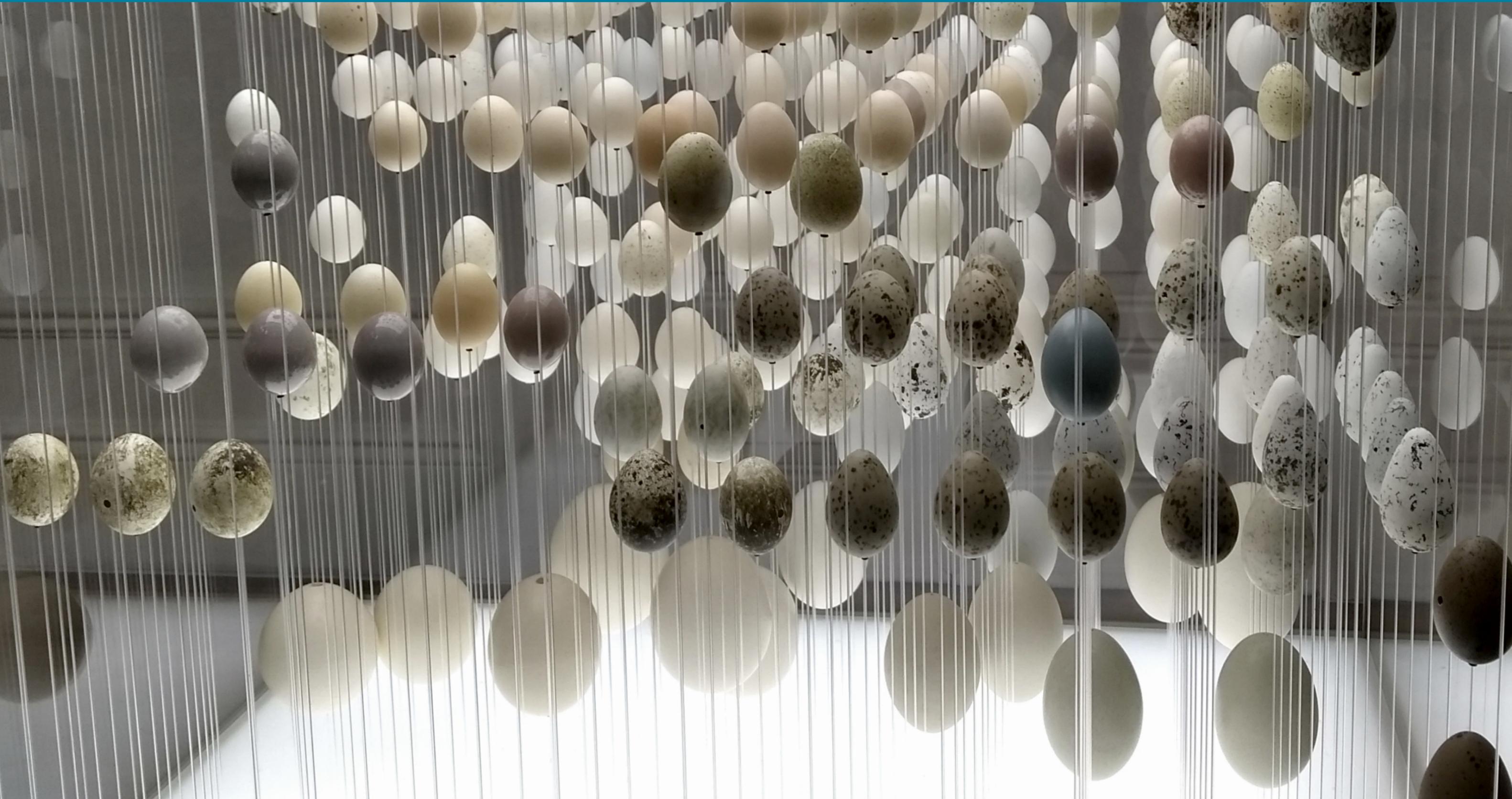


# ENGAGING VISITORS IN NATURAL HISTORY MUSEUMS

A NEMO - THE LEARNING MUSEUM GROUP REPORT



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## INTRODUCTION

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## NEMO WORKING GROUP LEM - THE LEARNING MUSEUM

The LEM Working Group started out as a continuation of LEM - The Learning Museum, a network project funded by the EU and carried out between 2010 and 2013, in which NEMO was a partner.

Collecting the legacy of LEM, the Working Group continues to explore topics around the fields of museum education, audience development, intercultural dialogue and lifelong learning.

Through various study visits to different museums in Europe organized for the Working Group members, as well as through studies and reports produced by the group, The Working Group LEM supports the exchange of information and learning among museum professionals in Europe.

The Amgueddfa Cymru - National Museum Wales is a NEMO member and plays an active role in NEMO's Working Group LEM. In 2018/19 the Museum proposed to carry out a research to deepen the understanding museums have of visitor engagement with natural history displays. This report is the result of the research and we hope it yields some interesting insights for natural history museums.

NEMO - The Network of European Museum Organisations

In 2016, Amgueddfa Cymru - National Museum Wales created a Concept Development group to explore the potential for exploring the further development of the natural history spaces at National Museum Cardiff.

As part of this process a Research and Visitor Studies working group was established. This group was firstly tasked with amalgamating existing literature relating to visitor experiences within natural history galleries. This work was intended to guide the Concept Development group.

The process showed the value of sharing knowledge more widely amongst the development team; opened up new discussions across hierarchies and departments; and shaped the thinking for a more research-led and participatory approach to museum development, harnessing visitor-centred values and needs.

What follows is a summary of the research collated and summarised, along with discussions and implications for natural history gallery developments.



Fox peering down at visitors in the Wriggle Den, National Museum Cardiff.

Our more recent re-development project has seen a change in the way we work with and for our audiences, placing cultural participation firmly at centre stage. The redevelopment of St Fagans National Museum of History was completed in 2018. We consulted with over 120 organisation and collaborated with artists, craftspeople, young people, academics and community groups to reimagine the Museum.

Together we made decisions about content, collected new objects and developed new narratives around collections. We have broken new ground in promoting the Welsh language and supporting those learning Welsh and English as a second language.

The gallery interpretation is structured around opportunities for people to participate and contribute - to be part of the story and not just visitors to it. We aimed to create history with rather than for people, thus facilitating people's access to their cultural rights. This is only the beginning of our journey towards cultural democracy.

Black (2012)<sup>2</sup> argues that for Museums to survive in the 21<sup>st</sup> Century, we need to change our practice and engage and involve our users on a number of levels, we must work at the heart of our local communities and help our visitors to become active partners in the work of the Museum.

1: <https://museum.wales/about/policy/community-engagement-strategy/>  
2: Black, G (2012) *Transforming Museums in the Twenty-first Century*. Routledge



National Museum Cardiff.

# ESTABLISHING A RESEARCH AND VISITOR STUDIES GROUP

A Research and Visitor Studies group was established in 2016 as part of the Natural Sciences Concept development group, exploring how we could develop our natural history galleries in future. Alongside this we also established an Activities and Benchmarking group to carry out small scale research into our visitors.

The Research and Visitor Studies working group comprised representatives across different departments; including learning officers, Head of Marketing, Head of Exhibitions, and natural sciences curators. It was led by Ciara Hand, Senior Learning, Participation and Interpretation officer.

The multi-disciplinary nature of the group opened up diverse discussions, enabled us to share skills and knowledge more widely, and allowed us to understand our visitors from a number of different viewpoints. It gave us a forum to discuss Museum strategies and how they relate to natural history displays and visitors to our galleries.

The working group was set 4 overarching tasks to undertake as part of a literature review.

We were tasked with finding:

- 1) Work conducted on the responses of visitors to science and natural science displays and activities/programmes
- 2) Published academic research on the public understanding and perceptions of the natural sciences and scientific issues important to society

3) Published academic research on science communication

4) Theory and current thinking on building creativity and interactivity into displays to achieve learning outcomes

The scope was large, and there was substantial overlap between the tasks.

Initially some work was completed around understanding what we already do as an organisation. As a large organisation, covering many different sites, it was essential to gain some understanding of practices in different disciplines. We carry out large-scale visitor surveys of our temporary exhibitions programme which enables us to learn from different practices in a variety of disciplines.

A large part of our focus was on the major development of St Fagans National Museum of History<sup>3</sup>, which involved participatory practices to understand more about our visitors, and to include them in the process of developing a new Museum<sup>4</sup>. These participatory practices have led to a more thorough understanding of our local communities and audiences, and has enabled us to develop a strong community engagement practice across Amgueddfa Cymru - National Museum Wales. The areas of research that would be needed to understand our audiences, from visitor motivations through to learning, social influences and design, were explored.

The questions which would help us focus our research were defined. For example;

- What motivates visitors?
- Are museum exhibits designed to facilitate learning?
- How does the Museum help visitors challenge or deepen their understanding of science/natural history?
- What are the social influences and interactions when visiting as a family and in groups?
- What kinds of participatory practice are there and how can visitors play a meaningful role in developing exhibitions?

3: <https://museum.wales/stfagans/>

4: Burge S, Rhys O, Williams N. 2016. Democratic Culture: Participation at St Fagans National History Museum. In. Museum Participation: New Directions for Audience Collaboration. Edited by Kayte McSweeney and Jen Kavanagh. Museums Etc

# TALKING TO COLLEAGUES WITHIN AND ACROSS MUSEUMS

As a group we began locating and reading literature, and created a database to record our observations and questions about the different papers. We talked to colleagues in other museums about topics of interest and tried to capture their ideas and opinions. We noted relevant outcomes and impacts of topics anecdotally, and looked to the published research to find confirmation.

There is a huge amount of research and evaluation done in museums across the world. Most of which isn't published in journals or in articles and therefore there is not a systematic way of analysing or synthesising information and lessons learned. This grey literature (unpublished) is a font of knowledge that often remains within organisations, and sometimes even only within departments. So, these conversations across Museums are really important to share knowledge and ideas, analyse trends and experiences.

We wanted to use this research to help us develop our knowledge of how visitors engage with natural history museum displays and collections, inform how we plan future displays or can improve current ones, and to enable us to develop a shared understanding of our visitors. Both for temporary exhibitions, and to be ready if a funding opportunity presents itself.

# WHAT ARE THE BENEFITS OF ESTABLISHING A RESEARCH AND VISITOR STUDIES WORKING GROUP?

**“THE VALUE OF MUSEUMS BEGINS AND ENDS WITH THE RELATIONSHIP WITH OUR VISITORS.”**

Firstly, to share knowledge amongst colleagues within and across museums. Cross disciplinary teams bring different skills and ideas to the table. Regular meetings with colleagues encouraged discussions beyond the research. These opportunities to discuss theories and ideas were welcomed by everyone involved, and gave us all an opportunity to reflect. Something which is hard to do within increasingly busy schedules!

This initial piece of research has opened up many discussions and has allowed us to shape our Natural History concept research agenda going forward. Many other museums are establishing their own research-led agendas, for example the American Museum of Natural History, New York<sup>5</sup>. And, in the UK, several natural history museums and universities have come together to explore a collaborative approach for learning research<sup>6</sup>.

This process is about helping us to engage with and include our visitors in unique ways, which we hope will lead to better experiences and better exhibition and display design and improved interpretation and programming.

This report does not capture all the literature research we did - this would be an impossible task and beyond the scope. However, pockets of research that might be useful to us and the wider sector have been captured.

5: Hammerness, K. Macpherson, A. & Gupta, P. (2016) Developing a research agenda aimed at understanding the teaching and learning of science at a Natural History Museum. Curator Vol 59, number 4  
6: <http://www.nhm.ac.uk/about-us/visitor-research-evaluation/learning-research-seminars.html>

# A VISITOR'S PERSPECTIVE

## UNDERSTANDING VISITOR MOTIVATIONS

Many museums categorise their visitors based on demographics. Indeed, that is the practice at Amgueddfa Cymru. It helps tell us who is visiting, and gives us an insight into those groups (in a wholly generic way). It can be analysed quantitatively and used in reports to describe Museum visitors. However, it doesn't help us answer 'why they are visiting'. So, how do we develop exhibitions for our visitors if we don't fully understand why they are visiting?

Visitors bring to Museums their own experiences, shared experiences, and their motivations are varied and complex. Falk and Storksdiack (2005)<sup>8</sup> and Falk (2009)<sup>9</sup> attempted to approach and understand the interconnection of identity, learning and the museum motivations. They identified five different identities:

- 1) Explorers are driven by their personal curiosity, their urge to discover new things.
- 2) Facilitators visit the museum on behalf of others' special interests in the exhibition or the subject-matter of the museum.
- 3) Experience seekers are these visitors who desire to see and experience a place, such as tourists.
- 4) Professional hobbyists are those with specific knowledge in the subject matter of an exhibition and specific goals in mind.
- 5) Rechargers seek a contemplative or restorative experience, often to let some steam out of their systems.



It's important to note that not everyone falls neatly into these groups. Families may have a few different motivations. However this doesn't mean we need to develop exhibitions for different identities, but to understand that there are different motivations upon visiting. A museum experience is broad-ranging and so are the audience expectations.

We recently developed an exhibition for 7-11 year olds, but we also realised that the exhibition was equally popular with adults. Indeed our twitter profile was filled with images of grown-ups wearing the costumes and crawling through

spaces originally designed for our younger audiences! So, motivations for visiting and demographics need to be examined with a different lens, so we can be more experimental in our thinking about defining audiences, understanding motivations and how we design for this.

We need to consider audiences not as neat demographics but as individuals with a whole myriad of influences, prior knowledge and expectations. And the way in which we present objects can be interpreted in many different ways.

8: Falk, J. 2009, Identity and the museum visitor experience. Walnut Creek, CA: Left Coast Press.

9: Falk, J. and Storksdiack, M. (2005) Using the contextual model of learning to understand visitor learning from a science center exhibition. Science Education, Vol 89, 5, Pages 744-778

# WHAT 'INFLUENCES' A VISIT?

Visitors come to us with a range of different experiences and knowledge. The way in which they learn is also different. Howard Gardner suggested 'Multiple Intelligences' that show how a person learns and accounts for a broader range of human potential: Visual-Spatial, Bodily-Kinaesthetic, Musical, Interpersonal, Intrapersonal, Naturalistic, Linguistic and Logical-Mathematical. He argues that "Students learn in ways that are identifiably distinctive. The broad spectrum of students - and perhaps the society as a whole - would be better served if disciplines could be presented in a numbers of ways and learning could be assessed through a variety of means."

Amgueddfa Cymru's interpretation strategy considers the way in which we cater for different learning styles.

Learning happens throughout life. Visits to galleries are learning experiences. Whether visitors learn something specific, or add to their own understanding of a topic, or whether the visit enriches their ideas or views of the world.

We all have different prior knowledge, and we make meaning of our experiences in many ways. Visitors interact with each other as well as the exhibit. In this way, every visit to a museum is a unique experience defined by that person, and their needs and agendas on that day.

Archer suggested ways in which we can support visitors to engage in meaning making, and help link their experiences in the museum to their own interests, knowledge, values and

experiences their habitus and capital (Archer et al 2016)<sup>10</sup>.

A person's habitus and capital can also influence their aspirations to visit. Museums may put off visitors whose life-experiences don't resonate with the museum's view, or are not relevant to their lives (Dicks 2016)<sup>11</sup>. Indeed, through consultation with National Museum Cardiff's local communities, many are nervous of entering our 'grand' museum. They see it as a space that isn't for them. Equally some visitors enter with an attitude of reverence. And those people who visit frequently enter as if they own the space. So, before a visitor even begins their adventure in the galleries their ideas of what to expect have been influenced.

A museum's physical barriers, the entrance, wayfinding language, getting to the museum and even community preconceptions all lead to how people are likely to see the museum as a place for them, a community place. Elaine Gurian's research explores how a museum's space can be perceived as welcoming and inclusive to communities<sup>12</sup>.

The research into Museums as spaces for social interaction, spaces for informal learning, as well as cultural democracy, has influenced the way we have developed Amgueddfa Cymru – National Museum Wales' community engagement strategies<sup>13</sup>.

**"VISITOR'S PRIOR KNOWLEDGE  
SHAPES THEIR VISIT."**

MCMANUS (1987)

10: Archer, L, Dawson, E, Seakins A, Wong, B (2016) Disorientating, fun or meaningful? Disadvantaged families experiences of a science museum visit.  
11: Dicks, B. The Habitus of Heritage: a discussion of Bourdieu's ideas for Visitor Studies in Heritage and Museums. Museum & Society, march 2016. 14 (1) 52-64  
12: <http://www.egurian.com/omnium-gatherum>  
13: <https://museum.wales/about/policy/community-engagement-strategy/>

We know that people can interpret the same exhibition in many different ways, and groups of visitors can create shared meanings. Doering and Pekarik<sup>14</sup> argue that the most satisfying exhibitions for visitors will be those that resonate with their experiences and enrich their view of the world.

However, before we even begin to tell stories, we need to be aware of how people's prior knowledge influences their perception of a natural history museum. Dewitt and Pegram's study (2014)<sup>15</sup>, at the interesting preconceptions about what science is, and how natural history museums see themselves compared to their visitors. Findings showed that families were more reluctant to describe the natural history museum as a 'science place', and for some families natural history did not count as science.

Examining the literature into visitor research enables us to better understand how our visitors use and engage with our museums. Practice and research in other museums gives ideas for us to consider and contributes to a shared understanding of the field. Examining how other museums undertake visitor research can help to consolidate our own ideas.

The Learning Museum's report on Audience Research<sup>16</sup> examined case studies from three different European museums on how and why they used audience research within the development of spaces. The use of advisory panels used within Glasgow's Riverside Museum re-development allowed for the sharing of different perspectives. Forssa

Museum's research initiatives increased the urban community's involvement. Overall their experiences echo our own in terms of increasing a shared understanding of museum visitors with staff across the museum.

We can explore research into understanding the psychology of a visit and determining what factors come into play in the level of attention that visitors pay to museum exhibits (Bitgood 2016). Through more participatory practices we can engage visitors in what they would like to see and how they would like to experience it.

Reiss *et al* (2016)<sup>17</sup> have written a comprehensive review of learning, in particular among school-age learners, in natural history museums, which includes several research papers exploring the factors that contribute to successful learning and engagement at exhibits. It also explores ways of developing evolution-based storylines, giving examples of how other museums tackle the issue of engaging visitors in timelines and the concepts of evolution.

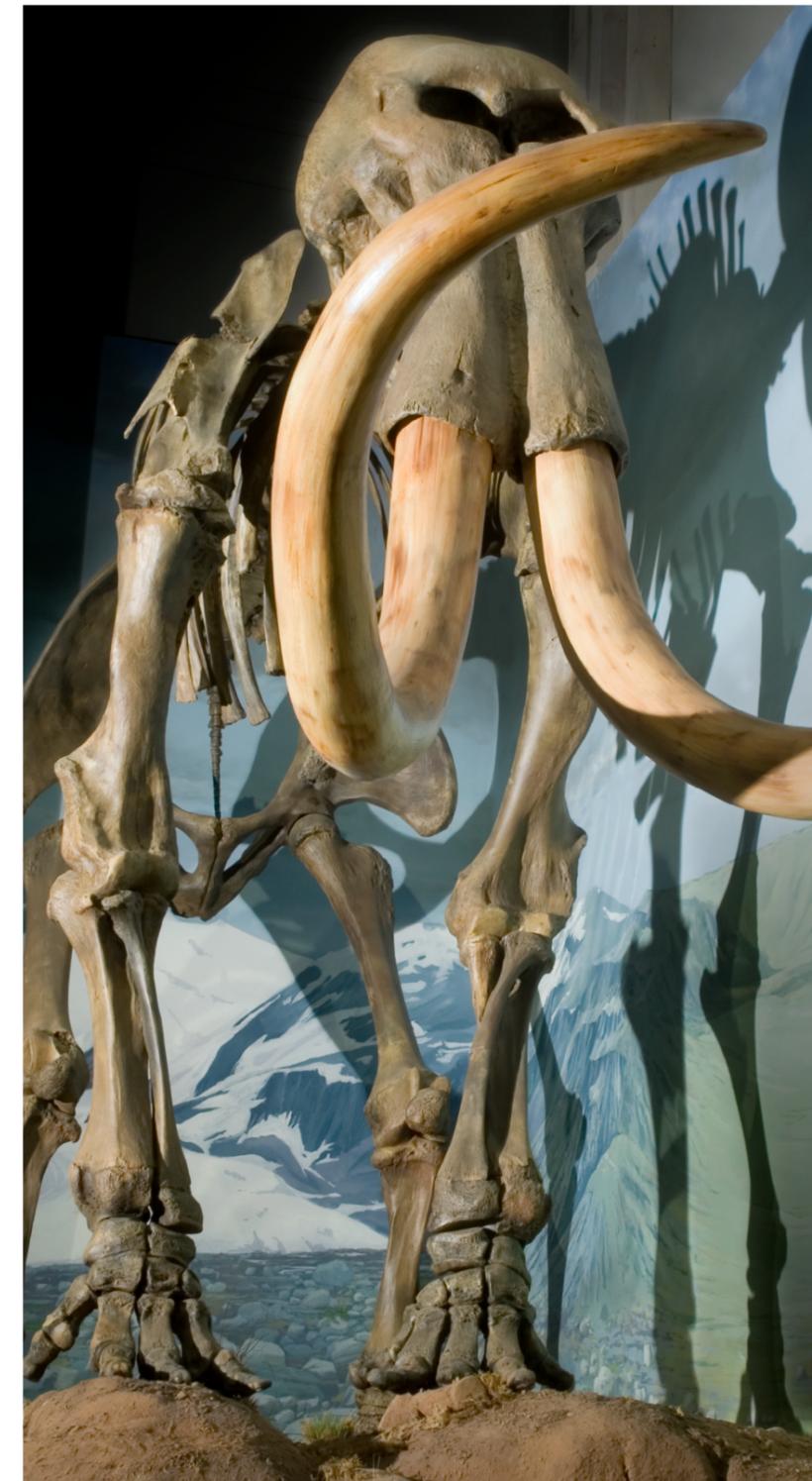
The British Museum's visitor research enabled them to understand their visitor behaviour and use a 'gateway object' as a way of conveying messages.<sup>19</sup> Visitors can encounter the objects in any order, and the objects build on one another to add greater meaning. Their research showed that most visitors ignore panel or wall texts, and yet traditionally these are the method of interpretive vehicles for essential information.

My own Masters research into visitor observations in natural history galleries revealed

that visitors read little of the text on display, but that the objects opened up many different conversations that related to people's own experiences. Leinhardt and Crowley (2001) in *Objects of Learning, objects of Talk: Changing Minds in Museums* categorised Museums as places of objects that support learning conversations. They also note that visitors choose their own path through exhibitions.<sup>20</sup>

**"OBJECTS ARE LIKE COMETS - CLOUDS OF DUST WITH A TALE"**

HILDE HEIN<sup>18</sup>



Mammoth, National Museum Cardiff.

Understanding family dynamics and how families use a museum are important to developing exhibitions. Borun et al (1997)<sup>21</sup> identified seven characteristics of successful family learning exhibits: multi-sided, multi-user, accessible, multi-outcome, multi-modal, readable, and relevant.

However we also need to remember that a child's reality is fundamentally different to an adults. Their brains are still developing and they have unique ways of making sense of things (Ringel 2005)<sup>22</sup>. So, when we are developing exhibitions we need to look at it from a different point of view. I would argue that there is a strong justification here for including children in the development processes of an exhibition, in order to fully capture the way they see the world.

Children are more excited by things that are familiar, or that they have prior knowledge of. There are lots of findings on young children's navigation of natural history in museum such as the way they make imagined or real links between different specimens. Giving children cameras to photograph their visit seemed to be best method for finding out about a young child's visit (Kirk 2013)<sup>23</sup>. This research demonstrated that certain aspects of their museum experience are often unknown to accompanying adults.

In 'How families use dioramas', one exhibit was designed for multiple entry points, for different ages, and using different heights of peepholes into a diorama. This provided different

experiences and talking points. (Ash, 2004)<sup>24</sup> We used this piece of research to help inform the design of floor and low-height displays for *Wriggle The Wonderful World of Worms* exhibition.

The role of the adult is important in scaffolding and facilitating the visit (Diamond, 1986)<sup>25</sup>. Through our observations of visitors we have noted adults guiding children through exhibits, answering questions, and posing questions. It's important that adults feel like they have the resources available to them to answer questions, or know what they are doing. Exhibits that guide adults as well as children can be particularly effective. Diana Kaiser's MSc project at National Museum Cardiff used different types of labels to observe how long families would spend 'engaging' with the same exhibit. The labels that encouraged an element of interactivity, or things for the whole family to do, saw a statistically significant increase in time spent with that display, compared with the 'control' didactic, information-giving label.



Toddlers exploring floor dioramas, National Museum Cardiff.

A diorama is a careful positioning of a number of museum objects in a naturalistic setting (Reiss & Tunnicliffe 2011)<sup>26</sup>. Love them or not, overall the literature shows that visitors really like dioramas (Schwarzer & Sutton 2010<sup>27</sup>). If we look to America, the American Museum of Natural History have gone to great lengths to preserve and update their dioramas. And the new \$58 million Natural Science Museum in development in Minnesota, the Bell Natural History Museum, are preserving and re-purposing their dioramas for display.

In undertaking this research I have spoken to a number of colleagues in different museums across Europe. In all our discussions we have come across the same question – what role is there for dioramas in re-developed displays? In those discussions what became clear was a consideration of whether a diorama is the best approach to tell the story, or whether it ‘fits’ the narrative of the display. Discussions with Caroline Breunese, Naturalis (due to open Summer 2019), describes their new dioramas as non-traditional. One example is the Powers of the Earth gallery, where the whole gallery is the diorama, rather than individual displays. Another gallery shows the landscape in a more abstract way. So, what is a diorama in the traditional sense and how can they be reinvented for the 21st century?

Studies indicate dioramas inspire groups of visitors to talk. Conversations can be personally important and meaningful. But exhibits need to have enough interpretive material to avoid frustration. Interestingly, Ghoussou and Tunnicliffe

(2018)<sup>28</sup> found that young people and older people create meaning from dioramas in different ways. Younger people’s responses tended to be more factual, compared to older people’s responses which involved more memories.

Data shows that interpretive additions to dioramas can make them more accessible to children, families and non-visitors. Povis and Crowley (2015)<sup>29</sup> showed by giving families torches to explore darkened dioramas increased the levels of joint attention and learning discourse for family groups (parent-child 5-8 yrs old) compared to those viewing the dioramas under normally lit conditions and no torch.

We’re also in the process of researching how our visitors respond to augmented reality alongside dioramas, with the use of Museum ExplorAR kits, bringing dioramas to life. And our latest community engagement project involved members of our Youth Forum creating a plastic pollution intervention #NoMôrPlastic for our marine displays (see later section on A Participatory Approach).



Image of ExplorAR kit at National Museum Cardiff ©Jam Creative

Authenticity has been interpreted in many different ways. In general, authentic objects originate from the real world, outside of the museum. Land-Zandstra et al's Spokes article 'Is it real?'<sup>30</sup> explores the literature and the importance of real objects in learning experiences at Naturalis Biodiversity Center, a natural history museum in Leiden (The Netherlands). Drawing on the literature research, and their own case studies, they developed a theoretical framework about authenticity borrowing concepts from different fields such as marketing and psychology. They considered how children perceive real objects and noted the appearance of an object, if it looks real, was important in their perception of authenticity.

More recently Natural History Museums are aiming to engage the public with the science research in Museums, and on issues within contemporary science, thereby creating authentic experiences for visitors.

National Museum Cardiff's 'Insight' gallery attempts to display stories about the collections and research behind the scenes to show the active nature of a museum and the science of our collections. This gallery is a space for us to experiment with ideas for how and what we display. We update the displays with new research or new stories about the collections. This is an ideal space for us to develop how we display, and how we learn from our visitors.

Our most recent evaluation of this space revealed some really useful feedback from visitors about

what works and what doesn't work. What worked well were displays on collections relevant to local visitors, fluid-filled specimen jars which are rarely seen on display, and collections which challenged preconceptions e.g. jewel beetles. What didn't work so well was conveying the message about the 'active' research happening in the Museum to our family visitors. Our aim is to undertake some visitor research exploring this in more detail, and looking for mechanisms and approaches to best convey our research.

To complement our Insight gallery, and to provide deeper engagement, we also host regular open days to meet scientists to discuss and debate their research, and our schools programme brings to life the school curriculum through relevant examples. Many museums offer a 'meet the scientist' experience. This can vary from simple presentations to volunteer work and long term apprenticeships. Evaluation of the Natural History Museum's Nature Live programme showed that visitors and students identified more closely with scientists through recognising common experiences. Indeed teachers have noted the benefits to students of meeting scientists and discussing and debating their research within a Museum visit (Collins & Lee, 2005)<sup>31</sup>. However we must also be cautious in thinking that all interactions with scientists have a positive effect.



We're all striving to be relevant to our audiences and to respond to and meet their needs. Our own evaluations and visitor studies reveal visitors want more interactives. But, what do we mean by interactives? Part of our Activities Working Group research involved asking what visitors want in the galleries. A common response we kept getting was 'more interactives'. So how do we find the right level of interactive experience? How do we find a balance of interactives that tell the story in the best way?

Interactivity can be physical, intellectual, emotional and a social experience. An opportunity to learn socially, to gain feedback in action, and to arrive at many different kinds of outcomes. Adams and Moussouri (2002)<sup>32</sup> note that "successful interactive experiences contribute to visitors' cultural appreciation and facilitate their understanding of how they fit within the culture, community and family". Specifically, visitors like to place themselves in context, and this is particularly the case with families who can create shared experiences that have a cultural and community connection.

Interactive experiences can help to provide playful, curious experiences. They convey a sense of adventure and anticipation. They can be physical manipulative, and/or encourage conversations, discussions or opinions.

However, the fact that something is interactive does not necessarily make it a valuable or meaningful experience. It's important to make sure that in planning displays that the



interactive is able to best convey the story and/or process that the object is trying to tell.

The next section of this report examines the museology approach of the Galeria da Biodiversidade, Porto, Portugal, who have approached interactive experiences in three different ways.

## A MUSEOLOGY APPROACH

### AT PORTO GALERIA DA BIODIVERSIDADE – CENTRO CIÊNCIA VIVA / MUSEU DE HISTÓRIA NATURAL E DA CIÊNCIA DA UNIVERSIDADE DO PORTO

I recently visited the Galeria da Biodiversidade (Hall of Biodiversity) in Porto, Portugal, which opened in June 2017 after major development. The Galeria is set within Porto's Botanical Garden, within a 19<sup>th</sup> century historical house, which used to belong to the grandparents of one of Portugal's most prominent poets and writers - Sophia de Mello Breyner Andresen, and her cousin, the also writer and essayist Rúben A., before being acquired in 1949 by the Portuguese Government and adapted to harbour the Botanical Institute Dr. Gonçalo Sampaio, and later the Department of Botany of the Faculty of Sciences of the University of Porto.

The permanent exhibition within the building is intended to encourage visitors to engage in deeper thinking around the processes of biodiversity and evolution. The Galeria (and Porto's Botanical Garden) is actually part of the Natural History and Science Museum of the University of Porto, a wider cultural project, which includes another historical building that is currently under construction and in which the new museographic approach developed therein will be used to foster new narratives based on historical scientific collections.

Their displays aim to stimulate visitors to discuss and debate biodiversity, and this becomes a tool for change, for individual change and ultimately social change. The approach they have taken to displaying natural history is rooted in the ideas of Jorge Wagensberg, former director of CosmoCaixa, Barcelona, who was heavily involved in the development

of the new Galeria. His idea was to develop a 'total museology' with objects that are real but are able to express themselves in three ways: manually interactive ("hands-on"), mentally interactive ("mind on") and culturally interactive ("heart on").<sup>33</sup>

The objects at the Galeria are displayed in a way that encourages you to think about how and why they are displayed, and a physical interactive to encourage you to understand the process. Through both interactives, the displays aim to encourage you to think about the wider application of the science.

The Hypercubic display of the egg, for example, allows the visitor to view the collections in 3 different ways - through colour, shape and size. On one axis of the display cube the objects are displayed from large to small vertically, on another from darker to light colour horizontally, and on the third axis they are arranged from spherical to ovoid. The physical interactive that is linked to the cube encourages you to explore the properties of shell shape and how they move, by pushing a button to make the different shaped eggs move around. The whole display is designed to encourage you to think about diversity.

Through visiting the Museum, I began to understand the intention behind the exhibits. The architecture and story of the building and the people that lived there were as much a part of the narrative as the objects and interactives on display.



Hypercubic display of eggs, Porto Galeria da Biodiversidade

<sup>33</sup>: Wagensberg J (2005) The 'total' museum, a tool for social change. *Historia, Ciencias, Saude - Manguinhos*, v. 12 (suplemento), p 309-21, 2005

## SOPHIA AND THE WHALE

Sophia de Mello Breyner Andresen spent some time during her Summer holidays in the house as a child. She wrote poetry and children's tales which brought the building and her childhood to life. She wrote a tale<sup>34</sup> about a city in which there was a big house, a palace, with large enough rooms that you could ride a bike inside, and a very big central atrium, which was the only place where a blue whale skeleton, that was once deep within the Natural History Museum's stores, could be mounted. This story became a reality through the development of the Museum. The Whale now features pride of place within the central Atrium, and not only fills the space with its aesthetic qualities and scientific value, but also brings to life the story of a child within a building and the wonders of imagination.

The interpretation of the whale is minimal. A large seat is placed on the 1st floor balcony, from which you can view the whale's skull in contrast with a shrew skeleton. On the seat are 3 buttons you can press. One provides you with the sound of a blue whale heartbeat, another the heartbeat of a shrew, and lastly a human heartbeat. No further interpretation is needed to connect yourself to the whale and shrew. The interpretation is simple, but effective. And, if needed, more information is provided in a short text on the chair's back..



Blue whale skeleton, Porto Galeria da Biodiversidade



Chair and shrew in front of whale skeleton, Porto Galeria da Biodiversidade



Museum Für Naturkunde Berlin's wet collection © Carola Radke

These displays demonstrate Wagensberg's ideas of total museology; of how an object or collection can be interpreted in 3 ways to encourage conversation and thinking.

The Natural History and Science Museum of the University of Porto's next challenge is to re-develop and display the natural history and science collections at the main building – the Historical Building of the Rectory of the University of Porto. This is currently under-going a huge amount of development, to create new spaces, re-display existing collections, and create new store areas for their collections.

They are building on the museology ideas from the Galeria da Biodiversidade, whilst exploring how to preserve the historic intentions of the main building.

On my visit we discussed many different topics of interest to natural history displays, from dioramas to displaying 'reserve' collections.

Their early 20th century chemistry lab has been re-developed faithfully and functionally to provide an authentic and fully operational space for engagement activities and exhibitions.

They have taken their ideas for displaying their 'reserve' collection of fluid materials (collections in alcohol) from the Wet Collection at Museum Fur Naturkunde Berlin. Their aim is similar, to provide access to this collection to the public and to demonstrate the importance of collections for biodiversity research.

Observations of visitors at the Galeria have helped to shape their ideas for the development of their new building. And they are embarking upon visitor research with Exeter and Minho Universities.

We also spoke in detail about how to include visitors in the process of developing displays. This has helped shaped the next section of this report.

## A PARTICIPATORY APPROACH

### AT THE NATIONAL MUSEUM CARDIFF

Embarking on this visitor research has led us to consider a more visitor-led approach to exhibition development within our natural history galleries. We are keen to engage visitors and non-visitors in developing exhibitions. Nina Simon's book 'The Participatory museum'<sup>35</sup> makes a great case for why it is important for museums to engage with their audiences, to help improve visitor experiences and empower them to see Museums as relevant to them. McSweeney and Kavanagh's<sup>36</sup> excellent book about audience collaboration in Museums gives plenty of case studies of deep participation, where visitors and non-visitors have engaged in many different aspects of museum development, from projects through to exhibitions.

With this in mind, we have been involving visitors in various elements of exhibition planning both within natural history galleries and our art galleries too. And learning new ideas and approaches from both disciplines.

*Who Decides?* was an Art exhibition curated by volunteers from the Wallich, a charity which supports people who have experienced homelessness. Its aim was to open up decision-making about what we exhibit to communities, and to create a more democratic and accountable museum.



Volunteers from the Wallich developing their storyline, National Museum Cardiff



Youth forum No Môr Plastics display, National Museum Cardiff

Our most recent Natural History temporary exhibition ‘*Wriggle! The Wonderful World of Worms*’, involved children as consultants; to ensure the exhibition narrative was defined by them and for them as an audience.

No Môr Plastics<sup>37</sup> #NoMôrPlastics was a Museum Intervention project at National Museum Cardiff, led by our youth forum. They temporarily transformed the marine displays with beach rubbish and brought the topic of plastic pollution into the Museum. This intervention enabled the young people to temporarily take control of the curatorship of the galleries, as a form of museum activism. Over 4 to 6 months, the young people cleaned and sorted beach plastic, they ran activities for other groups of visitors, from family workshops to targeted workshops with communities. They planned the interpretation and installation of the intervention in the dioramas, with support from natural history conservators. They then volunteered, and assisted in providing activities for visitors.



Youth forum No Môr Plastics creation, National Museum Cardiff

The feedback from other visitors was very positive. They engaged with the plastic problem, and seeing it juxtaposed with real specimens in a ‘perfect’ beach scene diorama further lent to its impact. Furthermore, the youth forum want to do more of this type of work and engage with the Museum in the longer term. This has also lead to further discussions about whether this can be seen as a form of museum activism. Its purpose is to shine a spotlight on problems and injustices of social, environmental, political or cultural nature.

All these examples have opened up new ideas to the exhibition teams, and have shaped and changed the way we display.

## 'WRIGGLE! THE WONDERFUL WORLD OF WORMS'

The Wriggle exhibition was a small-scale temporary exhibition we created for 7 – 11 year olds, from 2016 to 2018, with the aim of demonstrating the diversity of worms on our planet and to convey the research happening behind the scenes of the Museum into polychaete worms.

The impetus for this exhibition came about when we were asked to host the 12th International Polychaete Conference, being held in Cardiff in 2016. Our polychaete scientists wanted to create an exhibition that showcased worms, coinciding with the conference.

After creating initial ideas for an exhibition, the interpretive plan was developed, guiding the process of development. Thus helping us to consider the aims, learning outcomes, narrative, specimens and stories we wanted to tell.

At this point it was decided to include a group of 7-11 year olds from a local school in helping plan the exhibition. They became our 'consultants' and the resulting exhibition was a mixture of their words and ideas, combined with ours.



Children in front of the Wriggloo. National Museum Cardiff

Activities in the Museum were set up, enabling the children to work with a range of different Museum staff from learning, natural sciences, exhibitions and design departments. This consultation was extremely useful in helping us to define our aims and narrative.

We gained feedback on our other exhibitions from small focus groups. This was valuable in helping the children see different types of displays and what they liked/didn't like about them.

The children helped us to understand what they already knew about worms, and what they wanted to know. They also helped shape information about areas of the gallery that they had no prior knowledge of, by working with scientists they could pick what was interesting so expanding their knowledge of worms beyond their prior experiences. They measured worms, and helped us to develop simple interactives.

They also helped develop the content for the gallery's computer interactive 'Which worm are you?'. A game that involved a multiple choice quiz with questions all designed to work out what kind of worm you would be. Children's commissioner for Wales, Sally Holland, took part in the consultation day, helping with the activities.

The children were also involved further in the process to check the interpretive text and feedback on the graphic design. And finally, they came in to evaluate the exhibition within a focus group.



Children consultation for Wriggle exhibition, National Museum Cardiff

The children consultants forced us to re-think our narrative and graphic ideas for the exhibition. Our initial ideas involved a monster worms approach, but they felt that was a bit too scary and they preferred more of a comic-style.

The interactive ideas the children suggested were incredibly imaginative, and helped us to see how they wanted the information presenting. They helped 'shape' the ideas, and suggested activities which would be fun and would help them understand worms. We asked them for all their questions on worms and the underground. Through the exhibition we attempted to answer these.

Staff members found the process incredibly useful in helping them to describe their intentions. Explaining your research four or five times to different groups of children really helps to work out what is and isn't important to say. Equally, asking them to tell you in their own words about your research, helps you to understand what information they remember most. Also, involving all departments was important for the end product, in helping to see the target audience's reactions.

They helped to conceptualist the walk-through worm den - the 'Wriggloo', and suggested crawl through spaces, and the sounds of underground squelches and slurps! The children also reinforced some of our ideas about how we were going to display the objects and helped us know we were 'on the right track'.

They came up with the name of the exhibition: Wriggle!

Throughout the development process, they helped 'check' our text as we were writing the displays. And came back in to test the ideas.

The same group of children then came back in at the end to feedback on the exhibition. They fed back as a focus group using traffic light post-it notes to reveal what they did and didn't like. We followed this up with a conversation to understand the motivations behind their comments. The post-its were colour-coded - Green - like, Orange - didn't like, and purple - what I would change. This process showed what worked, and what we could do differently next time.

Interestingly, it was the simplest things that we didn't expect. One child liked the fox peeking out of the Wriggloo, because it was unexpected but also because it was looking at a familiar specimen in a different way: "You don't usually get to see foxes' faces" - green post-it.

In our group discussion, they all liked the fact the animals were looking at them in the Wriggloo.



Children consultation for Wriggle exhibition, National Museum Cardiff

Involving visitors in developing the Wriggle exhibition has been extremely worthwhile. The resulting exhibition was received very positively by the children – 79% of children describing it as excellent.

97% and 94% of all visitors correctly identified two of our 3 main aims - There are a huge variety of worms, and worms are important all over the world. Our third aim 'National Museum

Wales staff are major UK experts in worms, was less successful. As noted previously in this report, perhaps we need to re-think the method of communicating the research we do in the Museum. Or continue our conversations with other museums to best practice ideas for exhibiting this information.

USA Today described our exhibition as one of 'the best museum exhibits in Europe'<sup>38</sup>.

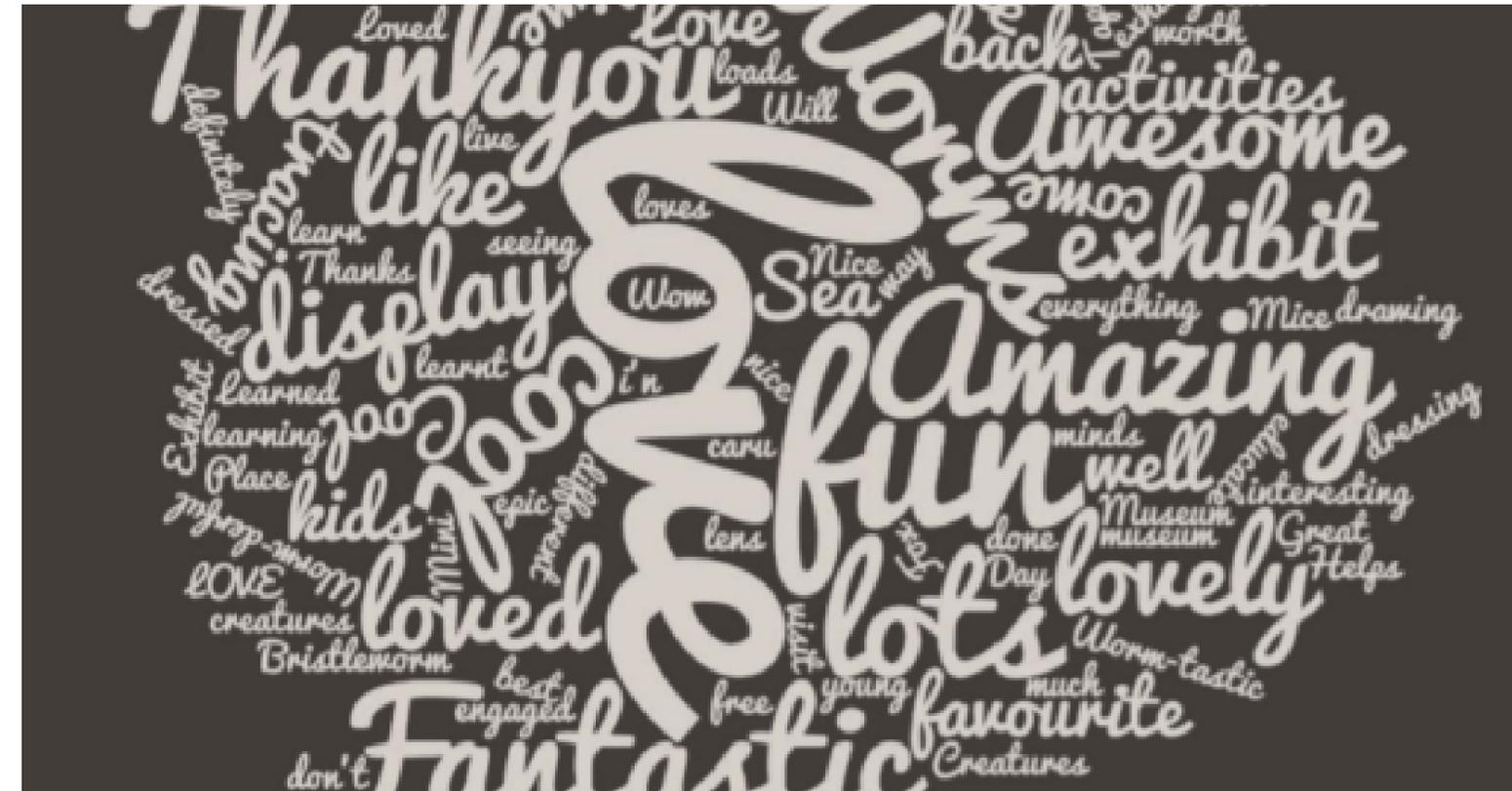
And importantly, the process helped us to develop the way we create exhibitions through involving our audiences in the process. It helped us, as a team, see the value in this way of working.

We want to build on this process. We want to embed research and participatory practices into our way of working.

Our next projects feature a small-scale redevelopment of a natural history display about fungi and vegetation, and a dinosaur temporary exhibition, both involving young people in co-curating the displays. We want to test some of the questions that have arisen through our projects to date. We'd like to explore the benefits of working with young people to co-curate displays, and find a common set of approaches to apply to future re-displays.



Testing draft worm 'top trumps'!



Word cloud showing visitor's reactions to Wriggle.

This process has helped to build up a shared understanding of the literature amongst staff. It has also given us clarity in our focus. We need to be very clear on the aims of an exhibition. Clear on the learning goals and take-home message. We ask the question; what do we want people to remember from their visit? And our process starts from defining our interpretive plan, which recognises that every visitor is different and learns in different ways.

We aim to further develop our participatory practices, and embed them within all exhibitions. We also aim to engage with communities that don't currently use the Museum and seek to find ways to make their experiences more relevant.

**“IT STARTS FROM UNDERSTANDING VISITOR MOTIVATIONS AND THEIR PRIOR KNOWLEDGE. EXPLORING HOW DIFFERENT VISITORS ENGAGE WITH EXHIBITIONS, HOW SOME VISITORS GENERATE SHARED UNDERSTANDING AND HOW SOME VISITORS SUPPORT OTHERS, PARENTS FACILITATING VISITS FOR EXAMPLE.”**

Like Alice descending in the rabbit hole, this research has felt like an exploration, an adventure, into different areas of museum practice. The breadth and depth of research into museum practice has felt at times like heading down new rabbit holes and having to emerge before becoming completely immersed in them. Whilst they are all interesting and relevant to every museum professional's practice, it's impossible to research all areas in full detail.

So, this report is just a snapshot of the research that we were particularly interested in exploring

as part of our Museum development group. As stated before, there is a huge amount of research and evaluation done in museums across the world. Most of which isn't published in journals or in articles. This grey literature (unpublished) is a font of knowledge that often remains within organisations, and sometimes even within departments. So these conversations across Museums are really important to share knowledge and best practice ideas.

How do we, as a museum-sector, get better at sharing this information? And how do we build a common framework for capturing data consistently across different organisations? The Wellcome Trust's Analysing the UK Science Education Community: The contribution of informal providers<sup>39</sup> have emphasized the need for a collaborative research agenda and a systematic approach to evaluation in informal science education. Between 2013 - 2015, UK natural history museums and universities came together in the UK to look at developing a collaborative learning research agenda for UK, how we measure impact and to scope future research opportunities<sup>40</sup>. Dillon et al (2016) noted shared challenges that could be addressed collaboratively<sup>41</sup>. Although this process has started there is still some work to do to embed research within museum practice. We have been working with other museums across the UK to develop research of common interest, however these are often funding dependent.

Moreover the problem is not with the will of natural history museum staff to undertake the evaluation and visitor studies, but more an

issue of time and focus within the organisation. Perhaps, within all our roles, we need to place a higher importance on undertaking evaluation and study that can be applied across the museum-sector.

Many natural history museums across Europe are re-displaying collections, developing displays that engage people with contemporary science issues and major societal problems. Researching how our visitors engage with our collections and stories and using participatory practices to engage people in the process of developing these spaces are a way of ensuring that what we say is most relevant.

Sharing the knowledge with colleagues from all over Europe through this NEMO LEM report gives us the chance to learn from each other and to make museum experiences for visitors better every day.

Throughout the process of writing this report I, and my colleagues, have spoken to many different colleagues both within and across natural history museums. I would like to thank everyone I've spoken to for their advice, hospitality, and excellent discussions which have been incredibly informative.

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