Neutral, balanced or controversial: an overview and some remarks on how technoscientific issues are treated in museum exhibitions

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Abstract

In the last two decades museum exhibitions that deal with the representation of technoscientific issues and their impact to society have gradually gained the attention of researchers in Museology, Science Education, Science and Technology Studies as well as the field of Science Communication. Older exhibition tactics on such topics presented a neutral or balanced narrative to visitors more or less descriptive in its content. Yet, from the end of the 1990s, bibliography particularly on Scientific Museology refers to examples of exhibition experiments which propose innovative ways of representation and visualization. Creating an exhibition narrative that could hopefully inform citizens on science and technology issues, provoke their minds and support critical thinking is a stimulating task for museum professionals considering the fluidity and unpredictability of the nature of scientific practice. Among the broad repertoire of technoscientific themes treated occasionally in exhibitions, science controversies and science issues that may create a controversy to the public are of particular interest. The article attempts to investigate the repertoire of technoscience as a theme in museum exhibitions, uncover the communication frames that underpin their presentation and gives particular emphasis on the concept of controversy as a promising framework that enable visitors' understanding of the impact of Science in everyday life.

Keywords

Science exhibitions, technoscientific issues, practice and process, communicating controversy in science, critical viewer, negotiation

Résumé

Au cours des deux dernières décennies, les expositions muséales traitant de la représentation des questions technoscientifiques et de leur impact sur la société ont progressivement attiré l'attention des chercheurs en muséologie, en éducation scientifique, en études scientifiques et technologiques ainsi que dans le domaine de la communication scientifique. Les stratégies d'exposition plus anciennes sur de tels sujets présentaient aux visiteurs un récit neutre ou équilibré plus ou moins descriptif dans son contenu. Pourtant, dès la fin des années 1990, la bibliographie notamment sur la muséologie scientifique fait référence à des exemples d'expérimentations d'expositions qui proposent des modes innovants de représentation et de visualisation. Créer un récit d'exposition qui pourrait informer les citoyens sur les questions scientifiques et technologiques, provoquer leur esprit et soutenir la pensée critique est une tâche stimulante pour les professionnels des musées compte tenu de la fluidité et de l'imprévisibilité de la nature de la pratique scientifique. Parmi le vaste répertoire de thèmes technoscientifiques traités occasionnellement dans des expositions, les controverses scientifiques et les questions scientifiques susceptibles de créer une controverse auprès du public présentent un intérêt particulier. L'article tente d'explorer le répertoire de la technoscience en tant que thème dans les expositions muséales, de découvrir les cadres de communication qui sous–tendent leur présentation et met particulièrement l'accent sur le concept de controverse en tant que cadre prometteur permettant aux visiteurs de comprendre l'impact de la science dans la vie quotidienne.

Mots–Clés

Expositions scientifiques, enjeux technoscientifiques, pratique et processus, communication de la controverse scientifique, spectateur critique, négociation

Unfolding science exhibition narratives

In recent years, museums that fall largely in the *science museum/science centre* type have undergone a great reshaping on the ways they reach out to the public in order to fulfill their role as actors in the broader network of Citizen Science. The *Naturalis*[1] in Leiden, the *CosmoCaixa*[2] in Barcelona, the *Futurium* in Berlin as well as the *Science Gallery* in Dublin are cases which reflect the diverse expressions –from the building's architecture to the exhibition halls– of today's science museums. We could suggest that each one of these cultural institutions approaches the relationship between citizen

1 https://www.naturalis.nl/en.

2 https://www.barcelona.de/en/barcelona–museum–cosmocaixa.html.

and science in a diverse way. *Naturalis* was founded in 1820 yet it was re–born in 2020 offering an enriched and multisensory experience to visitors based on its digitized, open access, collections. *CosmoCaixa,* on the other hand, focuses on educating young people towards STEM–related professions. Whereas *Futurium*[3] functions as an exhibition site, without any permanent collection, based mainly on the digitalized form of exhibiting the interactions among Man, Technology and Nature.

In the past decades, the casual way of exhibiting science in museums focused on the presentation of concepts, natural phenomena and events as well as the biographies of scientists and their achievements. That approach to the exhibition content enables museums to achieve their role as non–formal science education environments. Exhibits such as scientific instruments and apparatus allow visitors to make their first step towards understanding the immateriality of natural phenomena via museum education activities based on the material elements exhibited in the museum space. Texts and labels, more or less in an academic style, support visitors' attempt towards meaning making. Yet as Weibel & Latour (2007, p. 94) point out, exhibitions are a particularly artificial congregation of objects, installations, people, arguments/narratives that cannot be met as such anywhere else. In recent years, research in the broad field of Museum and Exhibiting Studies often mention a shift from object–centred approaches towards human–centred perspectives as a way to tackle that kind of introvert look in the world of sciences. Moreover, science centres, since the 1970s, have offered a different way of displaying natural sciences, more interactive and less static, yet the interpretation problem can be evident as in many cases the interactive exhibits may offer a game–like approach to visitors but that is somehow a *sketchy* introduction into sciences. As Yaneva, Rabesandratana, & Greiner (2009) state, approaches such as the above–mentioned ones fail to grasp the quick rhythm in which scientific practice moves, the uncertainty, the experimental nature and the repetitiousness that characterizes the everyday work of the scientist. To delve into that particular area of Scientific Museology the researcher needs to understand the ways in which sciences are articulated or inscribed in the museum space. Some sparse examples since the early 2000s and forth have been located and are presented below. These indicate a move away from the casual display of science as an introvert, non–contextual, process and confirm the strong impact mainly from the fields of Science and Technology Studies, from anthropological interpretations of scientific practice and the Cultural History of Sciences which shape the exhibitions' aims, content and how the public as an active visitor is perceived.

Art–Science approaches constitute a form of exhibition expression that enables the lay museum visitor to visualize the abstractness of Science. The *Simply Complex* exhibition in the Museum of Design in Zurich curated by cultural historian Marius

3 https://futurium.de/.

Kwint focused on the "dendritic form" observed in nature and in the human brain and has been creatively used as a conceptual tool by artists, philosophers and linguists in their own research endeavors (Kwint, 2010). Similarly, artist Lucy Lyons applied the medical concept of *delineation* in a series of art installations that took place in the Medical Museion in Copenhagen (Lyons, 2010). Other kinds of display tactics focus on the materiality of sciences and target at opening the "black box" of Science and reveal the social networks in which materials (i.e. scientific instruments) are entangled. *n01se A series of exhibitions about information and transformation* was one such example hosted by a number of Cambridge Museums such as the Whipple Museum for the History of Science, the Museum of Archaeology and Anthropology and the Fitzwilliam Museum and the Kettle's Yard. The exhibition was the result of an interdisciplinary collaboration between a historian of science and an artist and aimed at investigating language as a communication medium (Steels, 2015, pp. 231–241).

A laboratory–based approach is another promising form of exhibiting as it exposes the everyday practice in the scientific laboratory or focuses and then reveals what happens in the laboratory during a critical experiment. *Laboratorium* was one of the first science exhibition experiments organized by the Fotomuseum Antwerpen in Belgium. There, researchers were practicing science in an enclosed, transparent, space within the exhibition hall. During the exhibition's opening hours, artists, along with scientists, interacted with visitors answering to questions about their work and the daily routine in the laboratory (Obrist, 2016). In that way, the scientist's laboratory was in a parallel "dialogue" with the artist's laboratory so that visitors could explore the interactions between science and art practice. Much later, another exhibition entitled *Biohacking: Do It Yourself!* took place in the Medical Museion of the University of Copenhagen[4] aiming at introducing biotechnology to the public pointing out at the uses of biotechnology in everyday life. In that case, the exhibition's curators – called "biohackers" – acted as interpreters who, in a playful way, interacted with visitors in the exhibition hall and allowing them to co–create exhibits in the context of museum education activities. This approach aims at studying how practice shapes the physical space and how space shapes hierarchies and interaction among scientists. Emphasis is given to the materialities of the laboratory, the tools, the experimental processes and on how researchers organize their work according to the available resources. It showcases and strengthens the fact that scientific practice is a process that involves trial and error**.** Meyer (2011) suggests that relocating publicly the laboratory to the museum space allows a chance for a conversation between experts and lay people in a different way than the one that already exists and is expressed via, for example, the science cafés. In addition, Davies et al. (2015) propose the role of visitors as co–creators of museum meaning (or co–

4 https://www.museion.ku.dk/biohacking–web–exh/.

curators) in the exhibition space bringing in the Scientific Museology discussion the concept of the participatory visitor, a concept already much discussed in the broader field of Museum Studies.

Besides exposing the inner sanctum of the science lab to the lay people, another example of exhibition approach is the one that reflects on the broader, physical, context of the city in relation to the location of the scientific institutions. Mapping the location of the scientific and technological sites and enterprises in the urban web supports the understanding of the spatial relations that emerge and the construction of scientific practice in the urban environment. *Sites of Science: City dynamics and scientific practices in Vienna 1900–1930* was an exhibition project developed by the Gallery of Research / Galerie der Forschung, an initiative of the Austrian Academy of Sciences in Vienna in 2005 (Filippoupoliti et al., 2006). The project aimed at inscribing the history of sciences in Vienna in the early 20th century from a "spatial" perspective and interpret the city's development along with the emergence of scientific sites in the city. A geography of science approach emphasizes on city dynamics, the city's impact on the production of technoscientific knowledge and its distribution to the broader community of experts and lay people. Exhibitions that apply this approach usually present themes from History of Science attempting to reconstruct the rationale behind the foundation of scientific laboratories and to offer a fresh interpretation of the networks developed in a city on a scientific, technological, academic and industrial level (Filippoupoliti & Koliopoulos, 2014).

Finally, it should be mentioned that the exhibition can act as a curatorial experiment with which the curator will inquire on new interpretation means. As Basu & MacDonald (2007, p. 2) mention any exhibition experiment is a research action and an inquiry tool for the curator. In Exhibition Studies, for example, the work done occasionally in the *Zentrum für Kunst und Medien* (ZKM) in Karlsruhe is such a case of exhibitions used as research tools. Philosopher Bruno Latour along with artist and art critique Peter Weibel conceived and realized in the *Zentrum* two exhibitions: *Ikonoklash–Beyond the image wars in Science, Religion and Art*[5] and *Making Things Public: Atmospheres of Democracy*[6] that successfully made philosophical arguments visual and visible to the public.

Exhibition cases such as the ones mentioned above one could say that are not the norm in science museums mainly due to practical reasons as, for example, they require an interdisciplinary exhibition team that demands the collaboration between experts from different fields. Furthermore, such exhibitions have a short–term duration or they are travelling exhibitions and, usually, there are no evaluation results as regard to visitors' expectations and museum experience. Another observation to be made

5 https://zkm.de/en/event/2002/05/iconoclash.

6 http://www.bruno–latour.fr/node/333.html.

regards the fact that although co–curation as a proposition is often utilized by museums in order to become more participatory in practice, collaboration of scientists with the exhibition team in order to host such displays is not that common unlike their participation in other museum communication initiatives, such as the science cafés. We should, however, note that the act of designing an exhibition and construct the narratives that visitors will follow is a method that enables researchers to explore new ways to reach out to society. This is not an easy procedure as Ana Delicado (2007) and others point out because of the fast rhythm in which science procedures develop and thus it is not easy to capture that in the form of a museum exhibition (also in Yaneva et al., 2009).

Approaches to representing scientific controversies in museum exhibitions

In 2005, the Austrian Academy of Sciences in Vienna hosted a pilot exhibition entitled *Mapping Controversies: the case of the Genetically Modified Food (GMF)*. The event was described as a visual experiment on the ways to communicate a quite popular technoscientific issue to the public. The exhibition aimed at delving into the challenges and the failures related to the communication of GMF issues and at inviting the public to take into regard the social, ethical, moral and political dimensions of the issue and the ways which these dimensions shape the public's everyday decisions (Yaneva et al., 2009, p. 79). Visually the exhibition team utilized mapping tools to create a depiction of the networks involved in the above–mentioned controversy in a quite innovative way such as issue–oriented web crawlers, scientometric tools and data–analysis engines.[7] Further, the exhibition included live presentations by researchers, journalists, museum professionals and policy makers (Venturini et al., 2015). Theoretical concepts from the field of Sociology of Science, such as the actor–network theory by Law & Hassard (1999) were utilized as a framework to understanding scientific practice as an open and ongoing process in a network that involves interacting actors, humans and non–humans in a non–hierarchical relationship (Weibel & Latour, 2007, p. 120). That concept has offered a way of looking and visualizing particularly scientific controversies (Venturini, 2010, pp. 260–261) as these constitute processes not yet stabilized and black boxed.

Since 2005 communicating technoscientific controversies to the public in science centres and museums has been a subject of interest among museum professionals (Davies, 2010; Meyer, 2011; Pedretti, Iannini, & Nazir 2018; Yaneva et al., 2009). Museums aim at supporting citizens' understanding on technoscientific and environmental issues

7 The Gallery of Research / Galerie der Forschung (2005). Mapping Controversies. The Case of the Genetically Modified Food. Event Report (11 pages).

offering a form of public pedagogy which will include different civic epistemologies on that field (Salazar, 2011, p. 123). Cameron (2011a, 2011b) indicates that long or short term controversies constitute the hot spot of scientific practice. Meyer (in Pedretti & Iannini, 2020, pp. 79–80) explains that controversies reveal the political, ethical and social web of sciences, all actors involved, methods, materials and processes. Venturini (2010, p. 261) focuses on the importance of exposing to the public all the parameters involved when tackling a scientific controversy offering climate change as an example of a multilayered phenomenon. As Cameron, Hodge, & Salazar (2013, p. 12) explain, climate change means different things to citizens all over the world, it is interpreted according to our sociocultural background, our ideologies, worldview and overall values, consuming patterns, economy, ethics etc. Besides climate change, genetically modified food, cloning, gene therapy, stem cells, waste management, nanotechnology (e.g., Kera, 2010; Laurent, 2010, 2012), nuclear energy and gold mining are some examples of controversial issues communicated through mass media and in some extent may be potential subjects in museum exhibitions. Not to mention the COVID–19 pandemic that has already become an exhibition theme such as *The Den* hosted at the Wellcome Collection in London[8]. However, the controversy surrounding vaccination has not yet raised a similar interest among exhibition makers. Also, Pedretti & Iannini (2020) refer to an exhibition entitled *Senses of Birth* hosted in a number of exhibition sites in Brazil. The exhibition utilized a series of media and means such as live drama and performance via which experts, theatre educators, artists, doctors, psychologists, journalists, epidemiologists and others collaborated in an interactive exhibition aimed at raising awareness about public health, pregnancy and motherhood (Oliveira et al., 2020).

Pedretti & Iannini (2020, pp. 70, 73) make a useful distinction between science issues that contain a controversy (internal controversy) and issues that are surrounded by controversy (external controversy) as a means to better design museum exhibitions about that subject. In the first instance, the controversy regards phenomena (e.g. climate change) that are long term, not easily tackled or resolved, are subject to uncertainty and the scientific procedures applied may at a later stage prove insufficient. In the second case, a scientific issue is exhibited in such a way so as to provoke visitors (e.g. reproduction methods, mental illness) particularly if visitors are positioned against the exhibition message due to ideology, personal belief, religion, cultural values etc.

8 https://wellcomecollection.org/whats–on.

Visitors' meaning making and experience in science exhibitions

It is expected that in practice inscribing the exhibition concept/scenario in the physical space may prove a difficult endeavor to achieve and initial aims and expectations may not finally be satisfied.

- How could an exhibition support dialogue among visitors on controversial issues?
- How could panels and texts be utilized to prompt the public to critical thinking?
- Should these prompt visitors to take further action?
- Should an exhibition present all possible approaches and particularly the ones that collide with each other in order to cultivate a global view of perspectives on a topic tacked in an exhibition?

Four models comprise the theoretical framework to understand how museum exhibitions communicate with visitors**:** *transmission, dialogic, participatory* and a forth one proposed by Pedretti & Iannini (2020, p. 34)*,* the *dissent/conflict***.** The linearity (top – down approach) that expresses the transmission model is disrupted by the dialogic model that offers to the public the "right to dialogue" (also, Bucchi, 2008). Researchers (e.g. Pedretti & Iannini 2020, p. 38) suggest that between the *transmission* and the *dialogic* model usually appears an overlap as, for example, an exhibition may have low interactivity, support a linear approach of visitors' movement between exhibits or require that visitors read lengthy texts in panels; yet that linearity may be interrupted by the use of interactive exhibits or any kind of activity needed to be performed by the visitor (e.g. answer a question in a touch on screen). The merge of these two communication models is usual in technoscientific exhibitions as it allows the gradual unfolding of the exhibition storytelling and associated information to the lay visitor. In addition, museum visitors are not a solid, homogenous, group of learners and meaning making is special for each one of them affected by a variety of factors, such as learning strategies, personal agenda and motivation and sociocultural background. So, a combination of communication methods facilitates the learning needs of museum visitors (see, for example, Brossard & Lewenstein 2010; Hetland, 2014, p. 13). The *participatory* model focuses on the co–creation of scientific knowledge by the public which allows on open and multidirectional type of interaction with the experts and eventually could lead to a reform of the research agenda (Pedretti & Iannini, 2020, p. 36). And, finally, the *dissent/conflict* model is proposed as an ideal one when sensitive issues related directly to society are treated in the exhibition space, such as mental health, GM food, drug use etc; such an approach to communication may prove more successful as it may inspire museum visitors to become more responsive towards the exhibition information they confront in the exhibition space (ibid., 39).

When discussion comes to how exhibitions provoke visitors' reaction researchers (e.g. Pedretti & Iannini 2020, pp. 61, 63) make a four–fold division:

- *pedagogical/didactic* which aims mainly at the cognitive parameter and at raising the level of the learner's personal knowledge on a subject. The exhibition content is highly explanatory so as to be accessible by the lay audience;
- *experiential* which invites visitors to participate on a physical, cognitive and emotional level utilizing multisensory learning approaches and interactivity;
- *critical* which supports a *silent dialogue* and aims at stimulating critical thinking with controversial issues, emphasizes on dialogue, decision making and awareness of the complexity involved in understanding such issues; and
- *agential* which is less common yet aims at influencing visitors and gradually constructs their identity as active citizen scientists.

The last category perceives the visitor as a political agent, a potential activist and an agent of social and political change that will affect, eventually, the science research agenda. The exhibition content sets critical questions, challenges the traditional or leading scientific narratives, calls of an interdisciplinary approach to the interpretation of the exhibition topic and for visitors' participation and self–reflection. In practice, the exhibition makers utilize interpretation methods to attract the visitors' attention and inspire further action, such as drama, role play, hypothetical scenarios, immersive experience and voting stations in the exhibition hall (Pedretti & Iannini 2020, p. 75).

As a concluding remark in this overview, we should repeat what some museum theoreticians have stated that is that science museums should remain relevant to society. That may sound as commonsensical yet as Janes & Sandell (2019) point out, in particular, science museums make up an ideal environment for reflection and speculation over ethical questions related to technoscientific practices. Pedretti & Iannini (2020, p. 54), too, suggest that the turn towards more anthropocentric exhibitions leads to a new genre of science museums that should acquire more progressive views towards scientific literacy and contribute to citizens' critical thinking and acting in the public sphere. As leading non–formal education institutions, museums offer to the public an organized introduction to scientific practice more than any other mass medium, adopt participatory strategies for visitors' involvement and offer chances for dialogue and debate. It is high time for museum practitioners to put in practice such propositions and inquire further on exhibition ways to make the Science–Society relationship more attractive to the public.

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