enormous number of specimens containing hazardous fluids. It was vital that there was clear communication throughout the design process to

Figure 8. The completed spirit case, displaying 1140 marine specimens. (Photo Jan Freedman)

ensure that the case was designed to be accessible, safe, and visually stunning for the specimens. The team held several face-to-face meetings to discuss the requirements, and detailed drawings were assessed, and comments were fed back with recommendations for improvements. With input for several specialists from different areas, and good communication throughout the process, the case had no difficulties during instillation, and was built with the key safety elements to prevent risk to the visitors.

Displays in museums need to show the specimens for visitors to see them up close, and not just be a mass of specimens. This was a really important element to this display. Working closely with the case designs, the shelves were divided into groups so that they would be easily identifiable by the visitors, and the stories for each grouping was clear in the accompanying labels.

The largest challenge of this case was the installation of the specimens. This had to be planned to the jar. Each jar had a specific place on each shelf, and after conservation, they were labelled to the corresponding shelf. Safely transported in order, they could be installed by matching the label to the exact position on the shelf.

The resulting case displays 1140 spirit specimens from floor to ceiling. The visitors have the opportunity, many for the first time in their lives, to see marine life up close. Not just a crab or an octopus, but an enormous variety of marine animals showing the beautiful biodiversity of life that is hidden just beneath the waves.

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References:

Freedman, 2011. Type specimens discovered in the spirit preserved collections at Plymouth City Museum and Art Gallery. *MBA News.* **46.**

Freedman, J. 2012. Undertaking an effective review of natural history collections. *NatSCA News.* **25.** pp.25-42.

Freedman, J. 2021. Hidden Gems: Using collections in museums to discover the motivations of collectors. *Collections: A Journal for Museum and Archives Professionals.* pp.1-8. DOI: 19.1177/1550190621998220

Marine Biological Association, 1904. Plymouth Marine Invertebrate fauna. Compiled from the records of the Laboratory of the Marine Biological Association of the United Kingdom. **7(2).** pp.155-298.

Marine Biological Association, 1931. *Plymouth Marine Fauna.* 2nd Edition. Compiled from the records of the Laboratory of the Marine Biological Association of the United Kingdom. pp.1-371.

Marine Biological Association, 1957. *Plymouth Marine Fauna.* 3rd Edition. Compiled from the records of the Laboratory of the Marine Biological Association of the United Kingdom. pp.1-457.

Moore, S. 1999. Fluid Preservation. In: Carter, D. & Walker, A. (eds). (1999). Chapter 5: Care and Conservation of Natural History Collections. Oxford: Butterworth Heinemann, pp. 92 - 132.

MSDS, 2015. Safety Data Sheet Methylated Spirit 99 V/V 74 OP LRG. According to Regulation (EC) No 1907/2006, Annex II. Reagent. Available at www.reagent.co.uk

Stoddart, R.W. Fixatives and preservatives, their effects on tissue. In *Conservation of Natural History Specimens. Spirit Collections.* Horie, C. V. (Ed). Proceedings from a one day course at The University of Manchester on 1st June 1989, organised by The Manchester Museum and the Department of Environmental Biology, The University of Manchester. pp.1-31.