FNAL REPORT TO THE UNIVERSITY OF HAWAI'I AT HILO MARINE OPTION PROGRAM

The Pacific Tsunami Museum (Internship)

Victor Ciaramitaro

Marine Science Department
University of Hawai'i at Hilo

MOP ADVISOR

Dr. Steven Colbert, Associate Professor
Division of Natural Sciences
University of Hawai'i at Hilo

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Abstract

The Pacific Tsunami Museum in Hilo, HI is among the most important museums on the Hawaiian Islands. The museum is our constant reminder of the dangers that are tsunamis. Located in the middle of the Pacific Ocean, prone to large waves and seismic events, we are constantly at the will of nature. What makes the museum so important is the reliable information it provides to those who come in and walk through the displays. My part in this project is to refurbish the, "Tsunami Warnings," section of the museum This section is just as significant as any other part in the museum because it details how we detect tsunamis within seconds of any tsunami-generating event. The final product described, in form of redesigned display, showed the process how tsunamis are detected in the open ocean and how we are alerted via the barometric pressure recorder. Working with Dr. Walter Dudley, George Curtis, Barbra Muffler, Marlene Murray, other staff, I have provided the museum with an effective way to translate this complex event that happens into a style that is manageable for the community to understand at all levels.

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Introduction

According to the theory of Plate Tectonics, we are standing upon active plates that push and pull from each other. These movements are bound to lock and hold until they give way. At any given moment we are vulnerable. Some consequences of such an event can cause traumatic shaking, which in turn, brings devastating destruction to its surrounding areas. On land, earthquakes can be felt approximately within a 500 km radius (USGS, 2014). Another resultant of earthquakes is a tsunami. Tsunamis are shallow water waves, which means their depth is much less than that of its wavelength. Tsunamis are known to travel across the globe in 24 hours. They can travel at speeds of 970 km/hr, reach a height of 30 m, and go as far inland as 16 km (NOAA, 2015).

To prepare for the worst conditions, the targeted area of the tsunami must be well informed as soon as possible so they can prepare themselves and the community. The Barometric Pressure Recorder is an instrument-recording device used by the National Oceanic and Atmospheric Administration (NOAA, 2015) so that minor changes in sea level can be detected and therefore tsunamis revealed. This device, also known as a DART (Deep-ocean Assessment and Reporting of Tsunami) buoy, can be utilized at depths of 5000 m. As a tsunami wave crest passes over the instrument, the increased pressure causes the Bourdon tube to uncurl, stretching the quartz crystal and increasing the vibrational frequency (Eble and Gonzalez, 1991). When this event happens, signals are transmitted to satellites in space, which are then emitted back to earth, and the data can be evaluated. Computer simulations that observe the sequencing patterns of the DART buoys during tsunami events are now able to predict the size and strength of these waves when they reach a destination (Okal and Synolakis, 2016). Extensive research in highly active areas have allowed scientists to build scenarios of possible tsunami events to better help the locations that are susceptible to the damage of a tsunami (Titov et al. 2001).

The physical damage of tsunamis is the most apparent. As the waves reach inland, buildings are flooded, destroyed, and washed away. One concept most viewers around the world tend to forget is the mental damage that tsunamis cause. Post Traumatic Stress Disorder (PTSR) scores were found highest from people in heavily damaged areas. Compared to neighboring places, a decline in scores was shown. Loss of relatives and property were shown to have the highest correlation with higher PTSR scores (Mental Health in Sumatra After the Tsunami, 2008). Not only does the physical damage hurt the community, but as can be seen as well is the mental health of the community and those around them are also in danger of being destroyed with the waves.

This information is essential for coastal habitants. Habitants on the coast must be completely informed and aware of the dangers of living on the coast. The mission of the Pacific Tsunami Museum is that through education and awareness, we believe that no one should die due to a tsunami. The goals of the Museum are to promote public tsunami education and to preserve history. The Museum serves as a living memorial to those who lost their lives in past tsunami events. (Pacific Tsunami Museum, 2014). I propose to work in collaboration with the Pacific Tsunami Museum in downtown Hilo, HI. By

working with Dr. Walter Dudley and other members and to refurbish the, “Tsunami Warning,” portion of the museum.

This is a key project because Hawaii stands in the middle of the Pacific Ocean. The Pacific Ocean is outlined with the infamous “Ring of Fire.” This makes plate activity very active, not to mention the fact the island is built up on volcanoes. Earthquakes and other sources of tsunami generation are to be taken very seriously on the islands since they have all been hit a multitude of times.

Objectives

My goal is to provide the museum with interactive forms of information so that people of all ages who come in, have the patience and ability to learn something before they walk out. The information already provided to the public is, to a certain degree, long and tedious to read. For many reasons, this is the only way because to explain such a complex event in small words is difficult. I hope to intrigue visitors as they walk into the museum and have them walk out the museum with a clear description in their minds of what happens during a tsunami-generating event.

Methods and Materials

The Pacific Tsunami Museum is located in downtown Hilo, HI. It contains numerous displays of about the history of tsunamis. Tsunamis occur all around the world and so, affect everyone. The museum does an extremely good job to represent that. They have displays that range from what is a tsunami to recorded interviews from the survivors of tsunamis, measuring utensils, emotional pictures, artifacts from the damage of previous tsunamis, and, the most popular, interactive exhibits that let you learn hands on.

On Thursday afternoons each week, from 1:00pm – 4:00pm or otherwise, I was at museum to work. The museum is divided up into distinctive sections. My focus was on the science room (Figure 1), specifically, the “Tsunami Warning,” portion of the room (Figure 2). For my portion of the room I started by researching into exactly what the barometric pressure recorder is and how it functions in the field. I then compressed all the information and put it in words easier to be understood by non-science intrigued people. While working with Dr. Walter Dudley and George Curtis, two well-known tsunami specialists, I built a display that effectively educates those who view it. This project took place from March 2015 to February 2016.

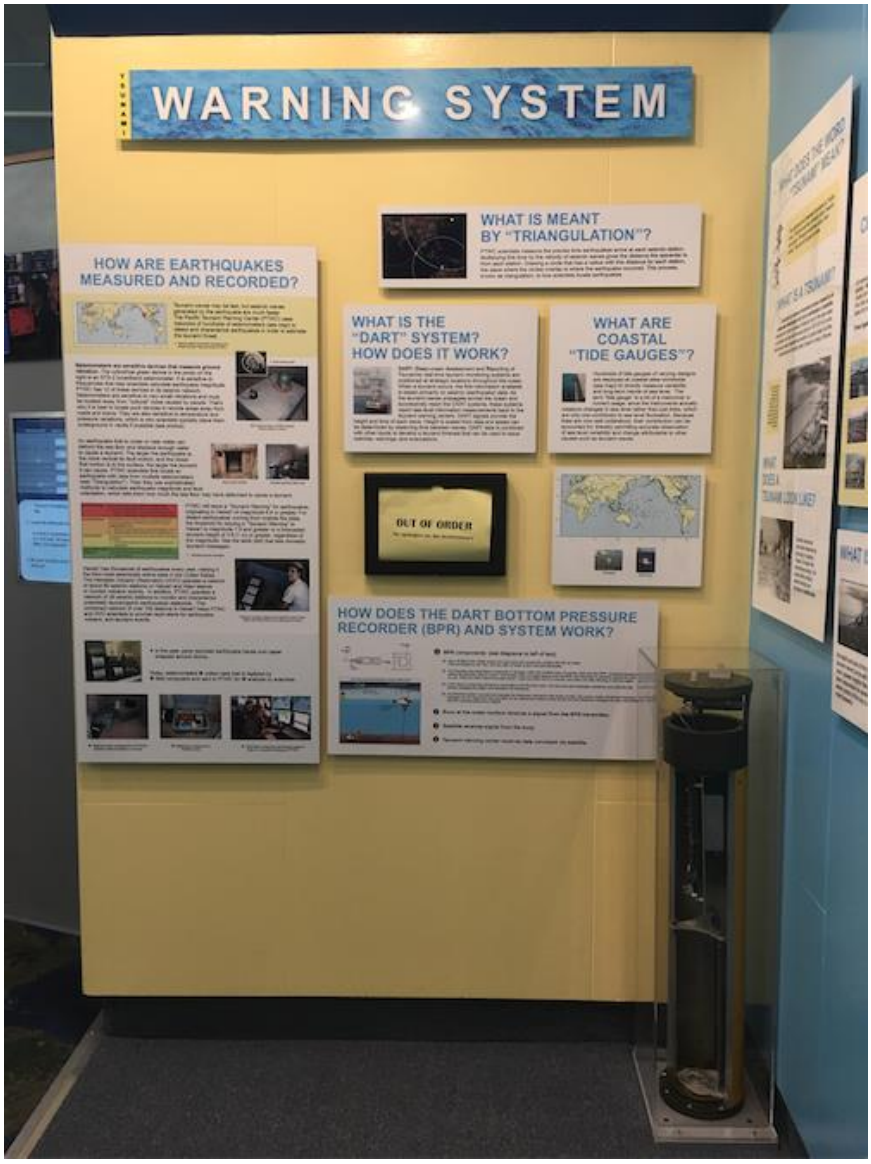
* [Figure 1] This picture encompasses the entire "Science Room" of the museum. Here all the scientific information obtained from a tsunami is portrayed through pictures and examples to detail the tsunami events in real time.

* [Figure 2]. The wall labeled with, "Tsunami Warning," will be reconstructed with information that is more suitable to those who come in. The pressure recorder, (device at the corner), will be my duty in this project so that this device can be explained thoroughly and effectively for the public.

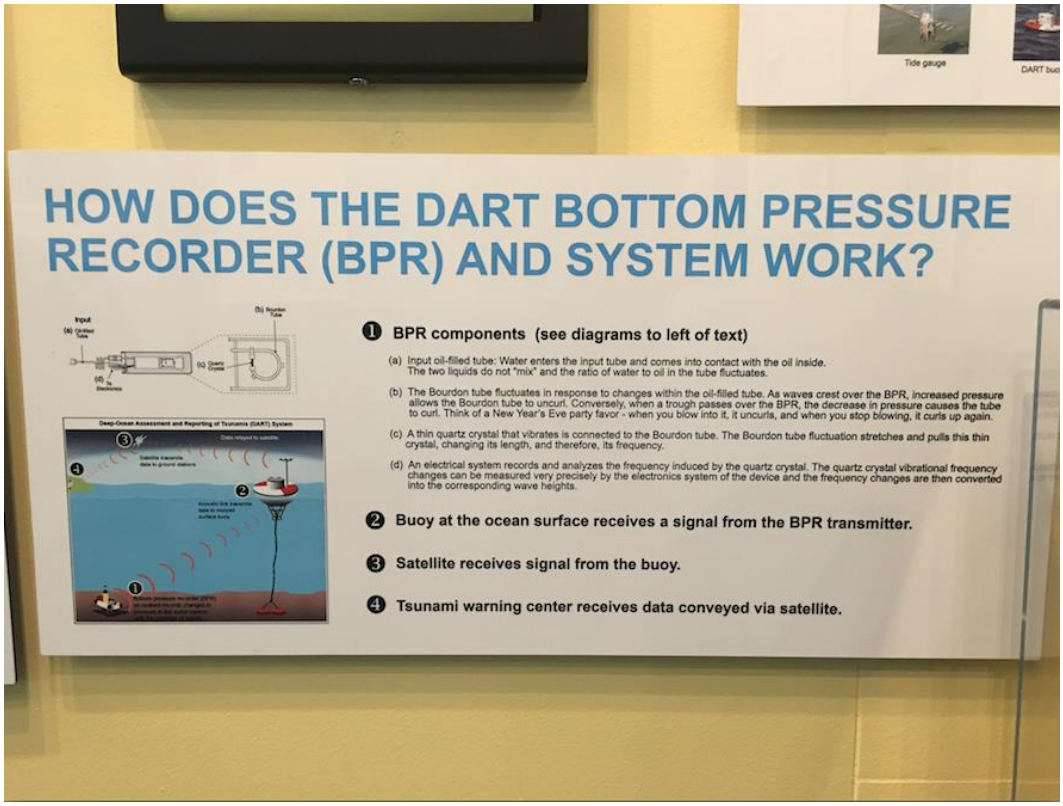
Results and Discussions

The final result of the project was a successfully created diagram with an easy overview of the functionality of the bottom pressure recorder. Through months of planning with the museum to coordinate funds for the reconstruction of the exhibit, a successful outcome

was achieved. I had come up with a couple designs for my display, which were influenced by the fellow tsunami experts I worked with. In FIGURE 3 the new design of the exhibit is much more lively and enjoyable to read. I have a simplified everything into a four step process with some explanation about how to detect an oncoming tsunami. The coloration of the wall and the placement of the displays play a vital role in capturing the attention of a visitor. One of the most attractive items in this whole piece is the touchscreen tablet that is to be placed in the slot that is covered by a paper. Here, most visitors are drawn to its interactive design and tend to spend most of their time at that location in the exhibits.



* [FIGURE 3]. New display that was the "Tsunami Warning" section and is renamed, "Warning System."



* [FIGURE 4]. My main piece of work put into this section of the Science Room.

Conclusion

The project at hand was an absolutely great experience. It was truly rewarding able to work with the executive director of a well-credited museum and two scientists that ware experts in tsunamis and the device I worked on to display. The Pacific Tsunami Museum does a fantastic job of keeping up with the interest of the public. The sleek modern look to the museum makes it easy for visitors of all ages to gain essential knowledge about the dangers of coastal living. The project from conception was to give the visitors of the museum a better understand of how tsunamis are detected before they cause any danger. The outcome of this project provided just that. The easy to approach display and coloration o the walls draws attention to its components and is able to effectively communicate to the visitors. The effort of all those who worked on the wall in the museum will be greatly appreciated for a long time to come. For those who walk into the museum will be met with a multitude of insightful information so that they can become familiar with and be aware of the real and natural power that the Earth holds.

References

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