Imagining the Brain, Engaging the Body: Designing Visitor Engagement in Science Exhibition Experiments with Art

Anja Johansen

Abstract:

Science museums have increasingly experimented with bringing art into their exhibitions to attract and engage visitors. While the prevalence and popularity of such experiments is growing, research on the rationales for collaboration and their outcomes, as well as the challenges involved, remains scarce. This paper analyzes and discusses how art is used as part of engaging visitors in two contrasting exhibitions about the brain and neuroscience: one using art as illustration of ready-made science, the other inviting artists as co-curators in evoking a feeling of science in the making. Drawing on models of public engagement and art-science collaboration, it discusses how notions of science communication and visitor engagement are imagined and enacted in the two exhibitions, and how they relate to different 'logics', or rationales, of interdisciplinary collaboration.

Key words: exhibition experiment; science communication; public engagement; art-science; visitor engagement

Introduction

During the last 20 years, it has become increasingly common to encounter art in museums of science, technology, and medicine. While bringing art and science together was part of the original strategy in hybrid institutions such as the Wellcome Collection in London, the Science gallery in Dublin, or Le Laboratoire in Paris, more traditional science museums have also followed. For example, the Science Museum in London has since 1996 experimented with ways of integrating art or artists in its exhibitions, and the Medical Museion in Copenhagen now does this on a regular basis. While some museums integrate thematically relevant art into their exhibitions, others invite artists to explore the museum collections and curate their own exhibitions.

Such experiments with bringing art and artists into science museums is often done in response to calls for public engagement and dialogue in science policy, illustrating the role of museums in communicating science and facilitating public engagement (Macdonald 2010; Horst *et al*. 2017). Art is seen as a promising new strategy for such engagement, both by curators and science museum scholars (Redler 2009; Macdonald 2010; Stephens 2012). For example, Macdonald (2010) claims that including art works or art installations into science exhibitions can 'elicit emotions' and 'prompt reflection' more readily than conventional, informative displays, because 'the public is probably more used to the idea that they can have their own opinions on art works than they are about scientific knowledge' (Macdonald 2010: 141). Thus, bringing in art can challenge the traditionally authoritative voices of science museums and open them for visitors' own experiences and reflections.

While the prevalence and popularity of experiments with art in science museums is growing, more discussion on what role art plays in different exhibitions, as well as the rationales for collaboration and the challenges involved, is needed (Redler 2009; Casini 2010). As asked in a recent anthology on the topic: Is art limited to being a 'tool' of science communication, does it bring threats or benefits to fact-based education in traditional science museums, or can it end up challenging the very nature of science museums, 'reframing their mission and

position in society'? (Rossi-Linnemann and De Martini 2020: 7) Moreover, as Birchall (2012) has noticed, ideas about the museum as conservative and the artist as innovative seem to imply that 'existing museum displays lack something, and that artists possess a particular faculty for working with a museums' materials in a way that curators and exhibition designers cannot' (Birchall 2012). While Birchall does not want to undermine the artists' contribution, his analysis shows that institutional characteristics and priorities, as well as curatorial agendas, play a significant role in shaping exhibition experiments with art.

This paper intends to contribute to discussion on experiments with art in science exhibitions by contrasting and discussing two exhibitions. Both exhibitions sought to engage their visitors in the topic of the brain and neuroscience and used art as part of their strategy to achieve this. *While Brain: The Inside Story* at the American Museum of Natural History in New York integrated art installations into their exhibition design, *Mind Gap* at the Norwegian Museum of Science, Technology and Medicine in Oslo invited an artist as co-curator, designing the overall spatial design of the exhibition. As such, both used art in the pursuit of science communication and public engagement. However, my analysis of the curators' intentions and the exhibition design reveals quite different approaches to neuroscience as well as to the role of art in public engagement. To explore these differences, I combine theoretical perspectives on science communication from Science and Technology Studies (STS) with perspectives on exhibition experiments and visitor engagement within museum studies.

In the next section, I provide a brief review of literature on the turn towards dialogue and participation in science communication, and how exhibition experiments with art in science museums relate to these shifts. The term 'science museums' includes museums of science, technology, medicine and natural history more broadly. Then, I present and compare the two cases, before I discuss potential benefits and challenges with both approaches – for museums and curators, as well as for visitors.

Science communication and visitor engagement

Science museums have traditionally been regarded as neutral mediators of scientific objectivity and technological progress (Haraway 1984; Gieryn 1998; Macdonald 1998). However, changes in the perception of scientific knowledge and practice as well as widespread demands for commercializing museums have impacted the public role of museums and the way they approach their visitors (Durant 1992; Witcomb 2003). Since the advent of the 'new museology' in the 1970s (Vergo 1989), there have been recurring attempts to re-imagine museum practice and pedagogy; from one-way models of communication towards more dialogic and participatory modes where visitors are seen as active interpreters and contributors (Hooper-Greenhill 2000; Simon 2010). Moreover, as science may be understood as controversial or unfinished, several museums have shifted their focus towards the social, ethical, and political contexts of science (Macdonald 2010).

Similarly, in the field of science communication, this shift is often presented as a narrative from 'deficit to dialogue', as a change from a one-way dissemination model of knowledge towards models that emphasize dialogue, debate, and participation (Gregory and Lock 2008). Within the dissemination model, audiences are seen as lacking knowledge (having 'deficits') about science and are in need of being informed by competent experts. Put simply, the goal of new forms of public engagement is to (re)establish trust in science and prevent resistance to the development of new technologies (Wynne 1998, 2006; Stilgoe et al. 2014). The dissemination or deficit model has been widely criticized for neglecting lay and local forms of knowledge. According to Wynne (1998), such knowledge should be seen as a different but no less valuable contribution to public debate. Lay people may frame the issue at stake differently than scientists or politicians, providing a more complex picture.

Dialogic models that favour two-way communication and emphasize reflection on the societal implications of technoscience have emerged as alternatives to the deficit model (Horst *et al*. 2017). Some authors (Trench 2008; Bucchi 2009) have further differentiated between dialogic and participatory practices, with the latter allowing active participation in decision-making, policy-making, and knowledge production. However, a challenge with this mode is that it is not always clear what 'participation' implies; why the public should participate in the first place, who should be involved, how it should be initiated, and so forth (Delgado *et al*.

2011: 828ff). As Hetland (2014) has noted, different models of science communication (deficit, dialogue, participation) can coexist as policy instruments and do not necessarily exclude each other. Moreover, although science museums aim to be more dialogic and participatory, such concepts may be understood quite differently and these differences may result in varying practices of enacting policies in specific institutions and exhibitions. National policies for science communication, as well as infrastructures for science-society relations, also play a vital role (Delicado 2009; Bandelli and Konijn 2013). As such, different approaches to science communication (by the respective museums or even exhibitions) may entail quite different goals: for example, to inform visitors about new research, to engage them in political debate about science, or to allow them to play with and explore natural phenomena explained by science – or a combination of these goals.

Experiments with art in science exhibitions

In science museums, incorporating new media technologies and interactive devices and stations has long been regarded as a promising way of democratizing science, allowing visitors to demonstrate scientific principles to themselves through 'hands-on' interaction (Barry 2001; Witcomb 2006). These innovations are also used to make exhibitions more fun and engaging for visitors – especially children and families. However, this may not work as well for historical, object-based museums or for adult audiences. More importantly, they might be less suited to facilitate social interaction, dialogue, and debate (Heath and vom Lehn 2009). As such, alternative strategies of democratizing knowledge and engaging visitors have also been explored. One approach has been to explore other, more dynamic formats for engagement than exhibitions, such as public lectures, debates, and dialogue-events (Bell 2008; Davies 2010). Another approach is experiments with the exhibition format itself, taking inspiration from art installations, scenography, and new media art (Macdonald and Basu 2007; Yaneva *et al*. 2009). Macdonald (2010) mentions three, partially interlinked, strategies for public engagement in science museum exhibitions: 1) showing unfinished science (or science in the making) while directing attention to the processes of constructing knowledge; 2) exhibiting scientific controversy and allowing contradictive perspectives on a given topic; and 3) including art or engaging artists as curators to prompt reflection and elicit emotions. These strategies can be, and often are, combined, as for example in the exhibition *Making Things Public* from 2005, by Bruno Latour and Peter Weibel.

Obviously, including art will not in itself make a science exhibition more dialogic or participatory and can be done within a deficit model of science communication. Moreover, using art as a 'tool' in science communication may sound like instrumentalizing art in the service of science communication. Discussing different 'logics', (rationales, motivations, or justifications) of interdisciplinary practices, Barry and Born (2013) refer to this as a logic of *accountability*, in which the art and/or artist is enrolled to make science more accountable and approachable for the public. In the contemporary field of art-science initiatives they also locate a logic of *innovation* that draws attention to arguments about industrial or technological innovation and economic growth. When these two logics operate together, 'science is conceived as finished or complete, and as needing only to be communicated, understood or applied' (Barry and Born 2013: 249) while art is seen as one of several 'tools' that curators can experiment with to engage visitors in science and make exhibitions more exciting and attractive, i.e. to draw more visitors. As such, the use of art becomes a 'device for the governance of affect', aligning the publics hopes and passions with those of the research institutions (Born and Barry 2013; cf. Anderson 2007).

However, Barry and Born argue that art-science collaborations can also be informed by a logic of *ontology* in which the collaborators are interested in 'altering existing ways of thinking about the nature of art and science, as well as transforming the relations between artists and scientists and their objects and publics' (Barry and Born 2013: 249). In such instances, science is understood as transformed and enhanced through its engagement with art (and vice versa). Moreover, rather than producing a public for the science, such collaborations start to resemble a 'public experiment'. The authors exemplify this with an interdisciplinary art-science project in which artists, scientists, engineers, and part of the public worked together to develop novel forms of knowledge.[1]

Although not all science exhibitions may be deemed a 'public experiment', the interest in 'exhibition experiments' (Macdonald and Basu 2007) as well as 'exhibitions as research' points toward this as they 'consider exhibitions as *knowledge-in-the-making* rather than platforms for disseminating already-established insights' (Bjerregaard 2020). As such, exhibitions can be sites where different perspectives and kinds of knowledge about a topic or phenomena meet. Furthermore, such exhibition experiments may transform the exhibition 'from a space of representation into a space of encounter' (Macdonald and Basu 2007: 14), foregrounding visitor's affective experiences and sense-making rather than the communication of scientific facts. In this context artists can be valuable collaborators, not because they help communicate scientific facts, but because they can aid in staging affective encounters that force visitors to think, operating as 'a rupture in our habitual modes of being and thus in our habitual subjectivities' (O'Sullivan 2006:1). As such, I will argue that exhibition experiments that challenge the roles of curators, scientists, and artists, as well as visitor's expectations and habits, may tie in with logics of ontology.

Analysing affective encounters in exhibition experiments with art

As mentioned, the paper analyzes similarities and differences between two exhibitions *Brain: The Inside Story* and *Mind Gap*. I observed the two exhibitions about the brain and neuroscience around the same time and was struck by their diverging strategies – both to neuroscience and to the use of art in a science exhibition.

To explore these differences, I have considered both discursive and material-affective aspects. First, I have analyzed curator statements and public interviews, press releases, and online presentations of the exhibitions. These sources have provided insights into how the exhibitions are presented to the public and about curators' intentions, rationales for including art in science exhibitions, and about their approaches to visitor engagement. In addition, I had the opportunity to interview the curator of *Mind Gap* myself and take part in a guided tour at the museum. The curator has also published an article about the curation, including reflections on the collaboration with the artist (Treimo 2013). This means the material about this exhibition is richer. Second, I analyzed reflection notes about my own bodily experiences of the exhibition designs, observations of other visitors in the rooms, as well as visitor surveys and evaluation reports by the museums. This material provided insights into how the exhibitions were experienced by visitors.

More precisely, I have analyzed the kinds of engagement that the exhibitions aim to facilitate through the design. That is, rather than asking about the learning outcomes of different media or exhibition designs, I follow Davies' and Horst's (2016) suggestion of asking what different kinds of spaces and designs can afford visitors. In their words: 'What possibilities do they offer to their users? What behaviours or experiences do they encourage, and what uses can they be put to?' (Davies and Horst 2016: 170). An important point is that designers and communicators alone (who may not have directly engaged in these considerations) are not fully in control of these experiences; they may be realized by the visitors themselves through their own engagement and exploration. Obviously, visitors' previous experiences and expectations inform this process.

While considering affective engagement is a way of emphasizing the role of bodily and sensory experience for visitor experiences in museum exhibitions (Dudley 2010; Witcomb 2010) this does not imply a neglection of the role of discursive framing (e.g., using labels, wall text, information leaflets, and museum guides). Rather, I have explored the dynamics between affective and discursive aspects of the designs. Both exhibitions provided an extensive programme of thematically related events, talks and debates at the museum during the exhibition period, as well as guided tours. These are included in the analysis of visitor engagement in and beyond the exhibition space.

I first visited *Brain: The Inside Story*. My initial analysis of the observations I made there led to the study of *Mind Gap* and the slightly extended collection of data about this exhibition. Thus, my research design was explorative, but I have enough material about both exhibitions to allow a thorough comparison of the curators' intentions and the exhibition designs. In the following, I present the two exhibitions in turn, before discussing similarities and differences more in-depth.

Brain: The Inside Story. Illustrating ready-made science

The exhibition *Brain: The Inside Story* at the American Museum of Natural History (AMNH) in New York aimed to bring 'visitors up to date on the latest in neuroscience', to highlight the brain's 'surprising ability to rewire itself' and to showcase new technologies for research and treatment.[2] Curated by Rob DeSalle, Division of Invertebrate Zoology at the AMNH and researcher at the Sackler Institute for Comparative Genomics, in close collaboration with neuroscientists Joy Hirsch (Columbia University) and Margaret Zellner (Rockefeller University), the exhibit presented a materialist and evolutionary account of how the brain works and how it has developed. As stated by Hirsch in a video interview: 'The way we think about our experiences, our perceptions, actually comes from, and actually originates from, the physical properties of our brains'.[3] Biochemistry and evolutionary psychology were employed to speak 'the truth' about the brain, providing facts about 'how it works' or 'why it matters'.[4] In the exhibition, they utilized two 'creative and innovative ways to present scientific information: artistic interpretations and interactive exhibits'.[5]

Fig. 1 Visitors in the walk-through installation Synaptic passage by artist Daniel Canogar. Courtesy of Studio Daniel Canogar.

Following a linear, but winding, structure, the space was divided into five topics relating to five stages in the exhibition route:
1) 'Your sensing brain',
2) 'Your emotional brain',
3) 'Your thinking brain',
4) 'Your changing brain', and
5) 'Your 21st century brain'.

The exhibition included art installations by two multimedia artists: Daniel Canogar was commissioned to create a walk-through installation *Synaptic passage* (2010), as well as a smaller sculptural element for another section of the exhibition, and Devorah Sperber contributed her recent art installation *After the Mona Lisa 8* (2010) which is part of a series of installations using colourful spools of thread to recreate familiar paintings and portraits. Canogar's *Synaptic passage* created the entrance to the exhibition; consisting of a semi-dark 35-foot walkway draped with heaps of tangled electrical wire and optical fibre, which came to life as beams of light danced over it (Fig. 1). After walking through the installation, visitors would enter a space with chairs and a video with a presentation of a dancer preparing for audition. The short video was accompanied by a model of the brain, whose different regions were illuminated when they came into play during the dancer's practice and performance – thus implying that different parts of the

brain take care of different tasks. Sperber's art installation *After the Mona Lisa 8* was placed in the section 'Your sensing brain', next to other examples of how we see and interpret the world around us. At first sight (and especially at a distance) Sperber's piece looks like a colourful arrangement of large spools of thread on the wall. When peeking through a small spherical lens in front of it, however, the arrangement of spools appears as a pixelated rendition of the painting *Mona Lisa* (Fig. 2).

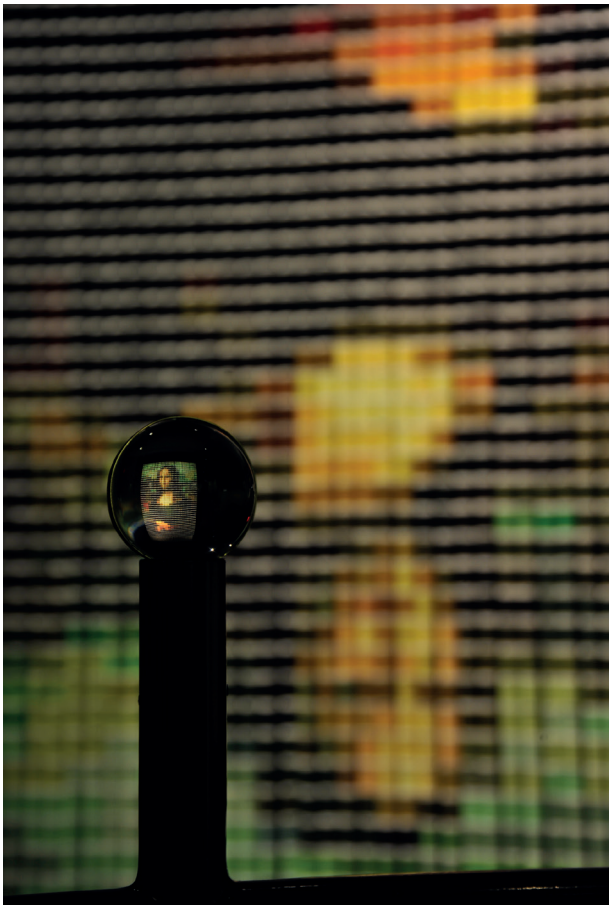

Fig. 2 After the Mona Lisa 8 by artist Devorah Sperber. Photo by Denis Finnin © American Museum of Natural History.

The next section, on emotions, focused on the evolution of the human brain, and comparisons of the human brain with different animal brains, as the exhibition information sheet explained: 'because many physical manifestations of human emotions are rooted in the experiences and behaviours of our early ancestors'. The section on learning was dominated by interactive displays and tasks to solve, such as testing language skills, testing capabilities of long-term planning through stacking objects, or experiencing the difficulties of trying to trace the figure of a star using a pointer while looking in a mirror instead of at one's hand (Fig. 3). The sections 'Your changing brain' and 'Your 21st century brain' focused on how to keep one's brain healthy as well as the possibilities of contemporary cutting-edge science and technological innovation, such as using feedback systems between the brains of disabled individuals and prosthetic limbs to aid in their operation. The exhibition concluded with a 'Brain lounge' where visitors were invited to sit down to watch videos on a table that showed fluctuating Functional MRI (fMRI) images of the brain activity of four professionals in action: a translator moving between Arabic and English, a basketball player engaged in a game and both a classical and rock musician playing their respective instruments.

In the exhibition leaflet the art is mentioned as one of the 'highlights' of the exhibition, described as 'gorgeous works of art that help illustrate the workings of the brain'.[6] In other words, the art was thought to function as illustrations of science and became one of several strategies used to engage the visitors in the science (and not necessarily in the art). Canogar's installations with light projections on wires was said to 'represent the brain's connectivity and to highlight its electrical impulses' and to 'illustrate the rapid development of the human brain *in utero*'.[7] Sperber's installation *After the Mona Lisa 8* was also presented as an illustration of the science of memory and perception, described as playing with the 'visitors' senses and memory by turning spools of thread into works of art', 'forcing visitors to interpret pieces of a visual puzzle'.[8]

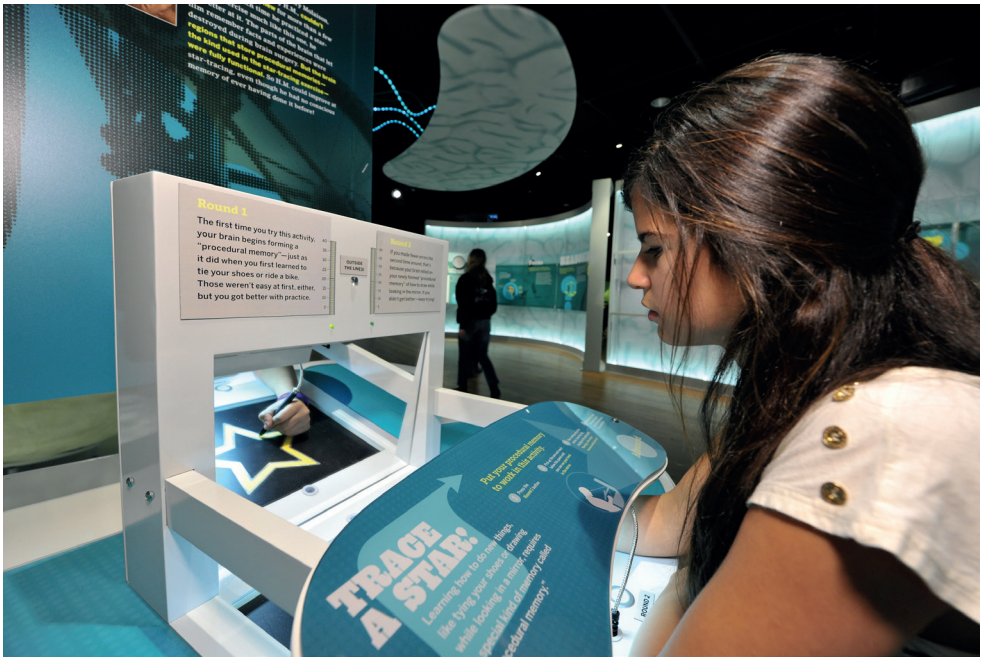

Fig. 3 Star tracing activity, to illustrate the shaping of procedural memory. Photo by Denis Finnin © American Museum of Natural History.

The exhibition did not only frame the artworks as illustrations of science discursively, both also materially – through the design. Even if Canogar's installation initially may have afforded visitors an immersive space of wonder and imagination, the rest of the exhibition seemed to work against this. After his walk-through installation, visitors were presented with scientific facts about how our brains work through extensive use of multimedia stations, hands-on interactives, and didactic displays (Fig. 4). Sperber's installation was also discursively framed as an illustration of how our senses play tricks on us, placed along other multimedia installations in the section 'Your Sensing Brain'. Through surprising encounters and interactive stations visitors were expected to solve tasks or reflect on their sensory experiences, such as interpreting combinations of sound and images, or their cognitive abilities, like long-term planning, learning languages, etc.

Most of the interactive stations in the exhibition were designed for a single user, giving feedback on individual performance (the neuron table being the exception). Contemporary science centres extensively use such interactives to facilitate learning by making visitors demonstrate scientific principles to themselves or solve tasks, potentially providing a feeling of agency and participation (Barry 2001; Witcomb 2006). Even if including interactive stations aims to turn visitors into 'active participants', they often reflect a model of human interaction, which implicitly, and sometimes explicitly, is taken from computer science or the interaction with computer-based systems. According to Heath and vom Lehn (2009: 3), the danger is that this form of interactivity becomes confused with an active (political) subject or even social interaction. Their point is that single user interactives might pacify users rather than making them active, keeping them busy and entertained with the given task.

Even if visitors to the exhibition were encouraged to 'explore' and 'discover', informative and explanatory text followed the visitors throughout the exhibition. Indeed, after walking through the exhibition I got the feeling it was already decided what we should be interested in, how we should behave and what we should be surprised about. For example, in the exhibit titled 'Stop & Listen: What do you hear?', visitors were confronted with an image of a woman in a rainy street and could listen to a soundtrack using headphones. We were asked to guess the source of the sound, before stepping around to the opposite side of the wall to see the

other picture – of frying bacon. One the one hand, this felt like a surprising and stunning way of communicating that how we interpret sound is very much dependent on visual input. On the other hand, this exhibit can also be seen as an example of how our attention, gaze and movements were strictly directed and clearly choreographed throughout – making sure we got all the facts about 'how the brain works' or 'why it matters'.

Fig. 4 View from the entrance to the section 'Your Thinking Brain'. Photo by Roderick Mickens © American Museum of Natural History.

Mind Gap. Exploring science in the making

During the same period that *Brain: The Inside Story* was on display, *Mind Gap* was exhibited at The Norwegian Museum of Science, Technology and Medicine (NMSTM) in Oslo. *Mind Gap* was part of the 200th anniversary of the University of Oslo and focused on Norwegian neuroscience – both its history and contemporary research. Henrik Treimo was responsible for the curation and production of the exhibition, in collaboration with curators Olav Hamran and Ellen Lange.

In contrast to *Brain: The Inside Story,* visitors to *Mind Gap* were not presented with a unified voice of science or given didactic explanations of 'how it all fits together'. According to curator Treimo, the intention was to offer 'a glimpse into the universe of neuroscience' and to examine 'neuroscience as practice and culture' (Treimo 2013: 259). With a background in cultural and social studies of science and technology (STS) his interest was to show the diversity of questions, methods, and practices among brain researchers in Norway, and to include personal accounts of what it meant to be living with brain-related diseases. This approach was also reflected in the introduction to the exhibition catalogue, where the curators write:

> What is the brain like? How does it work? The answer to these questions depends on the position and perspective. The individual researcher's point of view, the methods, and the tools, determine what is possible to see. And what is possible to answer. (…) Brain research is a lot of things (Treimo 2011: 17-8).

Being less about communicating ready-made facts and more about conveying a sense of the heterogeneity of the field, the curatorial team wanted to create an exhibition in which visitors

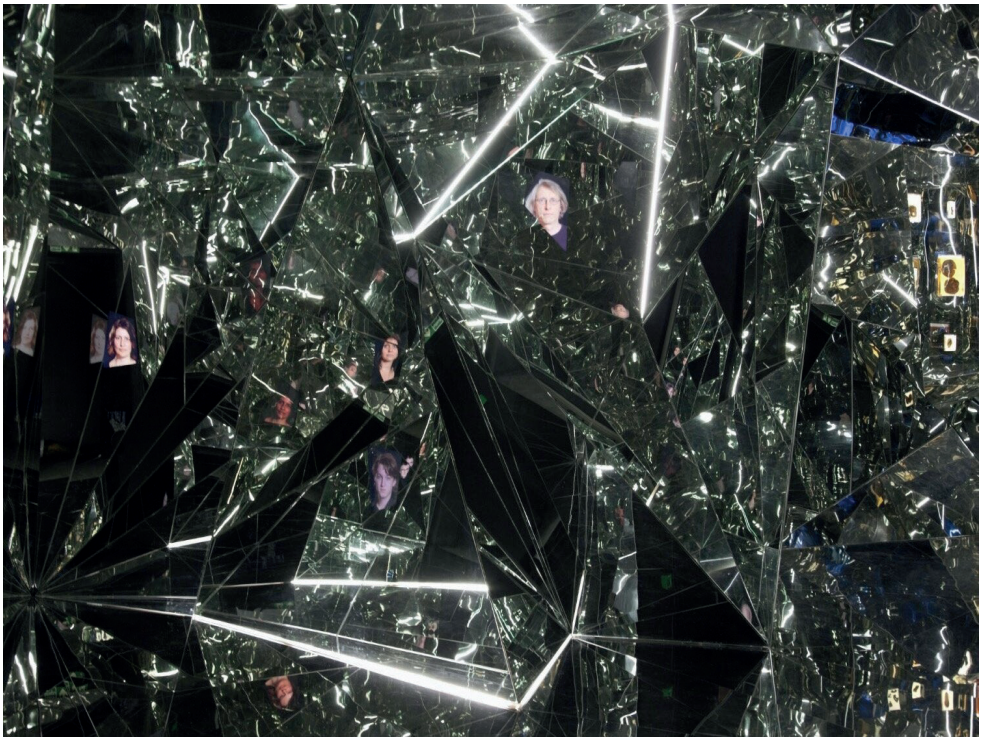

Fig. 5 Faces in the 'Mirror Room'. Photo © Lesley Leslie-Spinks.

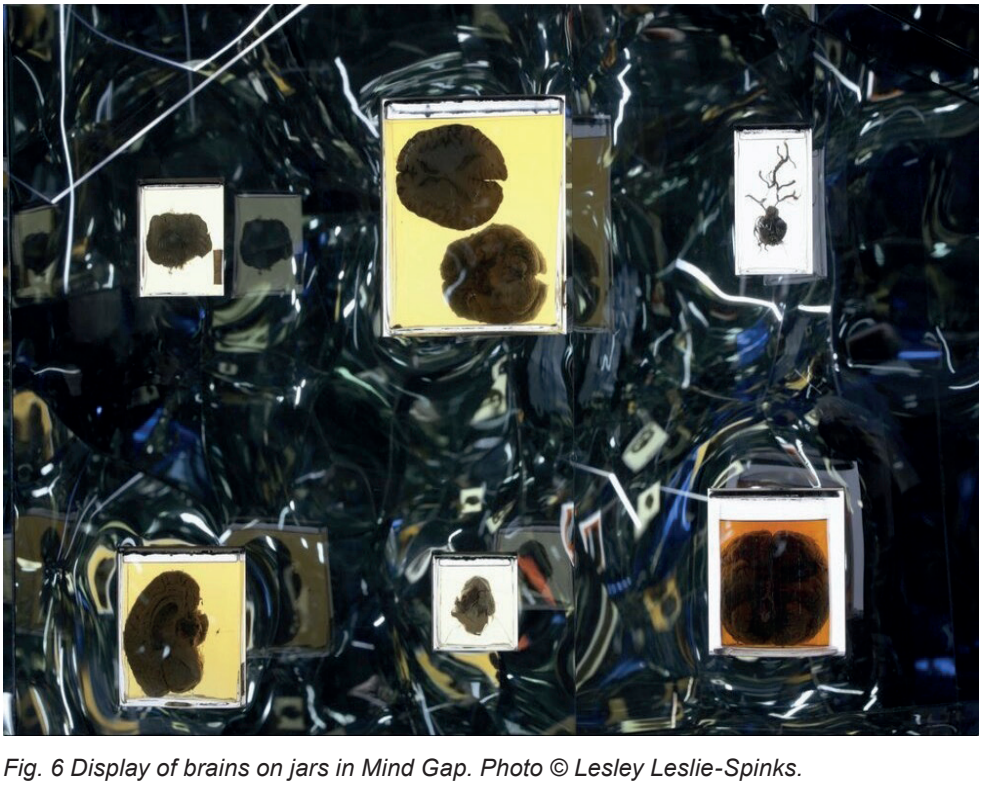

Fig. 6 Display of brains on jars in Mind Gap. Photo © Lesley Leslie-Spinks.

could 'immerse themselves in the universe of neuroscience' and be encouraged to 'ask their own questions' (Treimo 2013: 259). The title – *Mind Gap* – was meant to be ambiguous, potentially referring to the synaptic gaps between neurons in the brain, discussion on the brain-mind gap in research, or even the gaps in our current knowledge about the brain. Indeed, a starting point for the process was how little (Norwegian) brain researchers said they knew about the brain (Treimo 2013: 260-61).

At an early stage, they hired avant-garde artist and playwright Robert Wilson to work as co-curator, contributing to the development of the exhibition concept as well as the spatial design. Wilson is renowned for his experimental use of light, sound, movement, and space – and minimal use of text or verbal utterances – in theatrical plays, operas, and exhibition designs. This approach was one of the main reasons for working with Wilson, as the curators wanted to 'create an exhibition space where things would take place outside the realm of seeing and reading about objects' and where the visitors' bodily experiences played a vital role (Treimo 2013: 262). As the curator explained in a newspaper interview, this form of visitor engagement differs from the hands-on interactives common in science centres: 'We have tried to create an interactive exhibition that engages both the intellect and the senses, instead of providing physical interaction through the use of knobs' (Treimo quoted in Skram 2011).

Like *Brain: The Inside Story,* visitors had to follow a one way, winding route through the exhibition. The exhibition space was divided into three rooms with distinctive designs and atmospheres, all of which included a small, dark entrance and exit. In a video interview, Wilson said that he imagined the visitors to be Alices in Wonderland, falling through a rabbit hole and experiencing different worlds along the journey.[9] When entering, visitors were enclosed in a dark elevator-like room for some minutes, with soft floor and walls. After some seconds, a loud voice was heard shouting out numbers in a random order, increasing in intensity and pitch. Later, I get to know that this was the voice of the autistic American artist and poet Christopher Knowles, who has frequently collaborated with Wilson. At the culmination of a crescendo of sounds, the doors suddenly opened to the first room, which, in contrast, was very brightly lit.

In the first room, which I refer to as the 'Mirror room', all surfaces – including walls, floors, and ceiling – were covered with mirror facets. This created a visual environment of fractured reflections, which, while visually fascinating, also made the space challenging to navigate. In the first part of this room visitors encountered what looked like photographic portraits of human faces on the mirror walls, but which turned out to be looped videos of people blinking (Fig. 5). Around the next corner, visitors were faced with displays of objects from the museum collections: preserved brains in jars, taxidermy animals, a 3,000-year-old canopic jar from an Egyptian burial chamber, a trepanned skull from the 1100s, and thin metal instruments used in neurosurgery from the beginning of the twentieth century, delicately placed on black velvet surfaces behind glass (Fig. 6). The end wall had a large built-in aquarium with small zebrafish, which created a shimmering, shifting surface of greens and blues.

A loud voice shouting 'Mind gap!' directed one's attention towards an entrance to the second room, later in this text referred to as the 'Forest room'. Stepping in, the feet encountered a new kind of surface: hard clay with fractures covered the floor, resembling a desert – or the wrinkly surface of the brain? The room was filled with wooden stems from floor to ceiling, creating a labyrinthine, semi-dark space. Several monitors hanging on the tree stems showed video interviews with researchers and clinicians from different fields of neuroscience, as well as patients with neurological disorders such as memory loss, Alzheimer's, and schizophrenia (Fig. 7). The other main component of this room was various technological apparatuses used in the history of neuroscience, such as microscopes and an electroconvulsive therapy (ECT) apparatus. In addition, two living rats had a temporary home in the 'Forest room'. They were kept behind glass and could be observed running along a lit corridor in the middle of the wall or resting in a lower chamber close to the floor. In the far corner of the room, visitors could watch the film Kool – Dancing in My Mind (Wilson 2009) on a screen. This film contains footage of Suzushi Hanayagi, a Japanese dancer and choreographer (as well as a close friend of Wilson) who developed Alzheimer's disease late in life.

Upon entering the third (and last) room, which I refer to as the 'Lightning room', visitors were plunged into a dark space. Then, the space was suddenly, harshly lit up, revealing a montage of medical instruments and technological apparatuses in the ceiling. The light source

came from bright light tubes in the floor, which, when fully lit, had a zigzag-shape (Fig. 8). Furthermore, the flash of light was accompanied by a grating and glaringly dissonant sound, which, after some seconds, decreased in pitch and softened in tone. As this process was repeated in intervals, the atmosphere of the room undulated between an eerie Frankenstein-like site and a peaceful, minimalist landscape. Leaving the exhibition, we had to pass through a short, narrow, and dark tunnel – surprisingly, ending up in the cloak room. The soundtrack for the tunnel was the sound of a deep, long sigh, as if letting out the very last breath.

In contrast to the role of artists in *Brain: The Inside Story*, Wilson's contribution to *Mind Gap* was not singular works of art but the overall design of the exhibition. Rather than communicating the ready-made facts of neuroscience, *Mind Gap* seemed to aim at communicating the very feeling of being immersed in the 'jungle of knowledge' about the brain and neuroscience, with all the joy, wonder and confusion that may entail. While *Brain: The Inside Story* guided the visitors' gaze, movements, and interactions through the exhibition with neatly divided topics and didactic displays, it was very much up to the visitors of *Mind Gap* to make sense of the spaces and the relationship between the different objects encountered. Short, descriptive labels allowed us to identify some of the function and historical context of the objects, but not necessarily their connection or relevance in the context of neuroscience. Some of these 'mysteries', however, were addressed in guided tours and referred to in the video interviews available in the Forest room (as well as in the exhibition catalogue and the exhibition web pages).[10] For example, in the exhibition a photograph of Fridtjof Nansen (1861-1930), best known for his polar expeditions, was placed next to a jar containing hagfish. Nansen did pioneering research on the nervous system of the hagfish, where he formulated a theory of synaptic gaps. Similarly, the zebrafish were included not only to create a shimmering, aesthetically pleasing surface; they also represented one of the most common animal models in neuroscience. In addition, the exhibition did use sound and light to get the visitors' attention and evoke curiosity, especially at the transition from one space to the other.

Wilson has described the design of the spaces as providing different forms of scale (close-up, portraits, landscape), tones (bright, dim, dark) or even modes of thinking (questioning, exploring, reflecting).[11] The most important, however, seemed to be that the materials and scenography (mirrors, clay, wooden stems, lighting) were metaphorically rich, but interpretatively open. For example, the use of mirrors, their reflections and fragmentation, are culturally associated with notions of the self and its disruption, whereas tree stems may have inspired visitors to think about neuroscience as a mysterious forest and lighting as neuronal firings. In an interview, Treimo has suggested that exhibition experiments like *Mind Gap* provide a way to think about the role of the exhibition in contemporary science communication, potentially competing with formats such as online videos, documentaries, and podcasts. He explained that their strategy was to use the advantages of each medium: the catalogue provided text for reading, webpages presented videos and links for online explorations, while the exhibition space was used to provide sensory experiences and affective encounters that registers in the body and sticks in the mind.[12]

Even though the exhibition did not explicitly engage visitors in controversial topics, some of the objects in the exhibition – the preserved specimen of an unborn child without a brain, the ECT-apparatus, and the living rats – could potentially generate strong feelings or spark discussion. Furthermore, controversial topics were mentioned in the videos in the exhibition and in the exhibition catalogue. For example, the catalogue presented the use of deep brain stimulation (using electrodes) in treating depression as a controversial practice that is still in use because it may work well for some patients. Others, however, experience undesirable effects (Hamran 2011: 44). Foregrounding uncertainty and gaps in scientific knowledge can also be a way of opening debate and dialogue, and such aspects were emphasized in school visits and other guided tours (Nesset 2014: 93ff).[13]

In the next section, I will discuss how the three logics of accountability, innovation, and ontology appear and potentially intersect in the two cases. I will also point to some possibilities and challenges with bringing art and artists into science museums, for curators and museums as well as for visitors.

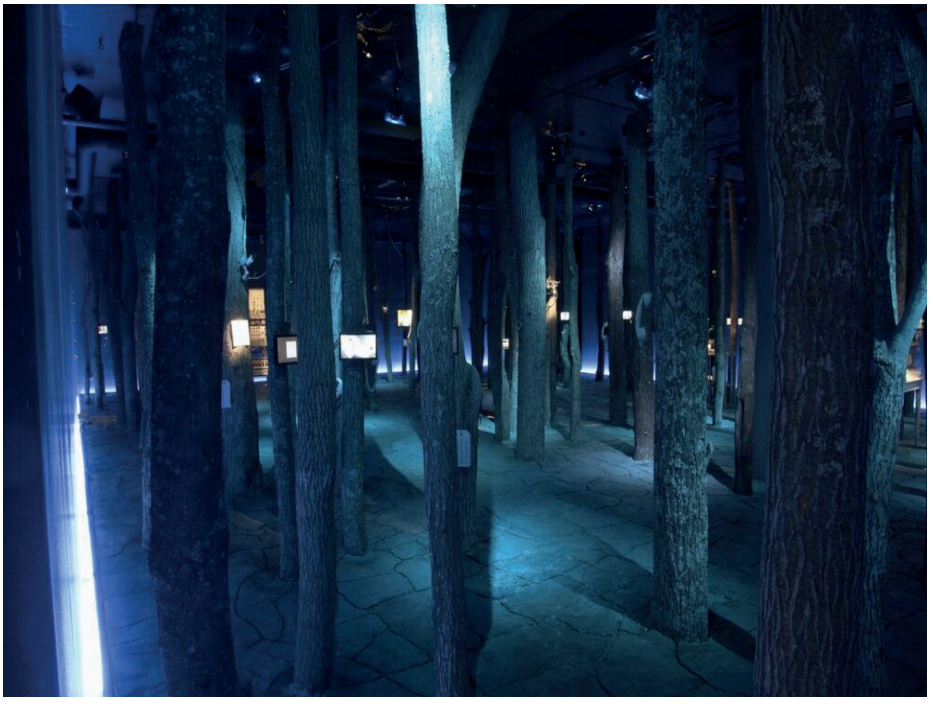

Fig. 7 View from the entrance to the 'Forest Room'. Photo © Lesley Leslie-Spinks.

Discussion: Bringing art into science museums

As we have seen, both exhibitions aimed at engaging visitors' bodies and minds, by making their own sensory experiences and cognitive processes an important part of the exhibition. However, there were major differences in their approach to (neuro)science and in the way they used art in the making of the exhibition: using art to illustrate ready-made science in *Brain: The Inside Story,* versus using art to create a scenography for exploring 'science in the making' in *Mind Gap*. This also led the curatorial teams to approach notions of visitor engagement and exhibition design quite differently.

Considering *Brain: The Inside Story*'s focus on 'facts', didactic displays and interactives, the exhibition largely adheres to a deficit model of science communication. Thus, neuroscience was treated as a well-defined body of knowledge, ready to be communicated to the public. Implicitly, then, the tasks of curators were to communicate scientific facts to the public and explain the relevance and importance of current and future science and technology. The use of 'imaginative art' was seen as a novel and innovative means of communicating ready-made science, and the art was discursively and materially framed as illustrations of science by the didactic texts and displays in the exhibition. Following (Barry and Born 2013), this positioned the collaboration within the logics of accountability and innovation, in which art is used to foster public interest and trust in science and new technologies.

Approaching the visitor as an active agent in the quest for knowledge about the brain, *Mind Gap* adheres to more dialogic and participatory modes of science communication, in which the visitors' own interpretations and meaning making are encouraged. The artists (Wilson and von Arx) were brought in to create an immersive scenography in which visitors would play the key role in exploring the brain and neuroscience – as a cultural practice and an on-going knowledge process. Consequently, the exhibition was not seen as a space for representing or communicating scientific facts, but rather as an experimental site for visitors to take part in and explore knowledge in the making. Whereas the use of art in the pursuit of communicating science (whether ready-made science or science in the making) may seem like

Fig. 8 Guided group of children walks along the light tubes in the 'Lighting Room'. Photo © Lesley Leslie-Spinks.

a case of instrumentalization, the collaboration with Wilson in *Mind Gap* resulted in an exhibition experiment that articulated a logic of ontology, at least in so far as it challenges traditional ideas about what a science exhibition should be, and, consequently, what roles artists, scientists, and visitors should take in this context. Still, *Mind Gap* also reflects the logics of accountability and innovation, since the invitation to engage with science in the making also encourages trust and interest in science and new technologies, since transparency is key to social robustness (Gibbons 1999).

However, by approaching the brain (and mind) from different perspectives – cultural, historical, scientific, artistic – *Mind Gap* did not only engage visitors in *science in the making*, but *knowledge in the making*. Patient perspectives and lived experiences were also considered important by both the curators (initiating interviews with patients) and by Wilson (who incorporated works and performances by artists living with neurological disorders). Working with Wilson meant working with his team of artists and performers, and the collaboration started with a week-long workshop at his creative laboratory The Watermill Center outside New York. During these workshops, several of the main components of the exhibition were decided, including the division of the space in three, and the use of materials, as well as a rough draft of content. Interestingly, what created a common ground for discussion was the focus on how little scientists today say they know about the brain and the mind (Treimo 2013: 261-2). While Wilson was mostly involved in the initial stages, the design was realized in collaboration with scenographer and architect Serge von Arx and his students at the Norwegian Theatre Academy.

In the process that followed, form and content were shaped together through several successive phases, in which both scientists and artists were considered as co-curators. According to the curator, they had a 'shared commitment to the idea that it [*Mind Gap*] was neither an art installation nor a science exhibition' (Treimo 2013: 265) The exhibition borrowed strategies from post-dramatic theatre, as well as pre-modern 'cabinets of curiosities', and resulted in a hybrid of a science exhibition and immersive installation art, framing the objects selected and material produced by the museum staff. In the end, it was Wilson who had the last say on design, while the curatorial team at the museum decided upon objects and stories (video interviews) in close collaboration with the scientific contributors and von Arx.

Regarding the collaboration, the curators said that their role might be described as 'mediating art and science' (Treimo 2013: 265). The collaboration with an established artist like Wilson did lead to long hours of discussion and negotiation.[14] The exhibition was quite

challenging to produce, both in terms of the technical and material complexity of the exhibition design as well as the coordination of all the people involved. Several of the ideas proposed by Wilson and his team was abandoned because the museum curators and staff thought it was too intrusive or demanding for their visitors, such as using specially designed scents for the different rooms or allowing only one person at a time through the first 'tunnel'. The use of labels and text in the exhibition also created discussion. Initially, the artists did not want any labels at all, but they had to compromise on minimalistic labels for the exhibited objects in the end. Later, as visitors complained that they had difficulties reading the labels, particularly those on glass surfaces, the museum staff made a hand-out with descriptions of the objects and some additional information.[15] My impression was that these negotiations pointed to tensions in balancing the artists' desire for unexpected experiences, ambiguity, and multivalence with the museum's ideas about the museum as a safe and comfortable learning space, as well as visitors' expectations.

Certainly, artistic and interpretatively open exhibition designs, such as *Mind Gap*, demand a more inquisitive approach from visitors, 'requiring them to produce their own interpretative narratives as a means to breach the gaps left open' (Gregory and Witcomb 2007: 269). This, however, can be experienced as quite demanding by visitors, depending on their background and familiarity with more experimental exhibitions, or with installation art. Indeed, some visitors to *Mind Gap* reported that it was difficult to know 'what to do' in the exhibition, which may be related to their expectations towards learning and interaction in science exhibitions.[16] Although science museums aim to facilitate dialogue and participation, and experiment with novel ways of doing so, visitors to science exhibitions may still expect to be informed. Indeed, regular science museum visitors are probably more familiar with text-rich exhibitions and interactive stations than with avant-garde scenography or installation art (Redler 2009). How should museums negotiate this tension between their own intentions and visitor expectations? To what extent does the art itself need to be communicated or explained to science museum visitors?

However, some visitors to *Mind Gap* appreciated the 'gaps' left for their own reflections and thoughts. Perhaps the surprise of an encounter with an unfamiliar and hybrid space can be a transformative and valuable experience in itself? As curator Treimo reflected upon in the interview, discussing visitor responses to the exhibition:

> I think that would be the mission of an exhibition: that you have produced something in which people return to you and say 'this was incredibly exciting, although I don't quite know why'. Perhaps that's a good thing, as I guess it means it has done something to you. [17]

This approach obviously demands that the curators are open-minded about what the visitors should experience and how they will interpret it (without necessarily relativizing knowledge). However, an advantage with interpretatively open exhibitions is that museum guides can build on and engage with the visitors' affective encounters in the rooms, as well as their previous knowledge, individual experiences, and memories, as happened in the guided tours that were offered to *Mind Gap.*[18]

Still, both cases also show how the logics of accountability and innovation may tie in together, using art as a means of 'governing affect'. The use of affective encounters to spark joy, wonder and surprise are widespread in the context of science communication, both old and new. To some extent both exhibitions used artistic means to evoke curiosity and wonder about the brain, as well as interest in contemporary neuroscience and its present and future impact. The latter was particularly the case for *Inside Story*, which presented quite a positive view of the role of science in society and focused on potential technologies for treatment and enhancement. In comparison, *Mind Gap* appeared more ambiguous, revealing the gaps, uncertainties, and shortcomings in current knowledge and treatment. The scenography reflected this ambiguity by confusing visitors' sense of orientation through fractured mirrors, suddenly immersing us in darkness, or surprising us with glaring sounds and unexpected perspectives. Even if this was not entirely the intention of the museum curators, the exhibition afforded visitors more ambivalent affective encounters with neuroscience than *Brain: The Inside Story.*

Last, but not least, museums and their curators may also have several goals and manage to combine these by adhering to several logics at once or by framing the collaboration differently for different actors. For example, even if the main reason for inviting Wilson was to create a hybrid of a science exhibition and art installation (logic of ontology), his status as a renowned artist also functioned to attract visitors interested in art and theatre who would not normally come to the science museum (logic of innovation). This does not necessarily make the experiment less interesting or good but might provide a more complex picture of the rationales that govern museums and their curators.

Conclusion

In this paper I have analyzed and discussed two exhibitions on the brain and neuroscience in which curators chose to collaborate with artists in making the exhibition. I have done so within the theoretical and conceptual frames of science communication and public engagement, as well as discussion on sci-art experiments in museums. Through a material-discursive analysis, I have shown that concepts such as dialogue, participation and visitor engagement are understood and put into practice and design quite differently in the two cases.

In line with Birchall (2012), this analysis shows that museums and curators play important roles in shaping the collaboration with artists. I have argued that the curators' initial approach to the brain and neuroscience shaped the collaboration with artists and the role art was allowed to play: communicating ready-made science framed by didactic displays versus contributing to an exhibition experiment evoking science (or knowledge) in the making. Approaching science and technology as cultural practices can engage visitors not only in science in the making, but also knowledge in the making, including patient, artist, and visitor experiences as valuable contributions. As such, I hope this analysis and discussion will inspire science museums and their curators to think critically and creatively about how to play their roles as interdisciplinary mediators in future exhibition experiments across art and science.

Submitted: 12 June 2020
Finally accepted: 4 May 2022

Acknowledgement

This research was conducted as part of a PhD project on communicating knowledge in exhibitions across art and science at the Department of Interdisciplinary Studies of Culture, NTNU. The PhD was part of the research project Inside out: New Images and Imaginations of the Body, financed by the Research Council of Norway. I am grateful for conversation and feedback from colleagues, museum staff and others who have all contributed to develop this paper, including the anonymous reviewers.

Notes

1 The main example discussed by the authors is *Pigeon blog* (2006-8), coordinated by artist and scholar Beatriz DaCosta. In this project, artists, scientists, engineers, pigeon fanciers and homing pigeons worked together to develop novel (and urgent) ways of monitoring and communicating air pollution levels to the public in Los Angeles.

2 American Museum of Natural History, 'About the Exhibition - Part of the Brain: The Inside Story Exhibition'. https://www.amnh.org/exhibitions/brain-the-inside-story/about-the-exhibition, accessed 1 March 2019.

3 Joy Hirsch in American Museum of Natural History, 'First Look at Brain: The Inside Story', November 2010. https://www.youtube.com/watch?v=wV6eA3wvTRs, accessed 1 March 2019.

4 See for example American Museum of Natural History, 'Brain Introduction - Part of the Brain: The Inside Story Exhibition'. https://www.amnh.org/exhibitions/brain-the-inside-story/brain-introduction, accessed 3 January 2020.

[5] American Museum of Natural History, 'About the Exhibition - Part of the Brain: The Inside Story exhibition'. https://www.amnh.org/exhibitions/brain-the-inside-story/about-the-exhibition, accessed 1 March 2019.

[6] American Museum of Natural History, 'Brain: The Inside Story', exhibition leaflet. http://docplayer.net/135068598-Brain-the-inside-story.html, accessed 3 January 2020.

[7] American Museum of Natural History, 'About the Exhibition - Part of the Brain: The Inside Story exhibition'. https://www.amnh.org/exhibitions/brain-the-inside-story/about-the-exhibition, accessed 1 March 2019.

[8] American Museum of Natural History, 'About the Exhibition - Part of the Brain: The Inside Story exhibition'. https://www.amnh.org/exhibitions/brain-the-inside-story/about-the-exhibition, accessed 1 March 2019.

[9] Presentation by Wilson and his contribution to the exhibition *Mind Gap* by NRK (national broadcaster in Norway), https://www.nrk.no/video/robert-wilson-forteller-om-arbeidet-med-mind-gap_3575, accessed 28 January 2022.

[10] The video interview, and additional material, was available on the exhibition web pages, https://www.tekniskmuseum.no/gml/mindgap-hjem, accessed 3 January 2020.

[11] Presentation by Wilson and his contribution to the exhibition *Mind Gap* by NRK.

[12] Henrik Treimo, interview by Johansen 28 November 2011, Oslo.

[13] Teacher and PhD candidate Snorre Nordal contributed to developing the educational material and guided tours for *Mind Gap*, focusing on school visits. The process, observations of pupils and interviews with designers, guides, and teachers, are discussed in his PhD thesis on explorative spaces for science education (Nordal 2015).

[14] Henrik Treimo, personal communication, 28 November 2011.

[15] Henrik Treimo, pers. comm., 28 November 2011.

[16] Visitors to the exhibition, personal communication, 28 November 2011.

[17] Henrik Treimo, interview, 28 November 2011.

[18] See Nordal (2015) for negotiations and discussions on how to best design guided tours and educational programs (2015: 93ff), and reflections on how the exhibition functioned as a space for participatory learning for school children (2015: 163ff).

References

Anderson, B. (2007) 'Hope for Nanotechnology: Anticipatory Knowledge and the Governance of Affect', *Area*, 39 (2) 156-65. doi:10.1111/j.1475-4762.2007.00743.x

Bandelli, A. and Konijn, E.A. (2013) 'Science Centers and Public Participation', *Science Communication*, 35 (4) 419-48. doi:10.1177/1075547012458910.

Barry, A. (2001) 'On Interactivity', in Andrew Barry (ed) *Political Machines: Governing a Technological Society*, 127-152, London: Athlone Press.

Barry, A. and Born, G. (2013) 'Art-Science: From public Understanding to Public Experiment', in Andrew Barry and Georgina Born (eds) *Interdisciplinarity Reconfigurations of the Social and Natural Sciences*, 247-72, New York: Routledge.

Bell, L. (2008) 'Engaging the Public in Technology Policy', *Science Communication*, 29 (3) 386-98. doi:10.1177/1075547007311971.

Birchall, D. (2012) *Institution and Intervention: Artists' Projects in Object-Based Museums*. London: University of London. https://museumcultures.files.wordpress.com/2012/12/dannybirchall_institutionandintervention.pdf

Bjerregaard, P. (2020) *Exhibitions as Research: Experimental methods in Museums*, London: Routledge.

Bucchi, M. (2009) 'Beyond Technocracy: Democracy in the Age of Technoscience' in Massimiano Bucchi and Adrian Belton (eds) *Beyond Technocracy*, 73-96. New York, NY: Springer New York. doi:10.1007/978-0-387-89522-2_4.

Casini, S. (2010) 'Art in Science Centres: A Challenge to Visitors and Evaluators', in Anastasia Filippoupoliti (ed) *Science Exhibitions: Communication and Evaluation*, 51-76, Edinburgh: Museums Etc.

Davies, S.R. (2010) 'The Exhibition and Beyond: Controversial Science in the Museum', in Anastasia Filippoupoliti (ed) *Science Museums: Curation and Design*, 152–177, Edinburgh: Museums Etc.

Davies, S.R. and Horst, M. (2016) 'Images, Spaces, and Emotions: Non-discursive Aspects of Science Communication', in Sarah R. Davies and Maja Horst (eds) *Science Communication*, 159–185, London: Palgrave Macmillan UK.

Delgado, A., Lein Kjølberg, K. and Wickson, F. (2011) 'Public Engagement Coming of Age: From Theory to Practice in STS Encounters with Nanotechnology', *Public Understanding of Science*, 20(6), 826–845. doi:10.1177/0963662510363054.

Delicado, A. (2009) 'Scientific Controversies in Museums: Notes from a Semi-peripheral Country', *Public Understanding of Science*, 18 (6) 759-67. doi:10.1177/0963662508098577.

Dudley, S.H. (2010) *Museum Materialities: Objects, Engagements, Interpretations*, London: Routledge.

Durant, J. (1992) *Museums and the Public Understanding of Science*, London: Science Museum.

Gibbons, M. (1999) 'Science's new social contract with society', *Nature* 402**,** C81–C84. https://doi.org/10.1038/35011576

Gieryn, T.F. (1998) 'Balancing Acts: Science, Enola Gay and History Wars at the Smithsonian', in Sharon Macdonald (ed) *The Politics of Display: Museums, Science, Culture*, 197-228. Routledge: London

Gregory, J. and Lock, S.J. (2008) 'The Evolution of "Public Understanding of Science": Public Engagement as a Tool of Science Policy in the UK', *Sociology Compass*, 2 (4) 1252-65. doi:10.1111/j.1751-9020.2008.00137.x.

Gregory, K. and Witcomb, A. (2007) 'Beyond Nostalgia: The Role of Affect in Generating Historical Understanding at Heritage Sites', in Simon J. Knell, Suzanne MacLeod and Sheila Watson (eds) *Museum Revolutions: How Museums Change and are Changed*, 263-75, London: Routledge-.

Hamran, O. (2011) 'Hjernen er en by', in Ellen Lange and Olav Hamran (eds) *Mind Gap: Eighteen Research Portraits*, 299, Oslo: Norsk Teknisk Museum.

Haraway, D. (1984) 'Teddy Bear Patriarchy: Taxidermy in the Garden of Eden, New York City, 1908-1936', *Social Text*, 11 20-64 doi:10.2307/466593.

Heath, C. and vom Lehn, D. (2009) ,Interactivity and Collaboration: New forms of Participation in Museum, Galleries and Science Centres', in Ross Parry (ed) *Museums in the Digital Age,* London: Routledge/Victoria & Albert Museum.

Hetland, P. (2016) 'Models in Science Communication Policy', *Nordic Journal of Science and Technology Studies*, 2(2), 5–17. doi:10.5324/njsts.v2i2.2144.

Hooper-Greenhill, E. (2000) *Museums and the Interpretation of Visual Culture*, London: Routledge.

Horst, M., Irwin, A. and Davies, S.R. (2017) 'Reframing Science Communication', in Ulrike Felt, Rayvon Fouché, Clark A. Miller and Laurel Smith-Doerr (eds) *The Handbook of Science and Technology Studies*, Fourth Edition, 881-908, Cambridge, Massachusetts: The MIT Press.

Macdonald, S. (1998) 'Introduction', in Sharon Macdonald (ed) *The Politics of Display: Museums, Science, Culture*, London/New York: Routledge.

Macdonald, S. (2010) 'Exhibition Experiments: Publics, Politics and Scientific Controversy', in Anastasia Filippoupoliti (ed) *Science Museums: Curation and Design*, 138-51, Edinburgh: Museums Etc..

Macdonald, S. and Basu, P. (2007) *Exhibition experiments*, Malden, Massachusets: Blackwell.

Nesset, B. (2014) Mind Gap: En Særegen Formidling av Hjerneforskningen på Norsk Teknisk Museum, *Masteroppgave i Kulturstudier*, Telemark høgskole.

Nordal, S. (2015) Åpenbaringsrom : Rom for Deltakelse i Realfagsundervisningen - Participatory Spaces in Science Education. PhD thesis. Norwegian University of Life Sciences, Ås. Available at: http://hdl.handle.net/11250/2496785

O'Sullivan, S. (2006) *Art Encounters Deleuze and Guattari: thought beyond representation*. Basingstoke: Palgrave Macmillan.

Redler, H. (2009) 'From Interventions to Interactions: Science Museum Arts Projects' History and the Challenges of Interpreting Art in the Science Museum', *JCOM: Journal of Science Communication*, 8 (2) C04.

Rossi-Linnemann, C. and De Martini, G. (2020) *Art in Science Museums: Towards a Post-disciplinary Approach*, Abingdon, /New York : Routledge.

Simon, N. (2010) *The Participatory Museum*, Santa Cruz: Museum 2.0.

Skram, M. (2011) Mind Gap – en utstilling om hjernen. *Aftenposten Innsikt*, 16(2). https://www.nb.no/items/be3f1a79419de29d645f38a4760500f6?page=29, Accessed 3 January 2020.

Stephens, S. (2012) 'Artistic Merit', *Museums Journal*, 112 (5) 22-7.

Stilgoe, J., Lock, S.J. and Wilsdon, J. (2014) 'Why Should We Promote Public Engagement with Science?', *Public Understanding of Science*, 23 (1) 4-15. doi:10.1177/0963662513518154.

Treimo, H. (2013) 'Mind Gap', *Interdisciplinary Science Reviews*, 38 (3) 259-74.

Trench, B. (2008) 'Towards an Analytical Framework of Science Communication Models', in Donghong Cheng, Michel Claessens, Toss Gascoigne, Jenni Metcalfe, Bernard Schiele and Shunke Shi (eds) *Communicating Science in Social Contexts*, 119-35, Dordrecht: Springer Netherlands. doi:10.1007/978-1-4020-8598-7_7.

Vergo, P. (ed) (1989) *The New Museology*, London: Reaktion Books.

Witcomb, A. (2003) *Re-imagining the Museum: Beyond the Mausoleum*, London: Routledge.

Witcomb, A. (2006) 'Interactivity: Thinking Beyond', in Sharon Macdonald (ed) *A Companion to Museum Studies*, 353–361, London: Blackwell Publishing Ltd.

Witcomb, A. (2010) 'Remembering the Dead by Affecting the Living: The Case of a Miniature Model of Treblinka', in Sandra H. Dudley (ed) *Museum Materialities: Objects, Engagements, Interpretations*, 39-52, London: Routledge.

Wynne, B. (1998) 'May the Sheep Safely Graze? A Reflexive View of the Expert–Lay Knowledge Divide', in Scott Lash, Bronislaw Szerszynski and Brian Wynne (eds) *Risk, Environment and Modernity: Towards a New Ecology*, 44-83. London: SAGE Publications Ltd. doi:10.4135/9781446221983.n3.

(2006) 'Public Engagement as a Means of Restoring Public Trust in Science – Hitting the Notes, but Missing the Music?', *Community Genetics*, 9 (3) 211-20. doi:10.1159/000092659.

Yaneva, A., Rabesandratana, T.M. and Greiner, B. (2009) 'Staging Scientific Controversies: A Gallery Test on Science Museums' Interactivity', *Public Understanding of Science*, 18 (1) 79-90. doi:10.1177/0963662507077512.

Author

Anja Johansen

anja.johansen@ntnu.no
ORCID iD: https://orcid.org/0000-0001-5919-8128
URL: https://www.ntnu.edu/employees/anja.johansen

Department of Interdisciplinary Studies of Culture,
Norwegian University of Science and Technology
Norway

Bio Statement

Anja Johansen works as Advisor in Communication, Innovation and Competence at the University Library at the Norwegian University of Science and Technology (NTNU). She has a background in Art and Media Studies and has previously worked as a lecturer, art critic and guide.