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# Assessing Visitor Experience for the Te Papa Natural Environment Zone Renewal

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## Assessing Visitor Experience for the Te Papa Natural Environment Zone Renewal

A report to inform the renewal  
of the Natural Environment Zone at the  
Museum of New Zealand Te Papa  
Tongarewa.

March 2, 2017

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*Sponsored by:*  
*The Museum of New*  
*Zealand Te Papa*  
*Tongarewa*

# Assessing Visitor Experience for the Te Papa Natural Environment Zone Renewal

An Interactive Qualifying Project  
submitted to the Faculty of  
WORCESTER POLYTECHNIC INSTITUTE  
in partial fulfilment of the requirements for the  
degree of Bachelor of Science

by  
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Date:  
2 March 2017

Report Submitted to:

Dr. Dean Peterson, Dame Claudia Orange  
Museum of New Zealand Te Papa Tongarewa

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*This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI, see <http://www.wpi.edu/Academics/Projects>.*

## **Abstract**

This project aimed to provide recommendations to the Museum of New Zealand Te Papa Tongarewa for its Natural Environment Zone renewal. We evaluated the current exhibitions and assessed the visitor experience through observations and interviews. We found that visitors enjoy eye-catching displays that promote emotional connections and hands-on involvement. We recommend that the renewal content focuses on aspects unique to New Zealand, maintains a connection between humans and the environment, and incorporates mātauranga Māori throughout. The results of this study support the museum's approach to the renewal and highlight opportunities for further improvement.

## Executive Summary

### *Introduction and Background*

The mission of the Museum of New Zealand Te Papa Tongarewa is to embody and promote Aotearoa New Zealand's rich diversity of culture, wildlife, and nature through community education and awareness. As part of this ongoing effort, the museum is in the process of thoroughly renewing the exhibitions that comprise its Natural Environment Zone. The renewed galleries will convey important lessons about the role humans play in caring for New Zealand's natural environment by helping audiences feel a connection to nature and natural history. The goal of our project was to evaluate the visitor experience in the current Natural Environment Zone exhibits and develop recommendations for the renewal based on our findings.

Currently, the Natural Environment Zone consists of three distinct thematic sections called Mountains to Sea, Awesome Forces, and the temporary Bug Lab exhibition. These exhibitions are located in different galleries of the museum and focus on different aspects of the natural environment. Mountains to Sea showcases the biodiversity of Aotearoa New Zealand, showing the environments, animals, and plants that make the country so unique. It also houses the *Colossal Squid*, a more recent addition to the exhibition. Awesome Forces contains displays and interactives about natural phenomena such as earthquakes, volcanic eruptions, and tsunamis. Bug Lab is a temporary exhibition that will soon travel internationally. It showcases many different kinds of insects and arachnids, from the jewel wasp to the orchid mantis. This exhibit features many interactive elements to encourage visitor engagement and learning, and illustrates what Te Papa would like to achieve in the renewal of the Natural Environment Zone.

Museums in general have begun to incorporate more entertaining and interactive elements in their exhibits. A term called the "new museology" has emerged to describe how museums have become more visitor-centric and focused on engaging and educating the community (Davidson & Sibley, 2011). Evaluating the visitor experience has played a central role in efforts to make museums and exhibits more visitor centric. Evaluation is typically divided into formative and summative approaches (Screven 1990). We conducted a summative evaluation using tracking studies and exit interviews to gauge visitor satisfaction with different elements of the existing exhibits (Kelly, 2004; Walhimer, 2012).

### *Approach*

Our first order of business was to tour the Natural Environment Zone as visitors and record our own experiences. We individually conducted a critical assessment of the content and design of the gallery based on personal observation. This allowed us to become more familiar with the content, design, and layout of the Natural Environment Zone.

To fully understand the intentions for each gallery, we conducted semi-structured interviews with some of the Science curators in charge of the galleries and exhibits in the Natural Environment Zone. We also interviewed Māori Studies curators about their wishes, perspectives, challenges, and goals for the renewal project.

To assess the visitor experience in the Natural Environment Zone, we used a combination of visitor tracking, observations, and exit interviews to gather data. This allowed us to combine many different data sets to inform our analysis of visitor engagement in the Natural Environment Zone. To obtain in-depth perspectives, we pursued conversation-based, semi-structured

interviews with the visitors. These interviews were semi-structured with some prepared questions, but were ultimately guided by the flow of conversation with each visitor.

After our data collection, we analyzed the results from the observations and the interviews. We identified underlying themes, such as if visitors prioritized social interaction versus deeper engagement with the material. We compared these data across the three galleries that we analyzed to determine trends in popular interactives.

### Findings

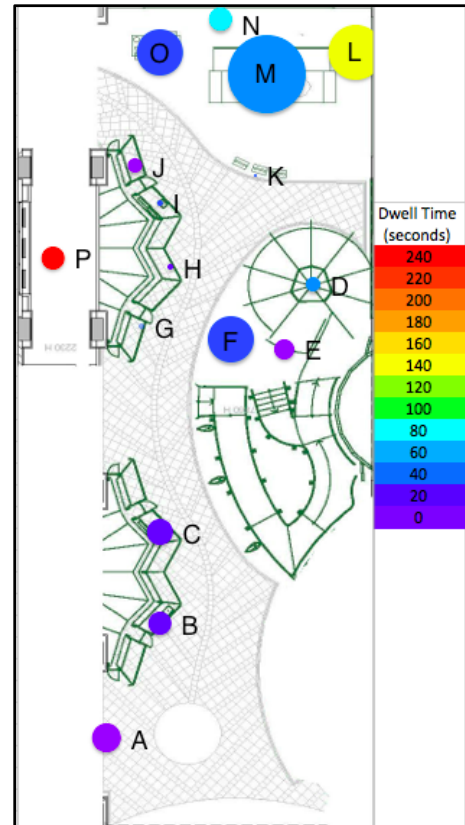
Mountains to Sea contains mostly traditional museum elements, such as taxidermy, species indices, and text panels arranged around diorama cases. As we went through the exhibition, we noted many wordy labels with extensive descriptions, although many lacked Māori interpretations or translations. We found the *Colossal Squid* exhibit to be more noteworthy than the rest of the gallery, and we were excited to watch the video of the team that researched it, as well as engage with the touch screen that told more about the squid's biology.

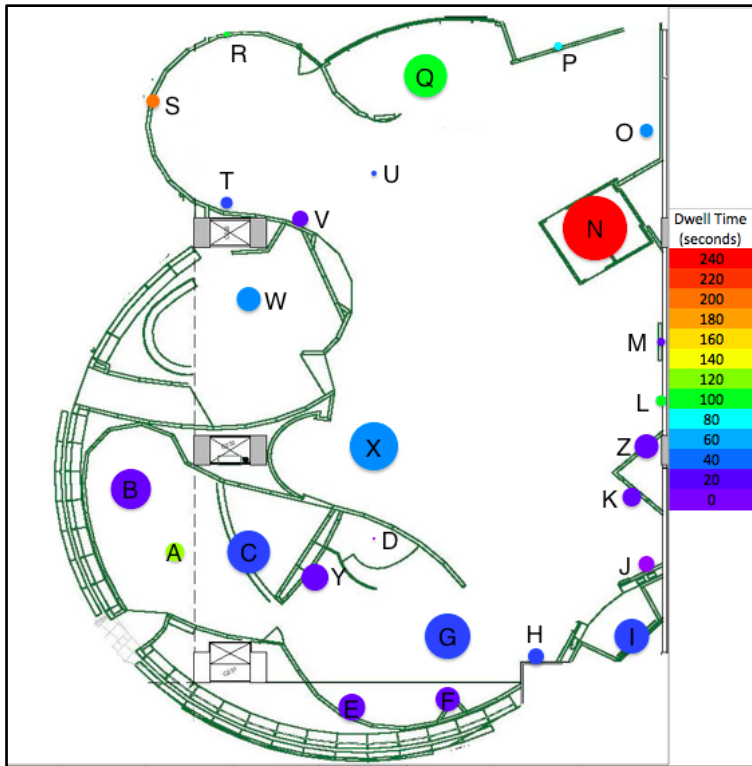
After our site evaluation, we tracked visitors and noted their dwell times and behaviors at each exhibit within the gallery. We created a heat map of all of the noteworthy exhibits (see right), where the size of the circle indicates how many of those tracked visited the exhibit, and the color of the point reflects how long they stayed (i.e. 'dwell time'). The dwell time is the average time that tracked visitors spent at each exhibit. From the 31 visitors that we tracked in Mountains to Sea, we found that they spent an average of 14 minutes in the exhibition. The most popular element was the *Colossal Squid Display Tank* (M), which attracted 27 out of the 31 tracked visitors.

After gathering this data, we pursued interviews with visitors to determine the more subjective aspects of the visitor experience. The squid again appeared to be the most popular attraction. Out of 31 interviews, 21 identified the squid as their favorite part. Five were fascinated by its huge size, 12 were drawn to it because it was so bizarre and the only one of its kind on display in the world, and 4 did not cite a reason. Many of these respondents were "browsing" and/or "killing time," and admitted to not looking hard enough at the information provided in the exhibit. However, 11 of our respondents felt that they learned something about the squid during their visit.

Overall, Mountains to Sea was praised for its large variety of animals and accurate depiction of New Zealand wildlife. However, visitor interviews indicated that the exhibit is outdated and fails to meet Te Papa's current vision. Most visitors noted that compared with other exhibitions, it was primarily factual and lacked emotional content.

Awesome Forces covers a range of topics, including tectonic plates, earthquakes, volcanoes, water levels, and the evolution of Zealandia. While we found all of these topics to be interesting, we noticed a lack of cohesion among the displays. There is such a diverse range of information, that it sometimes seemed disjointed and lacking in a logical or thematic flow.





After experiencing Awesome Forces for ourselves, we observed other visitors to note their interactions and dwell times at each exhibit (left). In Awesome Forces, 31 visitors were tracked, with 18 minutes being the average time spent in the exhibition. This average is influenced by an outlier in our data collection, who spent a total of 78 minutes in this gallery. Removing the outlier reduces the average time in the gallery to 16 minutes. The *Earthquake House* (N) attracted the most people, 24 of the 31 tracked visitors, and had the highest dwell time of 240 seconds.

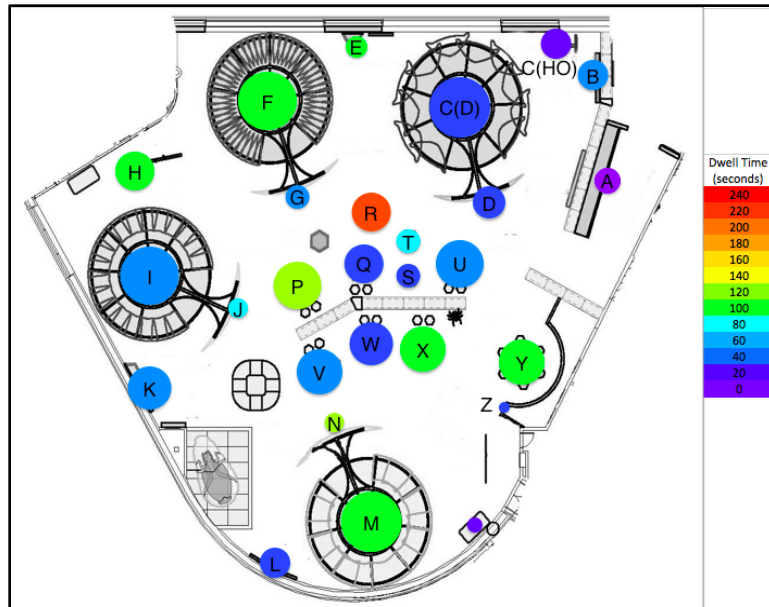
Several visitors identified favorite exhibit elements in Awesome Forces based on reasons ranging from the level of interactivity to personal interest. However, 14 out of 31 visitors identified the *Earthquake House* as

their favorite activity. Visitors also retained a variety of information when asked what they learned, including the movement of tectonic plates and how to prepare for an earthquake.

While we received very positive feedback from visitors, it was evident that visitors still felt that Awesome Forces needs renewing. One frequent Te Papa visitor specifically addressed this issue, citing some recent natural disasters that she would have liked to see in the gallery. Most visitors were tourists and came to learn about New Zealand earthquakes, but many felt underwhelmed. Another visitor suggested making the earthquake section more “in your face” because most countries do not experience earthquakes of New Zealand’s magnitude and cannot relate to the severity. When asked to compare Awesome Forces to other galleries, many had a personal interest or background in geology and preferred Awesome Forces for that reason.

The Bug Lab presents information about various types of bugs, including arachnids, myriapods, and insects. There are four large chambers, each with a dynamic display, three of which were created by Weta Workshop. These chambers give particular focus to the orchid mantis, the dragonfly, the jewel wasp, and the Japanese honeybee. We enjoyed how the bugs were personified and given storylines, since it added an extra layer of information that we could connect with. We were also pleased to see all of the learning material about how humans use characteristics of bugs to develop new technologies, such as drones and exoskeletons. Our team comes from an engineering background, so we were enthusiastic to see something that was relevant to our interests. We also found this exhibit to be extremely interactive, with touch screens, videos, hands-on activities, and opportunities for teamwork.

We tracked visitors to determine which exhibits were the most popular and engaged visitors for the longest times (see right). In Bug Lab, we tracked 30 visitors and found that they spent an average of 35 minutes in the exhibition. The large displays attracted the most visitors, with both the *Display Lab: Orchid Mantis Model* (C(D)) and *Swarm Lab* (M) having 28 people enter. Similarly, 27 visitors entered *Flight Lab* (F) and *Venom Lab* (I). *The Bug Debate* (Y) appears popular from the heat map above, but out of the 21 visitors who stopped, only 3 actually completed the activity.



The results of our study pointed to patterns in visitor expectation that can assist Te Papa in its renewal process. Much of our analysis revealed that efforts that have been adopted in the renewal project are headed in the right direction to enhance visitor engagement, while some exposed additional opportunities for innovation. Our evaluation also uncovered a wide appreciation for the museum and its enormous contribution to both local and international visitors. Based on our evaluation, we recommend the renewal team:

- Focus on topics that are unique and native to New Zealand;
- Continue to develop and maintain a connection between humans and the natural environment;
- Explore ways to integrate mātauranga Māori from the start of the exhibit development and design;
- Keep information concise and simple, and use digital labels to encourage more in-depth learning;
- Embrace the peculiar and bizarre aspects of the natural environment;
- Create detailed and eye-catching displays; consider more partnerships with Weta Workshop;
- Arrange the layout of the gallery so that valuable or costly exhibits are front and center;
- Incorporate hands-on games and activities for engagement with both children and adults; and,
- Encourage Māori Studies and Science curators to collaborate when developing content that relates to mātauranga Māori.

Overall, our evaluation of visitor experience has shown the full extent of visitor satisfaction and appreciation of Te Papa being an acclaimed national museum and international source of education. We are honored to have been able to contribute research and recommendations to further help Te Papa in its vision of *Changing Hearts, Changing Minds, Changing Lives*.



## **Acknowledgements**

We would like to recognize the individuals who have supported our team during the past seven weeks. Their guidance and advice were greatly appreciated throughout the implementation of our project.

We would first and foremost like to thank our sponsoring organization, the Museum of New Zealand Te Papa Tongarewa, for partnering with Worcester Polytechnic Institute and giving us the opportunity to contribute to the Natural Environment Zone renewal. We would like to especially thank Dr. Dean Peterson, Head of Science, and Dame Claudia Orange, Research Fellow, for their guidance.

We are grateful for the support of the Natural Environment Zone renewal team, the Science curators, the Mātauranga Māori curators, and the entire staff at Te Papa for their support of our project and willing participation in interviews. Special thanks to Susan Waugh for looking after us at the Tory Street building, to Ricardo Palma for giving us a tour of the extensive collections housed at Te Papa, and to Chloe Johnston and Celeste Skachill for guiding us in our data collection.

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Thank you.

## Authorship

All authors contributed equally to this work. We were in constant collaboration throughout research, data collection, analysis, and writing. Below is a list of tasks that individuals were responsible for. Any component of this report that is not listed here can be assumed to have equal contributions by all authors.

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- Visitor path maps
- Demographic information

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- Visitor observation data analysis

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- Exhibition maps
- Heat map figures
- Decay curve figures and analysis
- Final formatting of report

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- Visitor interview analysis

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## Glossary

- *Kaitiakitanga*: Guardianship and protection of the environment; a shared responsibility for all New Zealanders (Peterson, 2016)
- *Mana*: Authority, power, and prestige; extraordinary power, essence, or presence (Museum of New Zealand Te Papa Tongarewa, 2014)
- *Mātauranga Māori*: System of knowledge used by the Māori to explain, interpret, and understand the world (Museum of New Zealand Te Papa Tongarewa, 2014)
- *Mauri*: The unseen “life force” common to all animate and inanimate things (Peterson, 2016)
- *Māui*: Māori cultural hero (Peterson, 2016)
- *Museology*: Best practice in museum development and implementation (Museum of New Zealand Te Papa Tongarewa, 2014)
- *Tangata whenua*: The indigenous or first people of the land (i.e. Māori) (Museum of New Zealand Te Papa Tongarewa, 2014)
- *Taonga*: Treasure or property that holds value (i.e. objects, narratives, languages, forms of cultural expression) (Museum of New Zealand Te Papa Tongarewa, 2014)

## Chapter 1. Introduction

The mission of the Museum of New Zealand Te Papa Tongarewa is to embody and promote Aotearoa New Zealand's rich diversity of culture, wildlife, and nature through community education and awareness. Once simply a repository for old artifacts and a place to look back and appreciate the past, the museum is now a source of education and a vehicle for social change. In fact, Te Papa's vision, *Changing Hearts, Changing Minds, Changing Lives*, encourages visitors "to understand and treasure the past, to enrich the present, and to meet the challenges of the future" (Museum of New Zealand Te Papa Tongarewa, 2014).

The museum is traditional in its guardianship of the nation's treasures, yet modern in its expression of cultural diversity and its dedication to the future of society. This vision guides the topics, designs, and content of their galleries. The museum prides itself on incorporating interdisciplinary approaches and bicultural themes throughout its work in order to fully contribute to the care and growth of Aotearoa New Zealand's inhabitants. To that end, Te Papa has identified three philosophies--Mana Taonga, Museology, and Learning--that contribute to the realization of their vision. Mana Taonga refers to the recognition of the authority and value of cultural treasures and expression; it is an acknowledgement of the respect that is owed to minority, particularly Māori, narratives and knowledge. It is also an empowerment of the cultural and spiritual diversity enabled by these narratives and traditions (Museum of New Zealand Te Papa Tongarewa, 2014). Museology refers to Te Papa's goal to fulfill the specific needs of the community by incorporating interactive experiences in their gallery. Learning, in this context, refers to Te Papa's dedication to address and provide a range of experiences in terms of learning styles, and echoes the value that Te Papa places on education.

The museum continually strives to reshape and reinvigorate its exhibits and programs in its efforts to pursue these three philosophies. As part of this ongoing effort, it wishes to evaluate and renew its Natural Environment exhibition through the use of digital technology and innovative approaches in the presentation of its conceptual framework of the natural environment. Te Papa hopes to convey important lessons about the role humans play in caring for New Zealand's natural environment by helping audiences feel this connection. The museum seeks to be a "forum for the future" by modernizing its exhibits while preserving and



appreciating New Zealand's traditional culture and characteristics that make it so unique (Museum of New Zealand Te Papa Tongarewa, 2014).

The goal of this project was to develop recommendations for the renewal of the Natural Environment Zone. In order to accomplish this goal, we analyzed the current exhibitions, assessed visitor experience, and proposed recommendations for the renewal based on visitor and staff feedback. We provided Te Papa with strategies to inspire visitor learning and a mindset towards the preservation of the natural world.

## **Chapter 2. Literature Review**

This chapter covers topics relevant to the renewal of the Natural Environment Zone in Te Papa. We first cover key points about New Zealand's unique flora and fauna, as well as its preservation of biculturalism. We then provide more information about Te Papa's vision and history, and go into more depth with the Natural Environment Zone Renewal. Finally, we conclude with a section on museum visitor studies.

### **2.1 Natural History and Cultural Identity**

Aotearoa New Zealand has a rich diversity that contributes to its national identity. In order to approach this project, we needed to recognize this complexity and the interplay of diversity, culture, and history, with regard to the environment.

#### *A History of Altered Landscapes and Wilderness*

New Zealand has many environmental wonders. It is home to a broad range of geographical features, including glaciers, fiords, mountains, plains, volcanoes, subtropical forests, and beaches (Essential New Zealand, n.d.). The country sits on two tectonic plates which create numerous earthquakes and extensive, ongoing geothermal activity. All of these environments contribute to the national identity, which emphasizes concern for environmental issues such as water quality, biodiversity, and climate change. The country is home to unique species of animals, such as the kiwi, the kakapo parrot, the Māui dolphin, and the takahe which have been threatened by the introduction of exotic species and habitat destruction (Essential New Zealand, n.d.). The Department of Conservation claims that New Zealanders have the responsibility to protect the biodiversity in their country, and that “people’s lives are enriched through connection to nature” (Department of Conservation, 2016).

#### *Incorporating Multicultural Perspectives*

The Māori people are a significant part of New Zealand culture; their heritage is protected by the Treaty of Waitangi, which was established as an agreement between the “people of the land” and the new European settlers in 1840 (Ministry for Culture and Heritage, 2016).

This treaty has set the course for a long history of collaboration between the Western world and the indigenous peoples of New Zealand.

The preservation of Māori heritage is therefore a significant part of New Zealand's identity. Māori heritage is represented in a variety of media: physical, such as burial sites and buildings; natural, such as rivers or mountains; and intangible, such as the language and rituals (Heritage New Zealand, 2016). Each of these aspects is important to upholding the tradition of Māori culture, and to preserving the diversity of New Zealand communities. These are all encompassed by the term *mātauranga Māori*:

*“Mātauranga Māori in a traditional context means the knowledge, comprehension or understanding of everything visible or invisible that exists across the universe...mātauranga Māori takes many forms, including language (te reo), traditional environmental knowledge (tāonga tuku iho, mātauranga o te taiao), traditional knowledge of cultural practice, such as healing and medicines (rongoā), fishing (kai moana) and cultivation (mahinga kai)” (National Library of New Zealand, 2011).*

The Māori body of knowledge is integral to the identity of New Zealand. It is critical for New Zealanders to keep these traditions alive and preserve *mātauranga Māori*. This is particularly important when considering the perspectives of scientific research and *mātauranga Māori*. For example, the concepts of *mauri* and *kaitiakitanga* complement scientific findings to inspire people to take action and protect the natural environment. *Mauri* is the “life force” that all animate and inanimate things possess; this includes humans, animals, and plants, as well as rivers and rocks. *Kaitiakitanga* is the responsibility to guard and protect the environment that all New Zealanders share. These concepts are used in Te Papa's exhibitions to connect visitors to the natural environment and emphasize humans' obligations and duties to the natural world (Peterson, 2016).

## **2.2 The Museum of New Zealand Te Papa Tongarewa**

The Museum of New Zealand Te Papa Tongarewa is dedicated to “tell the whole story of Aotearoa New Zealand” (Museum of New Zealand Te Papa Tongarewa, 2014). This broadly describes its goal to address the cultural, environmental, and historical aspects of the New Zealand community in their diverse range of exhibitions. The museum is committed to providing

a forum for people of every background to preserve the heritage of New Zealand, explore the contemporary issues facing the community, and engage in discourse and learning about the future of the nation.

Te Papa has identified six strategic intentions on which to focus its responsibilities as a museum. They are: Accessing all Areas, Connecting with People, Housing the Treasures, Sharing Authority, Being a Forum for the Future, and Saving the Planet (Museum of New Zealand Te Papa Tongarewa, 2014). These intentions are meant to guide Te Papa in fulfilling its goals of audience engagement, sharing collections, and supporting cultural and intellectual leadership. The museum is also committed to meeting the ever-changing needs of the people of Aotearoa New Zealand. With the growing popularity of mobile and personal technological devices, the museum must adjust its methods of information delivery in order to remain relevant and effective in serving the community. These technological changes have enhanced digital access to the museum collections and extended its international outreach.

Educating today's generation of museum visitors requires an understanding of how people are best engaged. Technology and social media have become an integral part of communication and learning. Te Papa is continuing the shift from traditional passive learning to a more interactive and stimulating experience for visitors through the implementation of technology (Russo, Watkins, & Groundwater-Smith, 2009). Many studies have shown that visitors prefer "hands-on" experiences (Gallo, Giapoudzi, Grimshaw, & Sabetta, 2015). Continuing to evaluate how visitors prefer to learn will support Te Papa as they create a learner-directed environment in which visitors have more control over their experience, thereby enabling more productive and meaningful engagement (Russo et al., 2009). The implementation of technology-based exhibits will contribute to Te Papa's overall goal of creating a hub of learning and a connection to New Zealand's taonga, or treasures.

### *The Natural Environment Zone*

Currently, the Natural Environment Zone consists of three discrete exhibition areas called Mountains to Sea, Awesome Forces, and the temporary Bug Lab gallery (see Figure 1). These galleries are located in different parts of the museum and focus on different aspects of the natural environment.

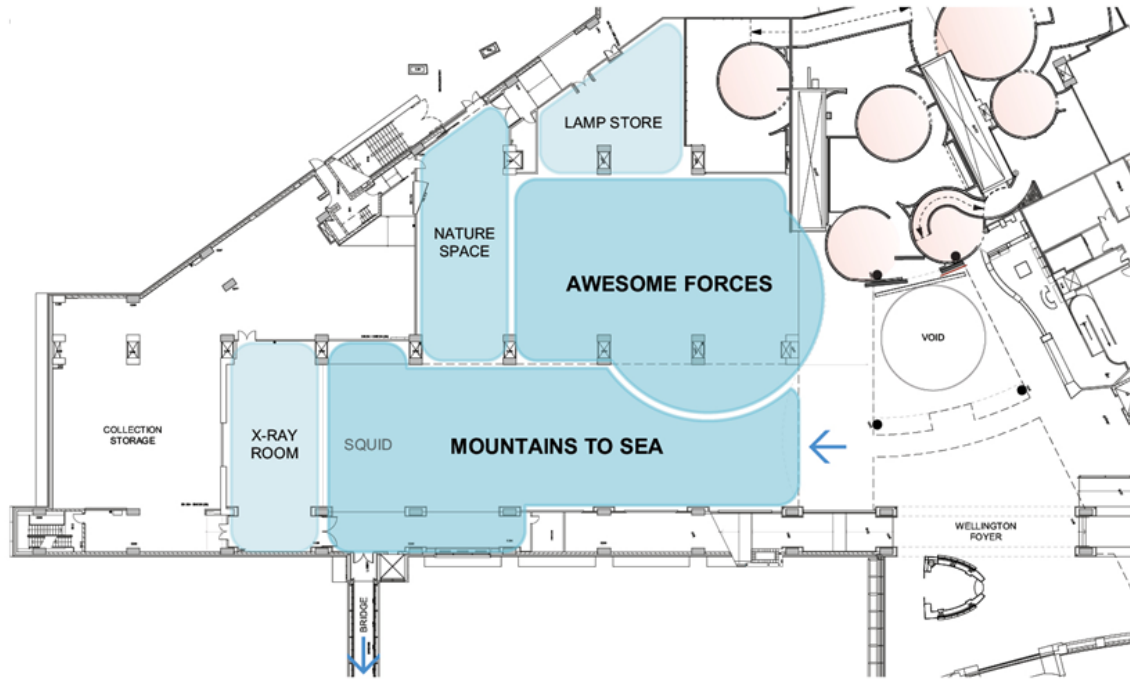


Figure 1. Map of Mountains to Sea and Awesome Forces (Bug Lab not pictured; it is on a separate floor in the travelling exhibition area).

Mountains to Sea was established at the museum's opening in 1998. It showcases the biodiversity of Aotearoa New Zealand, showing the environments, animals, and plants that make the country so unique. It also houses the *Colossal Squid*, a more recent addition to the exhibition. Awesome Forces was installed in 1998 and contains displays and interactives about natural phenomena such as earthquakes, volcanic eruptions, and tsunamis. There is also information about the supercontinent Gondwanaland, as well as displays of extinct species that used to reside in New Zealand. Both of these exhibitions have been refreshed over the years, but are still showing some age in terms of the way the artifacts are interpreted. They house static displays, such as dioramas in cases, and they include relatively little Māori text or interpretation. Bug Lab, on the other hand, is a temporary exhibition that opened in 2016 and will soon travel internationally. It showcases many different kinds of insects and arachnids, from the jewel wasp to the orchid mantis. In addition to the information about characteristics of these diverse creatures, there are also stations where visitors can learn about how bugs have inspired humans to build and engineer devices such as drones and prosthetics. This exhibition features many

interactive elements to encourage visitor engagement and learning, and illustrates what Te Papa would like to achieve in the renewal of the Natural Environment Zone.

Te Papa has recently adopted a new set of principles that express the overarching interpretive approach of the renewal of the Natural Environment Zone, which together form the acronym INSPIRE. Through the renewal, Te Papa hopes to Inspire wonder, Nurture diversity, Shake things up, Prepare for the future, Invite involvement, Reach out, and Empower our communities. These principles will guide the renewal to promote experiences that incorporate bicultural themes, inspire sustainable futures, encourage participation and innovation, and empower visitors to share their perspectives.

The team behind the renewal has identified goals for its development which focus on what visitors should Think, Feel, Do, and Do Next while going through the galleries. These new exhibitions will connect more closely with visitors by fascinating them and promoting appreciation for New Zealand's unique landscape and diversity. They are being designed to raise concern in visitors by pointing out how human activity may affect their way of life in the future or how the country's biodiversity is declining. However, the renewal will avoid adopting an accusatory or depressing tone, which front-end evaluations indicate alienate rather than engage audiences, and will instead take a more empathetic route by explaining both the Māori and the European settlers' intentions as they tried to acclimate to a new country. The museum hopes to raise excitement for the future by showing visitors options for getting involved in current preservation and restoration projects. The new exhibitions aim to inspire visitors to take action based on the emotional connection they feel to the interactive content, stories, and characters that will be presented in the renewal (Williams, 2016).

The renewed Natural Environment Zone will begin with an entrance into Mahitahi, or Bruce Bay, along with an introduction to Māui, who is said to have been the first to set foot in Aotearoa New Zealand (Figure 2). This will provide a personified example of the many ways in which humans interact with the environment, allowing visitors to relate their own experiences to the content in the exhibitions. Using Māui can demonstrate the range of human interactions, including "curious exploration," "brazen exploitation," and "pioneering problem-solving" (Peterson, 2016). This can not only provide a valuable interactive experience for visitors, but also contribute to the conservation of Māori culture within the exhibition.

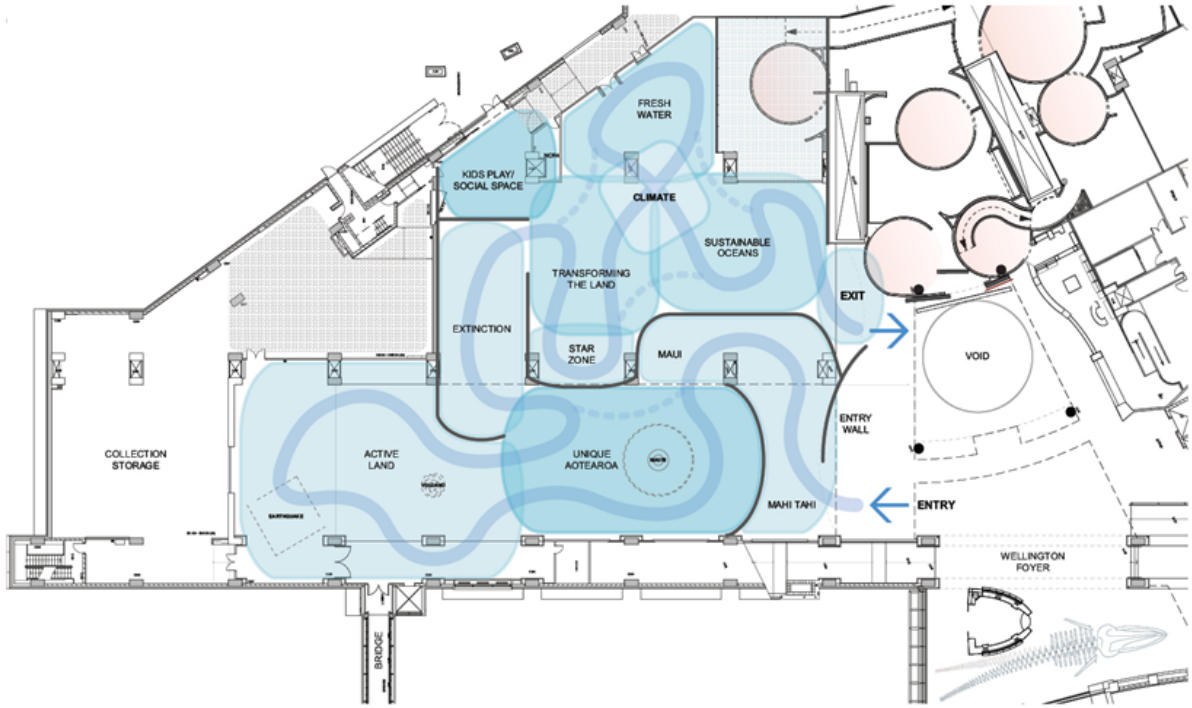


Figure 2. Renewal Concept for Natural Environment Zone.

The exhibition will then branch out into sections dedicated to environmental issues facing the country. This includes an area dedicated to extinct species, another focusing on the uniqueness of New Zealand and its biodiversity, and another featuring a “Dinozone”. There will also be separate sections exploring sustainable oceans, active land, waterways, climate change, and how human settlement has transformed the land. There will also be a Stardome that explores Māori constellations and stories, and an updated Bush City exhibition.

### *Museum Visitor Profiles*

In order to have the greatest impact on visitor experience, Te Papa adopted Morris Hargreaves McIntyre’s culture segments to target specific groups of people within their core exhibitions. Morris Hargreaves McIntyre are a research agency based in the UK with offices located in Australia and New Zealand (About Us, 2017). These culture segments, designed specifically for culture and arts, categorize visitors based on their beliefs and values as opposed to demographics or age. The culture agency makes recommendations specific to the needs of the institution’s findings (About Us, 2017). The three target groups that Te Papa is focused on are Expression, Affirmation, and Stimulation, with a stretch target being Entertainment. From

previous surveys, these three groups have been found to make up 59% of Te Papa's current cultural market, with Expression being 30% and Affirmation and Stimulation being 16% and 13%, respectively (Williams, 2016). People who are categorized under Expression tend to be social, creative, and are known to bring others together, while those under Affirmation tend to be young, culturally engaged families. Those classified under Stimulation are early adopters who seek challenge and take risks. The stretch target, Entertainment, makes up 7% of Te Papa's current cultural market and they tend to be younger, social adults who are drawn in by big ticket items. Targeting the four specific groups of visitors will help contribute towards fulfilling the museum's mission. A majority of the visitors in these groups are young individuals who are eager to help promote change. Furthermore, they tend to share similar ideals of learning and support audience engagement, which creates a more cohesive experience within the exhibitions. In addition to the target culture groups, Te Papa aims to reach three target social groups: Māori, children and families, and educators and learners. The target culture segments favor both families and Māori, which have higher percentages in all three segments than lone individuals and non-Māori.

### **2.3 The New Museology**

Museums have gone through somewhat of an evolution in the 21st century. A term called the "new museology" has emerged to describe how museums have become more visitor-centric and focused on engaging and educating the community (Davidson & Sibley, 2011). Museums have begun to incorporate more entertaining and interactive measures in their exhibits. Curators must come up with creative ways to keep their audience engaged. Museums can provide a space for visitors to learn, discuss, and debate issues that are relevant to their own realities. In this way, museums have evolved into agents of local and global impact. George Brown Goode, a former museum administrator at the Smithsonian, wrote the following about the new museology:

*"The museum of the past must be set aside, reconstructed, transformed from a cemetery of bric-a-brac into a nursery of living thoughts. The museum of the future must stand side by side with the library and the laboratory...as one of the principal agencies for the enlightenment of the people"*  
(Goode, 1891).



This idea prompted museums to shift their focus from the display of collections to the engagement of the visitors with those collections. It set the course for museums to become valuable places of learning for everyday people, rather than simply showcases of artifacts for intellectuals to admire (Goode, 1891).

### *Evaluating the Visitor Experience*

The visitor-centric focus of museums made necessary a system to analyze the visitor experience. Evaluating exhibitions is a lengthy process, with several phases. Our project is primarily focused on the summative phase, which is done when the exhibition is already in place. This phase involves getting feedback on how objectives were met, learning what messages got across to the audience, and determining their level of satisfaction, which is generally done through exit surveys (Kelly, 2004; Walhimer, 2012). Te Papa's Resource Guide "Know Your Visitors" stated that key features of surveys include standardized questions, conducting the survey as they leave, and making sure there is a representative sample (Te Papa National Services, 2001). This ensures that the answers are comparable without being biased, and by conducting exit surveys, we would not interfere with the experience visitors have in the museum.

In getting these surveys, it is important to understand that visitors have their own reasons for attending museums. Marilyn G. Hood (1993) researched this and found that non-frequent visitors believed that the messages conveyed by museums were not relevant to their own worldview, but were instead biased by the perspective of the "ideal museum visitor". Museums generally attract people who seek out new, stimulating ways to learn. In the United States and Canada, frequent visitors tend to come from upper economic, educational, and social classes. They believe that museums are challenging and will enhance their knowledge, whereas people of lower status tend to find museums overwhelming and confusing, which diminishes their experience (Pommerehne & Frey, 1980). Another factor that can deter people from visiting museums is the risk of museum fatigue. While most people may view this as a physical discomfort with the excessive amounts of standing and walking around, others may argue that it can be more of a psychological discomfort due to the "mental saturation that more often wears people out" (Hood, 1993). As a result, museums should accommodate the "average visitor", rather than the "ideal museum visitor" by creating an environment that is open to all different

types of learning styles and levels (Robinson, 1933). These findings verify the need to target certain culture segments, which encompass a range of diverse types of visitors.

Aside from surveys, there are many other means of studying visitors. In general, the methods of studying visitors fall into one of three categories: observations, talking to visitors, or examining a product of human activity. Observations often occur through tracking visitors through the exhibition or by timing them as they go about their business. Talking to visitors is where surveying comes into play, but this could also be done with methods such as questionnaires, comment cards, or focus groups. The last category covers activities such as recording visitor conversations or combining aspects of other methods. Each of these methods have advantages and disadvantages depending on the situation and other constraints (Hein, 1998).

### *Interactive Learning*

As museums have begun to adopt the new museology, new methods of visitor engagement have been explored. There have been many studies researching how visitors learn, which can be affected by the context, design, and presentation of information within an exhibition. A study by Stephen Bitgood explored what types of displays of information visitors retain the most. The study categorized different exhibits into objects, sensory impressions, and label content. It found that visitors are most likely to recall objects and are least likely to recall label content. Furthermore, the study found that the types of objects that were most recalled tended to be large or distinctive, including displays which were also interactive. Sensory impressions were also recalled frequently by visitors, including sounds, temperature, and lighting. Overall, label content recollection was the lowest, with only a few noteworthy labels being cited by visitors (Bitgood, 1994).

We adapted our definition of interactive from the interpretation of the project staff at the Smithsonian Institution. An interactive involves physical activity, intellectual and emotional engagement, and, occasionally, technology. An interactive includes a sensory experience that exceeds sight and requires visitor involvement. The interactive must successfully convey the information it was intended to teach and allow audiences to engage more deeply with the content. When the interactive is computer-based, it should allow the visitor “freedom of navigation,” giving them the opportunity to manipulate their learning experience to meet their

interests. A successful interactive is based on: relevant and interesting content; user-friendly, fun, and eye-catching presentation; and an outcome in which the user has become more engaged with the subject ("Developing Interactive Exhibitions at the Smithsonian," 2002). While interactivity is associated with technology, this is not necessarily the case. Identifying simpler interactives that meet the needs of interactivity as defined by the Smithsonian staff can be as easy as crayons and paper. Creating cost-efficient interactives will be key in the renewal since it has a limited budget.

Ben Gammon has done extensive research in interactive exhibits. He cites Corinne Hutt's theory of play, which separates play into three main categories: epistemic play, ludic play, and games with rules. Epistemic play involves problem-solving and exploration, ludic play is symbolic and suggests role play, and games with rules foster cooperation and competition. Each of these types of play is important to consider when designing interactive exhibits. Gammon found that in most science and technology museums, epistemic and game play are encouraged. However, while creative prompts for play can be beneficial for learning, Gammon warns that the games must be intuitive for visitors to behave with them as intended (Gammon, 2008). He outlines some characteristics of successful interactive exhibits; this includes providing the visitor with control over their experience, producing a comprehensible challenge with feedback, inspiring playfulness, encouraging shared experiences, and communicating a theme or message for the visitor to take with them (Gammon & Cutting, 2008).

We also considered lessons from the American Museum of Natural History in New York City, since prior research has identified many aspects of its exhibits as ideal. One exhibition raises natural disaster awareness through interactive stations that explain the workings of each natural phenomenon. Visitors have the opportunity to manipulate their experience and generate a virtual natural disaster or engage with an interactive map (American Museum of Natural History, 2015). This encourages a more informal setting for learning in which the visitors take charge of their own experience, and the interactive feature encourages greater engagement in the subject (Freeman et al., 2016; Russo et al., 2009). The museum also has exhibitions that contain live animals, use video demonstrations, encourage communication, and/or require physical exertion. Sometimes, the notoriety of the artifact alone is enough to draw visitors in, as seen with their famous taxidermy of Lonesome George, the last Pinta Island tortoise. This wide variety of exhibitions not only encourages participation and engagement, but also caters to many different

types of visitors. This museum has attempted to reach every visitor through different types of interaction and convey content in a manner that will best reach them. Museums foster a cycle of learning and experience; they provide knowledge to visitors, who in turn develop a connection to the subject and hopefully are moved to action. The American Museum of Natural History has demonstrated the successful implementation of recommendations provided by countless studies and surveys. It is a good example of best practices that we used to make informed and educated decisions about our own methodology.

### *Transforming Visitor Expectations*

Despite New Zealand's bicultural context, there are still struggles when it comes to including authentic Māori narratives. Tourists often arrive with stereotypical views of the Māori as being "traditional people frozen in time." This is perpetuated by tourists' generalized ideas and sometimes even aspects of the Māori tourism market, which fosters a one-dimensional view of indigenous culture to meet superficial commercial needs rather than address the heart of the culture. Findings have shown that the current state of tourist-Māori experience is brief and "romanticized" and that the indigenous culture is merely an "object of the tourist gaze" (McIntosh, 2004). Tourism has the potential to provide economic benefits and even independence to indigenous people without exploitation if handled properly. McIntosh's paper explores multiple studies focused on Māori culture that aimed to find a mutual balance between economic growth and cultural preservation, and found that a more meaningful experience would include closer and more sincere contact with the culture (McIntosh, 2004).

The limited perceptions adopted by tourists may be rooted in the clash of a science-driven world with the traditional beliefs of the indigenous people. Bringing mātauranga together with science is more important than ever. One case of a museum that has respectfully portrayed the indigenous culture in a contemporary manner where science can coexist peacefully with the traditional values of an indigenous culture is the Imiloa Astronomy Center. This museum was created as a result of years of conflict between indigenous Hawaiians and astronomers over the mountain called Mauna Kea, meaning White Mountain (Ciotti, 2010).

This mountain is a highly coveted site for astronomical observation. However, for the indigenous people of Hawaii, this mountain was the altar of Wākea, the sky god. The University of Hawaii at Hilo formed a team of educators, scientists, and community leaders to develop the

Imiloa Astronomy Center. The museum's exhibitions and attractions contain bilingual captions, and the museum parallels the seemingly contrasting themes of culture and science by pairing its exhibitions side by side in a cohesive manner. The Imiloa is designed to bring scientists, tourists, and native Hawaiians of all ages together in an educational and integrative environment to foster an informal learning setting (Ciotti, 2010; McIntosh, 2004).

Imiloa Astronomy Center is a great model for successfully portraying native cultural beliefs with the advancements of science in an equal manner. Imiloa has technologically advanced exhibitions that engage tourists and foster appreciation of indigenous culture. Assessing the success of this bicultural model can give us valuable insights for incorporating both mātauranga Māori and science in the Natural Environment Zone at Te Papa.

Another example of a museum incorporating an indigenous group is the Australian Museum. In 1997, the museum opened a new exhibition, Indigenous Australians: Australia's First Peoples. During the conceptual stages, the Project Team used front-end evaluation to ensure that the content of the exhibition would successfully reach the public. Front-end evaluation allows museum development teams to "understand how visitors comprehend and think about themes, ideas, concepts, and objects that will be displayed in an exhibition" (Downey, 2012). In exhibition development, Screven (1990) argued that the longest phase should be the planning period, as opposed to focusing on the current exhibitions. Thus, the Project Team chose to focus primarily on the development period and was able to effectively define the specific goals, strategies and content to use for the new exhibition. They created a list of steps to lay out the methods for the project, some of which include, "understand the goal", "generate ideas and concepts for testing", "gather and analyse data on visitor perspectives", "develop solutions", "test with the visitor", and "improve" (Kelly and Sullivan, 1997). By surveying people to determine which issues to include in the exhibition, the Project Team identified underlying themes to keep in mind when creating the exhibition, specifically leaving "a positive message for the future" and creating "a space where indigenous people can express, explain, and talk about their lives and experiences" (Kelly and Sullivan, 1997). The feedback from the surveys showed the hopes and fears people had for the new exhibition regarding the indigenous culture. Next, the Project Team developed some models to present to three focus groups, which consisted of families, indigenous people and schools, predominantly teachers of indigenous studies. The reactions from the three groups varied. Most of the families found the information presented to

be “too hard hitting”, while many of the indigenous people found it to be “insufficiently hard hitting” (Kelly and Sullivan, 1997). As for the teachers, they liked the content and believed that they could prepare people for the more emotionally-difficult elements. Ultimately, the different responses from the three groups allowed the Project Team to reassess their visions and goals for the project and further the progress of it. Instead of looking at the negative responses, the team made adjustments as needed and focused on the way the content was being presented to match visitor comfort, particularly the balance of serious content to be more spread out among the themes, including a positive view of the indigenous group for the future, and taking into account the suggestions made by the indigenous people.

## **2.4 Summary**

New Zealand is a unique place with a distinct natural environment and cultural identity. Among other topics, the country’s biculturalism is a tricky balance that the Museum of New Zealand Te Papa Tongarewa attempts to tackle in its Natural Environment Zone. The exhibitions that are currently in the museum will undergo a major renovation, and Te Papa has goals in mind for what the new museum will accomplish, and the audiences they want to target. The literature review identified methods for understanding visitor engagement. We used this information, along with our understanding of Te Papa’s mission, to inform the basis of our own study.

## **Chapter 3. Methodology**

The goal of this project was to provide the Museum of New Zealand Te Papa Tongarewa with recommendations for the renewal of the Natural Environment Zone involving the incorporation of engaging and future-proof exhibitions. The museum wanted to gain a better sense of visitor experience so that it could enhance the galleries in the renewal to increase audience engagement. Our objectives were to:

1. Understand the mission and vision of Te Papa;
2. Evaluate the visitor experience in Mountains to Sea, Awesome Forces, and Bug Lab; and,
3. Propose recommendations for the renewal based on visitor and staff feedback.

### **3.1 Understand the Mission and Vision of Te Papa**

Te Papa has an ambitious mission to tell the whole story of Aotearoa New Zealand. In order to properly ground our research, we reviewed the materials online and in the museum to better understand how Te Papa defines and accomplishes its mission. We conducted site evaluations of the three current Natural Environment Zone exhibitions: Mountains to Sea, Awesome Forces, and Bug Lab. We also interviewed the curators in charge of the renewal project to identify their vision and goals for the new galleries, as well as what they hoped visitors would take away from their experience.

#### *3.1.1 Site Evaluation*

Our site evaluation started with familiarizing ourselves with the Natural Environment Zone, which consists of Mountains to Sea, Awesome Forces, and Bug Lab. Our first order of business was to tour the Natural Environment Zone as visitors and record our own experiences. We individually conducted a critical assessment of the content and design of the gallery based on personal observation. We rated each gallery on a variety of criteria (Appendix A) such as level of interest, interactivity, and so forth. These criteria were assessed according to our personal experiences in each gallery, as we provided input as first-time visitors who were knowledgeable about the museum's vision and goals. We each recorded additional notes on our personal observations and compared these to determine any trends within our group experience. This allowed us to become more familiar with the content, design, and layout of the Natural

Environment Zone. We pretested this process in the *Gallipoli: The Scale of Our War* exhibition at Te Papa, which is not associated with the Natural Environment Zone, to ensure that our observations gave meaningful data. The Gallipoli exhibition showed us the direction Te Papa is moving towards in terms of interactive technology, focused portrayal of information, and impact of the design. We were able to use Gallipoli as a baseline for our standards while assessing the Natural Environment exhibitions.

We then constructed a map of each of the exhibitions that we evaluated by going through them as a group and identifying key exhibits with interactive elements and displays, each labelled with a letter.

### *3.1.2 Interviews with Museum Curators*

To fully understand the intentions for the renewal, we conducted interviews with Dean Peterson, the Head of Science at Te Papa, as well as semi-structured interviews with the Science curators in charge of the developing galleries in the Natural Environment Zone. We asked questions about their vision in redesigning the exhibitions, what they hoped visitors would take away from them, how successful they believed the current exhibitions had been in meeting their goals, and if they had any input for the renewal. We used snowball sampling, a process of referrals in which we asked the representatives to suggest other relevant individuals to interview, to obtain feedback from a variety of curators.

In order to tell the whole story of New Zealand, accurate representation of Māori perspectives is essential in a successful renewal process. We interviewed Māori Studies curators about their wishes, perspectives, challenges, and goals for the renewal project. We asked questions about their feelings toward the Natural Environment Zone, how well they felt represented in these exhibitions, as well as any input for the renewal in terms of being more in touch with the Māori perspective.

The interviews were conducted in-person at a place and time that was convenient to the interviewee. Each interview started with an introduction of who we were and the purpose of our research. Additionally, we informed the respondent that they had the right to review materials before publication or remain anonymous. A list of the participants can be found below in Table 1. A more extensive list of our interview questions can be found in Appendix B.



Table 1. List of interviewees.

<b>Name</b>	<b>Position/Role</b>	<b>Date</b>
Dean Peterson	Head of Science	12/01/2017
Wayne Ngata	Head of Mātauranga Māori	18/01/2017
Dougal Austin	Curator Taonga Tuturu 19-20th Century	19/01/2017
Migoto Eria	Curator Mātauranga Māori	19/01/2017
Susan Waugh	Senior Curator Sciences [Oceans]	01/02/2017
Bradford Haami	Contractor	31/01/2017
Leon Perrie	Curator Botany [Head of Renewal Project]	02/02/2017
Alan Tennyson	Curator Vertebrates [Active Land]	21/02/2017
Dave Armstrong	Writer and Exhibition Developer	02/02/2017

### **3.2 Evaluate the Visitor Experience in Mountains to Sea, Awesome Forces, and Bug Lab**

To assess the visitor experience in the Natural Environment Zone, we used a combination of visitor tracking, observations, and interviews to gather data. This allowed us to combine many different data sets to inform our analysis of visitor engagement in the Natural Environment Zone.

#### *3.2.1 Visitor Tracking*

Our selection for who to observe, track, and interview was determined using convenience sampling. Random sampling would not have worked, since our availability to track the next visitors entering the exhibition would be dependent on how long the first visitors we were tracking traveled through the exhibition. The tracking was done at different times of the day and on different days of the week to generate a wide range of samples. We did not include individuals who were part of a tour group, since they were not self-guided, but instead limited our subjects to those visiting independently, with a family, or with a small group of adults. In the case of a family or group, we only tracked one adult.

We observed visitors to determine how immersed they were with displays and devices in each of the three galleries. We used the maps that were constructed during the site evaluation to identify where visitors were engaged. The exhibits within each gallery were labeled on the maps to be used for the observation matrix. As the visitor travelled throughout the gallery, the exhibit was marked off and the completion of the interactivity or video as well as dwell times were noted. For accuracy and consistency, we developed some standards for observation, many of

which were informed and adapted from previous studies of museum visitor observation (Hein, 1998). We observed external actions so that there was limited bias from attempting to interpret the interest of the visitor. A complete matrix of the observation criteria can be found in Appendix C. These observations were done discreetly to ensure that the behaviors of the visitors were not affected.

Using the data collected from visitor tracking, we developed heat maps for each of the three exhibitions and determined which exhibits, as well as what types of interactives, attracted the most visitors. This allowed us to identify what elements were most popular with the visitors. We also constructed maps of the pathways that visitors took throughout their time in the exhibition.

### *3.2.2 Visitor Interview*

To obtain in-depth perspectives, we pursued conversation-based, semi-structured interviews with the visitors. Much of Te Papa's previous studies on audience engagement had been guided by these types of interviews, which evoked stories and anecdotes that would later be analyzed. There was no set protocol for this type of data collection, so we decided to analyze the anecdotal data based on common themes in the responses.

These interviews were conducted as the visitors exited the exhibitions in the Natural Environment Zone. At the request of the survey design team at Te Papa, we conducted these interviews in pairs of two, with one person interviewing and the other taking notes. We offered visitors a 20% discount to the Te Papa store as compensation for their time. We asked visitors about their favorite exhibits in the gallery, what they found most memorable, and their interests for what they wanted to see more of in the museum. This gave us some qualitative data in addition to the more quantitative data reported by the observations and mapping methods. These interviews were semi-structured with some prepared questions, but were ultimately guided by the flow of conversation with the visitor. A sample of our prepared interview prompts can be found in Appendix D. We pretested these methods with a small sample of visitors.

## **3.3 Propose Recommendations for the Renewal Based on Visitor and Staff Feedback**

After our data collection, we analyzed the results from the observations and the interviews. We identified underlying themes, such as if visitors prioritized social interaction

versus deeper engagement with the material. We compared these data across the three exhibitions that we analyzed to determine trends in popular interactives. This information helped us to determine which exhibits of the galleries visitors enjoyed the most, allowing us to be informed about recommendations for the Natural Environment Zone renewal.

We also analyzed the feedback based on which elements were most memorable, what information visitors learned or retained, and what had the most emotional impact. We determined what subjects resonated the most with visitors, as well as which topics were lacking in visitor engagement. The data that we collected from our observations were supplemented by the interviews we conducted. The information gained from these different sources was used to propose recommendations for the Te Papa Natural Environment Zone renewal.

## **Chapter 4. Results and Discussion**

This chapter covers the results of our activities and discusses our findings for our first two objectives with regard to the Natural Environment Zone renewal. Our third objective is discussed in Chapter 5, which covers our recommendations and conclusions.

### **Part 1. Results**

In our assessment of the Natural Environment Zone, we conducted interviews with curators, participated in a site evaluation, tracked and observed visitors throughout the galleries, and interviewed visitors about their experiences.

#### **4.1 Understand the Mission and Vision of Te Papa**

To better understand the museum's mission, we interviewed the curators involved in the renewal project. Their names and titles can be found in Table 1. The interviews were open-ended and semi-structured. To protect our interviewees' privacy, responses are not associated with individuals.

We asked the curators what they felt the current Natural Environment Zone does well, and most of them responded that visitors particularly enjoy the *Colossal Squid* in Mountains to Sea and the *Earthquake House* in Awesome Forces. Due to the popularity of these attractions, they will be kept in the renewal, but they will be adapted and modernized. One of the curators said that the current *Earthquake House* does not provide any scientific information during the simulation, and current development ideas show that they may create simulations of different conditions of earthquakes, such as being in a high-rise building, in a house, and on a mountain.

When questioned about their vision for designing the new Natural Environment Zone exhibits, the curators overall wanted to get visitors to admire the environment of New Zealand but also understand that there is still work to do in terms of conservation efforts. One curator responded that Mountains to Sea and Blood Earth Fire show the environment, but do not tell visitors about the issues or ways that these issues can be addressed. There was also a concern expressed about how to encourage people to care without making them feel demoralized or telling them what to do; another respondent said that they wanted to make sure it is not depressing but instead funny and uplifting in getting visitors to care about the environment.

We also asked curators what they hope the main takeaway that visitors get from the new exhibitions, and we received a variety of responses. All of the curators want visitors to learn about the natural environment and how people interact with it. The science curators explained that they wanted visitors to be informed about the unique nature of New Zealand but not turned away or scared by it. In our conversations with the curators, biculturalism was emphasized, with one respondent saying that they want visitors to understand the cultural aspects of natural history. Another respondent said that they hope it will be more inclusive than just science, and all of the curators that we interviewed said they hoped for an emotional reaction from visitors. One of the curators was also particularly interested in transforming visitors' thinking by helping them better understand the cultural context of the natural environment, and in turn transform visitors' behavior and inspire them to take action to preserve and nurture the environment.

When we asked the museum staff members about mātauranga, all of them were keen on incorporating it. Some respondents made a point of explaining how mātauranga and science are two very distinct bodies of knowledge. A difference of opinion was revealed in which some respondents said that the two should be integrated, and others said that they are too different and should be showcased equally but separately. Multiple curators we interviewed pointed out that in Bug Lab, the Māori section is pushed off in the back corner but that is not the plan for the renewal. The curators we interviewed want to showcase mātauranga and the value that is placed on the natural environment. They recognize, however, that there are challenges in doing so, such as getting permission from different iwi to use their stories and making sure there is an overall willingness to build a bicultural institution.

## **4.2 Evaluate the Visitor Experience in Mountains to Sea, Awesome Forces, and Bug Lab**

To evaluate the current Natural Environment Zone for visitor experience, we gathered preliminary data by exploring the galleries ourselves as first-time visitors. We then engaged in visitor tracking and interviews to determine the behaviors and preferences of other visitors.

### *4.2.1 Mountains to Sea*

Mountains to Sea showcases New Zealand's biodiversity with various displays of plant and animal species (see Figure 3).

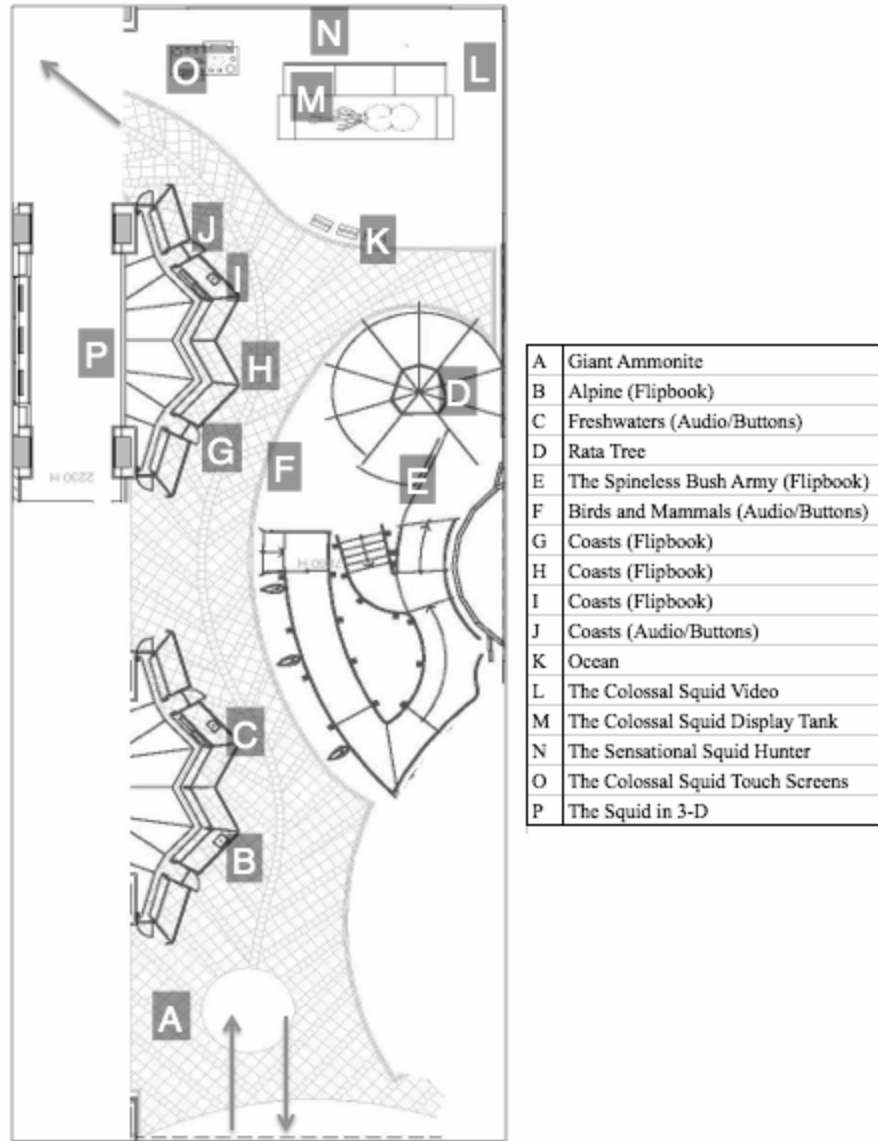


Figure 3. Map of Mountains to Sea.

We began our evaluation with a site assessment, during which we went through the exhibition as first-time visitors. We rated the exhibition on a variety of criteria, which can be found in Table 2. This table displays the average rating as well as the distribution of scores from our team, with 1 being strongly disagree with the statement, and 5 being strongly agree with the statement.

Table 2. Site Evaluation Criteria for Mountains to Sea.

Criteria	Average Rating	Distribution
<i>The exhibition, overall, captured my interest</i>	2.25	
<i>The exhibition was interactive</i>	1	
<i>The display of the exhibition was eye-catching</i>	3.5	
<i>The labels and descriptions were easy to read and understand</i>	1.25	
<i>The exhibition was informative and educational</i>	4	
<i>The exhibition inspired me to think differently about things I take for granted</i>	1.25	
<i>The exhibition encouraged me to adopt new perspectives</i>	1.25	

This exhibition contains mostly traditional museum elements, such as mounted specimens, species indices, and text panels arranged around diorama cases (see Figure 4a). As we went through the exhibition, we noted that there were many wordy labels with extensive descriptions. We rated this exhibition a 4.25 out of 5 in terms of how informative it was, since there was a lot of material about New Zealand biodiversity (Table 2). However, we felt overwhelmed by the sheer amount of information, and it was difficult to retain anything afterwards. In addition to this, the lighting was poor in many areas, making it difficult to read the descriptions (see Figure 4b).



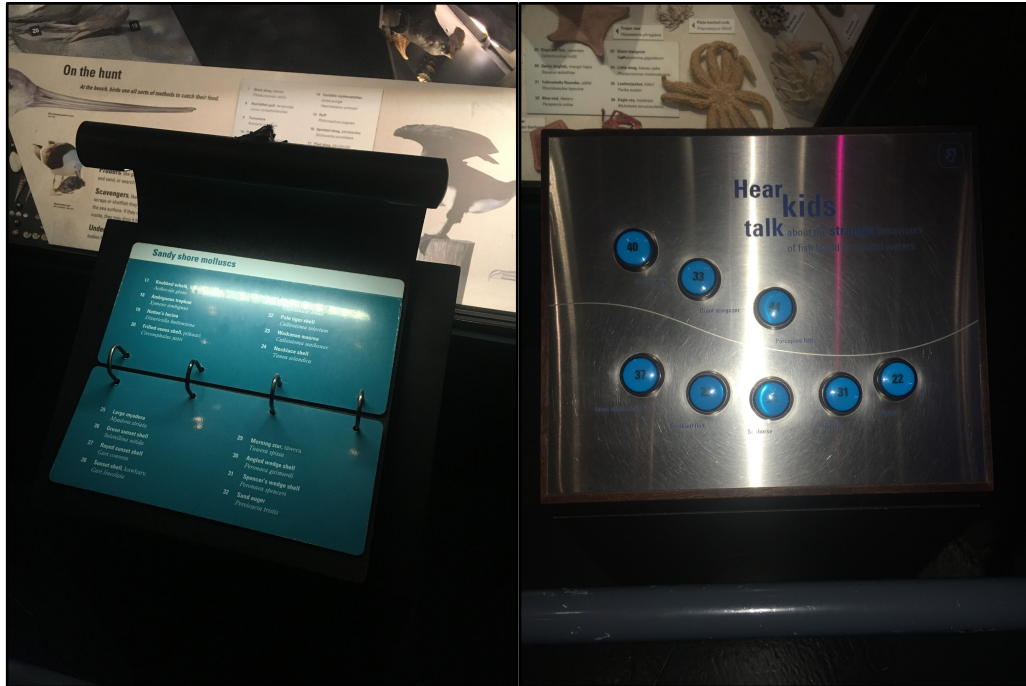
(a)

(b)

Figure 4. (a) Display of coastal species; (b) Poorly-lit label in Mountains to Sea.

We also did not find the exhibition to be very interactive. There were flip-books with names keyed to the displays, but they did not give additional, more interesting information about the specimens themselves (see Figure 5). There were also buttons that you could press to hear children talk about the animals, but it was quite underwhelming in terms of engagement. We rated interactivity a 1 out of 5, since there were mostly just displays to look at and admire (Table 2). We felt that this exhibit could have benefitted from a more “show-don’t-tell” approach, with more displays or interactives demonstrating the characteristics and behaviors of the plants and animals rather than labels describing them.



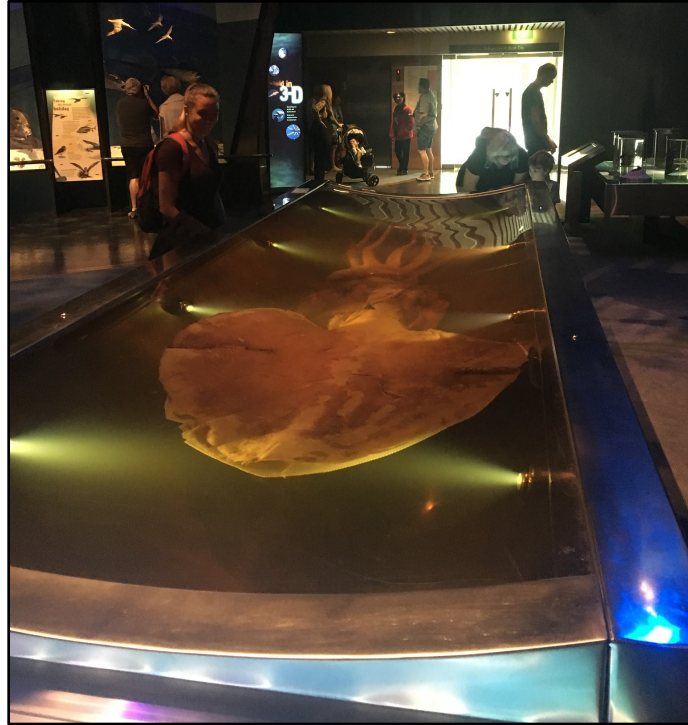


(a)

(b)

Figure 5. (a) Flip-book index of species names; (b) Audio buttons for commentary on species.

We found the *Colossal Squid* exhibit to be more noteworthy than the rest of the exhibits, and we were excited to watch the video of the team that examined the squid in preparation for display, as well as engage with the touch screen that told more about the squid's biology. We also found this section to be much more visually appealing, with the animal models hung from the ceiling and the colorful displays of marine life (see Figure 6). Because of this, we rated Mountains to Sea a 3.5 out of 5 for eye-catching displays (Table 2).



(a)



(b)

Figure 6. (a) *Colossal Squid* Display Tank; (b) Models of marine life in Mountains to Sea.

Overall, this exhibition did not appear to us to be designed to communicate a particular message about the natural environment. We were able to learn a lot about the characteristics of New Zealand’s diverse plants and animals, but we did not find much information about the challenges facing them. We rated this exhibition a 1.25 out of 5 for encouraging new perspectives, since we did not find any particularly moving messages about the species (Table 2).

After our site evaluation, we tracked visitors and noted their dwell times and behaviors at each exhibit within the gallery. We created a heat map of all of the noteworthy exhibits, with the size of the point indicating how many of those we tracked visited each exhibit, and the color of the point reflects the dwell times or the average time those visitors spent at each exhibit (see Figure 7). Our complete observation matrix can be found in Appendix G.

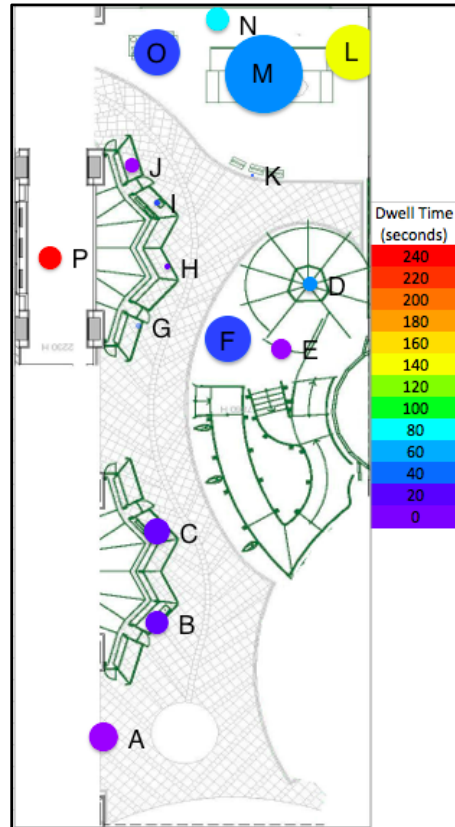


Figure 7. Heat map of Mountains to Sea.

From the 31 visitors that we tracked in Mountains to Sea, we found that visitors spend, on average, about 14 minutes in the exhibition. The most popular element was the *Colossal Squid* Display Tank (M) which attracted 27 out of the 31 tracked visitors. However, the average time

spent at the squid was only about 68 seconds. The *Squid in 3-D* Video (P) took up the most dwell time, at an average of about 239 seconds, but only 8 visitors stopped by, with just 4 of them actually completing the video. Similarly, the *Colossal Squid* Video (L) attracted 19 visitors, with an average dwell time of about 148 seconds, but only 6 participants completed the entire video. Sixteen visitors stopped by and spent about 47 seconds at the *Colossal Squid* Touchscreens (O), but only 10 of those 16 actually interacted with them.

On the other hand, the large displays with the flip-books and buttons were not as popular. The first two (B and C) attracted more visitors--8 and 9, respectively--as opposed to the other ones further into the exhibition (G, H, I, and J), which only attracted 2, 2, 2, and 5 visitors, respectively. However, the dwell times for B and C are 25 seconds and 27 seconds, respectively, which are both less than G, H, and I which are 58 seconds, 33 seconds, and 43 seconds, respectively. The most popular animal display was F, in which 16 visitors stopped at and stayed for about 49 seconds.

We also displayed a portion the data in a decay curve, which shows the proportion of visitors that stayed at certain exhibits over time. Figure 8 shows the results for some of the exhibits in Mountains to Sea.

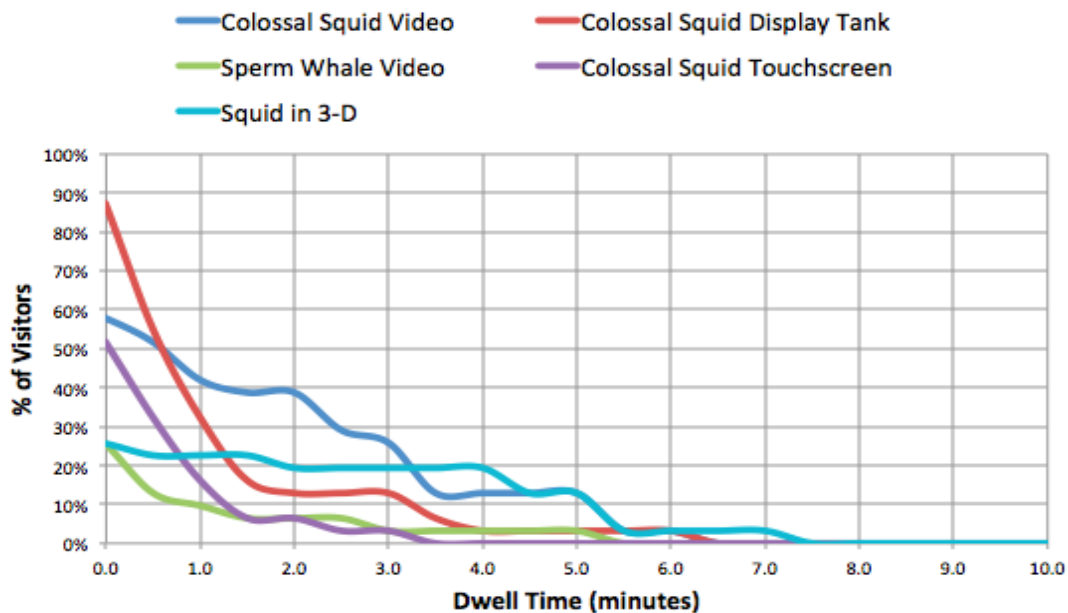


Figure 8. Decay Curves for Mountains to Sea.

As shown in the graph, the *Colossal Squid* Display Tank (M) attracted the most visitors, although only 30% stayed for a minute or longer. The *Squid in 3-D* Video (P) engaged visitors for the longest, but only attracted 25% of the visitors in the exhibition. The *Colossal Squid* Video (L) appears to have the largest area under the curve, indicating that it attracted more people for longer dwell times.

As for talking with others, both the *Colossal Squid* Display Tank (M) and the *Birds and Mammals* display (F) led to the most visitor conversation. Thirteen of the tracked visitors conversed at the Colossal Squid and 7 of the tracked visitors conversed at the *Birds and Mammals* display. Moreover, 2 of the tracked visitors took a picture of the *Colossal Squid* and 2 visitors took a picture of the *Birds and Mammals* display. In terms of working with others, only 3 exhibits each had 1 of the tracked visitors do so: *Alpine* flipbook (B), *Coasts* audio/buttons (J), and the *Colossal Squid* Touchscreens (O). The most completed activity was the *Colossal Squid* Video (L), with 6 of the tracked visitors. Following that was the *Squid in 3-D* (P), having 4 of the tracked visitors complete the video.

We also traced the visitors' routes through the exhibition. Figure 9 depicts the paths of all 31 tracked visitors. Most visitors walked directly toward the *Colossal Squid* Display Tank (M), as seen by the more heavily marked pathway. They also stopped by the videos (L and P) and the interactives (O) related to the squid. The path map also indicates that many were interested in the kiwi exhibit (F). Few stopped to use the flipbooks or play in the treehouse area as their paths are less heavily marked. The path map of Mountains to Sea supports our findings in the heat map and once again illustrates that the *Colossal Squid* is an audience favorite.

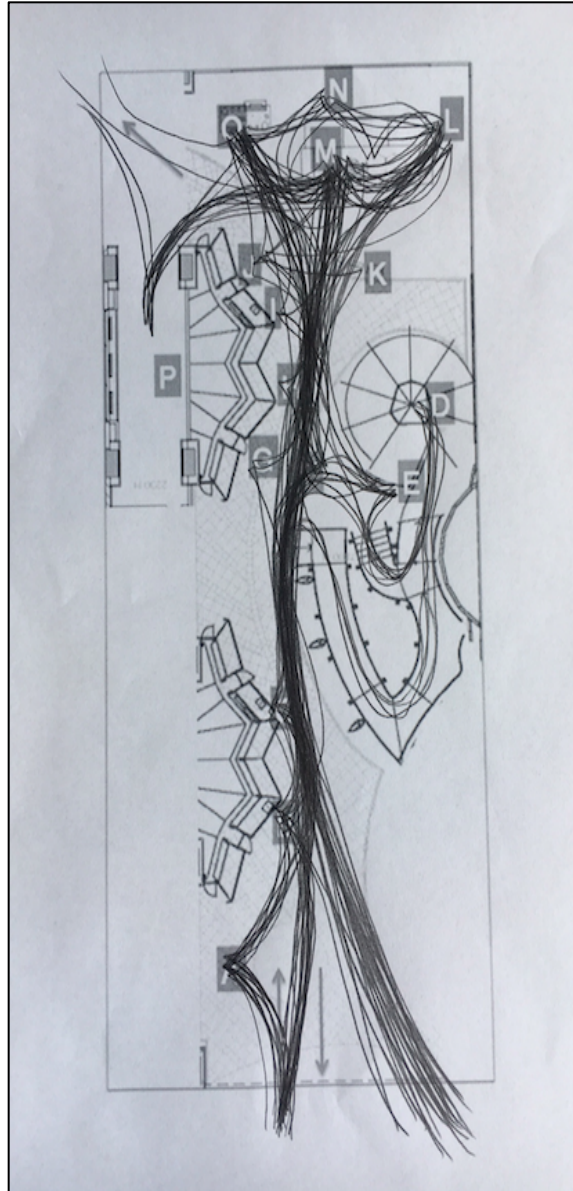


Figure 9. Visitor Path Map of Mountains to Sea

After gathering these data, we pursued interviews with visitors to determine the more subjective aspects of the visitor experience. In Mountains to Sea, the squid appeared to be the most popular attraction. Out of 31 interviews, 21 identified the squid as their favorite part. Five were fascinated by its huge size, 12 were drawn to it because it was so bizarre and the only one of its kind on display in the world, and 4 did not cite a reason. One visitor described it as “alien-like,” and another exclaimed that they could not believe that it was real. Of our participants, 9 came out of Mountains to Sea with little to no recollection of anything in the exhibition, with

most citing too little time or too much information as the issue. Many of these respondents were “browsing” and/or “killing time,” and admitted to not looking hard enough at the information provided in the exhibition. However, 11 of our respondents felt that they learned something about the squid during their visit. Five were fascinated by the squid’s eye being the largest eye in the world, remembering that it was equivalent to the size of soccer ball; 2 learned of its bioluminescence; and 2 remembered that scientists have only found female squids. Nine participants enjoyed the video accounts of the squid being caught or the 3-D video, saying it made the squid feel “alive” and gave it a story. Three enjoyed the hands-on interactives, 2 enjoyed to “touch and feel” parts of the squid, while 1 enjoyed building their own squid on the screen. One visitor specifically stated that more interactive elements would improve Mountains to Sea.

Some individuals identified particular aspects of Mountains to Sea that stuck out to them, but these were not common among our entire sample. Some particular elements identified by individuals included the *Ammonite Shell* (A), the *Insects* display (E), and the buttons that prompted audio of children talking about animals (C, F, J). Separate parties said they learned that more people have visited outer space than the depths of the ocean, that warthogs were imported to New Zealand, and that frogs carry their young on their backs. Some respondents also said they learned about animal habits, godwit migration patterns, evolution, and characteristics of the kauri tree. One visitor said they enjoyed identifying a duck that they had seen on the South Island while another visitor said Mountains to Sea encouraged them to reuse and recycle.

Overall, Mountains to Sea was praised for its large variety of animals and accurate depiction of New Zealand wildlife. However, visitor interview findings indicate that the exhibition is outdated and fails to match Te Papa’s current vision. Compared with other exhibitions, most noted that the gallery lacked emotional content and stayed objectively factual. One visitor said it was not as “gripping” as Gallipoli. Only 1 out of 31 visitors mentioned the information about conservation efforts from the exhibition even though Te Papa aims to make people more environmentally aware. When asked about Māori, only 1 of our participants said that they noticed the giant Māori carving on the wall, while 3 noticed the bilingual captions. All but 2 visitors said they would like to learn more about Māori, with one visitor specifically wanting to learn about the legends.

#### 4.2.2 Awesome Forces

Awesome Forces covers a range of topics, including the Earth's layers, tectonic plates, the split of Gondwanaland, earthquakes, volcanoes, water levels, tsunamis, and the evolution of Zealandia (see Figure 10).

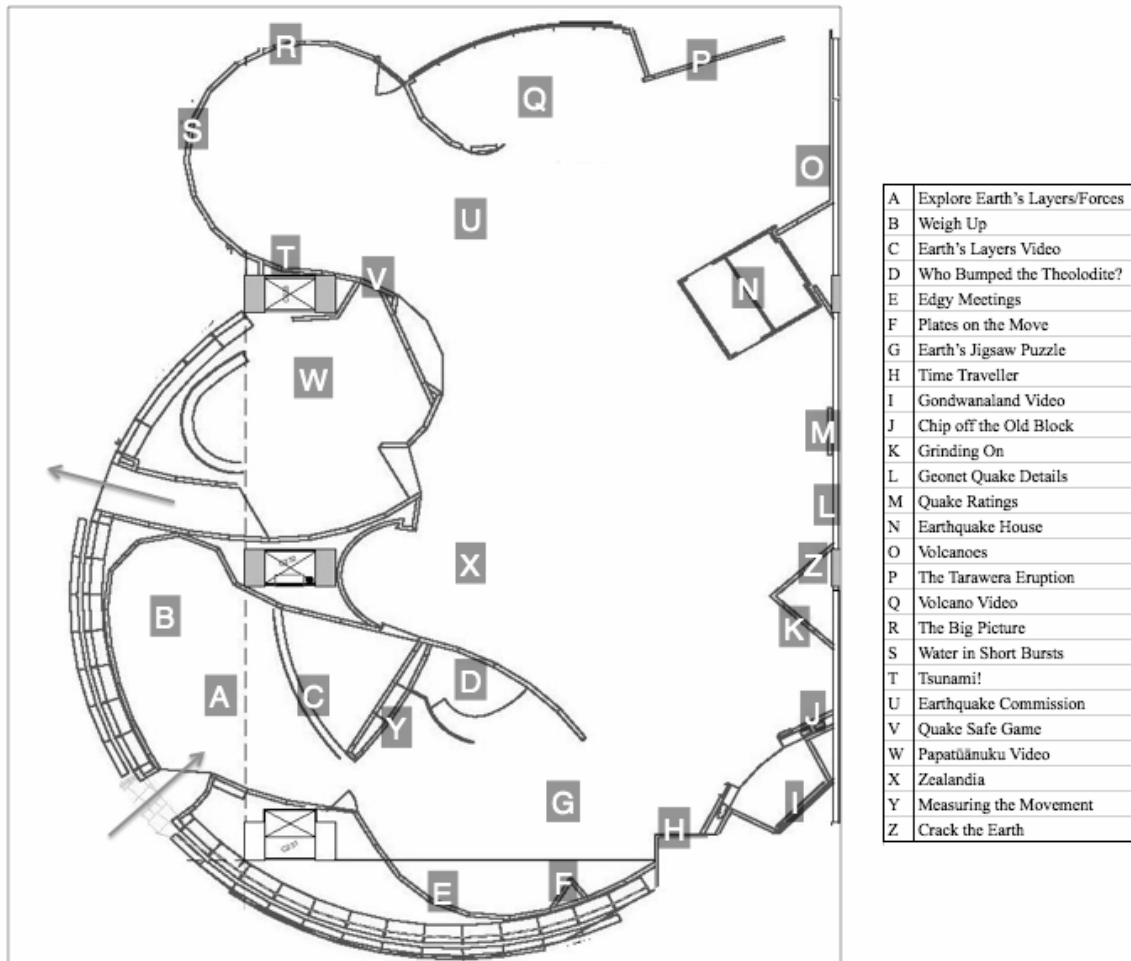


Figure 10. Map of Awesome Forces.

We rated Awesome Forces based on the criteria found in Table 3, with 1 being strongly disagree and 5 being strongly agree.



Table 3. Site Assessment Criteria for Awesome Forces

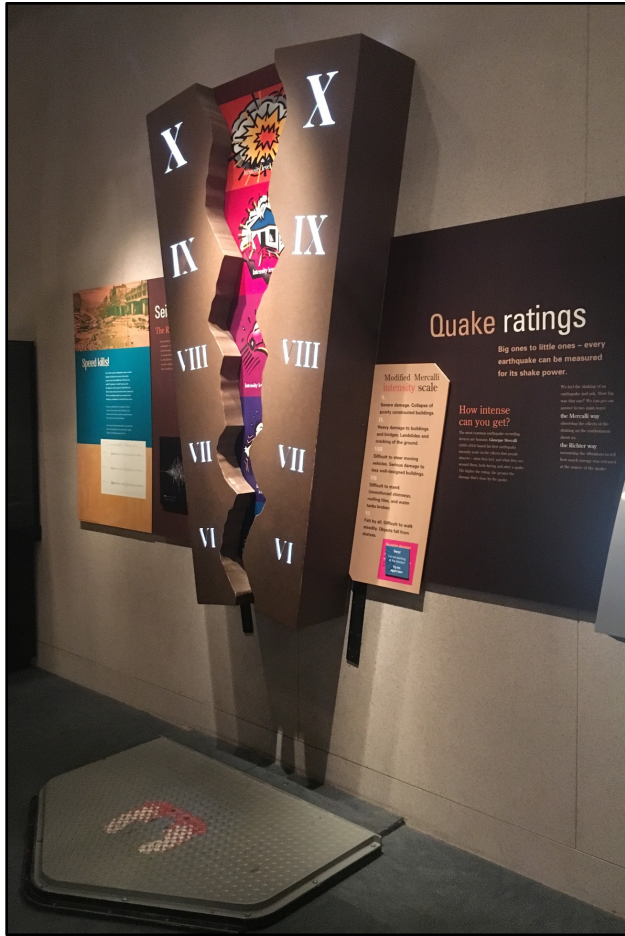
Criteria	Average Rating	Distribution
<i>The exhibition , overall, captured my interest</i>	3	
<i>The exhibition was interactive</i>	2.75	
<i>The display of the exhibition was eye-catching</i>	2.75	
<i>The labels and descriptions were easy to read and understand</i>	3.25	
<i>The exhibition was informative and educational</i>	4.5	
<i>The exhibition inspired me to think differently about things I take for granted</i>	4	
<i>The exhibition encouraged me to adopt new perspectives</i>	3.25	

While we found all of the topics covered in Awesome Forces to be interesting, we noticed a lack of cohesion among the displays. There is such a diverse range of information, that it sometimes seemed disjointed and lacking in flow. We were particularly confused about the presentation of the dinosaurs and other prehistoric displays, which were placed between the tectonic plates and earthquake sections. While we were interested to learn about these extinct species, we felt that they did not match well with the natural phenomenon theme (see Figure 11).



Figure 11. Display of dinosaurs in *Zealandia* section of Awesome Forces.

In terms of engagement, there were a number of both passive and active interactive elements, including videos about Gondwanaland, volcanoes, and the Māori god Papatūānuku; maps of the Ring of Fire and different types of volcanoes; a *Quake Rating Game* (M), where you can test how strong an earthquake your jump measures up to; an *Earthquake House* (N), which simulates an earthquake; and a *Quake Safe Game* (V), in which you must make a house safe from earthquakes in a touch-screen game (see Figure 12). While we found a couple of these to be fun and exciting, such as the *Earthquake House* and the *Quake Safe Game*, we found that not many of the others engaged us for very long. For this reason, we rated Awesome Forces a 2.75 out of 5 for interactivity (see Table 3).



(a)



(b)



(c)



(d)

Figure 12. (a) *Quake Rating Game*; (b) *Quake Safe Game*; (c) *Earthquake House*; (d) Queue outside of *Earthquake House*.

Overall, the gallery was very informative about the natural phenomena that it presented. We learned a lot about the ways in which tectonic plates move, how earthquakes manifest, the history of volcanic eruptions in New Zealand, and how to secure household items in the event of an earthquake. We rated the exhibition a 4.5 out of 5 for being informative (Table 3).

In terms of encouraging visitors to think differently, we rated Awesome Forces a 4 out of 5 (Table 3). We thought it presented a good amount of information about each of these phenomena both from a perspective of nature and how it works, as well as from a perspective concerned with the effect on humans. After going through the gallery, we felt we appreciate more the awe-inspiring dynamics of nature.

After experiencing Awesome Forces for ourselves, we observed other visitors to note their interactions and dwell times at each exhibit. A complete observation matrix can be found in Appendix G. Figure 13 shows the heat map, with size indicating the number of visitors and color indicating the dwell time.

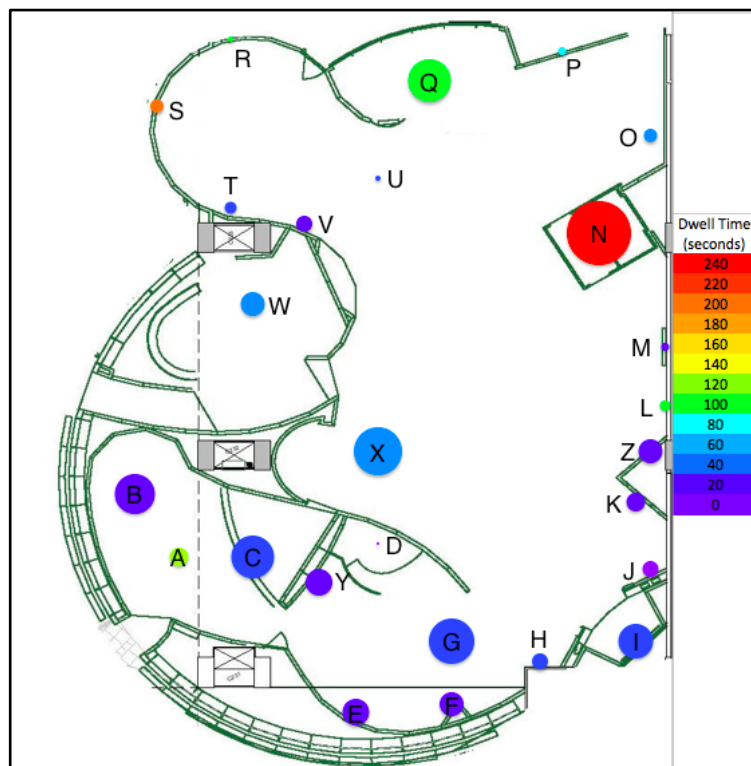


Figure 13. Heat map of Awesome Forces.

In Awesome Forces, we tracked 31 visitors, with 18 minutes being the average time spent in the exhibition. This average is influenced by an outlier in our data collection, who spent a total of 78 minutes in this gallery. Removing the outlier reduces the average time to 16 minutes. The *Earthquake House* (N) attracted the most visitors, 24 of the 31 tracked visitors, and had the highest dwell time, 256 seconds. Out of the 24 visitors, 14 of them had to wait in line for the simulation. The second most visited element was the *Zealandia* display (X) which attracted 18 out of the 31 tracked visitors who spent an average of 75 seconds there. The *Earth's Jigsaw Puzzle* (G) had 17 visitors stop by and spend about 41 seconds there, but only 9 out of the 17 visitors touched the globe. At the entrance of the exhibition, 7 visitors looked at the *Explore Earth's Layers/Forces* touch screen (A) with only 6 actually touching the screen and average time being 123 seconds. Fifteen and 16 visitors stopped at *Weigh Up* (B) and the *Earth's Layers* video (C) respectively, yet the dwell times were about 32 seconds for B and 43 seconds for C. Ten of the 15 actually attempted to pick up the rocks, and only 2 of the 16 actually completed the *Earth's Layers* video. Furthermore, the *Water in Short Bursts* video (S) had an average dwell time of 210 seconds, but only 5 visitors stopped by. Similarly, the *Geonet Quake Details* (L) had only 4 visitors stop by, with all 4 interacting with the touch screen for about 106 seconds. The *Volcano Video* (Q) captivated 16 visitors for an average of 106 seconds, as well. The least popular element was *Who Bumped the Theodolite?* (D) with only 1 person who stopped by and spent 5 seconds there. Additionally, *Quake Ratings* (M) was the only activity not working during our data collection, yet 3 visitors stopped by it and spent about 29 seconds there.

Figure 14 shows that seventy-eight percent of visitors we tracked were drawn to the *Earthquake House* (N) and stayed for a relatively long period of time, partly because the simulation runs for a set amount of time (about 4 minutes). The proportion of visitors at the exhibit drops at around 4 minutes, reflecting the fact that the simulation runs for a set period of time. Counterintuitively, the continuation of the curve out to 7.5 minutes represents the time that the visitors had to queue to enter the house. The *Zealandia* section (X), the *Volcano Video* (Q), the *Earth's Jigsaw Puzzle* (G), and the *Earth's Layers* Video (C) all attracted a similar proportion of guests, between 50-60%. *Water in Short Bursts* (S) only attracted about 17% of the visitors, but engaged them for the longest time.

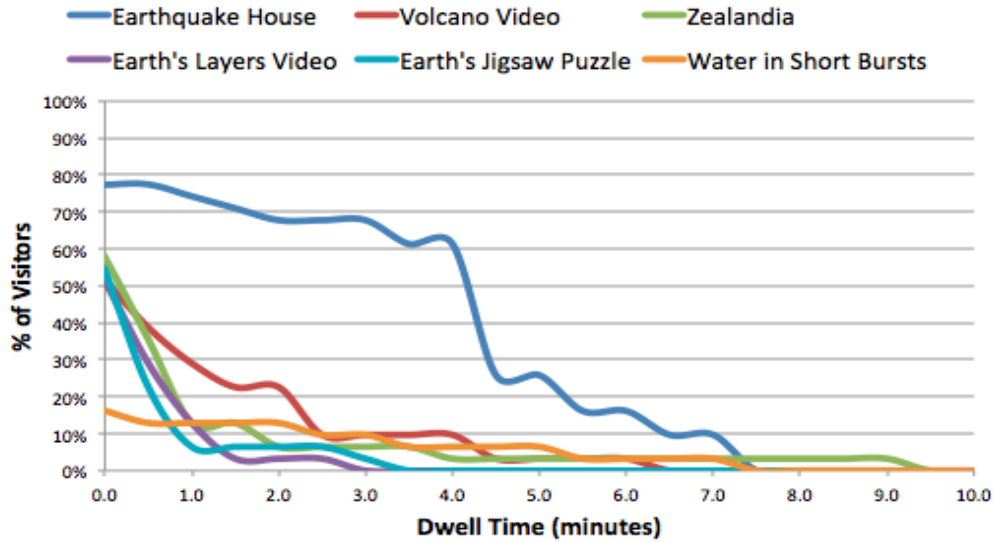


Figure 14. Decay Curves for Awesome Forces.

Moreover, *Earth's Jigsaw Puzzle* stimulated 9 of the tracked visitors to converse with others, followed by the *Earthquake House*, which stimulated 7 of the tracked visitors to converse. Both *Weigh Up* (B) and *Edgy Meetings* (E) each stimulated conversation for 6 of the tracked visitors. *Crack the Earth* (Z) caused 5 of the tracked visitors to work together, while *Weigh Up* caused 4 of the tracked visitors. The most pictures/videos taken were at the *Zealandia* exhibit (X), in which 3 of the tracked visitors did so. As mentioned before, 23 visitors completed the *Earthquake House*, making it the most completed activity in the gallery. The second most completed activity was the *Volcano Video*, where 5 out of the 16 visitors to watch the video completed it.

Figure 15 shows the paths of the 31 visitors tracked in Awesome Forces. The most heavily travelled pathway leads to the *Earthquake House* (N) from each of the two entrances/exits. It is also clear that visitors preferred the exhibits closer to the center of the gallery and/or on the way to the *Earthquake House*. The exhibits that lined the perimeter of the gallery were not as visited which can be seen by the lighter, less travelled pathways. This path map supports the findings from the heat map and further illustrates that the *Earthquake House* is the most visited area of Awesome Forces.

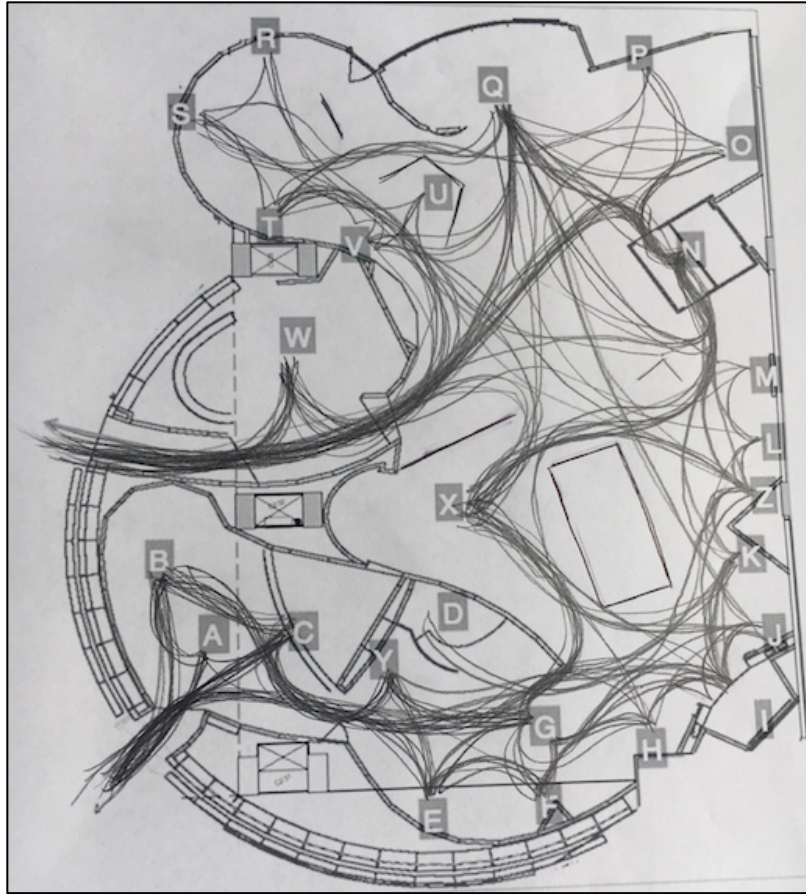


Figure 15. Visitor Path Map of Awesome Forces

Our visitor interviews revealed similar patterns. Awesome Forces had a distribution of favorite activities, with some visitors naming more than one for reasons ranging from interactivity to personal interest. Fourteen out of 31 visitors identified the *Earthquake House* as their favorite activity. From those who answered, 5 of 15 had experienced an earthquake before, 3 of 7 agreed the simulation felt realistic with one visitor emphasizing the “rocking from side to side” as matching that of an actual earthquake. Six of 11 felt Awesome Forces successfully prepared them for an earthquake.

Nine participants said that learning about volcanoes and earthquakes was their favorite part. Six others responded that they liked studying the Earth’s layers and lifting the rocks. Five enjoyed the *Zealandia* section, with 2 preferring the moa and giant eagle, while the other 3 were more drawn to the dinosaurs. Two respondents liked learning about the water and its effects. One visitor enjoyed the *Time Traveller* wheel (H).

Visitors also retained a variety of information when asked what they learned. Nine recalled the tectonic plates and enjoyed learning how the Earth moved. Two respondents specifically recalled the video about the supercontinent Gondwanaland. Eight visitors mentioned a range of facts about earthquakes, from the way they develop to safety preparedness. Six visitors learned about the earth's various layers and the weight of the respective rocks. One mentioned how the earth gets hotter towards the core, while another visitor recalled the distance to the center of the Earth. Three visitors remembered content from the water section, such as learning about the temperature of the ocean and discovering how a tsunami starts. Three recalled information from the *Zealandia* section with 1 visitor wanting to see more. Two recalled learning that Taupo is a big volcanic crater.

While we received very positive feedback from visitors, it was evident that Awesome Forces is still perceived as outdated. One frequent Te Papa visitor specifically addressed this issue, citing some recent natural disasters that she would have liked to see in the gallery. One visitor, who was an architect, thought the place was “a bit cheesy, to be honest,” wanting more advanced information to be available. Two other visitors felt that the gallery was more geared to children, but still found it to be enjoyable. One visitor also noted that Zealandia felt out of place. Most visitors were tourists and came to learn about New Zealand earthquakes, but many felt underwhelmed. One visitor suggested making the earthquake section more “in your face” because most countries do not experience earthquakes of New Zealand's magnitude and cannot relate to the severity. Another visitor suggested that the gallery inform museum goers about what to do if an earthquake occurs, implying that they did not see this information during their visit. When asked about Māori, only 6 visitors noticed the earthquake god and 2 visitors confused Māori for other attractions such as the moa and giant eagle. When asked to compare Awesome Forces to other galleries, many had a personal interest or background in geology and preferred Awesome Forces for that reason.



### 4.2.3 Bug Lab

The Bug Lab is a temporary exhibition that will soon be travelling internationally that presents information about various different types of bugs, including arachnids, myriapods, and insects. There are four large chambers, each with a dynamic display, three of which were created by Weta Workshop. These chambers give particular focus to the orchid mantis, the dragonfly, the jewel wasp, and the Japanese honeybee. There are also stations dispersed around the middle that give more information about display, flight, venom, exoskeletons, swarms, and silk (see Figure 16).

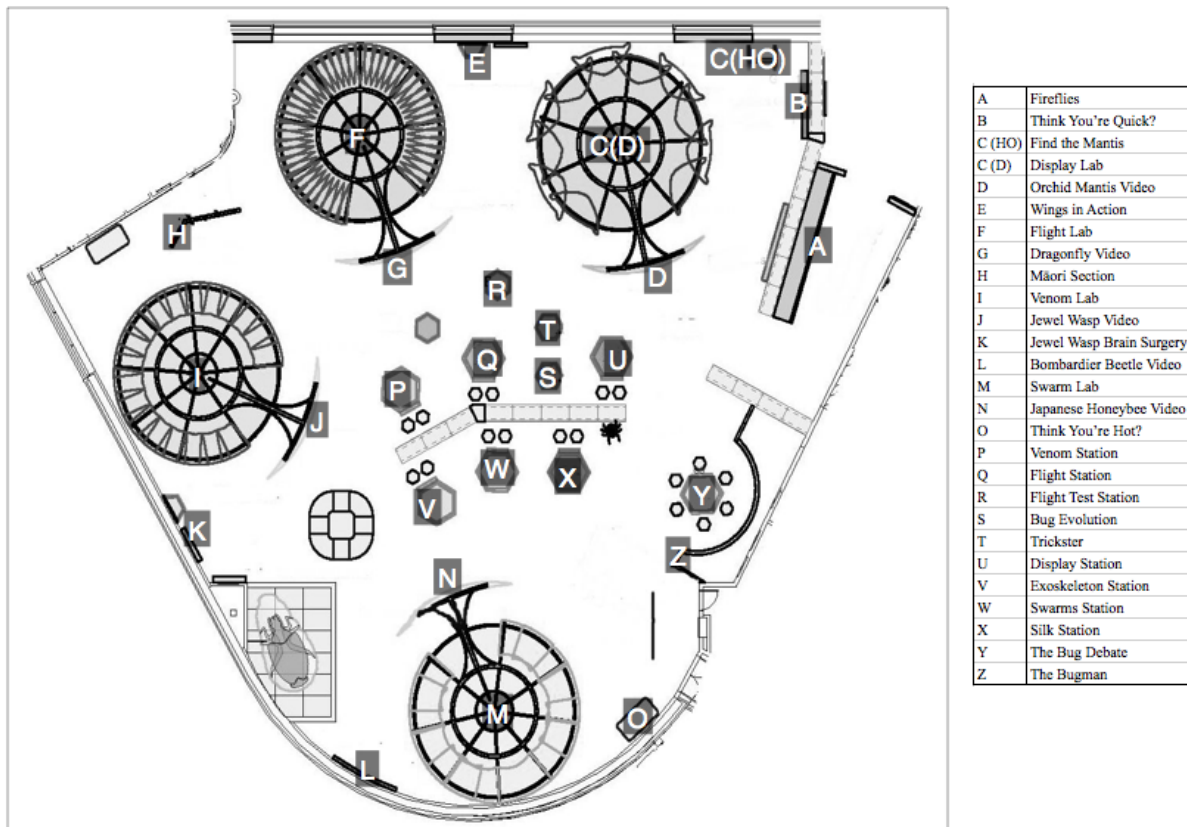
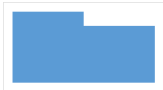








Figure 16. Map of Bug Lab.

We went through Bug Lab as first-time visitors and rated the gallery based on the criteria in Table 4. This table shows our average ratings as well as our team's distribution, where 1 is strongly disagree and 5 is strongly agree.

Table 4. Site Assessment Criteria for Bug Lab

Criteria	Average Rating	Distribution
<i>The exhibition, overall, captured my interest</i>	4.5	
<i>The exhibition was interactive</i>	5	
<i>The display of the exhibition was eye-catching</i>	4.75	
<i>The labels and descriptions were easy to read and understand</i>	4.5	
<i>The exhibition was informative and educational</i>	5	
<i>The exhibition inspired me to think differently about things I take for granted</i>	3	
<i>The exhibition encouraged me to adopt new perspectives</i>	4	

We found the exhibition to be very visually appealing. Not only were the large Weta Workshop models stunning, but the lighting around the gallery and the design of the stations were also quite beautiful (see Figure 17). We rated Bug Lab a 4.75 out of 5 for visual appeal (Table 4).



(a)

(b)

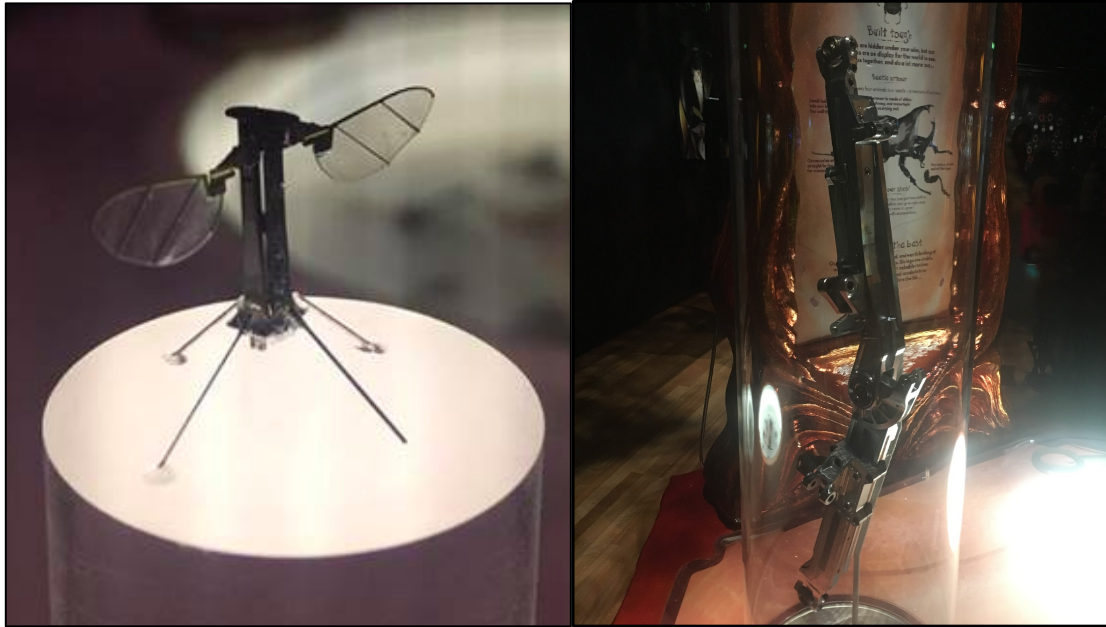


(c)

(d)

Figure 17. (a) *Display Lab: Orchid Mantis*, (b) *Flight Lab: Dragonfly*, (c) *Venom Lab: Jewel Wasp*, (d) *Swarm Lab: Japanese Honeybee*.

The exhibition was also extremely informative and we rated a 5 out of 5 on this criterion (Table 4). None of us were particularly interested in learning about bugs beforehand, but the presentation of the information was engaging and personal. We enjoyed how the bugs were personified and given storylines, since it added an extra layer of information that we could connect with. We were also pleased to see all of the learning material about how humans use characteristics of bugs to develop new technologies, such as drones and exoskeletons (see Figure 18). Our team comes from an engineering background, so we were enthusiastic to see something that was directly related to our interests.



(a) Bee-inspired drone; (b) Exoskeleton leg.

We also found this exhibition to be extremely interactive, with touch screens, videos, hands-on activities, and opportunities for teamwork. We loved the games that engaged us with the bugs, such as the *Think You're Quick?* game (B) that tested our reflexes against the orchid mantis, the *Flight Test Station* (R) that allowed us to test our origami designs in a fan, the *Jewel Wasp Brain Surgeon* (K) that showed how precisely a jewel wasp has to sting a cockroach, and the *Swarm Lab* (M) that made us work together to heat up and defeat the invader wasp (see Figure 19). These games were not only fun and engaging, but they taught us even more about each type of bug as we were enjoying ourselves. We rated Bug Lab a 5 out of 5 for interactivity (Table 4).



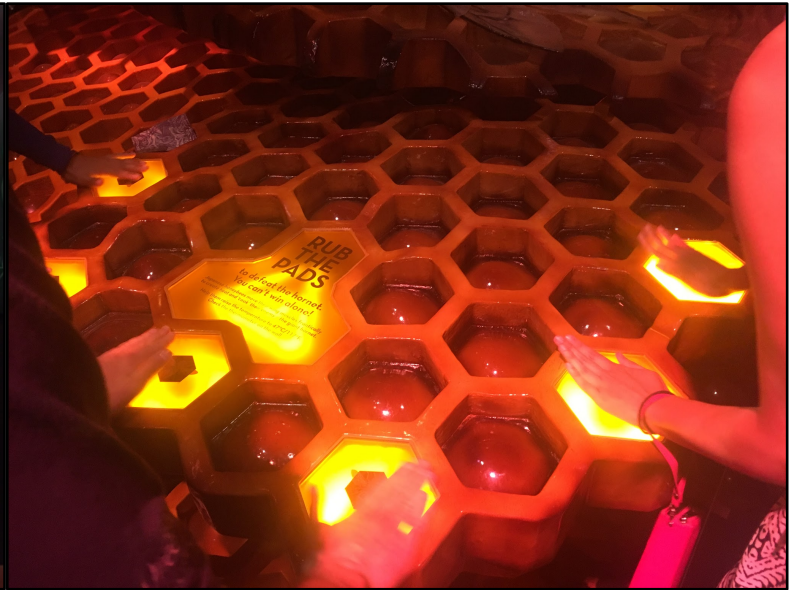
(a)



(b)



(c)



(d)

Figure 19. (a) *Think You're Quick?*, (b) *Flight Test Station*, (c) *Jewel Wasp Brain Surgery*, (d) *Swarm Lab*.

Through all of these interactives, we also felt a greater appreciation for all of these bugs. Despite the small section on Māori legends (H), we learned about how bugs fit into the whakapapa and genealogy of nature (see Figure 20). We rated the exhibition a 4 out of 5 for encouraging new perspectives, since we felt a greater appreciation for the advanced evolution of bugs and how they interact with and inform our world (Table 4).



(a)



(b)



(c)

(d)

Figure 20. (a) Māori section in Bug Lab; (b) View of exhibition from the Māori section; (c) Rāta story; (d) Māori carving.

We then tracked visitors to determine which exhibits were the most popular and engaged visitors for the longest. Figure 21 shows a heat map of Bug Lab, with size indicating the number

of visitors that stopped at an exhibit and color indicating how long visitors stayed. A complete observation matrix for Bug Lab can be found in Appendix G.

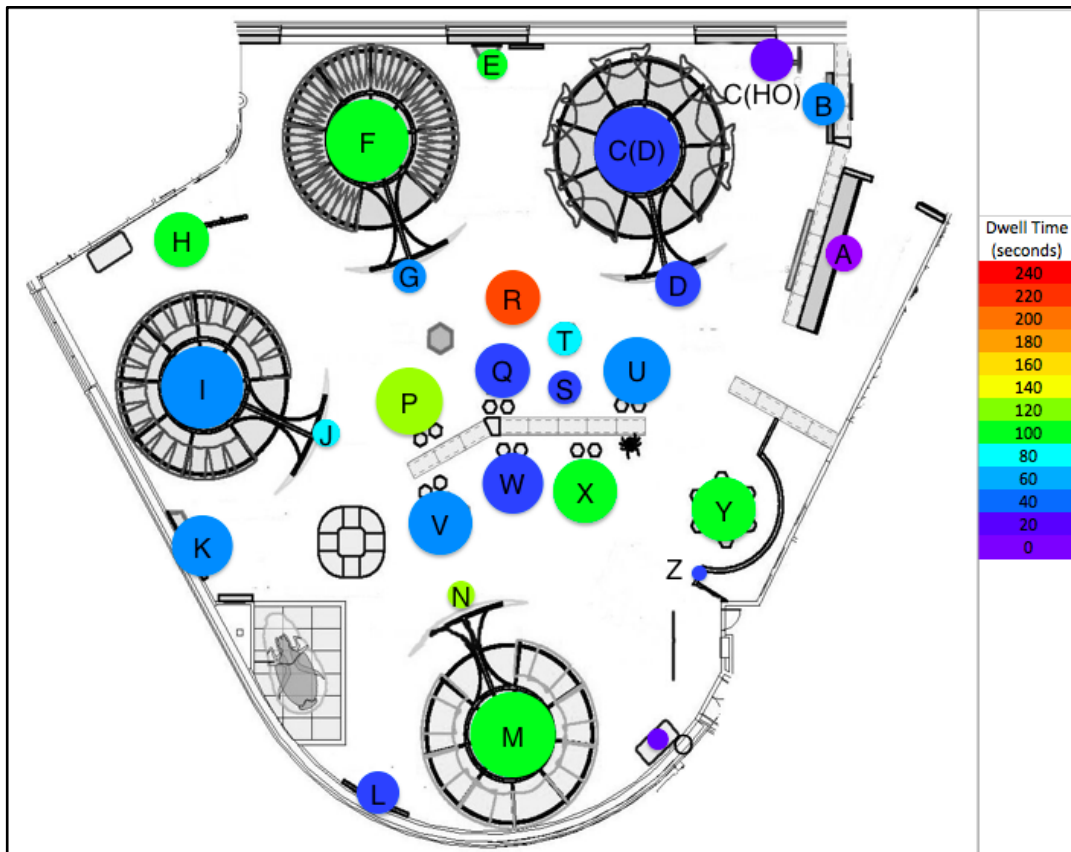


Figure 21. Heat map of Bug Lab.

In Bug Lab, we tracked 30 visitors and found that they spent an average of 35 minutes in the exhibition. The large displays attracted the most visitors, with both the *Display Lab: Orchid Mantis Model* (C(D)) and *Swarm Lab* (M) having 28 visitors enter. In terms of dwell time, visitors spent an average of 48 seconds in the *Display Lab*, whereas visitors spent about 109 seconds in *Swarm Lab*, in which 8 visitors had to wait. Out of the 28 visitors who entered *Swarm Lab*, 15 touched the apparatus and only 6 of the 15 completed the activity. Similarly, 27 visitors entered *Flight Lab* (F) and spent an average of 113 seconds there, but 5 had to wait and only 13 watched the entire display. *Venom Lab* (I) also attracted 27 visitors who stayed for an average of 65 seconds.

The videos outside of the big displays were not as popular. 15 visitors spent about 51 seconds watching the *Orchid Mantis* video (D) but only 3 watched the entire video. Furthermore,



11 visitors watched the *Dragonfly* video (G) for about 67 seconds and only 4 completed the video. Both the *Jewel Wasp* video (J) and the *Japanese Honeybee* video (N) had 9 visitors stop by and only 6 out of the 9 completed the video. The dwell times for the *Jewel Wasp* video and the *Japanese Honeybee* video were 86 seconds and 121 seconds, respectively.

The *Flight Test Station* had the highest dwell times, totaling 226 seconds for the 18 visitors who stopped at the exhibit. However, 5 of them had to wait and only 7 completed the activity. The stations in the center of the gallery attracted more visitors compared to the ones along the outer wall. *Venom Station* (P) and *Display Station* (U) both attracted 22 visitors. For *Display Station*, visitors spent about 71 seconds there, whereas *Venom Station* engaged the visitors for about 123 seconds, in which 2 visitors had to wait and 2 completed the video. For the activities along the wall, 7 visitors stopped at *Think You're Hot?* (O) for about 34 seconds and only 2 completed the game. Additionally, 5 visitors watched *The Bugman* video (Z) for about 49 seconds, yet they all left without completing it. The *Jewel Wasp Brain Surgery* (K) game attracted 20 visitors, in which 19 touched the apparatus but only 10 completed the activity. Visitors stayed there for about 69 seconds of their time and 4 had to wait. *The Bug Debate* (Y) appears popular from the heat map above, but out of the 21 visitors who stopped, only 3 actually completed the activity. The average dwell time for *The Bug Debate* was 105 seconds. Out of the 14 visitors who stopped at *Think You're Quick?* (B), 10 touched the apparatus, and 9 completed the activity. The average dwell time at *Think You're Quick?* was 60 seconds. As for the Māori Section (H), 18 visitors were attracted to the exhibit for about 101 seconds.

Figure 22 shows the decay curves for some of the exhibits in Bug Lab. The four chambers attracted around 90% of the visitors. The *Display Lab* (C(D)) and *Venom Lab* (I) had about 40% of visitors stay for longer than a minute, while the *Flight Lab* (F) and *Swarm Lab* (M) kept about 70% of visitors engaged for a minute or more. The *Flight Test Station* attracted about 60% of visitors, with 30% staying for more than 4 minutes and 10% staying for more than 8 minutes. The *Jewel Wasp Brain Surgery* game and the *Think You're Quick* game had about 20% of visitors stay for longer than a minute. The *Venom Station* attracted 30% of visitors, where about 25% stayed longer than a minute.

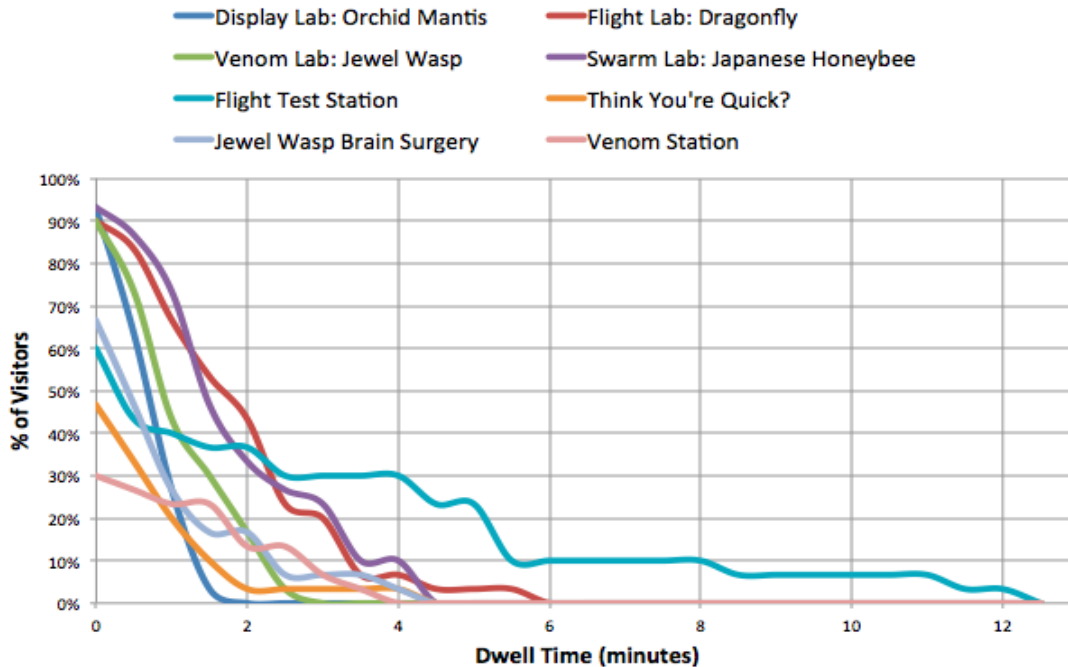


Figure 22. Decay Curves for Bug Lab.

The *Display Lab: Orchid Mantis Model* generated the most conversation among the tracked visitors, where 21 out of the 28 visitors spoke to another person. *Swarm Lab* had 19 visitors converse, whereas both *Flight Lab* and *Venom Station* each had 17 visitors converse with someone. *Venom Station* (P) was found to create the most opportunity for visitors to work together, as 12 out of the 22 visitors who stopped by were engaged with others. *Swarm Lab* and *Jewel Wasp Brain Surgery* both also allowed people to work with others, engaging 11 of the 28 tracked visitors and 10 of the 20 tracked visitors, respectively. Five out of the 28 tracked visitors who entered *Swarm Lab* took a picture or video. The most completed activity was *Flight Lab*; 13 of the tracked visitors completed it. Following this was *Jewel Wasp Brain Surgery* and *Think You're Quick?*, which had 10 and 9 of the tracked visitors complete each of the games, respectively.

Figure 23 shows the paths of the 30 visitors we observed in Bug Lab. Visitors seemed to congregate in the middle of the exhibition, neglecting the exhibits on the outside. The paths to the WETA models (C(D), F, I, M) are also heavily marked indicating their popularity. As with the other exhibits near the perimeter of the gallery, the Māori exhibit (H) went largely unnoticed by many visitors in part due to its location. Another curator favorite that unfortunately did not attract many visitors was *Wings in Action* (E) which was also located near the outer edge of the

Bug Lab. The path map shows promising results with many visitors seeing more parts of the exhibition than Mountains to Sea or Awesome Forces.

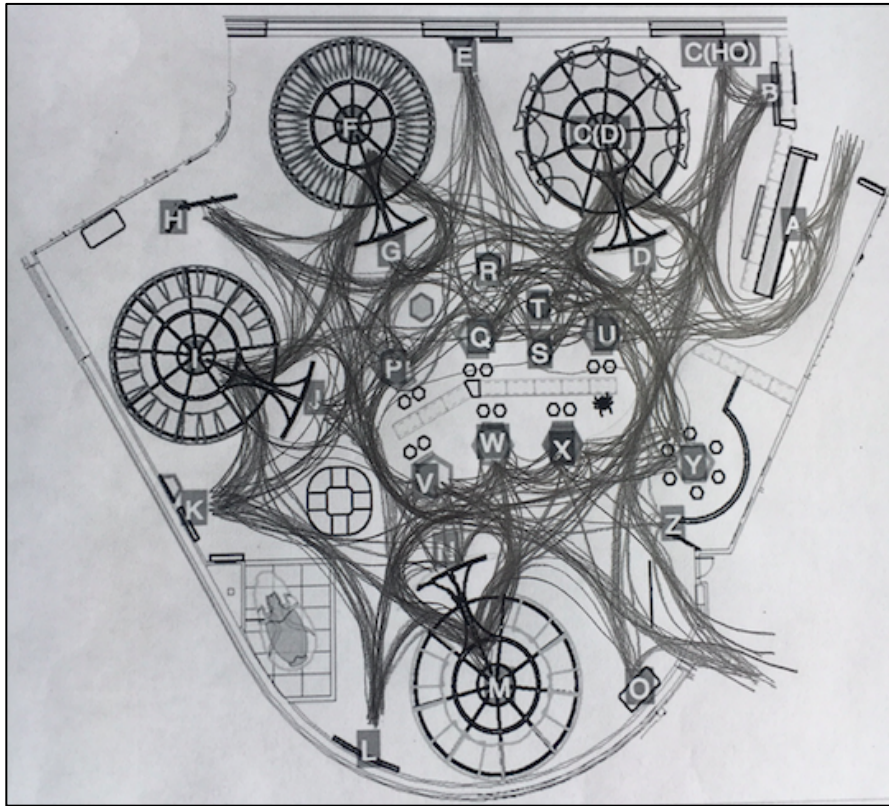


Figure 23. Visitor Path Map of Bug Lab.

Bug Lab received generally positive reviews based on the 30 interviews we conducted. The Weta models were the favorite attraction. Five visitors liked all the Weta models while others named some combination of the Weta models and their surrounding content. Fifteen visitors said their favorite display was the Japanese Honeybees, 13 visitors liked the Dragonfly display, 10 visitors liked the Orchid Mantis model, and 5 visitors liked the Jewel Wasp. Visitors found the Orchid Mantis, in particular, to be visually stunning. Guests enjoyed the light and sound effects that accompanied the models as well. When asked about favorite interactive elements, 9 visitors, both children and adults, enjoyed the slide, 7 visitors liked the *Flight Test Station*, 5 liked the *Think You're Quick?* game, 4 enjoyed the *Jewel Wasp Brain Surgery*, 3 really enjoyed the phones, videos, and touch screens, on the inner stations, and 1 person liked using the magnifying glass to look at the pinned bugs.

The Weta exhibits also had the largest educational impact on the respondents. Seven visitors remembered the Jewel Wasp process and how it turns the cockroach into a zombie. Five respondents reiterated how the Japanese Honeybees create friction with their wings producing heat that kills an invading hornet. Three visitors recalled information about the Orchid Mantis, including its ability to disguise itself as a flower. Two visitors were surprised at how violent insects can be in a “bug eat bug world.” Seven of our participants found more interest in the engineering applications, noting the value of spider silk and the benefits of venom. Three remembered the Bombardier Beetle and its chemical-firing abilities. Two guests enjoyed learning about bug evolution, and 1 liked the exhibit concerning mosquitos. Two visitors could not remember any information.

More visitors noticed Māori content than in Mountains to Sea or Awesome Forces. Eighteen visitors confirmed seeing Māori representation in the gallery, compared to 10 visitors who did not report seeing anything. Māori was not discussed in 2 interviews. Five visitors remembered the flute, 4 visitors remembered the carving, and 4 enjoyed the family tree and legends.

According to most visitors, Bug Lab was superior to other exhibitions. Visitors mentioned that Bug Lab felt “new and fresh.” They loved the interactives, technology, and immersive experience. “Colorful”, ”captivating”, and ”unusual” were other descriptors that visitors used to recall their experience in the gallery. Many liked how the models broke up the reading for them. Some even suggested more partnerships with Weta.

Despite being the most innovative gallery thus far, visitors still had some suggestions for improvement. Three visitors said they would have liked to see more bugs native to New Zealand. One visitor even mentioned Golden Days as a good example of a gallery that was unique and personal to New Zealand. Two visitors would have liked to learn more about species interaction. One guest thought the bugs felt a bit dark for children and 3 wished it was geared more for adults but still believed it fulfilled its purpose for children. A few visitors found the touch screen and magnifying glass tricky and difficult to use. Some visitors would have liked to see more information.

## Part 2. Discussion

Our data analysis revealed some general patterns about what visitors enjoy and are most drawn to in each of the three galleries. The results show that the *Colossal Squid*, the *Earthquake House*, and the Weta Workshop chamber models were the most popular exhibits for Mountains to Sea, Awesome Forces, and Bug Lab, respectively. The reasons that visitors tended to give for being drawn to these is that they were big, unique, and that they had never seen anything like it before. These exhibits were also the most memorable, with visitors recalling information about the colossal squid's biology, being immersed in the earthquake simulation, and admiring the detail and lifelikeness of the bug models.

Visitors also enjoyed hands-on experiences throughout the galleries. Despite the lack of interactives in Mountains to Sea, many visitors stated during interviews that they enjoyed engaging in the “touch-and-feel” activities for different parts of the squid, such as its beak. In Awesome Forces, the *Weigh Up* stations with rocks and the *Earth's Jigsaw Puzzle* globe were relatively popular in comparison to other non-interactive elements. In Bug Lab, many visitors reported enjoying *Think You're Quick?*, *Jewel Wasp Brain Surgery*, and the *Flight Test Station*. They enjoyed these games because they could immerse themselves with and relate to each of the bugs on display, giving them a better understanding of and appreciation for them. Many visitors liked learning about the connections between humans and nature, with one respondent saying that “bugs are an essential part of our universe and life cycle.”

Among the visitors who had visited all three galleries, many enjoyed Bug Lab the most. Some respondents described Bug Lab as “brilliant” and a “must-see”, with one visitor exclaiming that “Bug Lab is next level,” referencing the various opportunities for interactivity and deeper learning. On the other hand, many visitors praised Mountains to Sea and Awesome Forces in their volume of content and uniqueness to the country, at the same time claiming that they wished Bug Lab included more species native to New Zealand. Figure 24 shows a comparison of the time spent by the tracked visitors in each exhibit.

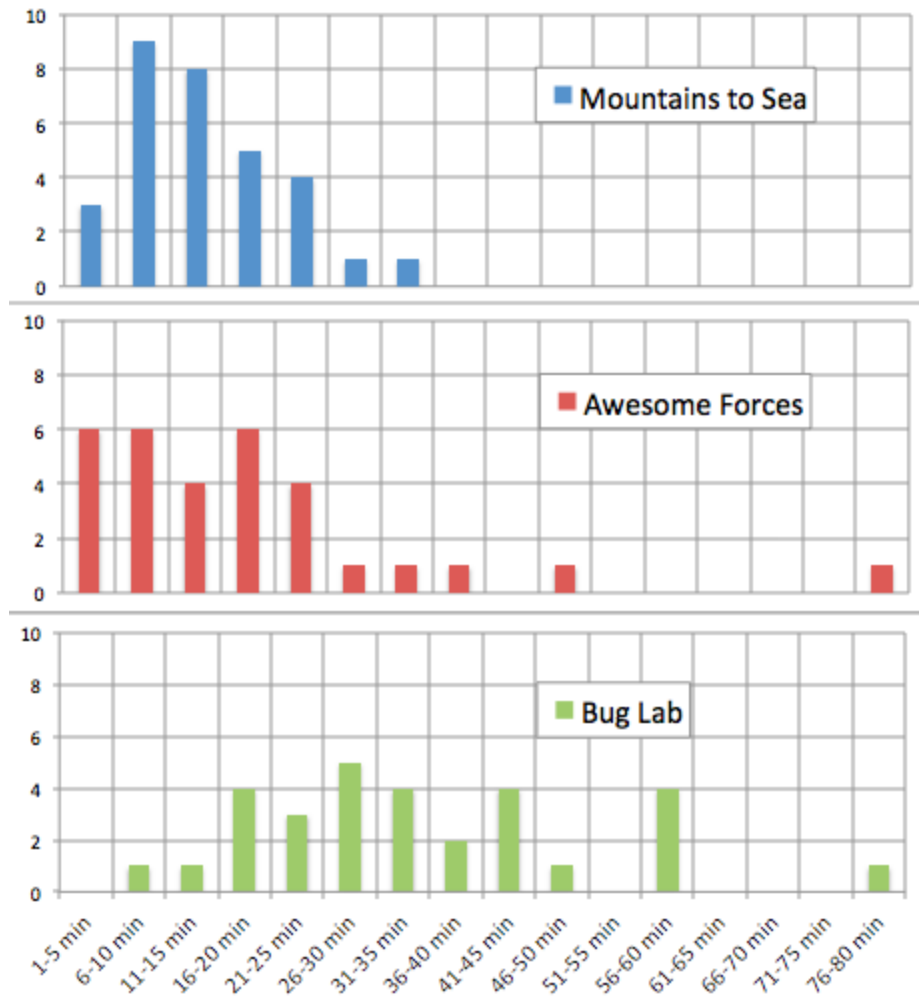


Figure 24. Distribution of time spent by tracked visitors in Mountains to Sea, Awesome Forces, and Bug Lab.

In Mountains to Sea, visitors spent an average of about 14 minutes exploring the gallery. However, some visitors stopped by for as little as a minute, while some spent a half an hour. There was a much wider distribution of time in Awesome Forces and Bug Lab. Most visitors in Awesome Forces spent between 2 and 25 minutes, to yield an average of 18 minutes, while there was one visitor who spent 78 minutes in the gallery. In Bug Lab, visitors spent an average of 35 minutes, with a range of 8 to 77 minutes. Table 5 shows a comparison of the time spent at the exhibits within the three galleries.

Table 5. Comparison of Time Spent in Mountains to Sea, Awesome Forces, and Bug Lab.

	Mountains to Sea	Awesome Forces	Bug Lab
Average time spent in gallery	14 minutes	18 minutes	35 minutes
Proportion of exhibits with 15 or more visitors	25% (4 of 16)	23% (6 of 26)	56% (15 of 27)
Proportion of exhibits at which visitors spent 1 minute or more	19% (3 of 16)	38% (10 of 26)	63% (17 of 27)

Evidently, visitors spent the most time in Bug Lab, which may be affected by the fact that there is an entrance fee. However, looking at the behavior of visitors within the galleries, Bug Lab also has the largest proportion of exhibits at which at least fifteen tracked visitors stopped, as well as spent an average of one minute or more. In Mountains to Sea, only 4 of its 16 exhibits had 15 visitors or more, which were the *Birds and Mammals* display (F), the *Colossal Squid* video (L), the *Colossal Squid* display tank (M), and the *Colossal Squid* touchscreen (O). In Awesome Forces, 6 of the 26 exhibits were visited by 15 tracked visitors or more. These included *Weigh Up* (B), the *Earth's Layers* video (c), *Earth's Jigsaw Puzzle* (G), the *Earthquake House* (N), the *Volcano Video* (Q) and the *Zealandia* section (X). 15 of Bug Lab's 27 exhibits were visited by at least 15 visitors, suggesting that Bug Lab contained a greater proportion of interesting and engaging exhibits. Some of these exhibits were the four chambers and some of the inner stations of the exhibition.

Bug Lab also had a large proportion of exhibits where visitors were engaged for an average of one minute or more, while Mountains to Sea and Awesome Forces had smaller proportions. In Mountains to Sea, visitors were engaged for the longest at the squid videos (L, N, P), while in Awesome Forces, visitors spent most of their time at the *Earthquake House* and videos (Q, R, S). In Bug Lab, visitors spent a lot of their time at the four chambers, as well as at the various games and activities throughout the gallery, including *Think You're Quick?* (B) and *Jewel Wasp Brain Surgery* (K).

Looking at the patterns in this data shows that more exhibits in Bug Lab engaged more visitors for longer periods of time than Mountains to Sea and Awesome Forces. While some of these results may be due to the entrance fee, this may also be influenced by the presence of creative interactives, eye-catching displays, and opportunities for deep learning.

As part of our site evaluation, we noticed a consistent lack of Māori topics in the current Natural Environment exhibitions. While there were elements in each of the galleries, they tended to be presented at the end or in a back corner, such as in Bug Lab. From our interviews with visitors, it was revealed that most visitors did not even notice these elements or confused them with other non-Māori topics. Fortunately, most of the respondents we asked indicated that they would have liked to see more information presented on mātauranga Māori. Our interviews with curators revealed that this issue is recognized, and will be addressed in the renewal process with the incorporation of Māui at the entrance as well as a keeping it present throughout the exhibitions.

In addition to these specifics, our evaluations also revealed that visitors are genuinely satisfied and gratified by their experience at Te Papa. Many visitors exclaimed that the museum was “not-to-miss,” and that they would be happy to visit again and recommend the museum to others. Many return visitors commented that they are continually amazed at the new innovations at Te Papa to create and present engaging content.



## **Chapter 5. Recommendations and Conclusions**

The ultimate goal of our project was to propose a set of recommendations for the renewal of the Natural Environment Zone. Our staff interviews, visitor tracking, and visitor interviews informed us about what works best both for audience engagement and for upholding Te Papa's values.

### **Part 1. Recommendations**

The results of our study pointed to patterns in visitor expectation that can assist Te Papa in its renewal process. Much of our analysis revealed that efforts that have been adopted in the renewal project are headed in the right direction for visitor engagement, while some exposed a few additional opportunities for innovation. Our evaluation also uncovered a wide appreciation for the museum and its enormous contribution to both local and international visitors.

#### *Focus on topics that are unique and native to New Zealand*

One of Te Papa's major goals is to tell the whole story of Aotearoa New Zealand. Since it is a national museum, visitors go to learn topics about the country. Mountains to Sea and Awesome Forces are both very unique to New Zealand, but Bug Lab went outside of native New Zealand species to include a variety of other types of creatures. Many visitors reported that they would have liked to see more species that were native to New Zealand. In the renewal, the content should focus on everything that makes New Zealand unique, which is already incorporated into the plans.

#### *Maintain a connection between humans and the natural environment*

One of the aspects of Bug Lab that many visitors enjoyed was learning about the ways that humans have used bugs to develop new technologies. Some visitors reported feeling a greater sense of connection and empathy with the bugs after seeing this relationship, encouraging them to retain more information about the creatures' characteristics. The renewal should maintain this connection and explore all of the ways in which humans interact with the natural environment. This is already being done with the focus on human impact in the renewal plans.

*Explore ways to integrate mātauranga Māori from the start of development*

Feedback from staff indicated that in the past, the incorporation of mātauranga Māori into exhibitions has often been delayed during development. In addition, many of the visitors that we interviewed indicated a desire to see more about Māori culture in all three of the galleries. A greater effort to include mātauranga Māori has already been seen in the renewal project, particularly with the placement of Māui in Mahitahi at the entrance of the exhibition, as well as the inclusion of Māori constellations in the Star Zone. This effort should be continued throughout development of the other sections in the renewal.

*Keep information concise and simple, and use digital labels to encourage more in-depth learning*

Our findings have shown that visitors do not like feeling overwhelmed with information, and oftentimes are unable to retain all of the content presented in an exhibition, as many reported in Mountains to Sea. Visitors seemed to prefer the touch screens in Bug Lab, which provided more in-depth information that they could look into if they were interested. The control of information is particularly important for the renewal, since it will be covering such a large range of topics. Main themes and topics should be presented, with more thorough information to be controlled by the user with a digital label. During interviews with curators, we learned that there are plans to incorporate digital labels, both to provide more learning opportunities for the visitor and to allow the content in the gallery to be updated if necessary.

*Embrace the peculiar and bizarre aspects of the natural environment.*

These sorts of unusual topics stood out to most visitors. For instance, in Bug Lab, many visitors recalled learning about the Jewel Wasp's pursuit of the cockroach since it is so grotesque and fantastic. In Mountains to Sea, the *Colossal Squid* is a main attraction, with visitors recounting that they had never seen anything like it before. Using smaller items from the collections is a potentially less expensive route, as visitors do enjoy these types of eye-catching displays provided there is a bizarre, memorable story or fact attached to them. For example, the Bombardier Beetle video and slide in Bug Lab were not large exhibits with respect to the rest of the gallery, but visitors still remembered its ability to spew chemicals because it was exciting and foreign to them. Te Papa should look to incorporate phenomena that visitors cannot encounter in

their everyday lives, because these are the types of exhibits that will prompt stories when visitors leave the museum.

*Create detailed and eye-catching displays; consider more partnerships with Weta Workshop.*

Visitors particularly enjoyed big displays such as the Weta models because of the larger-than-life scale and the attention to detail. Not only do visitors remember the models during surveys, but they also retained the information and stories surrounding the largest attractions. Many visitors would even mention the stories surrounding the Gallipoli Weta models because they were so impactful. Such displays often evoked powerful responses from disgust to wonder, thus making them stand out from the rest of the elements in their respective galleries. In order to leave a lasting impression and impart the most crucial information on museum goers, Te Papa should continue to look for ways to partner with Weta and use large scale models as an educational tool.

*Arrange the layout of the gallery so that valuable or costly exhibits are front and center*

From our observations, we noticed that most visitors tend to look at the exhibits that are located in the center of the galleries. Specifically, in Bug Lab, visitors were more drawn to the center stations, as opposed to the exhibits along the outer walls of the gallery. In the renewal, the placement of main themes that the museum wants visitors to take away should be placed in such a way that they will not be missed. Moreover, to help with museum fatigue, there should be a fair amount of seating located throughout the exhibitions to allow visitors to take a break as they explore different exhibits. Awesome Forces contains a lot of informative displays with minimal seating areas. When asking visitors to stop for an interview, one person declined saying they were too tired. Therefore, adding more opportunities for visitors to relax as they learn, allows for a more comfortable experience.

*Incorporate hands-on games and activities for engagement with both children and adults*

Visitor feedback has revealed that the most popular type of interactive is hands-on. In Bug Lab, visitors particularly enjoyed *Think You're Quick?* and *Jewel Wasp Brain Surgery*, both of which are hands-on and immersive. These games engaged visitors for relatively long periods of time, and they were noted as the most popular during interviews. While these types of games

should be incorporated into the renewal, they may be quite expensive to implement. One of the biggest favorites, however, was the *Flight Test Station*, which was fairly simple with a fan and some paper for origami. This game was highly engaging for visitors despite being relatively cheap to implement. Visitors also spent a fair amount of time at *The Bug Debate* station, in which they wrote their opinions in response to various questions about bugs. This allowed the visitors to engage in reflection about their experience, so this type of activity should also be incorporated into the renewal.

*Encourage Māori Studies and Science curators to collaborate when developing content that relates to mātauranga Māori*

According to our staff interviews, finding a balance between mātauranga Māori and science can be difficult when presenting information to visitors. All of the curators that we spoke to emphasized the importance of displaying these two worldviews with equal weight. Inciting collaboration between the Māori Studies and Science curators to develop content may alleviate this struggle and ensure that both sides are represented.

*Consider placing the Dinozone elsewhere in the museum*

The inclusion of dinosaurs in the Natural Environment Zone renewal has been a topic of some debate according to our curator interviews. There are some concerns about how well it fits with the rest of the exhibition concepts, as well as where it should be placed. This was mostly expressed in the fact that dinosaurs are not unique to New Zealand; however, as we found in some of our visitor interviews from Awesome Forces, dinosaurs are a popular topic among guests. We recommend that the renewal team revisit this concept and consider reworking it or moving it to a separate gallery in the museum where it might flow better.

*Encourage a positive atmosphere in the Extinction Experience, and add an opportunity for reflection to transition to the rest of the exhibition*

Due to the fact that the topic of extinction may be emotionally impactful for many visitors, we recommend that this section of the exhibition promotes admiration for the species on display rather than promoting guilt. The significance of human impact on the natural environment can be reinforced by presenting information about conservation efforts and success

stories for endangered species. We also recommend that there is a small station at the end of this section to allow visitors to reflect on their experience, similar to *The Bug Debate* in Bug Lab.

This station could include questions such as:

- What endangered species are you most passionate about preserving? Why?
- If you could bring back an extinct species, what would you choose and why?
- What efforts can you make to preserve endangered species?
- How do humans have an impact on the animals and plants around them?

## **Part 2. Conclusions**

The purpose of our project was to assist the Museum of New Zealand Te Papa Tongarewa in the process of its renewal of the Natural Environment Zone. Our research has both confirmed the value of measures currently being taken by the renewal team, as well as revealed other opportunities for visitor engagement. Our results can also be valuable for future research in visitor engagement.

We must also acknowledge the limitations in our research. We were quite limited in time, and we would have liked to dedicate more time to collecting observational and anecdotal data to contribute to our results. In addition, with more time we may have been able to construct more comprehensive maps of the galleries to increase our understanding of where visitors interact. We also would have liked to incorporate more detailed interviews about visitor motivations and preferences.

Overall, our evaluation of visitor experience has shown the full extent of visitor satisfaction and appreciation of Te Papa being an acclaimed national museum and international source of education. We are honored to have been able to contribute research and recommendations to further help Te Papa in its vision of *Changing Hearts, Changing Minds, Changing Lives*.

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## Appendices

### Appendix A. Criteria for Site Evaluation

Exhibition Name \_\_\_\_\_

Rate the following statements about your experience in the exhibition in terms of how strongly you agree (5) or disagree (1).

\_\_\_\_\_ The exhibition, overall, captured my interest

Explain: \_\_\_\_\_

\_\_\_\_\_ The exhibition was interactive

Explain: \_\_\_\_\_

\_\_\_\_\_ The display of the exhibition was eye-catching

Explain: \_\_\_\_\_

\_\_\_\_\_ The labels and descriptions were easy to read and understand

Explain: \_\_\_\_\_

\_\_\_\_\_ The exhibition was informative and educational

Explain: \_\_\_\_\_

\_\_\_\_\_ The exhibition inspired me to think differently about things I take for granted

Explain: \_\_\_\_\_

\_\_\_\_\_ The exhibition encouraged me to adopt new perspectives

Explain: \_\_\_\_\_

Additional notes about exhibition:

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## Appendix B. Interview Questions for Museum Curators

Dean Peterson, Head of Science:

- What prompted the renewal of the Natural Environment Zone?
- Which aspects or areas of the Natural Environment Zone do you feel are popular with the visitors?
- How would you describe the Natural Environment Zone now, and where do you see it going in the next few years?
- Do you have a sense of how well the Natural Environment Zone has resonated with the Māori visitors?
- What are the measures that you and the curators have taken to incorporate mātauranga?
- What do you hope is the main takeaway that visitors get from their experience in the Natural Environment exhibitions?
- Would you recommend someone else with whom we could interview?

Curators in the Natural Environment Zone:

- What is your role in the Natural Environment Zone renewal?
- Which aspects or areas of the current Natural Environment Zone exhibitions do you feel are popular with visitors?
- What is your vision for designing the new Natural Environment Zone exhibitions?
- What do you hope is the main takeaway that visitors get from the new exhibitions?
- How do you plan on incorporating mātauranga in the renewal?
- What displays or interactives have you developed so far?
- Is there anything specific you would like to see incorporated into the renewal? Why?
- Would you recommend someone else with whom we could interview?
- Is there anything that we can do to help you in this process?

### Māori Perspectives:

- How well do you feel the Natural Environment Zone has embodied mātauranga?
- Is there another exhibition in the museum that you feel could be a good example of representation of Māori narratives?
- What has been your greatest challenge in overseeing Māori studies at the museum and why?
- There has been some talk about incorporating the Māori cultural figure, Māui, into the Natural Environment Zone renewal to guide visitors through their visit. How do you feel about this idea, and do you have any suggestions about how to do this to successfully address Māori perspectives?
- What would you like to see incorporated into the renewal?
- What do you hope is the main takeaway that visitors get from their experience in the Natural Environment Zone?
- Do you have a sense of how well the Natural Environment Zone has resonated with the Māori visitors?
- What do you perceive as the primary points that non-Māori do not understand about mātauranga?
- Would you recommend someone else with whom we could interview?

**Appendix C. Observation Matrix**

Observation Matrix																	
Exhibition Name										Observer Name							
Date	Time In	Time Out	Visitor Gender M F		Visitor Age 20 30 40 50 60+					Group Composition							
Weather									Cruise Ship Y N								
Devices Not Working																	
Exhibition Section																	
Time Spent (s)																	
Observed Actions		Tick Appropriate Columns															
Reads label																	
Touches/moves apparatus																	
Has to queue or wait																	
Works alone																	
Works with others (P/G)																	
Talks with others (P/G)																	
Watches others (P/G)																	
Uses cellular device																	
Takes picture/video																	
Watches video																	
Completes activity/video																	

P = member(s) of the public G = member(s) of group they came with

**Comments:**

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## Appendix D. Interview Prompts for Visitors

We are a group of students from Worcester Polytechnic Institute assisting Te Papa with evaluating visitor experience. Thank you for taking part in this interview measuring visitor experience for Te Papa. Today we will be gathering your feedback to better serve your interests in the future. We would like to know more about what visitors experience within these exhibitions. This interview should take about 5 minutes of your time. These responses are anonymous and will not be identified with you in any way.

Below is a list of conversation prompts to choose from.

All:

1. What brings you to Te Papa today? How did you hear about this exhibition?
2. What was your favorite part of this exhibition? Why?
3. Can you tell me about something you learned?
4. If you were to tell a friend about this exhibition, what would you tell them?
5. What was your favorite thing to do? Why?
6. Did you see anything about Māori that captured your interest? What? Why?
7. Is there anything else you would like to share with us?

Only Mountains to Sea:

1. Did you go to see the Colossal Squid? What did you like about it?
2. Do you have any ideas about how to improve the Colossal Squid?

Only Awesome Forces:

1. Did you go to the Earthquake House?
2. Have you ever experienced an earthquake?
3. How realistic was the Earthquake House?
4. Do you feel prepared to deal with an earthquake?
5. Did you have any preconceptions about earthquakes before coming to New Zealand?
6. Do you have any ideas about how to improve the Earthquake House?

## Appendix E. Pretesting Data

### Gallipoli

Criteria	Person	Rating	Comments
The exhibition, overall, captured my interest	Shannon Harrington	5	I generally don't enjoy war related things, but this exhibition was so powerful and immersive that I was interested in all of it
	Brooke Klepper	5	I enjoy history but to a certain extent. The exhibition was VERY informative, but almost too informative. I did not read everything, however there were many aspects that captured my interest.
	Shannon Moffat	4	I had never heard about the Gallipoli war, so I was interested to learn more about its impact on New Zealand.
	Kaylee Perron	2	Not interested in history but can see where a history enthusiast would enjoy this
The exhibition was interactive	SH	3	There were a few places where you could interact with something, like the gun with the mirror to aim, or the hats to try on, or the drawers to pull out, but in general it was more visual
	BK	2	There were some interactive pieces, but most of it was reading or observing things, which were still entertaining.
	SM	2	There were some interactive portions, but not many hands-on opportunities. It makes sense in the more somber setting, but it would have been more engaging with more active portions.
	KP	3	Most was visual, not many games, but that makes sense for the topic
The display of the exhibition was eye-catching	SH	5	The giant people were AMAZING WHAT THE HELL. I liked that there was a path through the exhibition with dates on it, the 3D holographic map was really cool too
	BK	5	The massive human-like models were INCREDIBLE. They appeared so life-like and helped add to the emotional aspect of the exhibition.
	SM	5	The Weta Workshop models were AMAZING. I kept waiting for them to move they were so lifelike. The rest of the exhibition was very eye-catching as well with the paintings and quotes.
	KP	5	Detailed sculptures were lifelike and eye-catching
The labels and descriptions were easy to read and understand	SH	4	The only reason this isn't a 5 is because there was just so much of it that it became overwhelming, and there were crowds at certain points that made it hard to see everything. Otherwise all the labels were easy to read.
	BK	3	For the most part, everything was easy to read, however there was just A LOT of information posted on the walls and I did not read all of it completely.
	SM	3	The descriptions were easy to read, but there were so many of them that it got confusing. I liked focusing on the bigger

			quotes, and some of the smaller descriptions were a bit extraneous. It was very visually stimulating, almost to a fault.
	KP	4	Told a story and kept it simple, but there were so many captions that I did not get to all of them due to the natural visitor pace moving through the exhibition
The exhibition was informative and educational	SH	5	It definitely caught you emotionally, which made you care more about the information. For me personally, I don't really like just reading the descriptions but there were so many other ways that information was presented, like the skeleton visual thing. There was also an element of needing a break from the emotional aspect of it, which is when you can stop and read information
	BK	5	I knew nothing about the Gallipoli war prior to entering the exhibition, thus after exiting I definitely learned a lot about the war.
	SM	5	I learned so much about each stage of the war in Gallipoli. Having never learned anything prior, I now feel like I could explain the war as well as its impact on New Zealand to someone uninformed about it.
	KP	5	Had no prior knowledge of gallipoli so everything was new and informative
The exhibition inspired me to think differently about things I take for granted	SH	5	I'm so glad I'm not a soldier.
	BK	4	I have learned a lot about wars in the past, and each time I feel sympathy for those who fought and died. I try to imagine what it would be like if this were to happen today and I can't. Each time I learn about wars, I am always thankful and try to appreciate my life more.
	SM	5	You never hear about New Zealand when you are learning about WWI. However, learning about this war helped to clarify that war affects the whole world. Even though I had never heard about it, Gallipoli was devastating for the groups involved.
	KP	5	The graphic pictures portraying the tragedies of war remind me how fortunate I am to live in a peaceful nation with a roof over my head
The exhibition encouraged me to adopt new perspectives	SH	5	I got the same sense that I get from most war-related things in that war is a waste of human life.
	BK	4	I do try to appreciate little things more and this exhibition did encourage me to be thankful for how lucky I am.
	SM	4	At the end of the exhibition, I felt very somber and emotional. I felt connected to the people portrayed in the exhibition. They were more than just soldiers devoted to their country. They were human beings with families and pain and sacrifice.
	KP	4	While it reminds people of how fortunate they are, the war doesn't necessarily change how people live or go about their daily lives.

## Appendix F. Site Evaluation Results

### Mountains to Sea

Criteria	Person	Rating	Comments
The exhibition, overall, captured my interest	SH	2	It felt like a regular museum and I was interested enough but it was underwhelming in comparison to what we had already seen. I liked the setup of the exhibition, like how there were different levels to walk on
	BK	3	I enjoyed seeing all of the animals but found the presentation of it to be a little boring. There were too many animals to see and too many labels to read.
	SM	2	The exhibition was a very traditional museum layout. I likely would have enjoyed it more if I had seen it before Bug Lab or Gallipoli. In comparison, it fell rather flat.
	KP	2	The exhibition felt very static and unengaging
The exhibition was interactive	SH	1	There were very few interactive things. The labels were in flip books that I guess could be considered interactive, but they were difficult to use and required a lot of concentration to figure out what you were looking at and didn't give much information. The section with the colossal squid had the best interaction, I liked how you could make your own squid.
	BK	1	Not many interactive activities. However, I enjoyed making my own squid and learning about the internal/external parts of the squid using the tablet.
	SM	1	Really the only fun interactive was the digital exploration of the colossal squid. You could learn more about it and build your own squid. All other interactives were just little booklets you could flip through to learn more, which weren't very interesting or creative.
	KP	1	Most of the exhibitions consisted of taxidermies. While there was a play area, the learning aspect was often missed due to very little interaction with the actual information
The display of the exhibition was eye-catching	SH	2	It looks cool as a whole, like with the ramps and stuff, but when you try to look at things individually there are a lot of places that just have bad lighting that makes it hard to see. A lot of things look fake, like how the displays were set up, so even just redoing it exactly as it is now but with more realistic trees for example, would make it a lot better.
	BK	3	Seeing the colossal squid in the tank was definitely the most "eye-catching". The other animals on display was interesting to see, as well.
	SM	4	The exhibition used a lot of beautiful models of animals, but they were nothing compared to the Weta Workshop models used in other exhibitions. Many of the other visuals, like trees and plant life were unappealing.
	KP	5	While the exhibition was beautifully organized, it felt overwhelming. There was too much on display with too much information. Rather, I admired the display for what it was and moved on, skipping the signs. The exhibition had bad lighting making it difficult to see all that was on display.



The labels and descriptions were easy to read and understand	SH	1	There were places where it was hard to read labels because they were in shadows. The colossal squid section was significantly better.
	BK	2	The labels were easy to read but there were TOO many; it was almost overwhelming. Lights were also very dim, which made it hard to see.
	SM	1	Many of the labels were oddly placed or in shadow, making them very hard to read. You could also miss a lot of information since there were so many signs with descriptions written. The exhibition should have incorporated more of a “show don’t tell” approach.
	KP	1	The labels were small and not well lit. The index of taxonomic names was uninteresting and laborious to flip through for a visitor.
The exhibition was informative and educational	SH	2	The information was there, but you had to look for it. It was easy to not learn anything - there were some kids just running around on the tree thing. The display cases were not particularly informative, it was mostly just labels instead of any explanations. Again, the colossal squid section was a lot better.
	BK	4	I think the most informative was the colossal squid since that seemed to be the main focus of it. The rest kind of just named the other animals.
	SM	5	The exhibition was very informative, but did not encourage much more learning beyond the information that was delivered.
	KP	5	The exhibition was packed with information but portrayed in a formal learning style that was unappealing to me. Therefore I had very little interest in reading the paragraphs of information. The index felt unnecessary and uninformative in that I did not learn anything more about the display other than its name. If it was portrayed in a more exciting manner, I may have gotten more out of it
The exhibition inspired me to think differently about things I take for granted	SH	1	I didn’t feel inspired by it.
	BK	1	The exhibition didn’t seem to include any pressing environmental issues, but rather inform the visitors about the names of different animals.
	SM	2	The exhibition was not very politically or socially charged, and it did not encourage any creative thinking.
	KP	1	I was not inspired and there was very little about it that related to my day to day life that I would have taken for granted beforehand.
The exhibition encouraged me to adopt new perspectives	SH	1	I didn’t really see a message anywhere, it was more of just “look at this cool stuff we found”
	BK	1	Same as above. There were no pressing issues displayed in the exhibition that would encourage people to change their views on nature.
	SM	2	Nothing was particularly inspiring.
	KP	1	There was no message or emotion in the way the exhibition was portrayed that would change the way I feel about the natural environment or the devastating effects of human industrialization on the earth.

## Awesome Forces

Criteria	Person	Rating	Comments
The exhibition, overall, captured my interest	SH	3	I really enjoyed the subject matter, and there were cool parts but there's definitely room for improvement.
	BK	4	Prior to this, I knew nothing about earthquakes, so it was interesting to learn about them.
	SM	3	There were some cool interactives right at the entrance of the exhibition with the description of the earth's composition. The information was also very interesting when it came to the natural phenomena. I didn't understand the relevance of the dinosaurs and other prehistoric creatures.
	KP	2	The content did not appeal to me but may have been more appealing to someone interested in natural disasters. I did enjoy the extinct animal section but due more to my interest in the subject matter rather than how it was displayed or interacted with.
The exhibition was interactive	SH	3	There were interactive elements for sure, but there was one that didn't work, one that was hard to use (telescope). I was expecting the Earthquake House to be better, it was crowded and you had to wait to go in, so I was expecting something cooler. The displays of the tectonic plates could have been interactive but weren't. I liked at the beginning how you could try to pick up the different rocks.
	BK	2	A lot of the interactive parts of the exhibition were not working properly.
	SM	3	There were quite a few fun interactives, including the Earthquake House and Quake Safe Game. However, I assumed that the displays of tectonic plate movements would be interactive and was surprised/disappointed to find that they were not.
	KP	3	The safety games were enjoyable. However, some of the interactive games were broken or a bit underwhelming. The games felt more like "bells and whistles" that opened a new paragraph of information that paralleled the dullness of a general sign. Some of the displays were deceiving in that I thought they were interactive and weren't
The display of the exhibition was eye-catching	SH	3	It looked cool as a whole and was definitely better than Mountains to Sea. There was one place where the display covered the label on the wall behind it, which seems dumb.
	BK	4	There were tons of cool things on display, however it was a little overwhelming. I did not necessarily see everything because there was almost too much to see.
	SM	3	There were some really great visuals, but it could have been more cohesive and consistent.
	KP	1	I did not find any of the displays exciting or interesting to look at
The labels and descriptions were easy to read and understand	SH	3	In general they were easy to read, except for that one behind the display.
	BK	4	Everything was easy to read and understand, however there was just too much stuff to read.
	SM	4	Most of the labels were visually appealing and easy to read.
	KP	2	The descriptions were laborious to read and the videos felt a bit too long to hold my interest

The exhibition was informative and educational	SH	3	I already knew a lot of the information, especially about the fault lines and tectonic plates. It looked very similar to what I remember learning in school, so it would probably be good for field trips.
	BK	5	The exhibition was very informative, which made it a little boring.
	SM	5	There was a lot of information presented about the natural phenomena experienced in New Zealand. However, some of it was irrelevant (too much into Gondwanaland, prehistoric creatures seemed out of place).
	KP	5	The exhibition was full of useful information. The earthquake safety and the extinct animal section was the information i felt i retained best due to personal interest and successful portrayal.
The exhibition inspired me to think differently about things I take for granted	SH	3	There was definitely some inspiration in terms of earthquakes and the results of them, but I think a lot of the messages were towards the end and I was over it (go that museum fatigue)
	BK	4	Seeing the damage done from earthquakes definitely made me more grateful for living in an area without them.
	SM	4	It did give me a greater appreciation for the uncontrollable natural phenomena experienced on the earth
	KP	5	Coming from a mild area of the U.S. I have never experienced personal natural disaster devastation. The precautions that people here in NZ have to take make me realize I'm lucky I don't have to worry about these things
The exhibition encouraged me to adopt new perspectives	SH	3	It is sympathetic to victims of earthquakes so I guess?
	BK	3	
	SM	3	The exhibition did encourage proactive and preventative measures for avoiding danger in the event of these phenomena.
	KP	4	I have a different outlook on the way natural disasters can affect lives.

### Bug Lab

Criteria	Person	Rating	Comments
The exhibition, overall, captured my interest	SH	5	I was definitely interested
	BK	5	VERY entertaining - I'm not a fan of bugs but it stimulated my interest
	SM	4	I was intrigued at all of the different aspects about bugs that I learned.
	KP	4	While I have no particular interest in bugs, the bug personification and engineering applications captured my interest
The exhibition was interactive	SH	5	There was no shortage of interactive elements
	BK	5	Wide range of activities - targeted most senses - good for learning
	SM	5	There was no shortage of interactive activities. There was a variety of fun and interesting interactives around the whole exhibition, most of which allowed multiple people to use at a time.
	KP	5	The exhibition was full of creatively diverse interactives that kept my attention

The display of the exhibition was eye-catching	SH	5	The Weta workshop models were cool
	BK	5	Liked the big displays with the huge creatures; they were very creative and entertaining; never seen anything like it
	SM	5	The Weta Workshop models were amazing, and I liked the small separate sections for each type of bug that were visually appealing on the outside as well as the attraction on the inside.
	KP	4	Yes the Weta models
The labels and descriptions were easy to read and understand	SH	5	I appreciated the captions in the videos
	BK	5	
	SM	3	Some of the writing was a bit small for the size of the whole exhibition, it would have been better if you could read it from further away.
	KP	5	Some of the screen interaction was lengthy and lost my interest even though it was vibrant and picture-driven. Overall, the labels were concise and well-lit
The exhibition was informative and educational	SH	5	There was so much information presented that it was difficult to get all of it. I liked that there was the section to answer questions at the end with you opinions and you could see things that kids had learned earlier in Bug Lab
	BK	5	Definitely learned more than I knew before about some bugs - wasn't too much information to handle
	SM	5	I learned a lot about bugs, and the information was very interesting. It ranged from basic to very detailed.
	KP	5	I thought it was a great educational tool for both kids and adults. Maybe too simple for experts.
The exhibition inspired me to think differently about things I take for granted	SH	4	I have a stronger appreciation for bugs now
	BK	4	Liked how we were entering the "bug's world"; gave the bugs character; made me more sympathetic to bugs as living beings and not just disgusting creatures
	SM	4	I guess I felt more connected to bugs after the exhibition. I usually hate bugs, but it was interesting learning about them. It was particularly interesting learning about how the Māori incorporate bugs into their "family tree", and that made me feel more of a "camaraderie" with bugs.
	KP	1	I have more respect for bugs but I don't feel like I ever took their presence for granted
The exhibition encouraged me to adopt new perspectives	SH	4	It takes you through the exhibition from the bug perspective and many of the labels say "you humans"
	BK	4	
	SM	4	I'm not sure how impactful this exhibition is in terms of changing perspectives or inspiring people to do things differently. This is definitely more of an educate/engage exhibition than an inspire exhibition.
	KP	5	I realize they can have a positive impact on our lives. From inspiring Māori art to biomedical applications, everything they do, they do for a reason (gross or not)

## Appendix G. Visitor Tracking Results

### Mountains to Sea

Mountains to Sea	Total Visitors Tracked: 31				Average Time Spent in Exhibit: 14 minutes																
Section	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P					
Proportional Time	2.0%	3.0%	3.2%	8.4%	2.2%	5.9%	6.9%	3.9%	5.1%	2.1%	5.4%	17.6%	8.1%	9.1%	5.6%	28.6%					
Average Time Spent (s)	16.4	22.6	21.6	44.1	14.1	31.6	44.8	18.3	23.3	10.8	27.5	74.8	53.0	65.1	31.6	135.7					
Reads Label	10	7	7	6	4	15	2	2	2	4	1	9	23	4	14						
Touche apparatus		4	2			2	1	1		4			1		10						
Has to queue or wait	1											3	1								
Works alone															3						
Works with others		1								1					1						
Talks with others	1	6	3	2	3	7		1	1	3	1	2	13	3	5	2					
Watches others		1	2										1	1	1						
Uses cellular device			1			2							3		1						
Takes picture/video			1			2							2								
Watches video												18		5	1	8					
Completes activity/video												6		1	1	4					
Total Visited	10	8	9	5	7	16	2	2	2	5	1	19	27	8	16	8					

### Awesome Forces

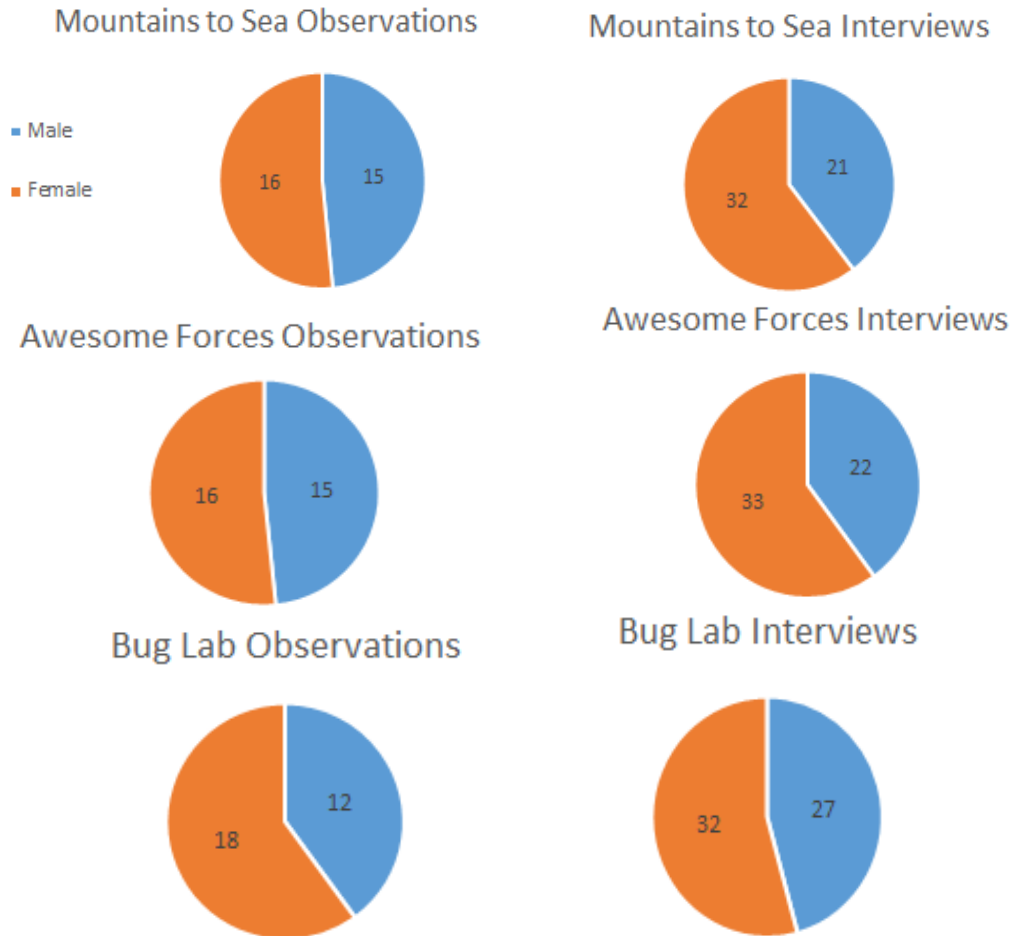
Awesome Forces	Total Visitors Tracked: 31													Average Time Spent in Exhibit: 18 minutes																		
Section	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z						
Proportional Time	11.3%	2.9%	4.0%	0.5%	2.6%	2.5%	3.8%	3.5%	4.2%	1.5%	2.9%	9.7%	2.7%	23.6%	6.4%	7.0%	9.7%	9.7%	19.4%	4.1%	5.1%	3.3%	6.4%	6.9%	2.8%	2.7%						
Time Spent	122.9	31.9	43.0	5.0	28.6	27.7	41.5	38.0	45.6	16.5	31.6	105.8	29.0	255.9	69.6	76.3	105.8	105.0	210.2	44.3	55.3	36.1	69.7	74.5	30.4	29.4						
Reads Label	6	13	1		9	8	14	5	4	3	7	4	3	2	5	3	11	2	4	6	1	5		17	10	6						
Touche apparatus	6	10			3	5	9	2	1	4	4	4			2	2		2	1	2		2			1	5						
Has to queue or wait	1						1			1				14		1			1			1				1						
Works alone	2	1			2					1						2			1	1			1		1							
Works with others	2	4				1	1	1	1	1	1	2			1			1		1			1			5						
Talks with others	3	6	3		6	5	9	3	4	1	5	3	1	7	1	1	4	1	2	1	1	2	2	5	3	3						
Watches others	2	2		1			1	2		1	3				2				1	2		3				6						
Uses cellular device		1	1			2	1			2					2		1	3		1				1	2							
Takes picture/video		1	1						1	1	1				1		1			1					3							
Watches video			15			1									4		17	1	4		2			10								
Completes activity/video	1	1	2						3					23	1		5						2			1						
Total Visited	7	15	16	1	10	9	17	6	13	6	7	4	3	24	5	3	16	2	5	7	2	6	8	18	10	9						

### Bug Lab

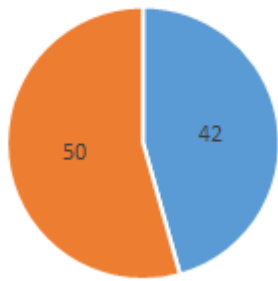
Bug Lab	Total Visitors Tracked: 30													Average Time Spent in Exhibit: 35 minutes																		
Section	A	B	C (H)	C (D)	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z					
Proportional Time	0.5%	2.9%	1.9%	2.3%	2.4%	5.3%	5.5%	3.2%	4.9%	3.1%	4.1%	3.3%	2.7%	5.3%	5.8%	1.6%	5.9%	2.4%	10.9%	2.4%	4.6%	3.4%	3.8%	2.8%	5.1%	5.1%	2.3%					
Time Spent (s)	10.8	60.4	38.9	47.8	50.7	110.6	113.3	67.2	101.0	64.8	85.6	69.0	55.7	109.4	121.1	33.9	122.5	50.4	225.9	49.8	96.3	70.9	77.8	58.4	105.5	105.5	48.6					
Reads Label	4	12	14	18	5	11	19	3	18	23	6	20	9	19	6	6	26	21	12	11	13	27	25	21	24	20	5					
Touche apparatus	1	10	6	1		6			3			19		15		6	22	6	11	2	13	14	16	11	17	3	1					
Has to queue or wait		4	2	1		1	5					4		8			2		5			1										
Works alone		4	1									3				2	5		1		4	3	6	5	7	1						
Works with others	1	4	7			4						10		11		2	12	5	6	1	7	6	6	2	3	5						
Talks with others	5	9	6	21	7	7	17	2	11	15	6	14	8	19	8	4	17	12	12	5	9	14	14	9	12	11	3					
Watches others	1	12	5	3		2	3		3	1		8	1	22		1	13		11	1	4	3	3	2	2	5						
Uses cellular device					2				1	1	1	1					4						1									
Takes picture/video					2			2		3						5							1	1								
Watches video					12	3	15	11				10			14							1	1		5	2	2	5				
Completes activity/video		9	2		3	2	13	4	1	1	6	10	5	6	6	2	2	1	7		2				3	3						
Total Visited	12	14	14	28	15	10	27	11	18	27	9	20	14	28	9	7	22	18	16	11	11	22	21	20	21	21	5					

## Appendix H. Demographic Information

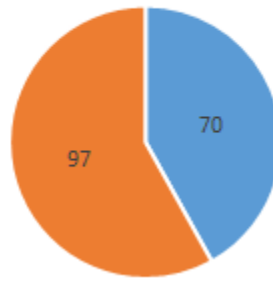
### Gender Distribution



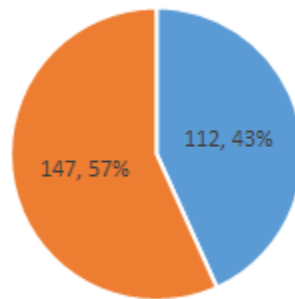
Observation Total



Interview Total



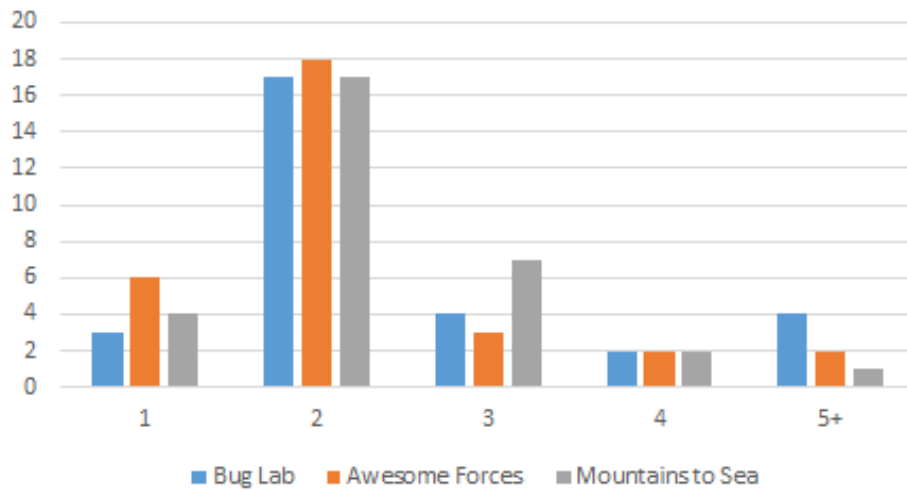
Total



■ Male ■ Female

### Group Sizes

Group Sizes: Observations



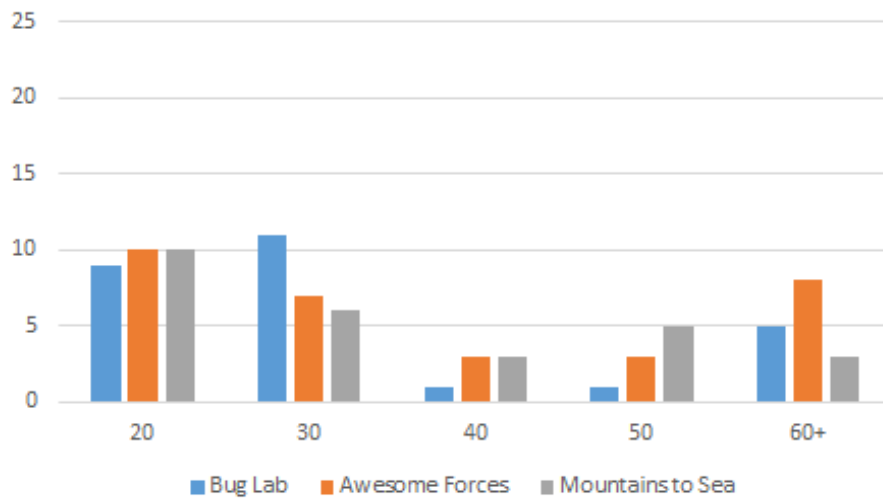
### Group Sizes: Interviews



### Age Range

All data is approximate

### Age: Observations





### Age: Interviews

