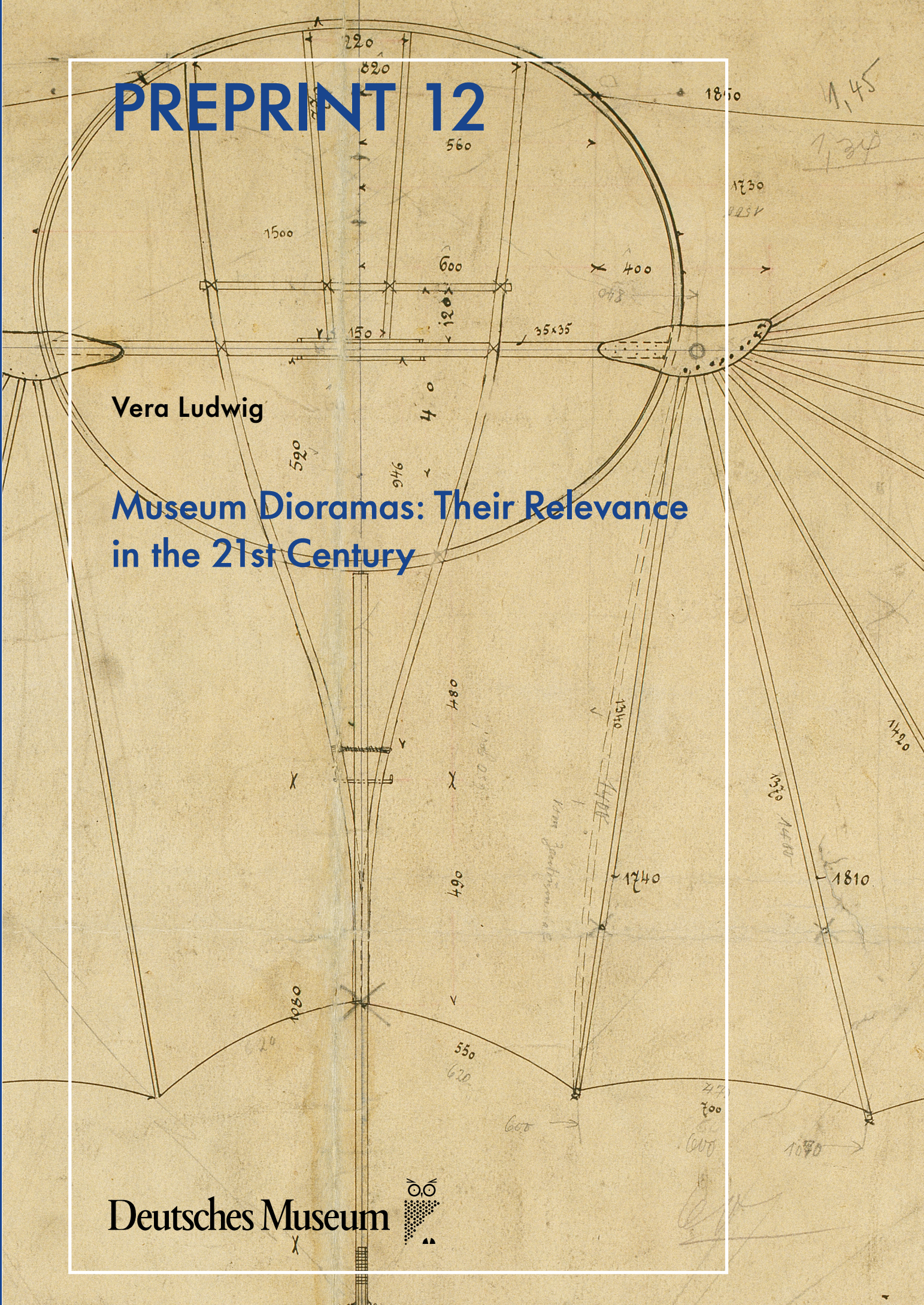


PREPRINT 12

Vera Ludwig

Museum Dioramas: Their Relevance in the 21st Century

Deutsches Museum



Museum Dioramas: Their Relevance in the 21st Century

Deutsches Museum Preprint
Edited by Deutsches Museum

Issue 12

Vera Ludwig completed her Master of Arts in Museum Studies at the University of Leicester in 2016 before becoming a museum scholar at the Deutsches Museum. For over two decades she worked as a trained master craftsperson for model-building at the Deutsches Museum and as a vocational school teacher. Because of her expertise concerning museum dioramas she began to see the urgent need for research into the effectiveness and contemporary relevance of museum dioramas which has led to her focus of research in her master's dissertation.

Vera Ludwig

Museum Dioramas: Their Relevance in the 21st Century

Based on a Master Thesis in Museum Studies, University of Leicester, 2016.

Bibliografische Information der Deutschen Nationalbibliothek
Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der
Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind
im Internet unter <http://dnb.d-nb.de> abrufbar.

Vera Ludwig, "Museum Dioramas: Their Relevance in the 21st Century"

© 2017 of the present edition: MV-Wissenschaft

MV-Wissenschaft is published by readbox publishing GmbH, Dortmund

<http://unipress.readbox.net/>

© Deutsches Museum Verlag

All rights reserved

Editor: Andrea Lucas

Layout and Design: Jutta Esser

Cover illustration: Draft of the Lilienthal glider, 1895 (Detail), DMA, BN 62779

Printing and binding: readbox unipress, Münster

ISBN 978-3-940396-65-5

Contents

Museum Dioramas: Their Relevance in the 21st Century

7	Abstract
9	Introduction
11	Methodology
12	The Diorama's Role in the Museum
12	Introduction
12	Conflicting Definitions
13	History and Development
15	The Cultural Value of Dioramas
16	Medium of Dramatic Display
17	Tool for Engaged Learning
19	Exhibiting Dioramas
22	Debate and Analysis
22	Introduction
23	On-going Debate on the Role of Dioramas in Museums
26	Visitor Studies
26	Bitgood on Effective Dioramas
27	Case Study: Dioramas at the Deutsches Museum
27	Introduction
28	The History of Diorama Building
29	Definition and Concept
29	The Role of Dioramas in the Museum
30	Visitor Studies
31	Interviews with Museum Professionals
34	Visitor Program and Questionnaire
37	Discussion
41	Innovative Strategies for Museum Dioramas
41	Improvement in Museum Management
42	Ideas and Limits of Keeping Dioramas Relevant
45	Technical Improvements
46	Immersive Experiences
46	From Concrete to Virtual Reality
49	Conclusion
51	Appendix
51	Bibliography
54	Source of Figures
55	Interviews with Museum Professionals at the Deutsches Museum
55	Introduction to the Interviews with Museum Professionals
56	Summarized Interviews with Museum Professionals at the Deutsches Museum
82	Visitor Questionnaires
82	Questions Asked
85	Questionnaire for Children
86	Responses to the Visitor Questionnaire

Abstract

Studien zum Thema Dioramen beschäftigen sich in der Hauptsache mit der historischen und künstlerischen Bedeutung von Museumsdioramen. Der vorliegende Band erweitert diesen Blick um eine museums- und besucherorientierte Sichtweise auf diese musealen Objekte. Die Autorin versteht unter dem Begriff Diorama eine weit gefasste Vielzahl von dreidimensionalen, illusionistischen Szenarien. Die Studie konzentriert sich zunächst auf die Rolle des Dioramas im Museum als materielles Kulturgut und auf ihre Wirksamkeit als dramaturgisches Ausstellungselement. Ergänzend dazu nimmt sie die zum Thema durchgeführten Besucherstudien sowie den in der Forschungsliteratur geführten Diskurs in den Fokus. Der zentrale Teil der Arbeit umfasst eine Fallstudie zu Dioramen im Deutschen Museum in München. Dazu werden mit Museumsfachleuten geführte Interviews sowie eine Besucherbefragung vorgestellt. Der letzte Teil bietet einen Ausblick auf die Zukunft von Dioramen im Museum in Hinblick auf Inhalt und Einbindung in die Ausstellung. Vor dem Hintergrund des zunehmenden Interesses an virtueller Realität stellt die Autorin diese neuen technischen Verfahren dem traditionellen Medium der Illusionserzeugung, dem Diorama, gegenüber.

Introduction

The Deutsches Museum in Munich was founded in 1903. Today it is among the world's oldest museums of science and technology. It receives approximately 1.5 million visits annually. With a total exhibition space of 68,000 square-meters it is one of the largest science and technical museums in the world. Since its beginnings the museum has implemented models and dioramas of all scales in its various exhibitions. Over the years, a vast amount of these displays have been built in-house by a team of workshops including sculptors, painters and model-builders.

During my 23 years as a member of the model-builders' workshop, my colleagues and I were assigned to the development and creation of 11 new models and dioramas. Since the model-builders distinguish strictly between dioramas and models only four out of the 11 are genuine dioramas. According to this definition, dioramas consist of a three-dimensional scenery in the foreground and a painted background which is situated in an enclosed space with a restricted view. Both models and dioramas require meticulous research about the context of the depicted topic and the exact outer appearances of the objects and the scenery. If possible, original objects are measured and scaled down so that they can be built as precise miniature replicas. Thus the model-builders like to refer to their models and dioramas as three-dimensional documentations. The set up of the scenery, the color concept and, with regard to the dioramas, the painted background is intended to deliver a convincing and lifelike atmosphere.

Notwithstanding the fact that models and dioramas require similar work effort and resources, based on my personal encounters with visitors, only a few models match the attractiveness of most dioramas. It has always filled me with pride to observe appreciative reactions and engaged conversations in front of dioramas. However, I question if the appeal of dioramas is due to our painstaking adherence to detail and authenticity or if other factors are either as important or even more important than the artistic quality of the product. I started wondering about that when I observed visitors at the Miniatur Wunderland Hamburg, an entertainment venue with a continuously expanding array of model-train dioramas. On a busy weekend visitors wait for hours to be let in. They are in awe about the little worlds, the moving trains, airplanes and other vehicles. Yet to my mind the dioramas are all of inferior artistic quality in comparison to the average diorama at the Deutsches Museum. Nevertheless, the Miniatur Wunderland has become a nationally well-known enterprise which has received 12 million visits from when it first opened in 2001 to 2014.¹

Despite the fact that there are significant differences between a typical museum diorama and model-train dioramas, the question remains whether the Deutsches Museum could learn any lesson from this success story. In other words, are museum dioramas still meaningful means of display and are they thus still relevant for current exhibition concepts.

This question is especially worthwhile asking in the current situation at the Deutsches Museum. From 2006 to 2025 the museum is undergoing an all-encompassing renovation project, an ambitious endeavour called "Zukunftsinitiative" (Future Initiative),² which has consequences for existing dioramas as well as new building projects of such exhibits. First of all, due to major construction work, all dioramas must be dismantled and removed from the exhibition space. Secondly the time frame for exhibition development and production is challenging. Thus all resources have come under serious

¹ https://de.m.wikipedia.org/wiki/Miniatur_Wunderland (accessed December 13, 2015).

² <https://www.deutsches-museum.de/zukunftsinitiative/meilensteine> (accessed April 1, 2017).



Figure 1 "Apollo 15: landing on the moon, 1971" in the exhibition Astronautics. The superior artistic quality of the miniature diorama makes it look very authentic.

scrutiny. While the museum's project management enforces cost and progress control, no all-embracing assessment of the effectiveness of its core product, namely the exhibition and its means of display, has been implemented yet. To determine the benefit of dioramas to visitors and the museum I will, in the course of this dissertation, examine the characteristics and impacts of museum dioramas from two different angles. Firstly I will expand on the broader perspective, the definition and concepts of dioramas, their history and purpose in museums, a selection of visitor studies and finally controversial issues concerning museum dioramas. Secondly I will narrow down the perspective and juxtapose the general perspective with a case study of the Deutsches Museum. Only recently did the Deutsches Museum publish two corresponding books about dioramas. With regard to this case-study these two volumes provide valuable background information mainly about the history of dioramas and especially about dioramas of the Deutsches Museum, which is complemented by interviews with museums professionals and a small-scale visitor study. Regardless of the overall appreciation of dioramas as valuable museum displays today, I view it as crucial to add a reflection about their prospects for the future. This research project is a starting point for more and comprehensive research into the relevance and impact of museum dioramas today and in the near future.

Methodology

The question whether dioramas are still relevant in museums of the 21st century should encompass both the museums' and the visitors' perspective. Most of the literature about dioramas assumes that they are valuable as museum objects as well as visitor attractions, but from my experience as a museum professional I could not agree more with Stephen Bitgood³ and Jobst Broelmann⁴ that the validity of museum dioramas has not yet been thoroughly evaluated.

In my dissertation I will explore the questions whether dioramas are visitor attractions and if museum professionals view them accordingly. My study includes two corresponding and compatible sections: a review of the relevant literature concerning dioramas in general and a case study of the Deutsches Museum in particular. The selected topics from the pertinent literature provide the scaffolding for this case study and will be reflected by the case study of the Deutsches Museum. The general literature review elucidates the relevance of dioramas today by examining their history, definitions and concepts and their cultural value. More importantly the dioramas role as a means of display and as a learning tool and a selection of evaluations of dioramas will be examined.

All these topics build the framework with which the case study of the Deutsches Museum will be investigated. The chosen methods for research are a literature review with special regard to the literature and information about the Deutsches Museum, semi-structured interviews with museum professionals of the Deutsches Museum and a small-scale visitor survey. Triangulation of the chosen methods will help to put the results and assumptions into perspective. The advantages of the case study are manifold, first of all the vast array of dioramas on display and easy access to information, namely from literature, available at the library of the Deutsches Museum. Moreover, as an employee of the museum, it is fairly straightforward to get access to other members of staff and visitors, even to get permission for performing a visitor survey. The disadvantages are that the Deutsches Museum, as a museum of science and technology, is quite exceptional in its extended use of dioramas. Furthermore small-scale surveys do not offer representative results as the sample is small and it is not aimed to reach a large variety of visitors and non-visitors. Taking these disadvantages into account, the visitor research is aimed at families to include at least a broad range of ages. However it can be argued that the objectives of my research are compatible to other museums such as museums of social-history and archeology. Notably an all-embracing approach is chosen when inquiring about future possibilities and enhancements of dioramas in order to include as many museum environments as possible.

Ethical guidelines concerning a questionnaire with minors in Germany were followed.⁵ The children's participation was fully voluntary; both the children's consent and their parent's formal consent were received. The children were accompanied by their guardians at all times.

The methodology is informed by theories of learning and concepts of sociological and psychological aspects of the museum experience. George Hein's diagram of the theories of knowledge and learning takes into account that the epistemology is on a continuum between external and constructed knowledge.⁶ Yet according to Osborne's critique of constructivism I find the idea of discovery learning most appropriate for science education.⁷ Furthermore Gardner's five types of intelligences⁸ and Falk and Dierking's concept of the leisure and learning experience have an impact on my research.⁹

³ Bitgood, *Social Design in Museums*, 2011.

⁴ Broelmann, *Geschichten, Räume, Horizonte*, 2016, p. 175.

⁵ Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e.V.: Richtlinie für die Befragung von Minderjährigen. http://bvm.org/fileadmin/pdf/Recht_Berufskodizes/Richtlinien/RL_2006_Minderjoehriger_D.pdf (accessed March 6, 2017).

⁶ Hein, G., *Learning in the Museum*, 1998, p. 25.

⁷ Osborne, *Beyond Constructivism*, 1996, p. 77.

⁸ Lane, "Gardner's Multiple Intelligences", n.d.

⁹ Falk and Dierking, *Learning from Museums*, 2000.

In addition the following sociological and psychological concepts inform the methodology: Walter Fisher's theory of a narrative paradigm,¹⁰ Nick Abercrombie's and Brian Longhurst's theory of the performativity of the museum experiences,¹¹ the theory of embodied cognition summed up by Margaret Wilson,¹² and the idea of an immersive experience in a real three-dimensional scenery voiced by Bitgood among other museum professionals.¹³

The Diorama's Role in the Museum

Introduction

From the early days of humankind, people have aimed to communicate through visual arts. One goal is to let the viewer become part of the scenery, to offer immersive experiences through art. Thus artists have strived to create an illusion of depth and spaciousness. Another goal is to depict three-dimensionality such as sculptures or representations of scaled-down objects. This study focuses only on combinations of three-dimensional features with two-dimensional illusionistic backdrops which are usually referred to as dioramas. To better comprehend the diorama's role in museums, the various definitions, concepts and their history and development need to be assessed. This background information is essential to analyze their value as museum objects and as means of display, especially their potential for immersive experiences and learning and their performative character.

Conflicting Definitions

It is remarkable that the academic literature concerning dioramas does not share one single definition or concept. For example, the term diorama has been used to refer to very different objects. The Merriam-Webster Encyclopedia differentiates between two distinct types.¹⁴ On the one hand it refers to a painting on translucent cloth with special lighting behind it. On the other hand it describes a three-dimensional scene which merges with a two-dimensional, usually painted, background. The most frequent types are either on a 1:1 scale, usually showing taxidermic animals in their habitat, so-called habitat dioramas, or a miniature version of a scenario. Although both definitions share similarities, their historical context, and thus their objectives are quite different. According to Ned Burns, the term diorama was first used by Louis J.M. Daguerre and Charles-Marie Bouton.¹⁵ The word diorama derives from the ancient greek word διοράειν - dioráein, which literally translates into: to see through.¹⁶ This Daguerre-style diorama, as pointed out by Birgit Verwiebe, is the predecessor of modern movie theatres because it not only created an illusion of movement and change through specific light arrangements, but also sounds or a commentator's voice and other sensual experiences were added.¹⁷ For the second kind, the museum diorama such as habitat and miniature dioramas Karen Wonders cautions in her comprehensive work about habitat dioramas that "... the word 'diorama' has undergone a number of transformations from its patented definition in 1822 by Louis Daguerre to its current museological usage".¹⁸ Even model-train landscapes which exhibit none of the

10 <http://communicationtheory.org/the-narrative-paradigm/> (accessed March 24, 2016).

11 Abercrombie and Longhurst, *Audiences*, 1998.

12 Wilson, *Six Views of Embodied Cognition*, 2002.

13 Bitgood, *Social Design in Museums*, 2011.

14 <http://www.merriam-webster.com/dictionary/diorama> (accessed February 14, 2016).

15 Burns, *The History of Dioramas*, 1940, p. 8.

16 <https://de.m.wikipedia.org/wiki/Diorama> (accessed February 14, 2016).

17 Verwiebe, *Lichtspiele*, 1997, pp. 8–9.

18 Wonders, *Habitat Dioramas*, 1993, p. 12.

characteristics described above are called dioramas. One consequence of this lack of a standardized definition is that authors feel free to adjust their concepts of a diorama to their specific research interests such as artistic, technical or visitor-oriented perspectives.

Wonders, an expert on habitat dioramas, postulates that only 1:1 scale habitat dioramas achieve the *trompe-l'œil* effect, literally translated into “deceive the eye” effect which creates an illusion of perspective and space.¹⁹ In contrast Jane Insley disagrees vehemently. According to her, scaled down dioramas do not want to deceive but to convince.²⁰ This debate seems to be finally overcome in the 21st century. Uwe Albrecht argues with regard to dioramas in museums of technology that they may vary in scale and design. Habitat dioramas are only one type of many. In his opinion the only important criteria for genuine dioramas is their restricted view through a window.²¹ Eventually, Michael J. Reiss and Sue Dale Tunnicliffe who have investigated the learning potential of dioramas offer an all-embracing definition: dioramas can be behind glass or open, life size or miniature even two-dimensional or three-dimensional.²² This extensive definition is the most helpful when investigating the museum dioramas' potential as a means for the visitors learning and leisure experience and shall be used in this study.

History and Development

According to Burns dioramas are far from being an invention of the 19th century. Nativity scenes, which date back at least to the 14th century, can be seen as a precursor to dioramas. Their popularity as a spiritually motivated means of display is immense in regions such as Italy, Austria and Southern Germany.²³ Nativity scenes share a lot of technical and artistic characteristics with museum dioramas like the three-dimensional scaled-down landscapes with figurines which merge with painted backdrops. Just like museum dioramas they aim for an emotional appeal and an immersion into the scenery. As stated by Karl Otto Meyer, besides nativity scenes, a variety of illusionistic scenarios were developed in the 15th century in Italy and became popular in the 17th century in Holland like perspective boxes, telescopic views and peepshows.²⁴

Eventually panoramas, large circular paintings which offer an all-encompassing view of landscapes or battle scenes, and later the Daguerre-style dioramas develop as a novel and popular means of visual arts and culture in the late 18th and 19th centuries. According to Alexander Gall panoramas and dioramas were both commercial entertainment venues with spectacular shows for a mass audience.²⁵ As stated by Burns, the Daguerre-style diorama as an “offshoot of the panorama” does not need to be examined any further because the first habitat diorama at a museum was a half-panorama with animals in their natural surroundings in the foreground. It was exhibited at Bullock's Museum in London in 1815.²⁶ According to Gall, Bullock's museum combined learning and entertainment thus being highly attractive to visitors.²⁷ It can be suggested that museums were inspired by the attractive and innovative exhibition techniques namely dioramas and panoramas of the world exhibitions of the 19th and early 20th century. Interestingly as noted by Gall, the diorama established itself as a means of display at museums at a time when the attractiveness of the panorama and diorama at the world exhibitions were on the verge of decline.²⁸

¹⁹ Ibid., p. 17.

²⁰ Insley, *Little Landscapes*, 2008, p. 27.

²¹ Albrecht, *Dioramen in technischen Museen*, 2006, p. 34.

²² Reiss and Tunnicliffe, *Dioramas as Depictions of Reality*, 2011, p. 447.

²³ Bogner, *Das große Krippen-Lexikon*, 1981, pp. 129 and 157.

²⁴ Meyer, *Szenarien der Illusion*, 1999, pp. 1902–1903.

²⁵ Gall, *Auf dem langen Weg ins Museum*, 2016, p. 27.

²⁶ Burns, *The History of Dioramas*, 1940, pp. 10–11.

²⁷ Gall, *Auf dem langen Weg ins Museum*, 2016, p. 53.

²⁸ Ibid., p. 87.

Archetypical museum dioramas are habitat dioramas and miniature dioramas with socio-historical or technical content. Although the general design principles of dioramas and panoramas have not changed, new materials, building techniques and methods evolve continuously. However Meyer feels that the “climax” of these means of display is the planetarium which was first built for the Deutsches Museum in 1923 and, according to Meyer, followed by such a venue at Madame Tussod's in 1957.²⁹ Finally Tunnicliffe and Annette Scheersoi believe that dioramas were out of fashion in the second half of the 20th century and are having a comeback in the 21st century.³⁰ In stark contrast to Wonders who believes that at the end of the 20th century they became even more popular³¹ and are on the decline since the 21st century.³² These contradictory conclusions are probably based on observations in different countries. Wonders focuses her research on natural history museums in the US and Sweden whereas Scheersoi did visitor research in German natural history museums. In addition, also Ruth Beusing, with regard to museums of archeology, believes that dioramas are used increasingly. Museums of archeology started as late as the 1980s to implement miniature dioramas followed by a growing amount of exhibits on a 1:1 scale in the 21st century.³³



Figure 2 Diorama “Ancient roman pottery workshop” in the exhibition Ceramics.

²⁹ Meyer, *Szenarien der Illusion*, 1999, p. 1904.

³⁰ Tunnicliffe and Scheersoi, *Dioramas as Important Tools*, 2015, p. 138.

³¹ Wonders, *Habitat Dioramas*, 1993, p. 10.

³² Wonders, *The Habitat Diorama Phenomenon*, 2016, p. 287.

³³ Beusing, *Dioramen in der prähistorischen Archäologie*, 2016, pp. 347 and 350. This chronology refers to the increase of archeological dioramas in Germany.

The Cultural Value of Dioramas

Considering museum dioramas the question arises whether they are appreciated as material culture. According to Susan M. Pearce material culture consists of movable and immovable features.³⁴ Museums concern themselves mainly with the movable objects which become socially and culturally appreciated once they are selected by a museum.³⁵ Presumably, dioramas do not quite fit into this definition of museum objects since museums are ambivalent about their treatment. Apparent reasons for this ambivalence can be detected in the museums' conceptions of dioramas, the socially constructed understanding of art and the technical feasibility of preserving dioramas.

Public museums have always been obliged to collect, preserve, research and present objects such as specimens, historical artifacts or art works. At the end of the 19th and beginning of the 20th century within the scope of the reform movement, museums have started to create exhibitions which were aimed towards the education of the broader public. Since then dioramas as didactic devices have been implemented in museum exhibitions. Yet the role of dioramas has always been inconclusive. As pointed out by museologist Hilde S. Hein, with regard to science centers, exhibited objects are perceived as primarily utilitarian.³⁶ Accordingly, Jesse Smith calls dioramas "learning tools".³⁷ In contrast, Samuel J. M. M. Alberti and Barbara H. Butler emphasize the value of dioramas as a natural and historical document³⁸ and an object of research.³⁹ Yet the museums' acknowledgement of dioramas as part of material culture is divergent. Rainer Hutterer reveals that due to the renovations at the zoological museum in Bonn not only were the number of dioramas on display reduced but also taxidermic animals were demolished without documentation.⁴⁰ This corresponds with Wonders who alerts us to the fact that only some museums of natural history have begun preservation efforts of their habitat dioramas.⁴¹ In contrast, Insley describes how dioramas at the Science Museum in London are inventoried and recognized as assets and gained historical and interpretive importance.⁴²

As implied by Pearce, in a socially constructed hierarchical order, artifacts rank below art works.⁴³ Within the relevant literature some authors try to elevate dioramas by referring to them as art or their creators as artists. Maura C. Flannery and Smith try to overcome the constructed separation of art and science when describing dioramas either as "beautiful examples of art and science working together"⁴⁴ or "a distinctive fusion of art and science".⁴⁵ Despite all this praise Wonders is surprised that "the habitat diorama has never been acknowledged as an art form".⁴⁶ She gives a possible explanation when she reveals that up to the 19th century, museum scientists believed in the strict separation of art and science.⁴⁷ In consequence, science museums traditionally do not consider their objects works of art.

34 Pearce, *Museum Objects*, 2012, p. 23.

35 *Ibid.*, p. 24.

36 Hein, H., *The Museum in Transition*, 2000, p. 28.

37 Smith, *DIORAMA-O-RAMA*, 2010.

38 Alberti, *Introduction*, 2011, p. 12.

39 Butler, *Nineteenth-Century Museums in the Twenty-First Century*, 1993, p. 12.

40 Hutterer, *Die Dioramen im Museum Koenig in Bonn*, 2014, pp. 49–50.

41 Wonders, *The Habitat Diorama Phenomenon*, 2016, pp. 312 and 315.

42 Insley, *Little Landscapes*, 2008, p. 29.

43 Pearce, *Museum Objects*, 2012, p. 25.

44 Flannery, *Looking into Dioramas*, 1998, p. 382.

45 Smith, *DIORAMA-O-RAMA*, 2010.

46 Wonders, *Habitat Dioramas*, 1993, p. 226.

47 Wonders, *Habitat Dioramas as Ecological Theatre*, 1993, pp. 295–296.

The ambivalence seen in museums can be illustrated by the following example. Although the Deutsches Museum has for a long time inventoried all dioramas, major renovation work has placed some dioramas at risk. When one of the artistically most accomplished dioramas of the Deutsches Museum, called Path of Electricity, needed to be moved, it was appreciated by an art expert. During the first evaluation, only the backdrop painting was estimated which resulted in a low market value. The diorama could only be saved from being demolished when the curator, Frank Dittmann, appreciated the diorama in its entirety. He was able to increase the monetary value by taking the entire cost of replacing the foreground plus the backdrop into account.⁴⁸

Currently, every single museum decides separately whether a diorama is perceived as a mere means of display, an artifact or even a work of art. To increase the level of recognition and protection dioramas receive in the future they must be recognized as part of material culture. Therefore it is crucial for museum staff to agree on the definition of dioramas at least as artifacts.

Medium of Dramatic Display

Besides the discourse about dioramas as part of material culture, it is as important to examine their value as a means of display. Dioramas as exhibits can be divided into two categories, the ones which resemble other artifacts or art works because they were taken out of their original context and placed into the museum context such as nativity scenes or pewter figurine dioramas, and the ones which are explicitly created for an exhibition concept. The latter, archetypical type, differs significantly from the majority of museum objects. Given the fact that exhibitions get updated and alternated more frequently than in the past, dioramas might not fit into current concepts. Reiss and Tunnicliffe criticize that “Dioramas, for all that they remain popular with many visitors, often continue to be disposed of as if they were nothing more than outdated cabinets”.⁴⁹

Reiss and Tunnicliffe suggest a conflict of interest between visitors and museums. Therefore, it is indispensable to explore the value of dioramas to visitors, namely their attractiveness and impact on visitors and their value to museums, especially their qualities as didactic devices. Yet the dioramas' success as learning tools is based on their appeal to visitors. Dioramas aim to contextualize scientific, historical, technical or any other topics. This contextualization and their graphicness makes the museum's interpretation of the given topic much more comprehensible. Moreover, Reiss and Tunnicliffe reveal that dioramas aim for plausible and correct yet “interesting reality” as opposed to actual reality. The impression is further enhanced by their unnatural stillness or a repetitiveness of a built-in motion and an idyllic scenery.⁵⁰ Thus, dioramas are, as H. S. Hein puts it, “dramatic visual representation(s)”.⁵¹ Like convincing stage settings, they create an illusion of reality for a story line. Their narrative and performative character gives visitors the opportunity for emotional and immersive experiences. Hence, these characteristics infer Abercrombie's and Longhurst's spectacle/performance paradigm.⁵² In summary, it can be stated that graphicness with its invitation for immersion and contextualization with its narrative and performative character all enhance the entertainment value of dioramas for visitors.

⁴⁸ Frank Dittmann, curator for the exhibition on information technology, robotics and high voltage, personal comment, January 10, 2017.

⁴⁹ Reiss and Tunnicliffe, *Dioramas as Depictions of Reality*, 2011, p. 457.

⁵⁰ *Ibid.*, p. 451.

⁵¹ Hein, H., *The Museum in Transition*, 2000, p. 80.

⁵² Abercrombie and Longhurst, *Audiences*, 1998.



Figure 3 A dramatic setting of a 19th century industrial workshop on a 1:1 scale in the exhibition Machine Tools.

Tool for Engaged Learning

Since leisure and learning experiences for visitors are inseparable as argued by Falk and Dierking,⁵³ dioramas are, therefore, perfect learning tools. With regard to habitat dioramas, Wonders believes that they are enormously successful as means of education.⁵⁴ She suggests that the contextualized information and objects not only support the acquisition of knowledge in biology but also reinvigorate and instill an awareness of environmental issues.⁵⁵ In the 21st century other museum professionals have started to investigate learning opportunities with regard to habitat dioramas more thoroughly. Namely, Scheersoi believes that habitat dioramas trigger learning better than single objects.⁵⁶ According to Leslie Owen Wilson, educators should incorporate into their teaching the “three

⁵³ Falk and Dierking, *Learning from Museums*, 2000.

⁵⁴ Wonders, *Habitat Dioramas*, 1993, p. 9.

⁵⁵ Wonders, *The Habitat Diorama Phenomenon*, 2016, p. 316.

⁵⁶ Scheersoi, *Warum Dioramen aus didaktischer Perspektive so wichtig sind*, 2014, p. 126.

domains of learning – cognitive, affective and psychomotor”.⁵⁷ Dioramas are ideal didactic means for this kind of holistic teaching. Considering habitat dioramas, Scheersoi explains that the contextualization of objects and topics with illustrated and comprehensible content which relates to personal life experiences supports cognitive as well as affective learning.⁵⁸ Moreover, dioramas also offer opportunities for kinesthetic learning. Visitors not only navigate their way through walk-through dioramas but also move around in front of enclosed dioramas to detect certain details and explore the scenery with their eyes. Visitors' opportunities for touching, smelling and hearing sounds or talk add to their psychomotor experience.

According to Falk and Dierking people use narrative as a means for learning, for organizing knowledge and structuring their environment.⁵⁹ Dioramas seem to be the predestined means for storytelling in the museological setting. Alix Cotumaccio underpins this notion with two case studies from the American Museum of Natural History in which the facilitators' narrative and their dialogues with participants in front of two dioramas get observed.⁶⁰ Also, Kate Tinworth⁶¹ and Keith Dunmall are both convinced of the great impact of performed storytelling in front of dioramas. Dunmall's⁶² observation derives from the storytelling program of a local theater company at the Powell-Cotton Museum, Birchington.⁶³ Tinworth's point of view is underpinned by a survey of the enactor program at the Denver Museum of Nature and Science.⁶⁴ However, Reiss and Tunnicliffe point out that also without facilitation, visitors create their own narrative internally or externally within a social group.⁶⁵

An interesting, well-designed storyline of a diorama could be the entry point for inquiry-based learning. Dioramas stir curiosity by inviting visitors to discover and observe details and whole scenarios. This, in turn, encourages visitors to share observations, knowledge, information and, most importantly, questions. Inquiry-based learning suggests interaction between people. Consequently, it is closely linked to social learning which makes dioramas perfect means for learning in groups, even heterogeneous ones. As stressed by Doris Ash, dioramas are ideal for designing different entry points for the entire family.⁶⁶ Furthermore, Gerda Windau reveals that the museum programs at the Museum für Naturkunde in Münster aim at a broad variety of groups like daycare centers, cross-generational groups and even people with dementia.⁶⁷

In conclusion it is interesting to note that all the criteria mentioned above, except inquiry-based learning, are also identified by Falk and Dierking as general criteria for enhancing museum learning. Without making any references to dioramas they elaborate on the all-embracing bodily experience of learning, the importance of contextualization and narrative for learning and the significance of a “community of learners”.⁶⁸

57 Wilson, *Three Domains of Learning – Cognitive, Affective, Psychomotor*.
<http://thesecondprinciple.com/instructional-design/threedomainsoflearning/> (accessed February 25, 2016).

58 Scheersoi, *Warum Dioramen aus didaktischer Perspektive so wichtig sind*, 2014, p. 122.

59 Falk and Dierking, *Learning from Museums*, 2000, p. 49.

60 Cotumaccio, *The Evolution of the Narrative*, 2015, pp. 189 and 191.

61 Tinworth, *Relic of the Past*, 2015, p. 228.

62 Dunmall, *Storytelling and Performance in Diorama Galleries*, 2015, p. 250.

63 *Ibid.*, p. 244.

64 Tinworth, *Relic of the Past*, 2015, p. 227.

65 Reiss and Tunnicliffe, *Dioramas as Depictions of Reality*, 2011, p. 455.

66 Ash, *How Families use Questions at Dioramas*, 2004, p. 10.

67 Windau, *Historische Dioramen und aktuelle Vermittlungsmethoden*, 2014, p. 113.

68 Falk and Dierking, *Learning from Museums*, 2000, pp. 24, 30, 48 and 91.



Figure 4 Disney's attention to detail at Animal Kingdom, Orlando, Florida. This picture was taken in the area designed to resemble an Indian landscape. The immersive experience for the visitors continues right up to the drinking fountain.

Exhibiting Dioramas

Although the pertinent literature is full of praise for the captivating character of dioramas, little is said about how to create appealing dioramas and ensure their attractiveness in museum exhibitions. At least some interesting remarks exist on the implementation and design of such scenarios. Considering that the set up of the world exhibitions from the late 19th to the early 20th century share similarities with modern fun parks and keeping in mind the fact that the design of the museum diorama derives from exhibits at exactly these world exhibitions, it is illuminating to compare such museum scenarios to modern fun park designs. It is especially worthwhile to contrast their underlying objectives since they determine the strategy for developing the respective design. As stated by Margaret J. King museums can learn from Disney's concept of presenting knowledge and information in an interesting and entertaining way.⁶⁹ Furthermore, Meyer suggests that, despite the internal conflict between museums' scientific objectives and dioramas' resemblance to fun park displays, exhibition designers should incorporate dioramas in a modern style.⁷⁰ From my personal experience I would like to emphasize Disney World's amazing effort for plausibility, technical perfection and the painstaking attention to detail in their design. Even the outer appearance of such facilities as bathrooms and shops as well as of basic equipment like trash cans and drinking fountains is incorporated into the overall theme which, in turn, enhances the immersive experience. However Disney World's primary goal is to entertain the public while learning is viewed as a "bonus factor".⁷¹ This stands in contrast to museums' objectives which do not aim for an idyllic atmosphere of a fairytale land but for historically authentic yet entertaining settings.

⁶⁹ King, *The Theme Park Experience*, 1991, p. 26.

⁷⁰ Meyer, *Szenarien der Illusion*, 1999, p. 1905.

⁷¹ Hein, H., *The Museum in Transition*, 2000, p. 82.

Because of these museums' goals it is paramount to develop and implement successful scenarios. Powerful immersive experiences and sufficient opportunities for learning with dioramas need the creation of a realistic and vivid scenery, an illusion of depth and authenticity. In other words vividness in dioramas can only be implemented through an appealing and comprehensible storyline and a meticulous effort of lifelike presentations. The effectiveness of dioramas is determined by certain factors considering the internal design of the diorama, its content and its implementation in the exhibition. In the following paragraph I will elaborate firstly on the artistry and craftsmanship of the execution, secondly on the psychological dimension of the visitor experience and finally on the criteria for implementing a diorama successfully into an exhibition.

From the technical and artistic point of view it is easier to create a convincing illusion in an enclosed space. The preferred shape of the back wall is a calotte. The painters aim to skillfully paint on the curved surface so that the background painting in combination with the absence of edges gives the impression of spacious depth of the scenery. The merging of the two-dimensional backdrop and three-dimensional foreground pose another challenge. An elegant solution is to build the bottom platform at an angle slanting from the higher elevation in the back to the front which enhances the



Figure 5 Diorama "Kite-Flying" in the exhibition Historic Aviation. Merging of two-dimensional backdrop and the three-dimensional foreground.

impression of depth. In the back there is a clear drop-off or a rounded edge to avoid the ground touching the back wall at an almost 90° angle. If possible, the edge of the drop-off is hidden by arrangements of trees, bushes, buildings or the like. Depth and perspective is created with features which get smaller from the front to the back or sometimes even with skewed perspective of three-dimensional structures.. From the start the three- and two-dimensional scenario get built for a certain height and for a defined and limited viewing angle with regard to the eye level of an average adult. Thus the height of the diorama and the positioning of the window determine the likelihood of an immersive experience. At an early stage the lighting arrangements get developed because they are crucial for creating a realistic atmosphere as well.

In comparison the development of an open scenario on a 1:1 scale poses a challenge for creating depth due to proportionally limited space and the unlimited viewing angle. The advantage of creating an authentic feel lays in the familiarity of the scale and in the possibility of incorporating original museum objects into the arrangements. Concerning sculptures of humans, Wonders cautions that “No matter how realistic a human model may be, there is always an intuitive sense of falseness”.⁷² But there are convincing artifices for overcoming this sense of falseness such as studied stylistic inconsistencies, for example using unnatural colors for the 1:1 scale figurines. Examples are white figurines at the Deutsches Museum, or a bronze one at the Museum für Ur-und Frühgeschichte in Weimar.⁷³ Furthermore it is an option to blend in the figurines with the surroundings like in the Walk-Through Mine of the Deutsches Museum.

The terms illusion and immersive experiences are used interchangeably throughout the relevant literature on dioramas. Creating an illusion as described above requires artistic and technical prerequisites embedded in a convincing story line which is reflected in the exhibition design. Consequently creating illusion through excellent artistry is a crucial factor, but it is only one of the factors which facilitates visitors' immersive experiences with dioramas. Scheersoi is one of the researchers who expands on psychological and sociological factors when she compares the strategies for visual merchandising with strategies for designing an appealing exhibition space with dioramas. Moreover, she expands on what Mathew Mitchell, educational psychologist, calls the “catch- and hold-factor”.⁷⁴ She describes the catch-factor as the initial point of attraction, which could be the presentation of beautiful, big or rare animals in habitat dioramas.⁷⁵ Once a relationship between visitor and scenery is established, the “hold factor” can be triggered by such features as the artistic and meticulous depiction of the surroundings.⁷⁶

It can be inferred that the same principle applies to any diorama. For example, a modern factory with enclosed machinery with a few employees being present is probably less interesting than an atmospherically lit factory from the 19th century with a lot of laborers operating the machinery. In any case the content must be embedded in a coherent narrative. It is definitely more challenging to successfully depict abstract concepts or invisible phenomena like global warming or the world wide web. But also concrete reality offers more or less interesting moments. The art lies in creating an appealing snapshot of the chosen content. Like good snapshots, dioramas contain a certain degree of randomness or imperfection. The scenario aims to suggest dynamism and offers a comprehensible structure and a moment of mystery.

⁷² Wonders, *Habitat Dioramas*, 1993, p. 17.

⁷³ Beusing, *Dioramen in der prähistorischen Archäologie*, 2016, p. 358.

⁷⁴ Mitchell, *Situational Interest*, 1993, p. 425.

⁷⁵ Scheersoi, *Warum Dioramen aus didaktischer Perspektive so wichtig sind*, 2014, p. 122.

⁷⁶ *Ibid.*, p. 125.



Figure 6 "The Crime Scene", diorama on a 1:5 scale introduces a "moment of mystery" into the new exhibition Chemistry.

It stands to reason that not only the content and interior design of the displayed scenario, but also spacial and contextual factors in the exhibition are significant for the visitors' reaction towards them. Stephen Bitgood and Donald Patterson reveal factors concerning the exhibit and its surrounding architecture which cause longer or shorter viewing times. The exhibit features which are compatible to dioramas are large size, novelty, and added sensory elements. The architectural features are visibility, close proximity to the visitor, positioning at eye level and realism. Furthermore, the inhibiting factors of appeal are even more interesting because they have nothing to do with the internal quality of the dioramas' design. The most prominent criteria are sensory competition with another visible exhibit close by, auditory stimuli from other exhibits, design factors, such as recessed positioning and object satiation by visitors ("museum fatigue").⁷⁷

Debate and Analysis

Introduction

For the longest time, museum dioramas have been an indispensable means of display and yet they have been taken for granted. Since museums started becoming more visitor-oriented as opposed to object-oriented, they evaluated their services, especially the appeal of their exhibitions to visitors.

⁷⁷ Bitgood and Patterson, *Principles of Exhibit Design*, 2011, p. 11.

Obviously, the epitome of the museum exhibit, the diorama, has been scrutinized, either through visitor research or through contemplations about their advantages and disadvantages for museums and visitors alike. Butler wonders if these “traditional nineteenth-century exhibits have a role to play in the next century”. Despite their tremendous building costs, dioramas continue to be implemented by museums of natural history and promoted by the American Association of Museums.⁷⁸ Butler concludes that dioramas are valuable in two ways, firstly, for the study of the history of science and historical museum concepts, and secondly, for their educational potential today. To secure relevance of dioramas in the 21st century, she suggests the use of visitor studies.⁷⁹ Nearly twenty years later, Bitgood points out that there is still a lack of comprehensive evaluations which could help determine successful design characteristics for dioramas and be used to justify the costs.⁸⁰ In the following paragraphs, firstly, a discourse about the debate on the role of dioramas in museums sets the tone. Next an example of visitor research is presented while in the third section Bitgood's recommendations for designing efficient dioramas and their exhibition environment are described.

On-going Debate on the Role of Dioramas in Museums

It is not surprising that Bitgood vehemently advocates for more comprehensive studies about the effective implementation of dioramas in museums.⁸¹ As long as dioramas have been used as means of display, their objectives and design have caused a controversial debate among museum professionals. According to Gall, from the end of the 19th to the beginning of the 20th century, museum practitioners criticized dioramas because of their lack of scientific correctness and seriousness. These critics were afraid that museums could lose their scientific reputation.⁸² In contrast, advocates of dioramas stressed the dioramas' qualities in terms of educating the masses (“Volksbildung”).⁸³ This debate continued well into the second half of the 20th century. Eduard Paul Tratz conveys that at the end of the 1960s leading museologists criticized dioramas as illusionistic and not scientific enough.⁸⁴ After forty years of positive experiences with dioramas, Tratz himself is convinced that museums should, besides imparting scientific knowledge, also offer impressive experiences for which “good dioramas” are an indispensable means.⁸⁵ In 1982, Meyer describes that Disney World has taken the technical concept of dioramas one step further by offering engaging lifelike “animatronic” experiences which are also used in the parks for learning opportunities. Yet he senses that museum professionals are reluctant to take Disney World's highly visitor- and entertainment-oriented media as valuable examples because they, like their predecessors mentioned above, question whether these popular media are compatible to museums' objectives of presenting clear and exact scientific facts.⁸⁶

⁷⁸ Butler, *Nineteenth-Century Museums in the Twenty-First Century*, 1993, p. 11.

⁷⁹ *Ibid.*, p. 12.

⁸⁰ Bitgood, *Social Design in Museums*, 2011, p. 178.

⁸¹ Bitgood, *Social Design in Museums*, 2011.

⁸² Gall, *Auf dem langen Weg ins Museum*, 2016, p. 93.

⁸³ *Ibid.*, p. 91.

⁸⁴ Tratz, *Zur Frage der Anwendung von Dioramen*, 1968, p. 5.

⁸⁵ *Ibid.*, pp. 7 and 12.

⁸⁶ Meyer, *Dioramen – aber wie?*, 1982, p. 93.

Currently, as stated by Gall, critics refer to dioramas as “dusty relics” from the past and criticize them for not being interactive enough.⁸⁷ Stephen Christopher Quinn observes that in many museums during the last decades dioramas have made way for interactive exhibits and computerized media. However “the diorama has made something of a comeback, as exhibit designers have realized its power to give visitors an experience unattainable through any other medium”.⁸⁸ Peter Lüps and Martin Troxler support Quinn's notion when they state that new means of display such as multimedia or inter-actives, although they compete with dioramas, will not replace them, because dioramas attract emotionally.⁸⁹ A more thorough discourse about the immersive potential of virtual reality in comparison to concrete reality of dioramas will be expanded on in the last chapter.

Considering the dioramas at the Science Museum in London, Insley cautions, that they are endangered because they often do not fit modern exhibition concepts and moreover their intentions have become less applicable to audiences.⁹⁰ This is exactly the dilemma the Deutsches Museum is facing currently. It is not always feasible to re-contextualize the old dioramas. Moreover the modern exhibition concepts tend to be more abstract than their predecessors like “world-nutrition” instead of “agricultural technology” which poses a challenge for picking an attractive content and story-line for a scenario in a diorama. With regard to habitat dioramas, Claudia Kamcke believes that the local public cares strongly about museum dioramas as their cultural heritage. She describes an incident in 2011 when the press had false pieces of information concerning the dismantling of dioramas. It caused an uproar in the press and emotional letters to the editor which eventually triggered substantial financial support from the government of the state of Lower Saxony in Germany and private donors.⁹¹ The Deutsches Museum has not faced any public uproar considering its renovation work yet. But it can be inferred that if the Walk-Through Mine, one of the most popular attractions of the museums, would be in danger of dismantling, it might also cause such an uproar.

Precisely because of the strong emotional influence of dioramas, museum professionals must be aware of their own lack of objectivity when interpreting the chosen content for dioramas. As agreed upon by Helmuth Trischler, Stephan Schwan, Bernhard Graf⁹², and Beusing, with regard to socio-historical content, museum dioramas present subjective interpretations of history.⁹³ Beusing, considering dioramas at archeological museums, points out that visitors are rarely alerted to the fact that the presentations are built upon hypotheses.⁹⁴ If the authorship of the interpretations were revealed by museums it would be a more egalitarian approach to the meaning-making process of visitors and museums alike.

It stands to reason, that due to the visitors' own life experience, knowledge and emotional background, the diorama's design not always delivers the intended messages in line with the museums' objectives. For example not only young animals in habitat dioramas but also miniature models tend to be perceived as cute. Consequently Tom Holert contemplates with regard to the miniature model of Auschwitz at the Imperial War Museum in London, the fact that on the one hand the scaled-down model might belittle serious content but on the other hand it emphasizes the enormous dimensions and encourages engaged observation of detail.⁹⁵ As indicated by Trischler et al., it is exactly the

87 Gall, *Auf dem langen Weg ins Museum*, 2016, p. 93.

88 Quinn, *The World Behind Glass*, 2006, p. 2.

89 Lüps and Troxler, *Von der Alpendohle bis zum Flusspferd*, 2014, p. 99.

90 Insley, *Little Landscapes*, 2008, p. 27.

91 Kamcke, *Die Braunschweiger Dioramen*, 2014, p. 80.

92 Trischler, Schwan and Graf, *unpublished (and rejected) research proposal*, 2012

93 Beusing, *Dioramen in der prähistorischen Archäologie*, 2016, p. 354.

94 *Ibid.*, p. 255.

95 Holert, *Das Unaustellbare en miniature*, 2016, p. 439.

detailed depiction and the scenario itself which can distract visitors away from important information. Chronological sequences, for example, are shown simultaneously in a diorama leaving the observer to decipher the order of events. Therefore museums should keep in mind that miniature scenarios have the potential of creating an atmosphere of innocent prettiness and an abundance of detail which might conflict with communicating serious historical or scientific facts. A striking example is the artistically well-done diorama of a launchpad at the “Heeresversuchsanstalt” Peenemünde for the missile A4 (better known as V2) which was developed by Germany during the Second World War. This miniature diorama while prioritizing the technical details of launching a missile omits the historical context of the production and use of the missile, which were assembled by inmates of the concentration camp “Dora Mittelbau”.



Figure 7 Diorama “Launching Pad of a V2 Missile” in the exhibition Astronautics.

In conclusion, dioramas as scientific learning tools have long caused friction among museum professionals. The critics argue that firstly, dioramas do not deliver scientific facts in a serious manner. Secondly, they lack interactivity, a key element of modern exhibits. Thirdly their content becomes outdated and therefore irrelevant to visitors. Fourthly dioramas represent the museums' interpretation of socio-historic or scientific facts. In contrast dioramas' supporters have praised them for playing an important role in exhibitions because of their strong emotional appeal to all types of target audiences which has been evaluated in a small number of visitor studies.

Visitor Studies

As stated by Bitgood, there have only been a few evaluations of dioramas which have been published.⁹⁶ In addition, visitor studies concerning dioramas are entirely aimed at habitat dioramas. Nevertheless, it is still worthwhile to examine the visitor research concerning habitat dioramas. One visitor study stands out as the most interesting and will now be described briefly.

Scheersoi has recently conducted visitor studies at three German museums of natural history. She concludes that visitors' situational interest is evoked if emotional responses are triggered by the dioramas. Emotional responses in natural history museums can be created among other criteria with big, young and rare animals, interesting scenarios and interaction in them, human traces and artifacts.⁹⁷ Although all visitor-studies analyzed agree upon the attractiveness of dioramas, none of the others besides Scheersoi, investigate effective design concepts for dioramas and the corresponding exhibition space.

Bitgood on Effective Dioramas

Museums have never stopped investing into the implementation, renovation and refurbishment of dioramas despite their expense. Nevertheless, as revealed by Bitgood, there is still an urgent demand for "systematic studies" about the specific design attributes of successful dioramas.⁹⁸ What distinguishes Bitgood's studies from the visitor studies mentioned above is the fact that they focus on strategies for designing or improving exhibits and their surroundings as opposed to taking the design as a given fact. Bitgood suggests the need for further studies underpinned by what he defines as the "attention-value model" which connotes economic pragmatism.⁹⁹ A visitor's attention is dependent on detectability and value which is the result of the visitor's benefit, such as pleasure or curiosity, balanced against time spent and effort.¹⁰⁰ Concerning the general design of exhibits, Bitgood and Patterson point out similar factors as mentioned by Scheersoi above like size, novelty, and intrinsic qualities such as young animals. Moreover they contrast factors which increase and decrease viewing time such as good visibility and proximity to the visitor and sensory competition with other exhibits and "object satiation".¹⁰¹

Concerning the particular design of dioramas as immersive exhibits, Bitgood illuminates three factors, creating an illusion of a particular time and space, three-dimensionality and mental imagery.

⁹⁶ Bitgood, *Dioramas in Exhibition Centers*, 2011, p. 179.

⁹⁷ Scheersoi, *Catching the Visitor's Interest*, 2015, p. 158.

⁹⁸ Bitgood, *Dioramas in Exhibition Centers*, 2011, p. 179.

⁹⁹ Bitgood, *Attention and Value*, 2013, p. 64.

¹⁰⁰ *Ibid.*, p. 66.

¹⁰¹ Bitgood, *Social Design in Museums*, 2011, pp. 13–16.

After having assessed evaluations by Peart,¹⁰² Ogden, Lindburgh and Maple,¹⁰³ Bitgood concludes that adding sound enhances the diorama experience.¹⁰⁴ Whereas when he analyses Peer's outcomes concerning added multi-sensory and interactive elements to dioramas, he cautions that it remains unclear if the increased viewing time is spent with the added elements or the diorama itself.¹⁰⁵ Bitgood follows Korenic's observation¹⁰⁶ with regard to miniature dioramas which are less realistic than large ones and agrees that they are thus less attractive.¹⁰⁷ Eventually Bitgood stresses three criteria for evaluating diorama design again: behavior, affect and cognitions. The first criteria refers to high stopping and viewing times, as frequently observed, in front of large sized dioramas. The second criteria, the emotional attractiveness, has been evaluated with positive results. The third criteria, cognitions, infers knowledge gain. Bitgood is of the opinion that dioramas do not aim to convey abstract information. It still must be determined in which way information with regard to the diorama's content gets delivered successfully and in which way enhancements such as labels and videos should be added. In concluding, Bitgood advocates for a mixture of a variety of well-designed exhibit types including dioramas.¹⁰⁸ Therefore I am of the opinion that museums should implement dioramas carefully and responsibly by underpinning the usage of dioramas with evaluations of their effectiveness and their limitations and moreover appreciating criticism of these exhibits as a vehicle for improvement for the design and concept.

Case Study: Dioramas at the Deutsches Museum

Introduction

The Deutsches Museum was founded in 1903 by the engineer Oskar von Miller. In 1925 it moved to its current location on an island in the Isar river which flows through the heart of Munich. Within the framework of its Future Initiative the museum is currently undergoing major renovation work. The exhibitions will either be refurbished, redeveloped or replaced by new ones. Currently the museum exhibits twelve open dioramas on a 1:1 scale which encompass approximately 770 square meters, approximately 60 enclosed dioramas encompassing 250 square meters and 4600 square meters of a Walk-Through Mine exhibit. Furthermore about 100 dioramas are registered as dioramas in the collections.¹⁰⁹ As the future of the dioramas has not yet been determined, it is quite timely that the Research Institute of the Deutsches Museum has recently published both a catalogue with a comprehensive collection of all dioramas which meet the authors' criteria¹¹⁰ and a contextualizing volume about dioramas.¹¹¹ This provides me with a profound overview about museological aspects of dioramas. On the other hand there is hardly any visitor research and no comprehensive contributions by museum practitioners available on such topics as museum learning, exhibition design and artistic execution with regard to the dioramas of the Deutsches Museum. Since the focus of my research is not only on the museological significance of dioramas but also on their visitor-oriented

¹⁰² Peart, *Impact of Exhibit Type on Knowledge Gain, Attitudes, and Behavior*, 1984.

¹⁰³ Ogden, Lindburgh, and Maple, *The Effects on Ecologically Relevant Sounds on Zoo Visitors*, 1993.

¹⁰⁴ Bitgood, *Dioramas in Exhibition Centers*, 2011, p. 182.

¹⁰⁵ Peers, *Improving the Motivational Owner of Dioramas*, 1991.

¹⁰⁶ Korenic, *Some Visitor Behavior Trends of Diorama Use*, 1995.

¹⁰⁷ Bitgood, *Dioramas in Exhibition Centers*, 2011, p. 184.

¹⁰⁸ *Ibid.*, p. 195.

¹⁰⁹ According to the collections' database of the Deutsches Museum.

¹¹⁰ Füßl, Röschner, and Lucas, *Wirklichkeit und Illusion*, 2017.

¹¹¹ Gall and Trischler, *Szenarien und Illusion*, 2016.



Figure 8 This period-room depicts a laboratory in Galileo's times in the exhibition Physics.

relevance, it is necessary to include peer interviews and a small-scale visitor questionnaire. The following paragraphs provide important background information about dioramas at the Deutsches Museum: the history of diorama building, definition and concept, the role of dioramas at the museum and visitor studies. All these pieces of information are complimented by the interpretation of the interviewees' and visitors' responses in the following sections.

The History of Diorama Building

When Oskar von Miller founded the museum his idea of museum learning was absolutely novel. He envisioned a museum which combines education and entertainment for the people.¹¹² The "Volksbildungsstätte Deutsches Museum" (people's education venue Deutsches Museum) was meant to provide visitors with an emotional and immersive experience. Miller got his inspiration from natural history museums, outdoor museums and world exhibitions such as the one in St. Louis in 1904. On the basis of these experiences in the early days of the museum he prioritized the implemen-

112 Füßl, Oskar von Miller, 2005, p. 256.

tation of dioramas on a 1:1 scale. In addition, as a collector of nativity scenes he saw the potential for narrative in dioramas.¹¹³ According to Wolfgang Adam et al. the 1950s and 1960s were the heyday of diorama building activities. But still in the 1980s some major diorama building projects took place.¹¹⁴ A striking example for these activities is the Walk-Through Mine exhibit which was constructed for the new building in 1925, expanded in the 1950s and again from 1987 to 1988. As stated by Jobst Broelmann, former senior curator, the dioramas in the shipping exhibition of the museum built in the 1970s and 1980s set standards for the later exhibitions on aeronautics and space travel.¹¹⁵ Otherwise he believes that starting in the 1980s, the exhibition concepts emphasized scientific abstraction and facts which could not be conveyed appropriately with a diorama. Nevertheless the building activities of new dioramas have continued well into the 21st century.¹¹⁶

Definition and Concept

Considering this long-standing and continuous tradition of dioramas it is not surprising that the museum has developed its very own definition of a museum diorama. According to Alexander Gall the museum has referred to scaled-down half panoramas with a modeled foreground as dioramas since the beginning of the 20th century.¹¹⁷ Wilhelm Füll, Andrea Lucas, Matthias Röschner are the authors of the catalogue about the dioramas at the Deutsches Museum and they support this notion when they adhere to the definition that a diorama is a display case with figurines and a landscape mostly in front of a half-circular background. The visitor's view should be restricted and defined to create a feeling of immersion. Whether dioramas on a 1:1 scale should be included in the definition is debatable. This catalogue reflects this debate and restricts the choices among the vast array of three-dimensional scenarios available. The authors' restricted concept definitely excludes highly attractive and well-known open dioramas such as the Walk-Through Mine exhibit or the model-train diorama among others.¹¹⁸ However, the former senior curator Broelmann, insists that a definition at the Deutsches Museum must be kept broad enough to allow for new topics and approaches.¹¹⁹

The Role of Dioramas in the Museum

Oskar von Miller was an early protagonist of what John H. Falk and Lynn D. Dierking described as the combined learning and leisure experience at museums.¹²⁰ As pointed out by Falk and Dierking, visitors seek experiences in museums which the Deutsche Museums has always aimed for in various ways, the display of dioramas being just one.¹²¹ The Walk-Through Mine is the most popular exhibit at the Deutsches Museum. Its design not only incorporates authentic objects but also provides a convincing mining atmosphere. This is an excellent example of what Jürgen Teichmann, Annette Noschka-Roos, and Traudel Weber describe as experiential and sensual learning possibilities which

113 Krückemeyer, *Von Tatsachen und Illusionen*, 2016, p. 110.

114 Adam et al., *Dioramen und Dioramenbau im Deutschen Museum*, 2017, p. 24.

115 Broelmann, *Geschichten, Räume, Horizonte*, 2016, pp.171 and 177

116 Ibid., p. 177.

117 Gall, *Auf dem langen Weg ins Museum*, 2016, p. 86.

118 Adam et al., *Dioramen und Dioramenbau im Deutschen Museum*, 2017, pp. 21–23.

119 Broelmann, *Geschichten, Räume, Horizonte*, 2016, p. 144.

120 Falk and Dierking, *Learning from Museums*, 2000.

121 Ibid., p. 75.



Figure 9 Immersive Experience in the Walk-Through Mine in the exhibition Mine.

are offered by dioramas.¹²² Dioramas contextualize objects, technical processes and present the socio-historical context. Apart from these mainly educational aspects, Barbara Krückemeyer elaborates on the psychological dimension of these special display techniques namely the visitors' opportunity for immersion in the scenery.¹²³ All of the mentioned aspects of dioramas add value to the learning and leisure experience of visitors.

Visitor Studies

There have been three pertinent visitor studies at the Deutsches Museum which happened to include dioramas. The first study was conducted by Bernhard Graf and Heiner Treinen in 1983 in the exhibition on aeronautics. While three miniature dioramas were included in the study, the only conclusion which could be reached was that the time spent in front of them was about equal.¹²⁴ The second visitor study was done in 2011 by Katrin Neubauer and Doris Lewalter for a topic in the chemistry department called Chemistry in Leisure Time and Sports (Chemie in Freizeit und Sport). The diora-

¹²² Teichmann, Noschka-Roos, and Weber, *Das Museum als öffentlicher Raum*, 2003.

¹²³ Krückemeyer, *Von Tatsachen und Illusionen*, 2016, p. 110.

¹²⁴ Graf and Treinen, *Besucher im Technischen Museum*, 1983.

ma included in the study depicts two mountain climbers on a 1:1 scale at different historical times in their contemporary gear. The results showed high amounts of time spent in front of the diorama.¹²⁵ The third visitors' questionnaire in 2012 explored the attractiveness and knowledge gain of the same exhibit Chemistry in Leisure Time and Sports. The results conclude that visitors did not view the diorama as a learning device though the mere observation of visitors' spent time indicates the diorama's attractiveness.¹²⁶

It is quite remarkable that the building of dioramas at the Deutsches Museum has continued to the present time, especially when one considers the strain on resources since 2006 arising from the Future Initiative renovation project. However there is no official museological strategy in place which refers to the handling of either the dismantling of dioramas or the implementation/construction of new dioramas. Of the eight period-rooms, which were selected as masterpieces of the Deutsches Museum,¹²⁷ three will definitely be displayed again in the exhibition on chemistry and three will be included into other new exhibition concepts. Although production management of exhibitions is quite rigid, no cost-benefit analysis concerning dioramas and other elaborate means of display has yet been implemented. Similarly there is no set museum definition for dioramas. For the objectives of my research I include all three-dimensional accessible or inaccessible scenarios and period-rooms which puts me in line with most of the relevant literature.

The recent publications about dioramas, edited by the Deutsches Museum, have been the first ones of their kind. They may initiate a discourse about these unique features of the Deutsches Museum and their preservation as tangible cultural heritage. Future visitor studies concerning dioramas could support an analysis of dioramas including the questions why they are attractive to visitors and if they contain potential for museum learning. In the following paragraphs I will elaborate on my findings with regard to the interviews with other museum professionals of the Deutsches Museum and the small-scale questionnaire of its visitors.

Interviews with Museum Professionals

I conducted eight semi-structured interviews with my colleagues who are all museum professionals at the Deutsches Museum. Four interviewees are involved in the planning and development process of dioramas: André Judäa, exhibition designer, Frank Dittmann, curator for the exhibition on information technology, robotics and high voltage, Franz Huber, supervisor of the model-builders' workshop, and Elisabeth Strasser, sculptor in the sculptors' workshop. The latter two are also involved in the actual creation and building process of dioramas. Furthermore I interviewed two colleagues who are concerned with offering learning and leisure experiences at the museum: Jörg Feder, presenter and technician for the model-train diorama, and Traudel Weber, coordinator and developer of educational programs. To include the point of view of the upper museum management, I interviewed Simone Bauer, department head for exhibition development, and Klaus Freymann, deputy director general. Each interview consisted of nine questions. As an introduction to the topic I asked three general questions concerning ideas, concepts and definitions. These were followed by six questions concerning their personal points of view, observations and conclusions concerning museum dioramas. A complete summary of the interviews is included in the Appendix.

125 Neubauer and Lewalter, *Zwischenbericht zu den Beobachtungsdaten des Prototyps der Ausstellung "Chemie im Sport"*, 2011, p. 64.

126 Neubauer and Lewalter, *Abschlussbericht zur Evaluation des Prototyps der Ausstellung "Chemie in Freizeit und Sport"*, 2012.

127 Deutsches Museum, *Meisterwerke aus dem Deutschen Museum*, 2004. These eight period-rooms are referred to as "Inszenierung".

The interviews started with two general questions about the interviewees' concepts and definition of dioramas. These were followed by questions about value to the museum and its visitors, museum objectives, the interviewees' contribution to meet the objectives and their quality control. I ended the interview with an outlook into the future and my colleagues' contribution to it. Despite the unofficial restricted definition for dioramas at the Deutsches Museum, the majority of my colleagues are quite open-minded concerning their concepts which are influenced by their personal and professional background. Most interviewees' approach towards a definition of dioramas is utilitarian as is their approach towards the value of dioramas.

It is remarkable that dioramas as museum objects are primarily appreciated as a means of display or didactic devices. Judäa refers to them as applied art, created with dedication and devotion. As a way of explaining he quotes Beethoven “möge es von Herzen zu Herzen gehen” (may it go from heart to heart).¹²⁸ In contrast the interviewees in management positions are reluctant to refer to them



Figure 10 A work of applied art – the diorama “Path of Electricity”, 1:20 scale, in the exhibition Electric Power.

¹²⁸ Interview with Judäa, 2015, see Appendix, pp. 65–68.

as works of art. Bauer feels that the concept of “art should not be overly strained”.¹²⁹ Dittmann maintains that “conveying information through materiality” is a unique characteristic of the museum which “justifies its survival and relevance”.¹³⁰ Furthermore he clearly states his obligation as a curator to preserve dioramas whereas Freymann's comments are more evasive. Bauer shows her commitment to their preservation by supporting the evaluation of dioramas. It becomes quite evident that there is no over-arching museum strategy in place concerning the handling of dioramas as museum objects. Most interviewees when asked about visitors' appreciation of dioramas rely on personal observations and experiences and from random or regular encounters with visitors and experiences as visitors themselves. Despite the fact that these personal reflections are worthwhile only Freymann quotes one visitor survey. Bauer and Weber point out that they have no way of defining the attractiveness to visitors exactly because they cannot rely on any visitor research.¹³¹ These facts suggest that there is a demand for more and for differentiated visitor studies.

Concerning objectives most interviewees agree on the main goals of conveying information or knowledge and attractiveness. Yet on a more detailed level there are no majority agreements on any of the most dominant characteristics mentioned in the literature such as contextualization, narrative, emotional and immersive experiences, self-determined and inquiry-based learning and leisure experiences. As for dioramas as museum objects there is no overall strategy in place concerning their objectives. Each exhibition team decides individually.



Figure 11 Dismantling of the diorama “Müngstner Brücke” for a planned reinstation on a scale of 1:100, in the exhibition Bridge Building.

¹²⁹ Interview with Bauer, 2016, see Appendix, pp. 78–81.

¹³⁰ Interview with Dittmann, 2015, see Appendix, pp. 59–62.

¹³¹ Interview with Bauer and Weber, 2016, see Appendix, pp. 78–81, and 72–74.

As reflected by the interviewees an evaluation of a diorama's quality encompasses visitor- and learning-oriented criteria as well as artistic and design-related criteria. However it becomes evident that most of the interviewees are not familiar with any visitor research concerning dioramas and their respective objectives do not get evaluated with standardized procedures.

Weber does not feel that dioramas “are at risk at the Deutsches Museum”.¹³² The positive outlook into the future of dioramas as expressed by Dittmann, Feder, Freymann and Weber stands in stark contrast to the dissatisfaction voiced by Judä, Huber, Strasser and Bauer's belief in the unpredictability of the future. The Deutsches Museum is in the middle of a great renovation endeavor to be completed by 2025 and the museum will require additional discussions concerning the effectiveness of both new and reinstalled dioramas.

Visitor Program and Questionnaire

A small-scale questionnaire on dioramas was conducted with visitors who participated in a family program at the Deutsches Museum. The program took place in December 2015 and January 2016. The program consisted of both a diorama tour and a handicraft project. The whole program was



Figure 12 The “Salt-Mine” diorama in the exhibition Mine is based on the historic salt-mine in Wieliczka, Polen.

¹³² Interview with Weber, 2016, see Appendix, pp. 72–74.

aimed towards families with children between the age of four and eight. At each diorama the facilitator became a fictional character who told a story revolving around the diorama's content. The story was aimed towards helping the children to put what they observed into a meaningful context. At the end of the tour, the children built their own Daguerre-style diorama. For this program, three dioramas were selected because of their significant characteristics. Firstly the Salt-Mine is a section of the Walk-Through Mine of the museum and is reached through an authentic pathway of a mine. The Salt-Mine itself is a large hall, with figurines of miners on a scale of a 1:1 in historical outfits shown working in the upper section of the hall. Secondly "The Path of Electricity from the Provider to the Consumer" ("Path of Electricity" for short) on a scale of 1:20 was selected as it is among the largest of the miniature dioramas of the museum and one of the artistically most accomplished. It is six meters long and two and a half meter deep. Thirdly the Montgolfiere is a diorama with abstracted scenery in bright colors and an interactive balloon.

When considering Bitgood's criteria for a worthwhile visitor experience with dioramas it becomes evident that the Salt-Mine should be effective because of its size and the possibilities for an immersive experience through a) an illusion of reality, b) its real three-dimensionality, and c) mental imagery (for example putting oneself into the place of a miner).¹³³ Also the Montgolfiere is prone to be successful as well since it is located at a prominent position in the exhibition and interactive stimulation is included. In contrast Path of Electricity is situated in a "cul-de-sac" with low visibility and must compete for the attention of visitors with a nearby video screen and interactive displays (figure 15). Consequently it will be revealing to see if these advantageous and disadvantageous criteria for the dioramas and the exhibition designs are of significance for the participants of this questionnaire.

Families were chosen as the targeted participants because this approach allowed for an insight into the viewpoints of adults as well as children. The enactor program made it possible to investigate if the story adds to the quality of the visitors' experience. The handicraft project was aimed towards additional feedback from children besides the questionnaires.

The children received a questionnaire with three pictures of the three dioramas of which they could pick their favorite ones and the most favorite features of them. Furthermore they built dioramas which served as a different way of commenting. The goal was to detect if there were any outstanding preferences and if the tour and the stories influenced their choice of topic of their craft project.

Sixteen adults, nine men and seven women between the ages of 30 to 53, participated in the questionnaire. The majority was between 30 and 40 years old (nine participants). All of the participants hold academic degrees. In addition there were three participants between the age of 11 and 18 years who filled out a questionnaire. Because of their age they do not fit into the main groups. The questionnaire for adults and youth was identical and contained five main questions. Thirteen children participated ranging from four to nine years of age.

All three dioramas were very much appreciated by the participants. Path of Electricity received the highest ranking for attractiveness because of its life-like depiction of the scenery and the illusion of depth and space. Immersion into the scenery was felt the best with Path of Electricity followed by the Salt-Mine and the Montgolfiere. Movement was almost equally sensed in the Montgolfiere and in Path of Electricity. The adults unlike the youth enjoyed the stories as part of the diorama

133 Bitgood, *Dioramas in Exhibition Centers*, 2011, pp. 181 and 184.



Figure 13 Enactor at the diorama “Montgolfiere” in the exhibition Historic Aviation.

experience. All participants clearly stated that their fondness was hardly related to an interest in the topic. When giving additional comments, the excitement of going through the passageway in the Walk-Through Mine, the authenticity and interesting perspective of Path of Electricity, and the colorfulness and high attractiveness for children of the Montgolfiere was pointed out by the participants.

The storytelling was much appreciated by the participants. “(It) made the dioramas come alive”.¹³⁴ Some adults were doubtful whether central background information concerning the dioramas' content was understood by the children. As one adult remarked, “I don't think my daughter understood where electricity comes from”.¹³⁵ One youth commented on the high interactivity of the performance in the Salt-Mine. It ranked slightly higher than the other stories told by the encator. While the story for Path of Electricity scored the lowest.

All participants reported that when they are on their own, they primarily look at dioramas for their enjoyment but they would also like to learn more, as expressed by two adults, “I enjoy the dedication to details which are especially visible in the old tunnel and bridge models”,¹³⁶ and “You get to look at situations which you normally don't think about”.¹³⁷ Adults would appreciate more information about the diorama topic and prefer to take their time at the diorama. Sharing experiences with others is ranked fairly low among the participants.

¹³⁴ Interview with a female participant, 49 years old, 2016, see Appendix, p. 88.

¹³⁵ Interview with a female participant, 45 years old, 2016, see Appendix, p. 88.

¹³⁶ Interview with a male participant, 53 years old, 2016, see Appendix, p. 90.

¹³⁷ Interview with a female participant, 49 years old, 2016, see Appendix, p. 90.



Figure 14 “The Montgolfiere”, diorama built during the program as part of the visitor study.

The majority of the children liked all of the dioramas equally. Only two participants pointed out special features or made comments like “the sky” in the Path of Electricity or “the cave”¹³⁸ referring to the Salt-Mine. The crafts project was aimed to reinforce the understanding of the main elements of a diorama including the rounded back wall with scenery and the window which restricts the view. In the introduction to the crafts projects a reference to the three dioramas was categorically avoided. The children were invited to build their favorite diorama. It incorporated the typical features of a Daguerre-style diorama, the rounded semi-transparent backdrop with a light shining through and a window to look at the scenery on the backdrop. The vast majority built a diorama with freely chosen content. The chosen topics ranged from a nativity scene, a mountaintop, a pyramid, fairytale castles, a “diorama machine”, a dog on straw bales to actual depictions of a scenery with features of the Path of Electricity and the Montgolfiere among others.

Discussion

There are limitations to drawing conclusions from this questionnaire. The sample of visitors is not only small but it also represents only one segment of visitors. In addition this approach leaves out the segment of non-visitors entirely. Furthermore the enhancement of the experience through the

¹³⁸ Personal comment of a boy, 6 years old, 2016.



Figure 15 The video screen adjacent to the diorama “Path of Electricity” distracts from the diorama in the exhibition Electric Power.

enactor program cannot be fully determined since this program was not compared to a family program without story telling.

Nevertheless this piece of research can give an impulse for further and more thorough investigations as it offers topics and questions which should be discussed further. In this summary first of all the questionnaire for adults and youth are discussed and then the feedback from children. Refer to the Appendix for the complete responses to the questionnaire.

The most striking result was that the Salt-Mine was not viewed as offering the best immersive experiences by far. On the contrary Path of Electricity ranked slightly higher. It is quite likely that the

highly accomplished depiction of a life-like scenery with an illusion of depth and space was responsible for this result. For the Salt-Mine in comparison to Path of Electricity a lack of authenticity was felt. It can be suggested that the Salt-Mine only impacts visitors as part of the designated route through the Walk-Through Mine. It sits at the very end and offers a spacious finale after visitors have meandered through narrow passageways. For this family program it was taken out of its exhibition context. Whereas, Path of Electricity sits alone and needs to create the illusion of authentic reality by itself. Nonetheless it can safely be concluded that dioramas on a scale of 1:1 are not per se more immersive than miniature dioramas. More factors than just mere scale impact visitors emotionally. Whether visitors are attracted by Path of Electricity without facilitation remains guesswork. From personal but random observations it can be inferred that because of the competition with a near-by video screen and interactive displays, Path of Electricity is rarely looked at.

The second most striking outcome of the questionnaire was the fact that movement was almost equally felt in Montgolfiere and Path of Electricity. The latter does actually not contain any concrete movement yet it was sensed. Path of Electricity conveys an accomplished depiction of a lively scenery which implies a certain dynamic feeling. The Montgolfiere displays the ascent and descent of the balloon and the illumination of the fire in the basket. It is safe to say that these features did not add significantly to the experience with it in comparison to the other two dioramas. Despite the fact that the Montgolfiere's minimal movement is not comparable to model-train dioramas this outcome still raises doubts whether mechanical devices are the only means for creating a convincing feeling of motion.

Concerning the conveying of intended information with dioramas it is quite revealing that even with the support of a storyline also unforeseen messages may be delivered. At first glance this seems to be an unwelcome outcome. However it also suggests that the content of dioramas are open to a wide range of interpretation, which broadens the possibilities for reusing them in changed or new contexts. Moreover according to Füßl the sponsor of the diorama, the Bayernwerk AG, aimed for three main messages to be delivered through the diorama. They were: (1) hydroelectric power cannot solely cover the demand for energy, (2) the Bayernwerk AG guarantees the continuous distribution of energy, and (3) the supply of electricity has reached even remote rural regions.¹³⁹ The first two messages were lost to most of the participants of the questionnaire. The participants were more concerned about the more obvious objective, comprehending the path of electricity from the power plant to the consumer.

Although all three dioramas were liked almost equally, the story in the Salt-Mine was enjoyed more. In the Salt-Mine the children were invited to taste salt, stir the salt into water and carry containers of salty water. Perhaps this participatory character of the performance caused its higher appreciation.

The outcomes of the handicraft projects may indicate whether the children were influenced by the stories or the dioramas' content. Out of the thirteen children only three incorporated their experiences into their dioramas in such a way that their dioramas resembled sceneries of the observed dioramas. They created sceneries with houses on meadows and either electric wires or "radio wires" and a colorful balloon. It can be inferred that these relate to Montgolfiere and Path of Electricity. The idea and concept of "radio wires" was probably thought up because of the respective story for

¹³⁹ Adam et al., *Dioramen und Dioramenbau im Deutschen Museum*, 2017, p. 47.

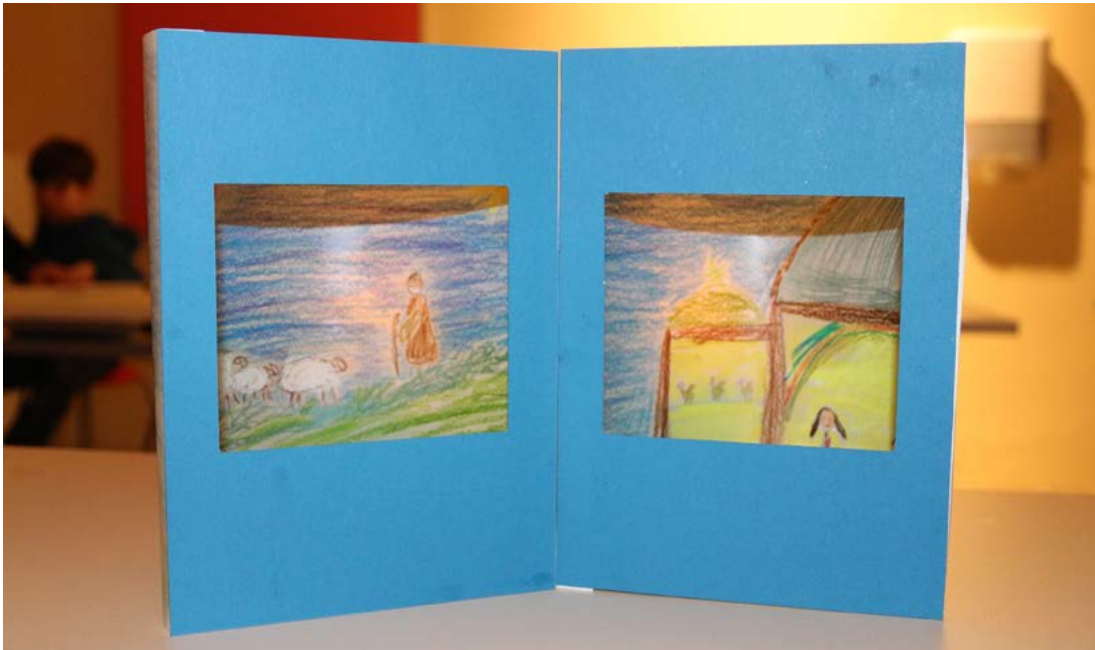


Figure 16 Nativity scene diorama built during the program as part of the visitor study.

Path of Electricity in which a girl in the 1950s was looking forward to getting a radio. It is interesting to note that one girl seemed to have made the intellectual transfer from museum dioramas she had seen to another very traditional kind of diorama, the nativity scene. Two boys had chosen topics such as a pyramid and a mountaintop for their dioramas which are ideal features for dioramas since they allow for the creation of depth, perspective and spaciousness. Generally speaking all children showed a continuous high-level of attention during the entire time of the program including the crafts project. None of the families had to leave earlier.

It can be suggested that when comparing the three dioramas the positive experience with Path of Electricity was enhanced through the enactor program. Whereas for the Salt-Mine it is probably true that not starting at the beginning of the path through the Walk-Through Mine took away the exciting feeling of exploring an authentic mine. For the Montgolfiere the enactor program might not have added much to the positive experience of children as they divided their attention between the performance and the activity of pushing the button. Further investigation is required to fully understand how visitors appreciate, enjoy and learn with dioramas at the Deutsches Museum. Granting that the museum's dioramas are created along a comprehensible storyline and in accord with high artistic and technical standards it is still not guaranteed that it is effective in the context of an exhibition. Although this visitor questionnaire suggests that facilitated programs such as enactor programs with dioramas can overcome disadvantageous factors which reduce the attractiveness of a diorama, enactor programs and the like obviously cannot reach a large audience and therefore do not pose a remedy

for bad exhibition design or incomprehensibility of the context. It is time for the Deutsches Museum to evaluate how their dioramas are embedded in the exhibition they were built for, namely by examining their contextualization and the design-related criteria elaborated on by Bitgood and Patterson.¹⁴⁰ This could lead the way to the development of a catalogue for criteria for adequate exhibition design and to possibilities of re-contextualization of old dioramas which in turn not only saves costs but more importantly allows the Deutsches Museum to offer improved learning and leisure experiences with their unique selling proposition – the diorama.

Innovative Strategies for Museum Dioramas

The previous chapters explore the role of museum dioramas in general and at the Deutsches Museum in particular, the outcomes of the selected visitors studies and the debate concerning dioramas. Based on these four areas of interest this chapter investigates the implications for the future of dioramas. Considering the tremendous renovation project at the Deutsches Museum it is especially crucial for the museum to position itself as an institution which continues its tradition of offering innovative means for learning and entertainment experiences. Achieving this goal requires strategic planning for its core services such as programs and exhibitions and in particular for one of its main selling points, the museum's dioramas. In the following paragraphs the possibilities for enhancements revolving around museum dioramas will be discussed such as improvements in museum management, novel interpretation strategies, technical improvements, immersive experiences and finally augmented and virtual reality encounters.

Improvement in Museum Management

To make informed decisions about incorporating new or existing dioramas in exhibitions, museums need to evaluate the status of each of their dioramas as an artifact or learning tool which will determine its historical, cultural and educational significance. These evaluations should be complemented by all-encompassing visitor studies. In addition it is advisable to implement quality management for the production of dioramas and the product itself. Furthermore Broelmann, for dioramas at the Deutsches Museum, suggests to perform cost-benefit analyses by comparing dioramas to interactive displays including their service life, cost of maintenance and human labor.¹⁴¹ Especially at a time when the Deutsches Museum is going to refurbish or newly develop its entire array of exhibitions, it is paramount that cost-benefit analyses including visitor studies on dioramas are embedded in the quality management for the production of the exhibition developments.

¹⁴⁰ Bitgood and Patterson, *Principles of Exhibit Design*, 2011.

¹⁴¹ Broelmann, *Geschichten, Räume, Horizonte*, 2016, p. 175.



Figure 17 Diorama called “Coking Plant” in the exhibition Mine, 1:75 scale.

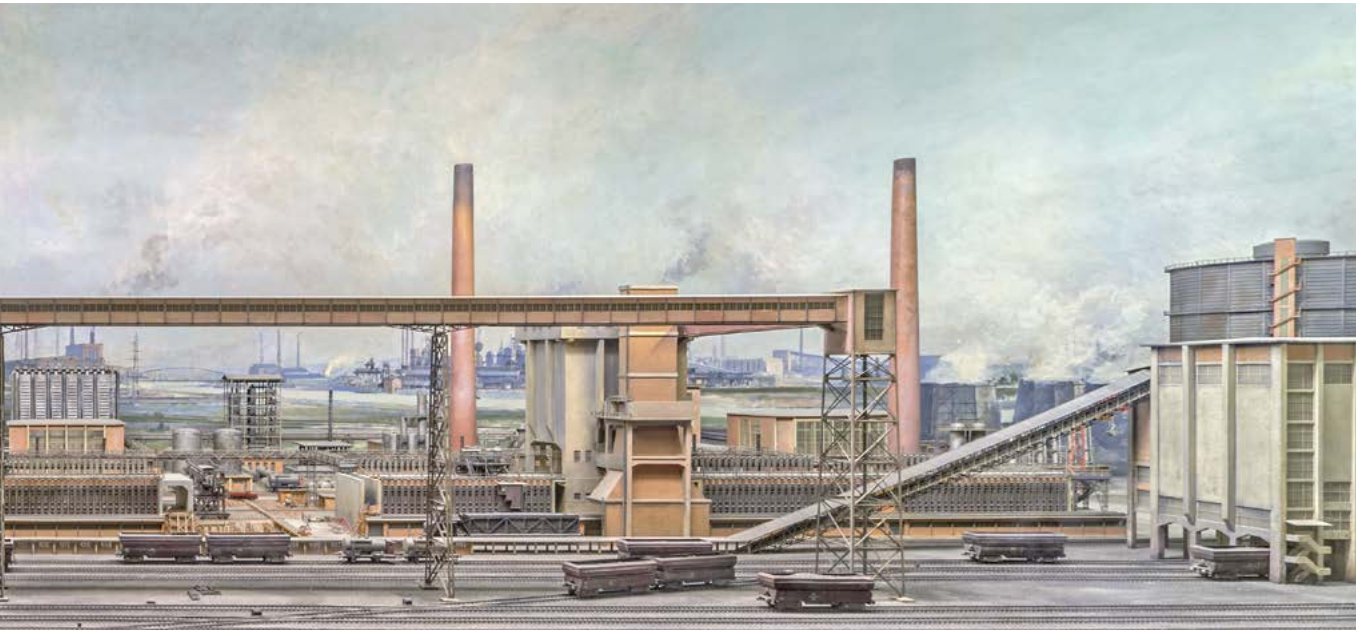
Ideas and Limits of Keeping Dioramas Relevant

Dioramas have been traditionally built into the structure as timeless works of art and as learning tools at the same time. During the last decades museums felt the need to reinvent themselves, to become more visitor-oriented, expand their services and adapt their exhibitions to modern museological concepts. Thus the traditional dioramas tend not to fit into these new contexts. Marjoie Schwarzer and Marie Jo Sutton, in their research report to the Oakland Museum of California, give exhaustive recommendations for the further usage of dioramas. As new interpretation strategies they recommend re-contextualization, layered information, storytelling, possibilities for visitors to look behind the scenes and participatory projects.¹⁴² In the following paragraph these four strategies will be illustrated with examples and suggestions from different museum professionals.

Particularly for museums of science and technology it is challenging to find new purposes for dioramas which were built to present the latest technological advances at the time. However Insley indicates possibilities. She suggests focusing on the historical significance and peculiarities of the technologies at the depicted time but also juxtapose them to current issues of interest such as environmental or health.¹⁴³ At the Deutsches Museum, the fate of two dioramas exemplifies the choices which can be made concerning these historical artifacts. The diorama Path of Electricity, which depicts the technical achievement of the 1950s to provide electricity to rural regions, will be re-contextualized. For the new exhibition, Dittmann, curator for the exhibition on energy, aims to stress the

¹⁴² Schwarzer and Sutton, *The Diorama Dilemma*, 2009, pp. 32–33.

¹⁴³ Insley, *Little Landscapes*, 2008, p. 31.



overarching concept of how electricity gets distributed from the power plant to the user.¹⁴⁴ Whereas, the diorama of an industrial site depicting a coking plant will be excluded from the new exhibition about mining, as the curator, Freymann, finds it rather “uninspiring”.¹⁴⁵ It can be inferred that it is, indeed, unsuitable for any re-contextualization in a refurbished exhibition.

The opposing concepts of these two curators shed some light on the complexity of the decision-making process. Both dioramas are large miniature dioramas. They both depict a scenario with outdated technology of the 1950s and 1960s. Therefore, generally speaking, both offer opportunities for new contextualizations. But as mentioned by Bitgood and Patterson there are more parameters than content alone which need to be taken into account when implementing effective dioramas.¹⁴⁶ For both, Path of Electricity and Coking Plant the backdrop was painted by Günther Voglsamer. Despite the fact that Path of Electricity is of artistically superior quality to Coking Plant the positioning and implementation of both dioramas is unfavorable to their attractiveness. Path of Electricity is obscured from view by a large wall, in a rarely dark “cul-de-sac” area (see also page 35). The Coking Plant is part of the exhibition on mining. It is situated at the end of the itinerary which starts with a highly attractive 1:1 scale walk through diorama of mining whereas in this part of the exhibition the space is overloaded with label graphics and photographs. Furthermore, vast amounts of similar exhibits such as models, dioramas and objects compete for the visitors' attention. It can be inferred that visitors suffer from ‘museum fatigue’ already. From my personal observation I noticed how visitors are attracted to a moving functional model placed directly opposite to the diorama.

144 Dittmann, personal comment, 2016, see Appendix, p. 61.

145 Freymann, personal comment, 2016, see Appendix, p. 76.

146 Bitgood and Patterson, *Principles of Exhibit Design*, 2011, pp. 13–16.

Despite the fact that the artistic quality and lighting of the diorama is quite satisfactory, the main topic, the process of coking is not depicted. Instead the required factory buildings are shown. Without reading the respective labels, the visitors cannot comprehend the content. Additionally it is difficult to make out details of the scenery, because the diorama is built on a small scale (1:75 scale). Thus even if unfavorable parameters such as the itinerary, competing exhibits and the context get altered it remains doubtful whether this diorama will become an attractive and therefore successful learning device. When comparing these two dioramas it can be implied that Path of Electricity has two advantages to Coking Plant: Firstly its content is more comprehensible without prior knowledge or information because it is comparable to personal experiences which leads to the second advantage. Path of Electricity enables visitors to create their own narrative, the prerequisite for immersive experiences.

Contextualization can serve as a basis for layered information and a narrative environment for dioramas. Layered information with regard to the different knowledge and interest levels of visitors refers to providing information in a hierarchical order from general to detailed and on specific topics of interests. Storytelling, as already mentioned, is elaborated on by Cotumaccio, Tinworth, and Dunmall, such as diorama tours underpinned by narratives,¹⁴⁷ an enactor-program in which actors approach visitors spontaneously in the exhibitions,¹⁴⁸ performances of a local theatre company and



Figure 18 Diorama of a “City of the Future” – participatory diorama building project for a temporary exhibition at the Deutsches Museum, called “Welcome to the Anthropocene.”

¹⁴⁷ Cotumaccio, *The Evolution of the Narrative at Natural History Dioramas*, 2015, p. 187.

¹⁴⁸ Tinworth, *Relic of the Past + People of the Past*, 2015, p. 230.

enactor programs as diorama tours.¹⁴⁹ Since 1994 the Deutsches Museums offers a program for families and children called “Märchen im Museum” (fairy tales in the museum).¹⁵⁰ It is a performance in which actors and actresses tell stories revolving around mostly 1:1 scale dioramas and objects of the museum.

Yet another way for museums to re-contextualize dioramas is to allow for a look behind the scene to see how dioramas are developed and created. In 2010 at the Yale Peabody Museum of Natural History in New Haven, Connecticut, Michael Anderson built the foreground for a diorama directly in the exhibition space to allow visitors to watch.¹⁵¹ The Academy of Natural History of Drexel University, Philadelphia, offers an exhibition on the making of dioramas called “Secrets of the Diorama”.¹⁵² The American Museum of Natural History in New York has a more hands-on approach and offers a six-day adult course of how to create your own diorama.¹⁵³ The Deutsches Museum offers tours to the workshops and diorama tours in which both the dioramas in the exhibitions and the ones in the making get explored while programs for children aged nine to twelve invite them to develop dioramas for temporary exhibitions. Schwarzer and Sutton build on visitors' interest in dioramas when they suggest that museums' websites should not only communicate about dioramas but that web users may share their expertise concerning dioramas. Moreover they recommend additional participatory opportunities for visitors such as tagging or commenting.¹⁵⁴

Technical Improvements

Schwarzer and Sutton suggest a variety of additional exhibition elements such as multimedia stations, interactive elements, additional labels, materials, sensory elements and relaxation spaces to improve dioramas.¹⁵⁵ As mentioned by Davidson, Heald and G. Hein, indicate great success with all visitors when “multi-sensory interpretive components” were added to an exhibition with dioramas in the Boston Museum of Science.¹⁵⁶ According to Beusing, in 1984 at the Jorvik Viking Centre in York, UK, dioramas on a 1:1 scale with acoustic effects and smell were installed while later new scenarios with more lifelike, even partially animated, figurines were developed.¹⁵⁷ Martha Marandino, Marianne Achiam and Adriano Dias de Oliveira also recommend adding enhancements such as soundtracks, interactive lighting and interactive text panels. Moreover they introduce Marianne Foss Mortensens' concept of immersive exhibits which they distinguish from dioramas.¹⁵⁸

149 Dunmall, *Storytelling and Performance in Diorama Galleries*, 2015, p. 244.

150 <http://www.deutsches-museum.de/blog/tags/märchen/> (accessed January 17, 2017).

151 Yale Peabody Museum of Natural History, *A Diorama Takes Shape*, 2016.

<http://peabody.yale.edu/exhibits/diorama-takes-shape> (accessed March 19, 2016).

152 The Academy of Natural History of Drexel University, *Secrets of the Diorama*, 2015.

<http://www.ansp.org/visit/exhibits/secrets-of-the-diorama/> (accessed November 6, 2015).

153 American Museum of Natural History, *Learn and Teach*, 2016.

<http://www.amnh.org/learn-teach/adults/adult-courses/the-art-of-diorama> (accessed March 19, 2016).

154 Schwarzer and Sutton, *The Diorama Dilemma*, 2009, p. 33.

155 *Ibid.*, pp. 32–33.

156 Davidson, Heald and G. E. Hein, *Increased Exhibit Accessibility through Multisensory Interaction*, 1999, p. 237.

157 Beusing, *Dioramen in der prähistorischen Archäologie*, 2016, p. 349.

158 Marandino, Achiam, and de Olivera, *The Diorama as a Means for Biodiversity Education*, 2015, p. 263.

Immersive Experiences

Mortensen expands on immersive exhibits which have taken the idea of the engaging experience provided by dioramas one step further. They are either concrete or virtual environments which invite visitors to become actors, interacting with the scenery and the exhibit's elements.¹⁵⁹ Despite the fact that museums increasingly aim for such immersive experiences, Kate Lunau voices her concern that museums might alienate their older visitors by striving to incorporate “high tech gadgetry” which inhibits the use of one's own imagination.¹⁶⁰ In addition Mortensen indicates that visitors of immersive environments react in three ways: with resonance, distance or rejection. According to her the latter two negative reactions can be observed with 30% to 40% of the visitors.¹⁶¹

From Concrete to Virtual Reality

The question of what really exists and what we imagine as reality is probably as old as humankind. The most basic idea of existing reality encompasses everything which can be physically experienced leaving imagined reality, as everything which is created in our minds. Humans are fascinated by plunging into imaginary scenarios.¹⁶² With the advent of the reform movement, museums, to meet their educational objectives, have utilized this longing for immersive experiences by implementing dioramas. Today, to meet visitors' expectations, museums offer immersive experiences in a variety of ways, one of them being augmented and virtual reality encounters. This paragraph will contrast the advantages and disadvantages of augmented and virtual reality to investigate how they can enhance or even substitute concrete dioramas. First of all examples of augmented and virtual reality experiences in museum contexts are presented. Then psychological, visitor-oriented and museum-related perspectives will be discussed.

In Berthold Schmitt's opinion augmented reality stands in the tradition of the peepshows of the 18th century. It is used in museums for presentations of art, enhancing objects, especially sensitive ones and the reconstruction of cultural heritage sites.¹⁶³ The Ayala Museum in the Philippines offers augmented reality guides with animations, sound effects and voice narration for their eighteen dioramas about Philippine history.¹⁶⁴ For all these encounters visitors need electronic devices with screens like smartphones or tablets with the required software. When the device is aimed onto the augmented objects it makes the content of the augmented reality appear on the display. Beusing observes a tremendous increase of digitalized reality in museums of archeology during the last 20 years. Virtual archeological 3D models get integrated into a photographed or filed environment, real people and objects can be placed into virtual models and these 3D visualizations can additionally be animated.¹⁶⁵

¹⁵⁹ Mortensen, *Designing Immersion Exhibits*, 2010, pp. 324 and 326.

¹⁶⁰ Lunau, *Get yer Fossils*, Folks, 2010.

<http://www.macleans.ca/culture/get-yer-fossils-folks-step-right-up/> (accessed October 24, 2015).

¹⁶¹ Ayala Museum, *Diorama Augmented Reality Guides*.

<http://www.ayalamuseum.org/2015/06/15/diorama-augmented-reality-guides/> (accessed March 19, 2016).

¹⁶² Lucas, *Illusion und Wirklichkeit*, 2017.

¹⁶³ Schmitt, *Was ist eigentlich... Augmented Reality?*, 2016.

¹⁶⁴ Ayala Museum, *Diorama Augmented Reality Guides*.

<http://www.ayalamuseum.org/2015/06/15/diorama-augmented-reality-guides/> (accessed March 19, 2016).

¹⁶⁵ Beusing, *Dioramen in der prähistorischen Archäologie*, 2016, pp. 359–360.

As stated by Schmitt, in contrast to augmented reality, virtual reality allows for total immersion into its realm. The depiction and perception are generated by the computer. Head-mounted displays and cyber-gloves are needed for this experience.¹⁶⁶ In 2009 the British Museum, in partnership with Samsung, opened the Samsung Discovery Center which offers augmented and virtual reality experiences, such as the virtual exploration of a 4,000 year old roundhouse with virtually placed objects.

Taking all these examples of augmented and virtual reality into consideration and keeping the concrete reality of dioramas in mind, the following questions arise with regard to the visitor-oriented aspects of all three realities: Firstly, whether all of them enhance the learning experiences of visitors, secondly, if all three are aimed towards creating immersion experiences and finally, whether the concrete three-dimensionality of dioramas conveys an intrinsic attractiveness.

All three realities demand physical and visual engagement, such as close observation, change of location and body posture. According to Margaret Wilson, embodied cognition describes a process of interacting with the surroundings as part of the meaning-making and learning process.¹⁶⁷ Therefore it can be inferred that all three reality encounters offer opportunities for engaged learning. However for the time being augmented reality is used mostly as an auxiliary device for enhancing cognitive or affective learning with real objects, heritage sites or even dioramas whereas virtual reality settings and dioramas are designed as stand-alone exhibits. As emphasized in most of the literature about dioramas, authors are convinced that these generate a convincing immersive experience because of concrete three-dimensionality. This thesis implies an inferior experience with virtual reality which is supported by Viatcheslav Wlassoff when he sums up the finding of experiments with rats in virtual and real environments. He states that the virtual environment activates 20% of space cells and the real environment activates 45%.¹⁶⁸ Space cells are neurons in the hippocampus which create cognitive maps. Eventually he concludes that “the brain creates more effective and comprehensive maps when it is fed with multi-sensory cues” which are generally not provided in virtual environments and that “the brain does not register stimuli accurately in the virtual environment.”¹⁶⁹ These experiments just give a glimpse of the brain's workings in virtual reality. Evidently more studies are needed for the comparison of the success of immersion experiences of dioramas and virtual reality settings.

Currently visitors still need to wear the required equipment for engaging with virtual reality, such as goggles and cyber-gloves, which limit free movement, spontaneity and social interaction. Danny Birchall and Mia Ridge observe that the coming generation of museum visitors will be used to wearable gadgets as their “intimate personal technology.”¹⁷⁰ In contrast as stated by Wonders, “in a diorama, the museum visitor can engage in a direct perception of the scene without the interference of technical devices that mediate and translate reality, predetermining the information that is communicated.”¹⁷¹ Similarly Parr, as early as the 1960s, indicates that stillness, as opposed to the stimulation of movies and TV, offers possibilities for learning because the individuals can pace their own intake.¹⁷² Yet from my personal observation I have detected that highly-acclaimed movies which are now 30 years old have become lengthy and boring. The pace of actions on screens, movies as well as video games, are continuously becoming faster and more complex. Thus two theses can be suggested: first

166 Schmitt, *Was ist eigentlich... Augmented Reality?*, 2016, p. 7.

167 Wilson, M., *Six Views of Embodied Cognition*, 2002, p. 625.

168 Wlassoff, *Brains aren't Fooled by Virtual Reality*, 2015.

<http://brainlogger.com/2015/02/24/brains-arent-fooled-by-virtual-reality/> (accessed January 19, 2016).

169 Ibid.

170 Birchall and Ridge, *Post-Web Technology*, 2014.

171 Wonders, *Habitat Dioramas*, 1993, p. 223.

172 Parr, *Mass Medium of Individualism*, 1961, p. 41.

of all, that eventually the brain adapts to these stimuli and secondly that the younger generation expects exactly these features in their surroundings. Beusing indicates that three-dimensional visualizations correspond to the lifestyle of the younger generation and offer astounding experiences.¹⁷³

Still, it is a common notion of museum professionals that concrete dioramas will continue to be exhibited in museums. Beusing insists that digital scenarios will not replace traditional dioramas in the foreseeable future: “The fascination of the tangible window into the past will continue to exist which is inherent to the elaborately created models and peepshows.”¹⁷⁴ One indicator for the validity of Beusing's statement is the fact that as mentioned above museum visitors are highly interested in the creation of dioramas and even building their own, as demonstrated by such programs as run by the American Museum of Natural History. Museums are even combining digital activities with tangible model-building experiences. The Vindonissa Museum in Aarau, Switzerland, invites visitors, especially families, to participate in the construction of a Lego-brick diorama of a Roman legionaries' barrack for the temporary exhibition called “Furius Constructor baut ein Legionslager”, paralleled by a digital participatory project for visitors to create an animated movie about it.¹⁷⁵ In 2014 the Deutsches Hygiene-Museum in cooperation with Cross-Media-Tour in Dresden invited teenagers to develop their own ideas for the lay-out of a city on Minecraft and then with the support of 3D printers converted their ideas into tangible models.¹⁷⁶

As suggested by Ross Parry and Andrew Sawyer information and communication technology will become an integral part of modern museums.¹⁷⁷ Despite the visitor-oriented potential, the digital technologies mentioned above pose several obstacles to implementing them, namely financial and ethical issues. Digital media compared to traditional means of display, such as dioramas, have a shorter lifespan and significantly higher maintenance costs. In addition to the financial strains “the remnants of past technologies,” as Birchall and Ridge¹⁷⁸ call them, cause embarrassment to museums since they strive to meet visitors' expectations of presenting state of the art technology. For example, visitors at the Deutsches Museums try desperately to swipe or enlarge images on old-fashioned computer screens. It can be suggested that the British Museum chose to partner with the company Samsung to cope with exactly these difficulties. Yet when museums forge joint ventures with private companies it might conflict with the museums' objective to be a forum for an unbiased public debate about controversial issues.

In concluding augmented and virtual reality hold a lot of potential yet it cannot be inferred that experiences with concrete three-dimensionality, namely dioramas, have become obsolete. There is strong evidence of their appeal from visitor studies and museum programs. Thus museums should aim for strategies to incorporate both concrete and virtual experiences sensibly into future exhibition designs.

173 Beusing, *Dioramen in der prähistorischen Archäologie*, 2016, p. 360.

174 *Ibid.*, p. 361.

175 https://www.ag.ch/de/bks/kultur/museen_schloesser/vindonissa_museum/ausstellungen/sonderausstellung/sonderausstellungen.jsp (accessed January 2, 2015).

176 <http://www.crossmediatour.de/rueckblick/minecraft/> (accessed March 19, 2016).

177 Parry and Sawyer, *Space and the Machine*, 2005, p. 48.

178 Birchell and Ridge, *Post-Web Technology*, 2014.

Conclusion

Museum dioramas have been called dusty relics of the past yet they are actually more like Cinderella, often hidden from sight in dusty corners of the exhibitions, waiting to reveal the unique emotional and physical experiences they can provide. Like movie theaters which also derived from the Daguerre-style dioramas over 100 years ago as a medium of immersive visual entertainment, dioramas are still relevant for museums in the 21st century despite the continuous introduction of more modern display technology. Museums have not only spruced up some of their Cinderellas but have also been enhancing their dioramas in a variety of ways and implementing new ones. Museums are using their dioramas as assets in two ways: as cultural heritage but more importantly as an emotionally appealing medium of display which provides learning and leisure experiences. Although few visitor studies exist, museum professionals know from their encounters with and observations of visitors that dioramas are intriguing for a variety of audiences. Their development and improvements are built upon the genuine characteristics of dioramas, their intrinsic emotional attractiveness and their narrative underpinning which lead to possibilities of immersive experiences.

Museums continue to implement and evaluate a variety of possibilities for the best use of dioramas. The story-telling character of dioramas increases the emotional appeal of their content. Even topics of technology and science, which are usually considered harder to comprehend, become more attractive. Thus this emotional attractiveness creates tremendous learning and leisure experiences for visitors. For museum experts to develop innovative exhibitions today, a more professional approach to implementing dioramas is urgently needed. They must be aware of the potential and limits of dioramas. When they choose to incorporate dioramas they should keep in mind the factors which support the strengths of dioramas including the chosen content, the positioning of the diorama and



Figure 19 An exciting moment in history - Lilienthal gliding down a hill. The diorama in the exhibition Historic Aviation contextualizes artifacts from the museum's collections (see also cover illustration).

effective contextualization. In terms of content, interesting or exiting moments in time are more attractive to visitors than uneventful processes, for example, Lilienthal gliding down a hill as opposed to scientists working in their laboratory.

Dioramas should be positioned prominently without interference from other displays, sensory experiences or narration loops which compete for visitors' attention. Most dioramas present content in a multi-faceted manner which provides museum professionals with a lot of possibilities for new contextualization. There are manifold ways of improving the experience with dioramas for visitors. Visitors respond with enthusiasm to programs which are offered revolving around real three-dimensional scenarios, such as interactive diorama tours, looks behind the scenes, building projects and enactor programs. These performative, hands-on, participatory and interactive programs lead to a positive museum experience for visitors.

All these novel interpretation strategies enhance the inherent possibilities of engaging experiences with dioramas but they are not the only solution for exhibiting contextualized information. Museums should be open-minded about the implementation of modern information communication technology, including the enrichment of dioramas with augmented or virtual realities or incorporating the concept of dioramas into new media. Especially for young people, digital reality is becoming an inherent part of their life whereas real experiences like model-building or the three-dimensionality of tangible objects is an exciting experience which is out of the ordinary. The unique selling point of museum dioramas today is that, unlike virtual reality, which can be installed at any location, their experience is confined to museums and is embedded in the overall museum experience. Nowadays society, underpinned by the idea of performativity and a strong sense of individualism, continuously seeks novel experiences. Museum dioramas with their timeless and unique artistic features are adaptive to these demands and will continue as beloved exhibits to engage a wide range of visitors in the future.



Figure 20 A timeless and unique diorama – “Ox on a treadmill,” a historical example of power machinery in the exhibition Power Engines.

Appendix

Bibliography

- Abercombe, Nicholas, and Brian J. Longhurst: *Audiences: A Sociological Theory of Performance and Imagination*. London, Thousand Oaks, New Delhi: Sage, 1998.
- Alberti, Samuel J.M.M.: Introduction. *The Dead Ark*. In: Samuel J.M.M. Alberti (ed.): *The Afterlives of Animals: A Museum Menagerie*. Charlottesville and London: University of Virginia Press, 2011.
- Albrecht, Uwe: *Dioramen in technischen Museen: Geschichte – Beispiele – Zukunft*. In: *Museum Aktuell* (Dezember 2006/Januar 2007), pp. 32–38.
- Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e.V. (ADM): *Richtlinie für die Befragung von Minderjährigen*. Frankfurt 1996 (rev. 2006). Available at http://bvm.org/fileadmin/pdf/Recht_Berufskodizes/Richtlinien/RL_2006_Minderjaehriger_D.pdf (accessed March 6, 2017).
- Ash, Doris: *How Families use Questions at Dioramas: Ideas for Exhibit Design*. In: *Curator* 47 (2004), no. 1, pp. 84–100.
- Beusing, Ruth: *Dioramen in der prähistorischen Archäologie*. In: Alexander Gall and Helmuth Trischler (eds.): *Szenarien und Illusion. Geschichte, Varianten und Potenziale von Museumsdioramen*. Göttingen: Wallstein, 2016, pp. 334–365.
- Birchell, Danny, and Mia Ridge: *Post-Web Technology: What Comes Next for Museums?* In: *The Guardian*, 3 Oct. 2014. Available at <http://www.theguardian.com/culture-professionals-network/culture-professionals-blog/2014/oct/03/post-web-technology-museums-virtual-reality> (accessed March 19, 2016).
- Bitgood, Stephen (ed.): *Social Design in Museums. The Psychology of Visitor Studies. Collected Essays, Vol. 2*. Edinburgh: MuseumsEtc, 2011.
- : *Dioramas in Exhibition Centers: a Selected Review and Analysis*. In: Stephen Bitgood (ed.): *Social Design in Museums. The Psychology of Visitor Studies. Collected Essays, Vol. 2*. Edinburgh: MuseumsEtc, 2011, pp. 176–198.
- : *Immersion Experiences in Museums*. In: Stephen Bitgood (ed.): *Social Design in Museums. The Psychology of Visitor Studies. Collected Essays, Vol. 2*. Edinburgh: MuseumsEtc, 2011, pp. 102–121.
- and Donald Patterson: *Principles of Exhibit Design*. In: Stephen Bitgood (ed.): *Social Design in Museums. The Psychology of Visitor Studies. Collected Essays, Vol. 2*. Edinburgh: MuseumsEtc, 2011, pp. 10–18.
- : *Attention and Value. Keys to Understanding Museum Visitors*. Walnut Creek (CA): Left Coast Press, 2013.
- Bogner, Gerhard: *Das große Krippen-Lexikon. Geschichte – Symbolik – Glaube*. Munich: Süddeutscher Verlag, 1981.
- Broelmann, Jobst: *Geschichten, Räume, Horizonte. Dioramen und verwandte Raumszenarien in der Schifffahrt*. In: Alexander Gall and Helmuth Trischler (eds.): *Szenarien und Illusion. Geschichte, Varianten und Potenziale von Museumsdioramen*. Göttingen: Wallstein, 2016, pp. 144–188.
- Burns, Ned J.: *The History of Dioramas*. In: *Museum News* 17 (15 Febr 1940), pp. 8–12.
- Butler, Barbara H.: *Nineteenth-Century Museums in the Twenty-First Century: Can They be Taken Seriously?* In: *Curator* 36 (1993), no. 1, pp. 9–12.
- Cotumaccio, Alix: *The Evolution of the Narrative at Natural History Dioramas*. In: Sue Dale Tunnicliffe and Annette Scheersoi (eds.): *Natural History Dioramas. History, Construction and Educational Role*. Dordrecht et al.: Springer, 2015, pp. 187–194.
- Davidson, Betty, Candace L. Heald, and George E. Hein: *Increased Exhibit Accessibility through Multisensory Interaction*. In: Eileen Hooper-Greenhill (ed.): *The Educational Role of the Museum*. New York: Routledge, 1999, pp. 223–238.
- Deutsches Museum (ed.): *Meisterwerke aus dem Deutschen Museum, Vol. IV*. Munich: Deutsches Museum, 2004.
- Dunmall, Keith: *Storytelling and Performance in Diorama Galleries*. In: Sue Dale Tunnicliffe and Annette Scheersoi (eds.): *Natural History Dioramas. History, Construction and Educational Role*. Dordrecht et al.: Springer, 2015, pp. 243–250.
- Falk, John H., and Lynn D. Dierking: *Learning from Museums. Visitor Experiences and the Making of Meaning*. Lanham (MD) et al.: Altamira Press, 2000.
- Flannery, Maura C.: *Looking into Dioramas*. In: *The American Biology Teacher* 60 (1998), no. 5, pp. 379–382.
- Fox, Cynthia: *Bioscience Technology: Virtual Reality vs. Real Life: How Brain Neurons Light Up*, 2015. Available at <http://www.biosciencetechnology.com/articles/2015/01/virtual-reality-vs-real-life-how-brain-neurons-light> (accessed January 19, 2016).
- Füßl, Wilhelm, and Helmuth Trischler (eds.): *Geschichte des Deutschen Museums. Akteure, Artefakte, Ausstellungen*. Munich et al.: Prestel, 2003.
- Füßl, Wilhelm, Oskar von Miller, 1855–1934. *Eine Biographie*. Munich: Beck, 2005.
- Füßl, Wilhelm, Matthias Röschner, and Andrea Lucas: *Wirklichkeit und Illusion. Dioramen im Deutschen Museum*. Munich: Deutsches Museum, 2017.

- Adam, Wolfgang et al.: Dioramen und Dioramenbau im Deutschen Museum. In: Wilhelm Füßl, Andrea Lucas, and Matthias Röschner: *Wirklichkeit und Illusion. Dioramen im Deutschen Museum*. Munich: Deutsches Museum, 2017, pp. 21–57.
- Gall, Alexander, and Helmut Trischler (eds.): *Szenarien und Illusion. Geschichte, Varianten und Potenziale von Museumsdioramen*. Göttingen: Wallstein, 2016.
- Gall, Alexander: *Auf dem langen Weg ins Museum. Dioramen als kommerzielle Spektakel und Medien der Wissensvermittlung im langen 19. Jahrhundert*. In: Alexander Gall and Helmut Trischler (eds.): *Szenarien und Illusion. Geschichte, Varianten und Potenziale von Museumsdioramen*. Göttingen: Wallstein, 2016, pp. 27–106.
- Graf, Bernhard, and Heiner Treinen: *Besucher im Technischen Museum. Zum Besucherverhalten im Deutschen Museum*. Berlin: Gebr. Mann, 1983.
- Hein, George E.: *Learning in the Museum*. London: Routledge, 1998.
- Hein, Hilde S.: *The Museum in Transition. A Philosophical Perspective*. Washington and London: Smithsonian Institution, 2000.
- Holert, Tom: *Das Unausstellbare en miniature. Modellbau, Museografie und der Holocaust*. In: Alexander Gall and Helmut Trischler (eds.): *Szenarien und Illusion. Geschichte, Varianten und Potentiale von Museumsdioramen*. Göttingen: Wallstein, 2016, pp. 428–448.
- Hutterer, Rainer: *Die Dioramen im Museum Koenig in Bonn: Geschichte und aktueller Stand*. In: *Kaupia. Darmstädter Beiträge zur Naturgeschichte*, no. 19, 2014, pp. 37–53.
- Insley, Jane: *Little Landscapes: Dioramas in Museum Displays*. In: *Endeavour* 32 (2008), no. 1, pp. 27–31.
- Kamcke, Claudia: *Die Braunschweiger Dioramen*. In: *Kaupia. Darmstädter Beiträge zur Naturgeschichte*, no. 19, 2014, pp. 67–83.
- Kaplan, Stephen, and Rachel Kaplan: *Cognition and Environment*. New York: Praeger, 1982.
- King, Margaret J.: *The Theme Park Experience. What Museums Can Learn from Mickey Mouse*. In: *The Futurist* 25 (1991), no. 6, pp. 24–31.
- Korenica, Mary S.: *Some Visitor Behavior Trends of Diorama Use in one Gallery at the Milwaukee Public Museum*. Paper presented at the Visitor Studies Conference, St. Paul (MN), 1995.
- Krückenmeyer, Barbara: *Von Tatsachen und Illusionen. Zur Geschichte des Dioramenbaus im Deutschen Museum*. In: Alexander Gall and Helmut Trischler (eds.): *Szenarien und Illusion. Geschichte, Varianten und Potenziale von Museumsdioramen*. Göttingen: Wallstein, 2016, pp. 109–143.
- Kutner, Max: *Museum Dioramas Are as Endangered as the Animals They Contain*. In: *Newsweek*, 8 Febr. 2015. Available at <http://www.newsweek.com/2015/08/14/museum-dioramas-endangered-american-museums-358943.html> (accessed November 6, 2015).
- Lane, Carla: *"Gardner's Multiple Intelligences". The Distance Learning Technology Resource Guide*. Available at <http://www.tecweb.org/styles/gardner.html> (accessed December 12, 2015).
- Lucas, Andrea: *Illusion und Wirklichkeit. Zur Geschichte der Dioramen im Deutschen Museum*. In: Wilhelm Füßl, Matthias Röschner, and Andrea Lucas: *Wirklichkeit und Illusion. Dioramen im Deutschen Museum*. Munich: Deutsches Museum, 2017, pp. 12–20.
- Lüps, Petzer, and Martin Troxler: *Von der Alpendohle bis zum Flusspferd: die Geschichte der Berner Dioramen*. In: *Kaupia. Darmstädter Beiträge zur Naturgeschichte*, no. 19, 2014, pp. 89–100.
- Lunau, Kate: *Get yer Fossils, Folks. Step Right up. Gone are the Dioramas – Today's Museum is a High-Tech, Interactive Carnival of Delights*, 2010. Available at <http://www.macleans.ca/culture/get-yer-fossils-folks-step-right-up/> (accessed October 24, 2015).
- Marandino, Martha, Marianne Achiam, and Adriano Dias de Olivera: *The Diorama as a Means for Biodiversity Education*. In: Sue Dale Tunnicliffe and Annette Scheersoi (eds.): *Natural History Dioramas. History, Construction and Educational Role*. Dordrecht et al.: Springer, 2015, pp. 251–266.
- Meyer, Karl O.: *Dioramen – aber wie?* In: *Museumskunde*, Vol. 47 (1982), no. 2, pp. 83–94.
- . *Szenarien der Illusion: Panoramen und Dioramen*. In: *Museum Aktuell* (1999), no. 49, pp. 1903–1909.
- Mitchell, Mathew: *Situational Interest: Its Multifaceted Structure in the Secondary School Mathematics Classroom*. In: *Journal of Educational Psychology* 85 (1993), no. 3, pp. 424–436.
- Mortensen, Marianne F.: *Designing Immersion Exhibits as Border-Crossing Environments*. In: *Museum Management and Curatorship* 25 (2010), no. 3, pp. 323–336.
- Neubauer, Katrin, and Doris Lewalter: *Zwischenbericht zu den Beobachtungsdaten des Prototyps der Ausstellung "Chemie im Sport" im Zentrum für Neue Technologien des Deutschen Museums München*. Munich: Deutsches Museum, 2011.
- . *Abschlussbericht zur Evaluation des Prototyps der Ausstellung "Chemie in Freizeit und Sport" im Zentrum für Neue Technologien des Deutschen Museums München*. Munich: Deutsches Museum, 2012.
- Ogden, Jacqueline J., Donald G. Lindburgh, and Terry L. Maple: *The Effects on Ecologically Relevant Sounds on Zoo Visitors*. In: *Curator* 36 (1993), no. 2, pp. 147–156.

- Osborne, Jonathan F.: Beyond Constructivism. In: *Science Education* 80 (1996), no. 1, pp. 53–82.
- Parr, Albert E.: Mass Medium of Individualism. In: *Curator* 4 (1961), no. 1, pp. 39–48.
- : Habitat Group and Period Room. In: *Curator* 6 (1963), no. 4, pp. 325–336.
- : Mood and Message. In: *Curator* 6 (1963), no. 3, pp. 204–216.
- Parry, Ross, and Andrew Sawyer: Space and the Machine: Adaptive Museums, Pervasive Technology and the New Gallery Environment. In: Suzanne MacLeod (ed.): *Reshaping the Museum Space*. London and New York: Routledge, 2005, pp. 39–52.
- Pearce, Susan M.: Museum Objects. In: Sandra H. Dudley (ed.): *Museum Objects. Experiencing the Properties of Things*. London and New York: Routledge, 2012, pp. 23–25.
- Peart, Bob: Impact of Exhibit Type on Knowledge Gain, Attitudes, and Behavior. In: *Curator* 27 (1984), no. 3, pp. 220–237.
- Peers, Barry: Improving the Motivational Owner of Dioramas. Ottawa, Ontario: Canadian Museum of Nature. Unpublished manuscript 1991.
- Quinn, Stephen C.: The World behind Glass: Museum Dioramas Create such a Compelling "Virtual Reality" that Visitors can Forget the Artifice and Engage with Nature itself. In: *Natural History* (April 2006), Vol. 115, no. 3, p. 48.
- Reiss, Michael J., and Sue Dale Tunnicliffe: Dioramas as Depictions of Reality and Opportunities for Learning in Biology. In: *Curator* 54 (2011), no. 4, pp. 447–459.
- Scheersoi, Annette: Warum Dioramen aus didaktischer Perspektive so wichtig sind. In: *Kaupia. Darmstädter Beiträge zur Naturgeschichte*, no. 19, 2014, pp. 121–126.
- : Catching the Visitor's Interest. In: Sue Dale Tunnicliffe and Annette Scheersoi (eds.): *Natural History Dioramas. History, Construction and Educational Role*. Dordrecht et al.: Springer, 2015, pp. 145–160.
- Schmitt, Berthold: Was ist eigentlich ... Augmented Reality? Eine hilfreiche Technologie mit Tradition und hohen Ansprüchen. In: *Kulturbetrieb* 1 (2016), no. 2, pp. 6–7. Available at http://www.kulturbetriebmagazin.de/fileadmin/user_upload/kulturbetrieb/KulturBetrieb-Ausgabe-eins-Februar-2016.pdf (accessed March 19, 2016).
- Schwarzer, Marjorie, and Mary Jo Sutton: The Diorama Dilemma: A Literature Review and Analysis. Final Draft 2009, 2010. Available at http://museumca.org/files/gallery-documentation/Diorama-Lit-Review_Schwarzer_Sutton.pdf (accessed March 18, 2016).
- Smith, Jesse: DIORAMA-O-RAMA. On the Trend of Making you Realize that, oh, hey! Dioramas are Fake!, 2010. Available at <http://thesmartset.com/article01281001/> (accessed November 6, 2015).
- Teichmann, Jürgen, Annette Noschka-Roos, and Traudel Weber: Das Museum als öffentlicher Raum: Wirkungsdimensionen zwischen Anspruch und Wirklichkeit. In: Wilhelm Fößl and Helmuth Trischler (eds.): *Geschichte des Deutschen Museums. Akteure, Artefakte, Ausstellungen*. Munich et al.: Prestel, 2003, pp. 363–395.
- Tinworth, Kate: Relic of the Past + People of the Past = Innovations for the Future: Denver Museum of Nature & Science Enactor Program. In: Sue Dale Tunnicliffe and Annette Scheersoi (eds.): *Natural History Dioramas. History, Construction and Educational Role*. Dordrecht et al.: Springer, 2015, pp. 227–242.
- Tratz, Eduard P.: Zur Frage der Anwendung von Dioramen in naturwissenschaftlichen Museen. In: *Museumskunde* 37 (1968), no. 1, pp. 5–12.
- Tunnicliffe, Sue Dale, and Annette Scheersoi (eds.): *Natural History Dioramas. History, Construction and Educational Role*. Dordrecht et al.: Springer, 2015.
- Tunnicliffe, Sue Dale, and Annette Scheersoi: Dioramas as Important Tools in Biological Education. In: Sue Dale Tunnicliffe and Annette Scheersoi (eds.): *Natural History Dioramas. History, Construction and Educational Role*. Dordrecht et al.: Springer, 2015, pp. 133–144.
- Verwiebe, Birgit: Lichtspiele. Vom Mondscheintransparent zum Diorama. Stuttgart: Füsslin, 1997.
- Weil, Stephen E.: *A Cabinet of Curiosities. Inquiries into Museums and Their Prospects*. Washington and London: Smithsonian Institution, 1995.
- Wilson, Leslie Owen: Three Domains of Learning – Cognitive, Affective, Psychomotor. Available at <http://thesecondprinciple.com/instructional-design/threedomainsoflearning/> (accessed February 25, 2016).
- Wilson, Margaret: Six views of embodied cognition. In: *Psychonomic Bulletin & Review* 9 (2002), no. 4, pp. 625–636.
- Windau, Gerda: Historische Dioramen und aktuelle Vermittlungsmethoden im LWL-Museum für Naturkunde in Münster. In: *Kaupia. Darmstädter Beiträge zur Naturgeschichte*, no. 19, 2014, pp. 113–120.
- Wlassoff, Viatcheslav: Brains aren't Fooled by Virtual Reality, 2015. Available at <http://brainblogger.com/2015/02/24/brains-arent-fooled-by-virtual-reality/> (accessed January 19, 2016).
- Wonders, Karen: Habitat Dioramas as Ecological Theatre. In: *European Review* 1 (1993), no. 3, pp. 285–300.
- : *Habitat Dioramas. Illusions of Wilderness in Museums of Natural History*. Philadelphia: Coronet Books, 1993.
- : The Habitat Diorama Phenomenon. In: Alexander Gall and Helmuth Trischler (eds.): *Szenarien und Illusion. Geschichte, Varianten und Potenziale von Museumsdioramen*. Göttingen: Wallstein, 2016, pp. 286–318.

Source of Figures

All figures with the indication:

DMA, BN = Deutsches Museum Archiv, Bildnummer

DMA, CD = Deutsches Museum Archiv, CD-Nummer

© Fotoatelier and Bildarchiv, Deutsches Museum

- Figure 1** "Apollo 15: Landung auf dem Mond, 1971", DMA, BN 23132
- Figure 2** "Römische Töpferwerkstatt, 1. bis 4. Jahrhundert", DMA, BN 37514
- Figure 3** "Historische Werkzeugmaschinen", © Fotoatelier, Deutsches Museum
- Figure 4** Scenario in Animal Kingdom, Disney World, © Vera Ludwig, Deutsches Museum
- Figure 5** "Drachen-Diorama, um 1980", DMA, BN 22435
- Figure 6** "Tatort", © Franz Huber, Deutsches Museum
- Figure 7** "Prüfstand VII der Heeresversuchsanstalt Peenemünde, um 1943", DMA, BN 30874
- Figure 8** "Labor zur Zeit Galileis", DMA, BN 14092c
- Figure 9** Atmosphere in the Walk-Through Mine, © Silvi Buchenberg
- Figure 10** "Der Weg des Stroms vom Erzeuger zum Verbraucher", DMA, BN 23505
- Figure 11** Moving of the diorama "Müngstner Brücke", © Tobias Pollinger, Deutsches Museum
- Figure 12** Salt-Mine in the 18th Century, © Silvi Buchenberg
- Figure 13** Enactor program with dioramas, © Vera Ludwig, Deutsches Museum
- Figure 14** Montgolfiere-Diorama, created by a child, © Vera Ludwig, Deutsches Museum
- Figure 15** Videoscreen close to a diorama, © Vera Ludwig, Deutsches Museum
- Figure 16** Nativity scene, created by a child, © Vera Ludwig, Deutsches Museum
- Figure 17** "Großkokerei, um 1950", DMA, CD 74109
- Figure 18** "Stadt der Zukunft", created by children, © Vera Ludwig, Deutsches Museum
- Figure 19** "Gleitflug von Otto Lilienthal, um 1896", DMA, BN 23511
- Figure 20** "Ochsentrettscheibe, um 1600", DMA, BN 40255

Interviews with Museum Professionals at the Deutsches Museum

Introduction to the Interviews with Museum Professionals

The Interview

As part of my master dissertation I conducted semi-structured interviews with eight museum professionals at the Deutsches Museum. After acquainting the interviewees with the main questions of my study I explained the structure of the interview. The first two questions were about dioramas in general. The following seven inquired about dioramas at the Deutsches Museum and the interviewees' professional involvement with regard to these exhibits. In concluding I informed the interviewees about their right of confidentiality and the requirement to give me their consent for publishing.

The Questions

- 1 What is a diorama in your opinion?**
Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering the question.
 - 1.1 Are there variations to this form?
- 2 Is a categorization or definition necessary, perhaps for communication purposes?**
- 3 Are museum dioramas valuable?**
 - 3.1 If yes, in which way, why and to whom?
 - 3.2 If no, why?
- 4 Do you think visitors like dioramas?**
 - 4.1 What makes you think that?
- 5 What is the purpose of museum dioramas?**
 - 5.1 What are their general objectives?
- 6 What do you in your profession contribute to meet these objectives?**
- 7 Do you have a way of telling if they are met?**
- 8 How do you envision the future of museum dioramas?**
- 9 If you think museum dioramas are still relevant is there anything you in your role want to do to keep them relevant?**

Interviews with Museum Professionals at the Deutsches Museum

Einführung in die Interviews mit Museumsfachleuten

Das Interview

Als Teil meiner Masterarbeit führte ich teilstrukturierte Interviews mit acht Museumsfachleuten am Deutschen Museum durch. Nach einer kurzen Einführung in die Fragestellung meiner Masterarbeit erklärte ich den Interviewaufbau. Die ersten zwei Fragen befassten sich mit Dioramen im Allgemeinen, die weiteren sieben mit Dioramen in Bezug auf das Deutsche Museum und die Tätigkeit des/der Interviewten. Abschließend wurden die Interviewten auf die vertrauliche Behandlung der Daten und die Notwendigkeit einer Einverständniserklärung zur Nutzung dieser für die Veröffentlichung der Masterarbeit hingewiesen.

Die Fragen

- 1 Was meinen Sie, ist ein Diorama?**
Es geht um Ihre persönliche Meinung und Einschätzung. Die Beantwortung dieser Frage sollte in Form eines Brainstormings erfolgen.
 - 1.1 Gibt es Ihrer Meinung nach Varianten?
- 2 Ist eine Kategorisierung, eine Definition notwendig, für Kommunikationszwecke vielleicht?**
- 3 Sind Museumsdioramen wertvoll?**
 - 3.1 Wenn ja, in welcher Weise, warum und für wen?
 - 3.2 Wenn nicht, warum?
- 4 Meinen Sie, dass Besucher Dioramen mögen?**
 - 4.1 Was überzeugt Sie, das zu denken?
- 5 Was ist der Zweck von Museumsdioramen?**
 - 5.1 .Welche übergeordneten Ziele haben Dioramen?
- 6 In welcher Weise können Sie mit Ihrem fachlichen Hintergrund und in Ihrer Position im Deutschen Museum dazu beitragen, diese Ziele zu erreichen?**
- 7 Haben Sie Möglichkeiten, zu erkennen, ob diese Ziele erreicht wurden?**
- 8 Wie sehen Sie die Zukunft der Museumsdioramen?**
- 9 Wenn Sie von der Relevanz von Museumsdioramen überzeugt sind, gibt es etwas, das Sie mit Ihrem fachlichen Hintergrund und in Ihrer Position tun möchten, um dies weiterhin zu gewährleisten?**

Summarized Interviews with Museum Professionals at the Deutsches Museum

Summarized Interview with Franz Huber

23/11/15

Profession: Model-builder

Place of work: Model-builders' workshop

Position: Supervisor of the workshop

Work experience at the Deutsches Museum: 30 years

1 What is a diorama in your opinion?

Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering this question.

At the Deutsches Museum a diorama is an enclosed showcase with one to up to four windows.

Lately interactivity is incorporated into dioramas.

The diorama delivers a storyline and a plot.

The scale determines if the story comes across well:

- A large scale works better for telling a story.
- Scale 1:1 seems to be the best, because it is closer to reality and to the real body language.

The artistic and technical quality of how it is designed and constructed is important.

Generally speaking a diorama is:

- a visually enclosed room.
- also an open space if there is nothing disturbing for the eye.
- The illusion of depth of a given space is important.
- A calotte¹ is optional.
- No restriction of scale is necessary.
- Like on a theatre stage a restricted vision is important.

1.1 Are there variations to this form?

Scenes on scale 1:1, with a clearly defined space, are more of a staged scenario than a diorama.²

Even the scene of immigrants on a lower deck³ is such a staged scenario, which is built on a scale of 1:1, as an enclosed room with a restricted view.

2 Is a categorization or definition necessary, perhaps for communication purposes?

During the developmental and building stage the definition must be identical. It must be agreed upon because an internal understanding for working together is necessary.

For academic purposes it is interesting to leave the definition in the open.

¹ A calotte is a concavity in the form of a niche, serving to reduce the apparent height of an alcove.

² They are referred to as "Inszenierung" by museum professionals of the Deutsches Museum.

³ Scale 1:1 scenario "Im Zwischendeck eines Auswanderer-Segelschiffs, um 1870", built in 1958, in the exhibition on marine navigation.

3 Are museum dioramas valuable?

The value of dioramas is defined by the shown artistry of the involved craftspeople and artists.

The art is to make a diorama appear lifelike.

For the latest project "Crime Scene"⁴ it is difficult to accomplish this feat because it is without figurines.

The heyday of dioramas was in the 1990s. These dioramas show dynamic development, skillfulness and confidentiality in the making.

The old dioramas, in general, convey confidence and experience in building dioramas and the smooth working together of the workshops. Therefore the old dioramas as opposed to the new ones have a higher artistic value.

One example is the "Puddelhütte"⁵. Concerning its context and artistic execution it is successful and beautiful.

The 1980s were the lowest point in building activities.

In order to continue with the quality of the 1990s the following components are needed:

– united engagement and the mutual agreement on the execution of the project which in turn leads to the creation of one three-dimensional picture.

Currently these components do not go together. Thus the workshops cannot match the artistry of former times.

3.1 If yes, in which way, why and to whom?

3.2 If no, why?

Yes, dioramas are valuable as means of display.

If they become outdated, they can be kept through technical changes such as:

- keeping the core of it.
- adding multimedia features.
- changing the location of the window.

The Deutsches Museum recognizes their value. There are examples of outdated dioramas, which were kept on display through sensitive technical adjustments to new demands. Examples are "DEMAG"⁶ and "Würzburger Lende"⁷. The overall impression was preserved and changes were handled sensitively.

4 Do you think visitors like dioramas?

4.1 What makes you think that?

Yes, visitors like dioramas.

The reasons being:

- easy to comprehend, without reading the labels.
- emotionally engaging.
- allow for self-determined engagement.
- present attractive scenes.

⁴ "Tatort" ("Crime Scene"), on a scale of 1:5, built in 2015, for the exhibition on chemistry.

⁵ The full title is "Puddelhütte, um 1840", on a scale of 1:10, built in 1953, depicts an early technology of manufacturing steel.

⁶ Formally called "Siemens-Martin- und Elektrostahlwerk", on a scale of 1:20, a model, which was converted into a diorama in 1994.

⁷ Formally called "Mainkran Würzburg, um 1840", built in 1962, depicts a part of the Würzburg harbor along the river Main.

5 What is the purpose of museum dioramas?

5.1 What are their general objectives?

Dioramas are utilized for museum learning:

- Content and information gets delivered.
- Initiate questions concerning the corresponding information on labels and the objects.
- as a point of entry to the topic.

Dioramas are exhibited as means of display in their own right, because the museum aims for a high standard of quality.

The emphasis is on effect and illusion, which aims to leave a long-lasting impression on visitors while technical perfection is not that important.

6 What do you in your profession contribute to meet these objectives?

The contribution encompasses the process of developing the diorama as well as the entire exhibition.

Concerning the development of the diorama it must be pointed out:

- Excellent communication and collaboration with all other contributing professionals such as workshops, curators and exhibition designers
- Build a mock-up for communication purposes
- Develop an interesting scene while keeping scale and view points in mind
- Rallying the production team to create the diorama as one unit, as if it had been built by one person
- Implement electronic media if it adds value

Concerning the implementation of the diorama in the exhibition:

- Having an impact on the exhibition design with regard to the diorama by considering the surroundings and the whole exhibition design

7 Do you have a way of telling if they are met?

Whether the objectives are met can only be determined by the contributing professionals not any outsiders.

Visitors can only appreciate the high standard of quality in comparison to other dioramas.

8 How do you envision the future of museum dioramas?

The management of the production process will be improved.

Curators and exhibition designers will support the building of dioramas through:

- providing the contextual and spacial framework.
- Sensible choices of topics will be made because some topics work well for being presented in dioramas e.g. health

The coordination between the workshops will be improved by merging them.

There will be one designated project manager for building a diorama, like professor Günter Voglsamer⁸ was in the old days.

There is going to be only one diorama project at a given time.

The workshops must not get lost in the details but focus on what is visible, what is important for the presentation.

All these improvements will lead to increased creativity and dynamics and lower production time.

9 If you think museum dioramas are still relevant, is there anything you in your role want to do to keep them relevant?

The workshop must maintain the high quality of the product in a short production time.

The production of the diorama must be coordinated well in the workshop.

Summarized Interview with Frank Dittmann

7/12/15

Profession: Engineer for electrotechnology and historian for the history of technology

Place of work: Exhibitions and collections department

Position: Senior curator for exhibitions on high voltage, technology of automation, oil and gas

Work experience at the Deutsches Museum: 11 years

Work experience at museums: About 20 years

1 What is a diorama in your opinion?

Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering this question.

- It is an amazing small world in which a lot can be discovered.
- Dioramas invite to be explored, especially with kids.

1.1 Are there variations to this form?

There are variations within the range of miniature dioramas containing more or less detail such as the "Path of Electricity"⁹, which depicts a landscape with plenty of detail, and "Drilling holes"¹⁰, which contains condensed detail.

In terms of being fascinated by them they are all the same.

⁸ Günter Voglsamer (1918–2004) was an artist, who painted highly accomplished backdrops of various dioramas at the Deutsches Museum.

⁹ "Der Weg des Stroms vom Erzeuger zum Verbraucher", on a scale of 1:20, built in 1953.

¹⁰ "Geschützbohrmaschine der königlichen Stückgießerei, Berlin 1774", on a scale of 1:10, built in 1954.

2 Is a categorization or definition necessary, perhaps for communication purposes?

A definition is needed for internal academic purposes, namely the two publications about dioramas by the Deutsches Museum.

This definition is based upon construction related details:

- No restriction of scale
- Restricted vision
- Restriction of movement for viewers
- Illusion of depth and space

Visitors do not need a definition, e.g. the "Ochsentretrad"¹¹ is fascinating no matter what.

Dioramas are scaled down if the extension of the context requires it.

Scale 1:1 scenarios with no windows for restricted view and hardly a background painting and walk-through scenarios are not dioramas.

Classical dioramas cannot be walked through, because the vision and movement of the viewer need to be directed in order to create an illusion of perspective and depth.

3 Are museum dioramas valuable?

3.1 If yes, in which way, why and to whom?

3.2 If no, why?

Yes, the value of dioramas will increase. In contrast the value of multi-media stations might not increase.

Dioramas are historical artifacts, not necessarily works of art. In other words they are part of our tangible cultural heritage:

- A unique characteristic of any museum is collecting original or authentic objects including dioramas, which justifies the museum's survival and relevance.¹²
- In a world where everything could be virtual and therefore manipulative, insemination of information through materiality is a unique characteristic of the museum.
- Visitors sense a haptic feedback between objects and dioramas. Both represent material culture.
- Dioramas as results of human labor need to be handled responsibly.

If the term "work of art" helps to better protect the diorama the interviewee would declare it as such.

4 Do you think visitors like dioramas?

4.1 What makes you think that?

People like dioramas such as nativity scenes. They even like to look at other variations like dollhouses.

5 What is the purpose of museum dioramas?

Their purpose is to inseminate knowledge.

Dioramas are suitable means for conveying historical contexts, technical, theoretical and even abstract concepts.¹³

Dioramas attract visitors and hold their attention by evoking irritation or interest.

¹¹ Formally called "Ochsentretscheibe, um 1600", on a scale of 1:8, first built in 1955 and refurbished in 1985.

¹² Frank Dittmann defines authenticity as socially constructed and debatable but nevertheless important.

¹³ F.D. gives an example for conveying abstract concepts. An interactive miniature model in the exhibition on renewable energy invites visitors to find the best location for wind mills and solar panels.

5.1 What are their general objectives?

At a time, when visitors have access to an abundance of information, museums should provide guidance concerning the available information.

Models, objects and dioramas are appropriate means for providing an overview and guidance concerning the acquisition of the most relevant pieces of information.

The diorama "Path of Electricity" is probably going to be used in the new exhibition for presenting the historical context of the diorama and for giving information about the general concept of distributing electricity.

6 What do you in your profession contribute to meet these objectives?

Curators should develop an awareness in which cases it is appropriate to use dioramas:

- Contextualization of an object
- Explanation of certain technologies and their usage

Curators should have a strong impact on the exhibition design.

Curators should conceptualize and promote new dioramas in sensible and innovative ways like paper theatres, which are inexpensive eye catchers.

Curators refrain more and more from using multi-media devices because they become outdated quickly and are costly in comparison to dioramas, even ones like "Path of Electricity".

7 Do you have a way of telling if they are met?

Visitor research is an option. But it can be misleading because the location of the exhibit is crucial. According to the interviewee's personal observations visitors interact with models and dioramas.

8 How do you envision the future of museum dioramas?

There will be a continuous use of dioramas in the future. The reasons being:

- Tradition
- Available resources
- Agreement among curators, who are in a position to promote dioramas

The interviewee has innovative ideas concerning content for the future:

- Presentation of abstract or virtual concepts such as the internet or the worldwide web

The interviewee will implement them, as long as dioramas are such unusual sights for visitors.

Dioramas might be exchanged by virtual reality in the future, but not soon.

9 If you think museum dioramas are still relevant, is there anything you in your role want to do to keep them relevant?

Curators should make sure that new ones are being built. But building one to two dioramas per year will reach the maximum capacity.

Curators should be open-minded and suggest new variations such as a scale 1:1 diorama in the exhibition on chemistry and the "Crime Scene" in the same exhibition.

Museum scholars at the Deutsches Museum are about to publish a catalogue about dioramas like the "Gemäldeband"¹⁴ which will increase public awareness and the interest in dioramas.

The Deutsches Museum is in the process of establishing an internet-portal called "Deutsches Museum Digital". Curators could present interesting objects including dioramas on this database. Thus this portal will increase public awareness as well.

Summarized Interview with Jörg Feder

19/12/15

Profession: Museum explainer

Place of work: Exhibition of the model train diorama

Position: Explainer and technician for the model train diorama

Work experience at the Deutsches Museum: About 10 years

1 What is a diorama in your opinion?

Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering this question.

A diorama is a comprehensible, scaled down presentation of models such as model trains with or without movement and mostly with a background.

There could be a hole in the background for the appearance of a train from the staging yard.

1.1 Are there variations to this form?

Model train dioramas include movement, the technicalities of train logistics and a staging yard. They are usually not as deep as regular dioramas, perhaps just 2m x 0,80m.

Topics of dioramas are natural sciences or technology for example dioramas about bridge building such as the railway bridge in Rensburg.¹⁵

The museum for model trains in Utrecht¹⁶ exhibits a variation with cutaway models. It contains a lot of authentic detail.

¹⁴ Eva A. Mayring (ed.): Bilder der Technik, Industrie und Wissenschaft. München: Deutsches Museum, 2008. It is a catalogue which reveals the vast collection of paintings at the Deutsches Museum.

¹⁵ Jörg Feder refers to a model of the "Rensburger Hochbrücke" from the exhibition on bridge building at the Deutsches Museum.

¹⁶ Het Spoorwegmuseum in Utrecht, Netherlands.

2 Is a categorization or definition necessary, perhaps for communication purposes?

A clear definition makes definitely sense for production purposes.

Considering model train dioramas the random use of segment and module causes confusion.

Yet a definition for segments and modules does exist.

3 Are museum dioramas valuable?

3.1 If yes, in which way, why and to whom?

3.2 If no, why?

Yes, they are very valuable and a specialty of the Deutsches Museum.

Dioramas should be appreciated because of the work which went into them: research, development and implementation.

They are financially valuable because their production is labor- and time-consuming.

They show artistry of different crafts, therefore they have artistic value.

They are valuable as didactic means:

- They touch emotionally.
- Immersion into the scenery makes taking in information easier.
- Taking in information visually is easier than listening.

They are valuable as means of display since they illustrate historical, socio-historical context, work processes and machinery in its environment.

4 Do you think visitors like dioramas?

4.1 What makes you think that?

It is very likely that visitors like dioramas.¹⁷

They participate in diorama tours and tours to the workshops, which increase their appreciation.

The personal observations of visitors at the model train diorama are the following:

- Engaged conversations
- Visitors relate to them and are fascinated by them because they create models themselves e.g. model trains.
- Enthusiasm
- Repeated visits

Visitors permanently compare the model train diorama at the Deutsches Museum to the Miniaturwelt, Hamburg, which the visitors find highly attractive and entertaining.

The interviewee, as a visitor himself, is emotionally touched by dioramas and impressed by the craftsmanship of the professional execution of dioramas at the Deutsches Museum and the museum for model trains in Utrecht.

¹⁷ It is interesting to note that J. F., who keeps in close touch with visitors on a daily basis, is more cautious than the other interviewees about interpreting the visitors' sentiments.

5 What is the purpose of museum dioramas?

Model train dioramas present technical and historical information such as interaction of the movable parts, cybernetic information, transportation of passengers and goods, logistics of transportation, correlation of means of transportation and traffic as well as historical aspects of train transportation.

5.1 What are their general objectives?

They are means for the insemination of technical as well as historical information, even theoretical background information.¹⁸

An aesthetically appealing scenario is aimed for.

Model train dioramas offer opportunities for recreation and undemanding entertainment.

6 What do you in your profession contribute to meet these objectives?

The explainers must engage in vivid explaining and presentation techniques.

The set up of the diorama allows for museum learning and even formal learning:

- The explainer can do presentations in a very comprehensible way by moving the trains while giving information simultaneously.
- The movements can simulate real situations in train traffic.

7 Do you have a way of telling if they are met?

It can be sensed from the feedback from visitors whether they like it or not.

Groups of students rushing through probably do not appreciate the model trains much.

Conversations especially with interested foreigners reveal their appreciation.

8 How do you envision the future of museum dioramas?

They will continue to be very important.

Dioramas are one available means to draw visitors' attention away from such distractions as their own smart phones.

Dioramas are terrific means for inseminating knowledge.

They are of indisputable importance as a visual means of display.

¹⁸ J.F. points out the contrast to Miniaturwelt Hamburg where entertainment and "action" are the main objectives.

9 If you think museum dioramas are still relevant, is there anything you in your role want to do to keep them relevant?

The interviewee wants to instill in visitors the idea that model train building is:

- an entertaining activity.
- a worthwhile leisure and learning activity especially for children.
- good for learning about other cultures.
- apt for socializing.
- excellent for learning social skills.
- highly participatory.

The interviewee wants to compete successfully with the Miniaturwelt in Hamburg.

He will collaborate with curators in the development and planning process of a new model train diorama for the Deutsches Museum.

He will propagate the historic and current relevance of trains in our society through the model train diorama.

Summarized Interview with André Judä

21/12/15

Profession: Exhibition designer

Place of work: Department of exhibition development

Position: Senior exhibition designer

Work experience at the Deutsches Museum: 14 years

1 What is a diorama in your opinion?

Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering this question.

A diorama is a copy of a scenario in a scaled down version.

Usually a diorama is situated behind a window, because it is important to restrict the viewer's vision onto the scenery.

The interviewee is unsure if the definition encompasses scale 1:1.

It is important that dioramas are built with a background, which creates perspective, aerial perspective and depth.

Dioramas cause the illusion of reality.

1.1 Are there variations to this form?

Variations are dioramas which include movement or the change of day and night.

Variations are scale 1:1 scenarios like the walk-through mine, the blacksmith's workshop and the laboratories.

The walk-through mine fits the definition of a diorama because it incorporates perspective like paintings of the baroque period and illusion.

2 Is a categorization or definition necessary, perhaps for communication purposes?

There is no clear definition possible because there will be a smooth transition between the different media.

Digital and electronic media will merge with modeled landscapes, figurines, models and backdrops.

Newly built dioramas will have interfaces with digital media, lighting installations and background sound.

Additionally a fundamental distinction between reality and virtuality becomes obsolete because dioramas are meant to be illusionistic like virtual reality.

More important than a definition is the question of authorship. The authorship of dioramas, the feeling to be able to relate to the people who build it, is more obvious than with digital media.

The communication is more direct from humans to humans.

3 Are museum dioramas valuable?

3.1 If yes, in which way, why and to whom?

3.2 If no, why?

Yes, dioramas are very valuable in a variety of ways:

- Dioramas are pieces of applied arts.¹⁹ They are, to a great extent, free from kitsch.
- The content or narrative may become a topic for research.
- They are an attractive means of display for a broad range of visitors, not only children.
- After phases of irrelevance and obscurity they can be re-contextualized.
- As a museum exhibit they are worthwhile because of their unique performative characteristics.²⁰
- Unlike computers, dioramas are only accessible as part of the museum visit. But this limitation to the museum location is exactly their strength and value.
- Emotionally they are highly valuable. Dioramas affect because they are developed with devotion.²¹
- They are the result of human labor and effort.

There is a possible loss of their museological value due to an increased consensus of their historical irrelevance.

¹⁹ Andre Judä explains that applied arts as opposed to liberal arts serves a purpose, in this case museum learning and the understanding of history.

²⁰ A.J. elaborates on the fact that a museum is a different medium from theater or film which needs different means of display.

²¹ A.J. elaborates on this topic by quoting Beethoven, who introduced his score *Missa Solemnis* with the phrase "Möge es von Herzen zu Herzen gehen" (May it spread from heart to heart).

4 Do you think visitors like dioramas?

4.1 What makes you think that?

Older visitors such as the interviewee's generation and older love dioramas.

The interviewee used to like building things himself as a kid which results in a high level of identification with dioramas.

This level might decrease because less people engage in building activities such as model train building.

Young people up to school graduation are familiar with virtual reality and 3D printing.

Accordingly they might look down on dioramas because they can do it themselves much better via 3D printing.

The interviewee voices ambivalence about his statements because society gets continuously more diverse.

5 What is the purpose of museum dioramas?

5.1 What are their general objectives?

Generally speaking dioramas are means for inseminating knowledge or information.

Exhibition designers try to create attention and sympathy for technology and natural sciences "that cannot be done with boring texts alone".

Dioramas are predestined means of display for conveying a narrative, e.g. in the exhibition on oceanology the diorama of the HMS Challenger (built in 2013, scale 1:5) creates a feel for the early exploration voyages.

Exhibitions do not want to present encyclopedic knowledge any longer but are designed around narratives.

A diorama is the first choice for a topic which revolves around a story line.

It is comprehensible not only for specialists but also for "normal" visitors such as families.

6 What do you in your profession contribute to meet these objectives?

The employees, who are engaged in the production process, use enough imagination and creativity to develop and build a diorama.

Exhibition designers must guarantee that the core messages are delivered and correspond with the overall design concept of the exhibition.

The interviewee does not interfere with the content. The curator is responsible for the content.

The interviewee accepts a degree of romanticism since humans strive for it. In addition sheer objectivity is pretentious.

Exhibition designers let a diorama convey its narrative through the lighting, the chosen colors, movement, which stirs attraction. These features are embodied in the overall design context.

If a meaningful overall context is neglected the diorama loses its purpose.²²

Exhibition designers create a convincing arrangement in correspondence with its "siblings" text and objects.

²² A.J. gives an example of a failed contextualization. The original object of a V2 rocket is presented in a totally different location than the diorama of a launching pad of this rocket, called "Prüfstand VII der Heeresversuchsanstalt Peenemünde, um 1943".

7 Do you have a way of telling if they are met?

There is no way of telling because there is no evaluation process implemented in the development and production process of an exhibition.

The upper management does not seem to be interested in the quality of the museum's "product" namely the exhibitions but only in production costs and longevity of the exhibition.

Quantitative visitor studies exist but they do not allow an interpretation of the quality of the exhibition design.

The only valuable feedback on the quality of an exhibition are the personal observations of the explainers in the exhibitions.

Furthermore appreciation can be inferred if a temporary exhibition travels.

8 How do you envision the future of museum dioramas?

As long as the workshops in the museum exist there will be a continuity of diorama building.

There is no benefit in outsourcing the production of dioramas because the quality of the in-house workshops cannot be reached. It will be too expensive and only commercially suitable since it will be too kitschy, ordinary and repetitive.

The in-house workshops are the "soul" of the dioramas, this tradition should not be questioned by arguments of high costs. Society needs spaces without strict cost/benefit analysis like research for the sake of research.

9 If you think museum dioramas are still relevant, is there anything you in your role want to do to keep them relevant?

The interviewee envisions improved management procedures of the production process:

- Curators and internal exhibition designers provide the contextual and spacial framework.
- In-house exhibition designers manage and control the development of the exhibition design with the emphasis of the exhibition development along story lines not on impressive and expensive wall panels for the exhibition designs.
- Highly experienced exhibition designers will be members of project management for exhibitions.

The interviewee wants to contribute to a change of thinking: The exhibition wall panels will depreciate in the long run whereas dioramas, models and objects will increase in value.

There should be a new position of an art director implemented at the Deutsches Museum.

An art director is like the artistic director in a theatre. He or she is a charismatic designer who shows leadership in order to deliver outstanding and yet pleasing exhibitions, which will be acknowledged as such by the public.

Summarized Interview with Elisabeth Straßer

21/12/15

Profession: Sculptor

Place of work: Sculptors' workshop

Position: Sculptor

Work experience at the Deutsches Museum: About 20 years

1 What is a diorama in your opinion?

Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering this question.

A diorama is a realization of scientific topics.
It is definitely an artistic realization.

1.1 Are there variations to this form?

Scenarios on a scale of 1:1 deliver a sense of far-reaching space.
For example the walk-through mining section provides a sensation of being actually inside a mine.
A good diorama does provide a feeling of immersion.

2 Is a categorization or definition necessary, perhaps for communication purposes?

A definition of a diorama is necessary for the academic literature about museum dioramas which is going to be published by the Deutsches Museum.

When talking with the curator about his or her wishes and ideas for a diorama, solutions evolve during the conversation between the curator and the interviewee.

Yet a strict definition might restrict the possibilities of developing a convincing or good diorama.

A diorama comes across with its overall impression otherwise it is not a diorama:

- The exhibit "Bergsteiger"²³ is defined as a diorama among museum professionals at the Deutsches Museum.
- To the interviewee the "Bergsteiger" is not a diorama because it does not allow one to step into the depicted world. It does not reveal a sense of space because the two windows are positioned at a wrong angle to each other.
- As opposed to the "Ochsentretrad" which allows one to figuratively dive into that scenery.

²³ Diorama "Bergsteiger früher und heute", on a scale of 1:1, built in 2011. Elisabeth Straßer created the two scale 1:1 figurines.

3 Are museum dioramas valuable?

3.1 If yes, in which way, why and to whom?

3.2 If no, why?

Yes, dioramas are very valuable as museum displays. They provide visitors with:

- sensual as well as cognitive experiences.
- historical context and technical details in contrast to models which are focused solely on technical information.
- overview about a given topic.
- guidance in the exhibition.

An additional value is the dioramas' real three-dimensionality as opposed to virtual three-dimensionality.

Humans sense the difference between real and virtual three-dimensionality.²⁴

4 Do you think visitors like dioramas?

4.1 What makes you think that?

Groups of teenagers do not appreciate dioramas when they run through the exhibitions. Without spending enough time in front of them it is impossible to comprehend them.

Only when teenagers are coaxed into taking their time in front of a diorama they might start to appreciate it.

Children, adults automatically stop and take time to deduce the diorama.

Single teenagers will stop to take in the scenery as well.

5 What is the purpose of museum dioramas?

Dioramas are conceived for the insemination of knowledge in an intuitive manner.

5.1 What are their general objectives?

Dioramas support the comprehension of the given context at a glance.

Knowledge gain is supposed to happen easily even without reading accompanying labels.

A striking example for these objectives is the new concept for a diorama about sunspots which shows three historical settings in a row. Some basic prior knowledge about history is necessary in order to deduce a lot of information from the diorama. For the first time, visitors not only view the three scenes from the front but they can look through one window and will see them in a row emphasizing the historic sequence of the three scenes.

²⁴ E.S. cautions that she is not familiar with special devices which might overcome the difference and allows the brain to experience virtual reality the same way as real three-dimensionality.

6 What do you in your profession contribute to meet these objectives?

It is important to stay in a dialogical process with the curator who provides ideas.

The interviewee develops a picture in her head, provides skits and mock-ups in order to visualize the ideas for further development.

She strives for artistic quality which translates into abstracted reality not technical perfection.²⁵

- Figurines are proportionate and their outfits are matching and realistic.
- Portraits are convincing.
- The abstraction of the landscape must be convincing.

Generally speaking the collaboration of sculptors, painters and model-builders is crucial for the overall impression of a diorama.

Yet the interviewee is candid about the limits of the collaboration with the model-builders who, with the help of CNC technology, copy reality. Whereas the sculptors abstract reality. Thus their products cannot be combined any longer.

7 Do you have a way of telling if they are met?

The interviewee believes if she can plunge figuratively into the scene it is of good quality.

8 How do you envision the future of museum dioramas?

Quality control of the artistic quality of all three workshops by a supervising and respected authority should be performed.

Project teams consisting of members of all three workshops build dioramas. Their respective project leaders are in charge of guaranteeing artistic quality.

Currently the vanity of the supervisors of the workshops is an obstacle to a better quality.

An internal structure for evaluating the production and the product should be implemented which will lead to a better quality.

9 If you think museum dioramas are still relevant, is there anything you in your role want to do to keep them relevant?

The interviewee will continue to keep a high level of artistic quality.

Dioramas should be shown to the public as much as possible even during the production process.

Through word of mouth curators get information about the possibilities of creating dioramas for exhibitions.

Curators should be made aware of the sculptors' high standard of professional expertise.

The interviewee is more than willing to collaborate with curators in the development process, discuss the topics, make drafts and develop ideas.

²⁵ E.S. states that sculptors build an idea of reality because an exact copy of reality does not trigger one's senses. Therefore she believes that her concept of "abstracted reality" offers better immersive experiences.

Summarized Interview with Traudel Weber

7/1/16

Profession: Secondary school teacher for chemistry and biology

Place of work: Educational department

Position: Coordinator and developer of educational programs for secondary schools

Work experience at the Deutsches Museum: About 20 years

1 What is a diorama in your opinion?

Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering this question.

The interviewee acknowledges that her definition is shaped by the way dioramas are perceived at the Deutsches Museum.

It is a scaled down reality depicting technical objects in their real environment.

The impression of reality is taken from historical pictures or paintings, but meticulously researched.

She is unsure if scale 1:1 scenarios could be defined as such. At the Deutsches Museum they are defined as scenario ("Inszenierung"). But that could be different at other museums.

1.1 Are there variations to this form?

One variation is the scale 1:1 scenario called "Inszenierung".

Dioramas could be built in a more abstracted way. The interviewee saw a diorama in a Swiss museum with mountains in the background made out of rabbit wire.

2 Is a categorization or definition necessary, perhaps for communication purposes?

A definition is important for the communication among professionals.

But it is all the same to visitors. For them the quality of an exhibit is important.

They want an interesting, engaging and comprehensible diorama.

3 Are museum dioramas valuable?

3.1 If yes, in which way, why and to whom?

3.2 If no, why?

Yes, they are of great value for museums.

Dioramas are valuable as didactic devices:

- Visitors comprehend the context of a diorama at one glance because of the three-dimensional presentation.
- The interviewee refers to Georg Kerschensteiner²⁶ who believed that the offered concreteness and graphicness in museums increases learning.

²⁶ Georg Kerschensteiner (1894–1932) was a reform pedagogue and a pioneer of museum pedagogy. He was a board member of the Deutsches Museum.

- She concludes that “Dioramas are multiplied concreteness and graphicness”.
- Visitors get a better understanding for the history of technology.

Dioramas hold material value because of the meticulous work effort which went into building them. They are “little works of art”.²⁷

Dioramas are attractive to visitors on a personal and psychological level:

- They can relate to them closely since visitors are reminded of doll-houses or construction kits.
- Humans are attracted to real three-dimensionality.²⁸ It has a strong impact on visitors.

4 Do you think visitors like dioramas?

4.1 What makes you think that?

Yes, most visitors do like them but surely not all.

The interviewee cautions that she has no proved way of knowing, since she is not familiar with any visitor research concerning dioramas.

According to her personal observations visitors do like dioramas:

- Intense engagement of students with dioramas during programs which she has conducted.
- Interviewee’s friends visit the museum especially for dioramas.

5 What is the purpose of museum dioramas?

5.1 What are their general objectives?

Dioramas serve a didactic purpose: the insemination of information.

Foremost they are means of display with the following objectives:

- Presentation of an attractive scenario, which is fun to look at
- Graphicness and concreteness of information
- Contextualization of technical objects

6 What do you in your profession contribute to meet these objectives?

The interviewee will continue to incorporate dioramas in educational programs for students.

In particular she will:

- guide their vision towards details in the diorama.
- include dioramas in questionnaires while stressing certain correlations between objects, the topic of the educational program and the storylines of the dioramas.

Educational programs are independent from the curator’s educational goals because they have different focal points. Thus the full educational potential of the diorama can be utilized.

²⁷ Traudel Weber calls them “kleine Kunstwerke”.

²⁸ T.W. implies that real three-dimensionality is different from virtual three-dimensionality.

7 Do you have a way of telling if they are met?

There is no systematic evaluation available for school programs. The interviewee relays solely on personal observations.

Her observations of students in school programs are:

- Learning outcomes are reached in most cases when students work in groups of three or give presentations to their class mates.
- Dioramas support her in reaching the envisioned learning outcomes.

8 How do you envision the future of museum dioramas?

The interviewee hopes and wishes that they will continue to exist and that they keep being built meticulously.

She suggests possible improvements:

- Movement would be good, for example the movement of watermills or of light from dawn to dusk like in the diorama “day and night”²⁹ at the Deutsches Museum.
- an audio guide with stories for each diorama
- Implementation of modern media is not necessary because “dioramas stand for themselves”.

9 If you think museum dioramas are still relevant, is there anything you in your role want to do to keep them relevant?

The interviewee is convinced that dioramas are appreciated at the museum. Therefore she believes that they are at no risk.

She will continue to incorporate them into educational programs.

She will communicate with colleagues about dioramas.

She knows that the head of her department promotes dioramas in meetings of the upper management of the museum.

²⁹ Diorama “Tag und Nacht”, built in 2003, for the exhibition “Kinderreich”.

Summarized Interview with Klaus Freymann

18/1/16

Profession: Geo-scientist

Place of work: Upper museum management

Position: Deputy director general of the Deutsches Museum, curator for mining

Work experience at the Deutsches Museum: 37 years

1 What is a diorama in your opinion?

Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering this question.

The classical diorama is a miniature scenario.

The interviewee describes immersive experiences by referring to them as “strolling into the diorama” (im Diorama spazieren gehen) .

He elaborates on examples: the market-square with a sales person selling spectacles in the exhibition on optics³⁰ and dioramas depicting the production of metals and crafts revolving around metals in the exhibition on metallurgy.³¹

1.1 Are there variations to this form?

Scale 1:1 scenarios are variations, for example the walk-through mine. One may literally stroll through the diorama.

Despite the fact that it is a fake mine, built with backdrops, it is a realistic depiction of a variety of mines even with figurines which are engaged in various work processes.

2 Is a categorization or definition necessary, perhaps for communication purposes?

No, there is no definition needed. It is all the same to visitors. Therefore it is more important to meet the museum's objectives.

The Deutsches Museum's foremost goal is to provide an atmosphere with dioramas. One example is the walk-through mine. Figurines are displayed. In addition real people, explainers, present and work the machinery and inseminate information about the respective technology.

Museum colleagues should not bother about a definition.

It is an academic question which is open to discourse at universities, in other words among scholars.

In addition out-house exhibition designers and museum professionals come up with more and different concepts of dioramas.

³⁰ Diorama “Reisender Brillenkäufer im 19. Jahrhundert”, on a scale of 1:5, built in 1989 for the exhibition on optics, which will not be presented in the new exhibition.

³¹ Klaus Freymann refers to two dioramas called, “Blick in die Edelmetallhütte, 16. Jahrhundert”, on a scale of 1:5, built in 1994, and “Die Plattner – Blick in eine Werkstatt der Renaissance”, on a scale of 1:10, built in 1994.

3 Are museum dioramas valuable?

3.1 If yes, in which way, why and to whom?

3.2 If no, why?

Yes, obviously they are valuable.

They are valuable as means of display, works of art and didactic devices.

For instance for exhibiting the topic mining the only possible solution is a walk-through diorama.

Every other focus of the display shifts the context.

The walk-through mine is attractive for all kinds of people, because it leaves an impression:

- Teenager experience the feel of it even when racing through. This impressive experience will be remembered and will encourage teenagers to study engineering.
- Adults appreciate the created atmosphere and take in the provided information. Both will be remembered.

In a manner of speaking dioramas are works of art, for example backdrops by Günter Voglsamer. Some of them are done excellently.

4 Do you think visitors like dioramas?

4.1 What makes you think that?

According to McKinsey³² 40 percent of the annual visits include the walk-through mine, which is approximately 400,000 visits per year.

Most visitors like them but surely not all.

From his personal experience the interviewee concludes:

- Miniature dioramas are probably not as attractive as the walk-through mine, because there are no crowds of visitors gathered in front of miniature dioramas such as the ones in the exhibitions on metallurgy and coal preparation.³³
- When the interviewee gives guided tours visitors show appreciation.

Yet the interviewee is not sure if visitors missed dioramas when they would be replaced by other exhibits.

5 What is the purpose of museum dioramas?

5.1 What are their general objectives?

Dioramas are supposed to create an atmosphere for visitors. For example the walk-through mine creates an atmosphere of a mine.

They inspire visitors' imagination.

They stir the visitors' soul and emotions.

They impress the visitors so that they come again.

Due to the size and complexity of objects and processes dioramas offer feasible solutions to presenting technical information which otherwise could not be exhibited.

Dioramas are utilized for inseminating information.

³² K. F. refers to an unpublished study by the international management consultancy McKinsey for the Deutsches Museum in 2008.

³³ He will certainly not include a diorama called "Coking Plant around 1950" in a future exhibition on coal preparation because he finds it "quite uninspiring", "Großkokerei um 1950", on a scale of 1:75, built in 1955.

6 What do you in your profession contribute to meet these objectives?

As curator for mining the interviewee will incorporate dioramas into the exhibition. It will be a mix of all available exhibits such as objects, dioramas and multi media displays.

As member of the upper museum management he will continue to critically question curators who present exhibition concepts which lack dioramas as exhibits.

Concepts get presented in their progressing developmental stages to the upper museum management which gives the interviewee an opportunity to follow up on the progress of the exhibition development and influence the concept up to straight forward management decisions in favor of dioramas but only if necessary.

The interviewee supports curators by offering to discuss the pros and cons for keeping dioramas in the exhibitions.

Preserving dioramas completely is expensive. One example is the preservation effort of the diorama "Müngstener Brücke".³⁴

Not every diorama is worth saving. For example the diorama "Coking Plant around 1950" which will be dismantled. Only the models of the foreground will be preserved and stored, not the backdrop.

7 Do you have a way of telling if they are met?

The interviewee takes information from the McKinsey study, namely the proportion of visits to the walk-through mine out of annual visits.

He relies on personal observations.

The objectives are likely to be met if the exhibition concept has been altered according to museum management's suggestions.

8 How do you envision the future of museum dioramas?

Dioramas will continue to be significant.

They will be implemented sensibly which means that their costs will be balanced against their objectives.

There will be miniature dioramas as well as scale 1:1 dioramas because exhibitions need diversity.

Their advantages are:

- Dioramas' traditional technical means have become timeless whereas displays on screens will become anachronistic quickly.
- Real three-dimensionality causes less fatigue than screens. The human eye focuses and refocuses on real three-dimensionality which causes less fatigue of the eyes, thus creating a physiological feeling of immersion.
- Maintenance costs as opposed to video screens are low.

³⁴ Diorama "Müngstener Brücke, 1896/97", on a scale of 1:100, built in 1998.

Ways of how to preserve dioramas will be found:

- One option is to cover up the diorama and keep it within the wall. One example for this method of preservation is the diorama “Lignite Mining”³⁵ in the locker room area.

No technical gimmicks will be necessary to improve dioramas.³⁶

Perhaps sensual stimulations such as lighting, audio or smell could be implemented.

These sensations are partially integrated already.

The scale 1:1 dioramas need more sensual stimulation.³⁷

Perhaps implementation of modern, more enduring building materials is advisable.

9 If you think museum dioramas are still relevant, is there anything you in your role want to do to keep them relevant?

The interviewee wants to be on the alert when exhibition concepts get presented.

He wants to make sure that the concepts show a balanced use of means of display.

He will adhere to democratic leadership when securing well-balanced exhibitions including dioramas if they prove to be a sensible display technique for the respective exhibition.

He will discuss the implementation of dioramas with colleagues during the presentations of exhibition concepts.

Summarized Interview with Simone Bauer

29/1/16

Profession: Civil engineer

Place of work: Department of exhibition development

Position: Head of the department of exhibition development

Work experience at the Deutsches Museum: About 25 years

1 What is a diorama in your opinion?

Your personal opinion and assessment is asked for. Therefore feel free to use brainstorming techniques when answering this question.

A diorama is like a snapshot or like a frozen moment in time.

It is an interesting moment in time which is perfect for the presentation of the chosen content.

1.1 Are there variations to this form?

Scenarios on a scale of 1:1 and habitat dioramas are variations.

Also doll-houses and nativity scenes are variations, even if “model-builders do not like to hear that”.

³⁵ Diorama “Braunkohlen-Großtagebau, um 1950”, on a scale of 1:50, built in 1950, demolished 1997.

³⁶ “Kein technischer Schnickschnack ist notwendig”.

³⁷ K. F. points out that the walk-through mine could smell damper, which in turns would lead to higher maintenance costs.

2 Is a categorization or definition necessary, perhaps for communication purposes?

The interviewee differentiates between definition and explanation.

If the term 'diorama' does not deliver a clear message its meaning in the context must be explained, e.g. 'house' could refer to a cabin or a mansion.

Since the technical term diorama might not to be understood by everybody it does not need to be thoroughly defined but to be explained further.

The meaning of the technical term can surely be elucidated during a conversation among museum professionals.

The in-house definition serves pragmatic purposes. It is needed for the illustrated book about dioramas published by the Deutsches Museum.

3 Are museum dioramas valuable?

3.1 If yes, in which way, why and to whom?

3.2 If no, why?

Yes, obviously they are valuable for everyone who is interested in the displayed topic and who appreciates dioramas. They are liked by the museum staff, the governing board of the museum and the visitors alike.

Dioramas as means of display are valuable because they are:

- fascinating and entertaining
- unfamiliar³⁸
- built for self-determined and contemplative exploration of the scenery.³⁹

Dioramas offer an emotional immersion into the scenery.

They hold an educational value.

They show artistry of the involved crafts. On the one hand, the interviewee cautions that the concept of art should not be overly strained, on the other hand she states:

"I am convinced some are definitely works of art".⁴⁰

They are of financial value. Since it takes time to build them: about 4000 hours sum up to approximately between 200,000 € and 400,000 €.

Their historical value is a matter of age, either they are works of art or artifacts.

³⁸ Simone Bauer adds that one does not need to swipe in order to detect something.

³⁹ S.B. is of the opinion that the lack of movement gives one time to detect details and to find hidden gimmicks and pranks.

⁴⁰ The art historian Anna Bauer, Munich, evaluated the backdrops of the dioramas, which were supposed to be dismantled in the fall of 2015. Although the foregrounds are an indispensable part of the artistic composition of a diorama they were not evaluated. At the end it turned out that the estimated monetary value of the backdrops alone was lower than expected.

4 Do you think visitors like dioramas?

4.1 What makes you think that?

Yes, visitors like dioramas because they are:

- fascinating
- entertaining
- educational
- artistically well done.

Visitors like them because of the possibilities of:

- self-determined exploration
- emotional experience
- immersive experience.

Visitors especially like the look behind the scenes. On tours to the workshops they want to know about the development of “these worlds on a small scale”.

The interviewee does not do visitor research herself but knows a lot of people who like them.

5 What is the purpose of museum dioramas?

5.1 What are their general objectives?

Dioramas, as didactic devices, explain correlations of a topic at a glance and almost without words. Three-dimensionality of dioramas, even scaled down three-dimensionality, affects emotionally more than two-dimensionality.

Dioramas are supposed to introduce some variety into the exhibition. Thus the combined leisure and learning experience such as the walk-through mine is like a haunted house. The interviewee calls it “infotainment”.

Dioramas want to stir ones imagination. They depict broad contexts which are also interesting for people who do not display a great affinity for technology.

6 What do you in your profession contribute to meet these objectives?

With regard to the exhibition development the interviewee will:

- further the production of new dioramas but not more than one to two dioramas per exhibition.
- secure the human resources in the respective workshops.

With regard to the amount of dioramas in the collections and exhibitions she will:

- point out or give advice to curators to implement dioramas from the collections and exhibitions into their concepts. They could adapt their concepts so that the content of the diorama fits.⁴¹
- indicate the difficulty of replacing an old diorama with an adequate substitute diorama. Possibly the curator prefers a different means of display.

41 S.B. views dioramas as treasures which should not molder in the basement.

7 Do you have a way of telling if they are met?

No, it is not my job to evaluate dioramas.

8 How do you envision the future of museum dioramas?

The long-term future of dioramas is completely open, it will be seen the coming 50 years:

- Virtual reality is implemented by museums already, for example in Italy a walk-through scenario of Pompeii right before the volcano erupted.
- Perhaps interactivity will be possible too in the future.
- In comparison dioramas will appear as lame displays, since they cannot compete with the three-dimensional virtual reality's new possibilities.
- Dioramas do not need to be preserved as didactic devices if better ones are available.
- The younger generation is used to faster virtual speed. Therefore they probably do not appreciate the dioramas' stillness.
- New display technique which incorporate virtual reality will change the concept of museums themselves.
- Perhaps there will be a niche for dioramas.

The near future of dioramas could be the following:

- If dioramas are going to be adapted to three-dimensional virtual reality they will not be dioramas any more. Yet it could be a convincing new form of display.
- But virtual reality is not convincing yet. It does not work without wearing special devices.
- Dioramas are allowed to be fallen out of time, they are "charming", if the rest of the exhibits are state of the art.
- It is worthwhile to preserve them because of their historical significance and as tangible cultural heritage.
- She is not so sure if it makes sense to keep them for didactic purposes.

9 If you think museum dioramas are still relevant, is there anything you in your role want to do to keep them relevant?

The interviewee wants to stay open-minded to changes of this means of display.

Dioramas might not be relevant any more in 15 to 20 years.

But the workshops will still exist because in the past new workshops have been added, not shut down, e.g. a workshop for electronic media got added. She is not concerned about the existence of the model-builders' and sculptors' workshop in particular as they will continue to produce devices for the exhibitions.

Visitor Questionnaires

Questions Asked – Fragebogen zu den Dioramen der Familienführung im Deutschen Museum

“Montgolfiere” (1983), “Weg des Stroms vom Erzeuger zum Verbraucher” (1953)
und “Salzbergwerk von Wieliczka” (1925)

Anmerkung: Wenn ein Diorama begehbar ist, wird es im Deutschen Museum als “Inszenierung” bezeichnet.
Im Fragebogen wird der Einfachheit halber nur von Dioramen gesprochen.

Alter:
Geschlecht:
Beruf:
höchster Bildungsabschluss:

1 Wie haben Ihnen die Dioramen gefallen? (Bitte kreisen Sie pro Diorama nur eine Antwort ein.)

a) “Montgolfiere”

sehr gut gut mittelmäßig nicht besonders gar nicht

b) “Weg des Stroms vom Erzeuger zum Verbraucher”

sehr gut gut mittelmäßig nicht besonders gar nicht

c) “Salzbergwerk von Wieliczka”

sehr gut gut mittelmäßig nicht besonders gar nicht

2 Das Diorama (Bitte das passende Diorama unterstreichen)

“Montgolfiere”

“Weg des Stroms vom Erzeuger zum Verbraucher”

“Salzbergwerk von Wieliczka”

hat mir am besten gefallen, weil ... (Bitte den passenden Buchstaben a – h einkreisen, Mehrfachnennungen möglich.)

- a) die Landschaft/ die Umgebung so täuschend echt aussieht
- b) es im Hintergrund weiterzugehen scheint
- c) ich Bewegung sehe
- d) es leuchtet
- e) ich mich in die Umgebung hineinversetzen kann
- f) mir die Geschichte gefällt
- g) mich das Thema interessiert
- h) (Platz für weitere Gründe)

3 Wie hat Ihnen die Geschichtenerzählung zum Diorama gefallen?

(Bitte kreisen Sie pro Diorama nur eine Antwort ein.)

a) "Montgolfiere"

sehr gut gut mittelmäßig nicht besonders gar nicht

b) "Weg des Stroms vom Erzeuger zum Verbraucher"

sehr gut gut mittelmäßig nicht besonders gar nicht

c) "Salzbergwerk von Wieliczka"

sehr gut gut mittelmäßig nicht besonders gar nicht

Platz für einen Kommentar zu Frage 3:

4 Was könnte Ihrer Meinung nach an den Dioramen verbessert werden?

(Bitte den passenden Text einkreisen, Mehrfachnennungen möglich.)

a) "Montgolfiere"

bessere Lichtverhältnisse im Diorama

mehr Hintergrundinformation ... als Text, ... als Video, ... als Audio-Installation

interaktive Möglichkeiten wie: ... virtuelles Ratespiel, ... Kommentar schreiben,
 ... Bewegung im Diorama in Gang setzen

weitere interaktive Möglichkeiten:

andere Position in der Ausstellung, weil

Sonstiges:

b) "Weg des Stroms vom Erzeuger zum Verbraucher"

bessere Lichtverhältnisse im Diorama

mehr Hintergrundinformation ... als Text, ... als Video, ... als Audio-Installation

interaktive Möglichkeiten wie: ... virtuelles Ratespiel, ... Kommentar schreiben,
 ... Bewegung im Diorama in Gang setzen

weitere interaktive Möglichkeiten:

andere Position in der Ausstellung, weil

Sonstiges:

Visitor Questionnaires
Questionnaire for Children

Welches ist Dein Lieblingsdiorama?
Mache ein Kreuz im Kreis!



Montgolfiere



Weg des Stroms



Kalibergbau



Was gefällt Dir besonders gut an Deinem Lieblingsdiorama?

Kreise es auf den Bildern ein oder schreibe dazu!

Dein Vorname

Dein Alter

Vielen Dank für Deine Mitarbeit
Deine Vera

Bisher erschienene Preprints

- Heft 1** Ulf Hashagen: Ein ausländischer Mathematiker im NS-Staat: Constantin Carathéodory als Professor an der Universität München
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint1_7
- Heft 2** Gerhard Filchner: Geschichte und Restaurierung eines Leitexponats: das Flugzeug CASA C-2.111B in der Flugwerft Schleißheim
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint2_6
- Heft 3** Ulf Hashagen, Hans Dieter Hellige (Hg.): Rechnende Maschinen im Wandel: Mathematik, Technik, Gesellschaft. Festschrift für Hartmut Petzold zum 65. Geburtstag
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint3_5
- Heft 4** Oliver Kühschelm: Kraftfahrzeuge als Gegenstand von "Arisierungen": Provenienzforschung zur Kraftfahrzeugsammlung des Deutschen Museums und Forschungen zur Enteignung von Kraftfahrzeugen in Bayern
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint4_5
- Heft 5** Rebecca Wolf: Die Musikmaschinen von Kaufmann, Mälzel und Robertson. Eine Quellenedition
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint5_4
- Heft 6** Artemis Yagou: Modernist complexity on a small scale: The Dandanah glass building blocks of 1920 from an object-based research perspective
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint6_3
- Heft 7** Karin Zachmann: Risky Rays for an Improved Food Supply? National and Transnational Food Irradiation Research as a Cold War Recipe
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint7_3
- Heft 8** Florian Ebner: James Franck – Robert Wichard Pohl. Briefwechsel 1906–1964
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint8_2
- Heft 9** Elisabeth Kraus: Repräsentation – Renommee – Rekrutierung. Mäzenatentum für das Deutsche Museum
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint9_7
- Heft 10** Denis Lomtev: Karl Wirths Notizbücher: Ideenwelt eines Musikinstrumentenbauers. Teil 1 – Faksimile: <http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint10-01-4>
Teil 2 – Transkription: <http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint10-02-1>
- Heft 11** Martin Frank: Mathematik der Renaissance: Studien zur Herausbildung und Verbreitung der neuzeitlichen Wissenschaften.
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint11_3
- Heft 12** Vera Ludwig: Museum Dioramas: Their Relevance in the 21st Century
http://nbn-resolving.de/urn:nbn:de:bvb:210-dm-preprint12_8

At a time when virtual reality has become a common feature of the leisure and entertainment business, museums must ask themselves what kind of immersive experiences they want to offer. Dioramas as the forerunners of virtual reality are the traditional means for providing museum visitors with a worthwhile leisure and learning experience. But do visitors really appreciate dioramas as much as museum professionals believe they do? A significant amount of literature concerns itself with museum dioramas as artifacts or even works of art. This study shifts the focus and examines the characteristics and impact of museum dioramas from two different angles: The broader perspective on museum dioramas in general gets juxtaposed with a case study of the Deutsches Museum, which is based on relevant literature, interviews with museum professionals at the Deutsches Museum and a small scale visitor study. The author would like her project to be a starting point for more and comprehensive research into the relevance and impact of museum dioramas today and in the near future.

Deutsches Museum
Museumsinsel 1
80538 München
www.deutsches-museum.de

ISBN 978-3-940396-65-5 (Printausgabe)
ISSN 2191-0871 (Onlineausgabe)

