

Introduction

Places of Progress?

Technology Museums, Memory, and Education

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“R evolutionary” technologies or large technological systems are often deemed controversial, risky, or ambivalent. Diverging interpretations clash when technological objects, such as rockets, airplanes, or nuclear reactors, are exhibited in museums or at heritage sites, with profound implications for underlying concepts of historical education. This special issue explores the argument that histories of technology have often upheld a traditional view of modern linear progress but became the focus of controversies when the social, political, and cultural conditions of perceiving and remembering these objects changed. At former “places of progress,” visitors and exhibition makers are confronted with the remains of the Industrial Revolution, colonialism, two World Wars, the Cold War, the Age of Coal, the Space Age, the Atomic Age and the Digital Age. Exhibitions and displays have been used to explain, teach, or make sense of the advents, successes, and failures of high-tech projects. Understanding technological artifacts and corresponding sites such as Chernobyl, Peenemünde, and Hiroshima as well as structures such as factories or bunkers as sites of memory (*lieux de mémoire*, a term coined by Pierre Nora) shifts our attention to processes of remembering modern technologies and the cases in which established narratives of progress have been supported or challenged.¹ Questions about the ethics of technology use often seem to subvert stories of the “heroes of invention,” leaving visitors with the impression of technological ambivalence.² Attempts to teach and learn about history and technology via objects and sites have been complicated, politicized, and contested.

This special issue focuses on processes of remembering and representing modern technologies in museum spaces.³ It does so by studying exhibitions and their selections of artifacts, narratives, and educational aims as well as the strategies and practices that, following Jan and Aleida Assmann’s conception, helped transform “communicative memory” into “cultural memory.”⁴ In museum exhibitions and heritage sites, historical events are embedded in narratives and utilized for cultural or educational purposes. All contributions to this issue examine the agendas,



stakeholders, practices, and institutions involved in remembering modern technologies, such as railways, airplanes, rockets, or sites of oil production. Stephan Jaeger systematically analyzes how weapons from the Second World War were represented in military history museums in Germany, Britain, Belgium, Poland, and the United States. Daniel Brandau examines enthusiasm for technology at the former army research center Peenemünde in rural northeast Germany before and after German reunification. Marcus Meyer focuses on the challenges of remembering forced labor at the Valentin Memorial Bunker, which was built from 1943 to 1945 for the construction of German type XXI U-boats (but never actually started production). Michael J. Neufeld explains the conflicts related to the history of atomic warfare in the United States and the case of the so-called Enola Gay affair, in which he was involved as curator at the National Air and Space Museum in Washington. Norman Aselmeyer analyzes the exhibition of colonial infrastructures and objects in Kenyan museums. Last but not least, Lise Camilla Ruud and Erik Thorstensen examine the seeming contradiction of a climate change exhibition at the Norwegian Petroleum Museum.

Historiographic Challenges of High-tech Sites of Memory

Pierre Nora's concept of sites of memory (*lieux de mémoire*) refers to the places at which collective memories of a social group crystallized into a culture of remembrance. This includes geographical places and physical spaces as well as immaterial topoi of memory and identity.⁵ A site, in Nora's understanding, is not necessarily defined by its specific physical and material conditions or its geographic location but rather by its symbolic and cultural meaning in a wider discourse and landscape of memory. The popularity of the concept since the 1990s also reflects new insecurities in both Western and Eastern European cultures of remembrance. After the end of the Cold War, historians and museum professionals looked for new ways to tackle history without resorting to traditional ideological themes. Nora's concept was criticized as an "attempt to compensate for a widespread disappearance of collective identity" in Europe, which led to a heavier focus on sites of memory marked by diversity, conflict, and tension.⁶ As such, however, it also allowed the reflection upon spaces and places, localized rituals, symbols, and institutions and appeared to reconcile academic history with the study of regional memory cultures.

There are two main types of institutionalized material sites of memory that also incorporate educational goals. These are memorials and museum exhibitions. Over the course of the twentieth century, memorials were financed by interest groups and governments. They aimed at

boosting political self-confidence and a sense of tradition. Fractured political systems were marked by polarized memory cultures. The Weimar Republic saw the emergence of both memorials for fallen soldiers during the First World War and Walter Gropius' Monument to the March Dead, commemorating the working-class victims of the Kapp Putsch of 1920.⁷ As a sign of political caesura after 1945, overtly fascist monuments were removed in not just Eastern but also Western Europe. However, the actual remembrance of the war in formerly occupied countries was torn between the remembrance of victims and heroic depictions of resistance that allowed new national myths or symbols of ideological persistence in the Eastern Bloc.⁸

Technology-related sites of memory can also mark postcolonial memory spaces.⁹ Exploitation of resources and labor via technologies involve transnational dimensions well beyond European shores. In his contribution to this issue, "Ruin of Empire: The Uganda Railway and Memory Work in Kenya," Norman Aselmeyer examines the exhibition of colonial infrastructures and objects at both the Nairobi Railway Museum and the Nairobi National Museum. He also looks at how the British-built Uganda Railway is being remembered within the context of the current Chinese-built Standard Gauge Railway project that promises, according to official narratives, new prosperity for the people of Kenya.

Despite the relevance of engineering and science in modern societies and their materiality in cities and rural areas alike, places of technological significance (from old railway stations, laboratories, airplanes, newsrooms, bunkers, U-boats, telephone cabins, skyscrapers, factories, and assembly lines to shopping malls and nuclear power stations) have been largely left out of published collections of sites of memory. Vice versa, memory has been a rarely analyzed dimension within academic histories of technology, despite the field's long held openness toward cultural perspectives.¹⁰ How is technology remembered, and how does it relate to social or political aspects within narratives of progress? How have modern technologies been used to create traditions or consolidate cultural memories and to support or undermine established historiographies? In which ways have narratives of technological progress been integrated in concepts of historical education? Have postmodern debates transformed enthusiasm for technology into nostalgia? What has been willfully "forgotten" in order to promote divergent narratives?

Furthermore, if the "invention" of tradition (Hobsbawm), or at least its promotion, was and remains a main function of institutions of cultural heritage, are "places of progress" then a whole other type of memory site?¹¹ During Romanticism, ruins were rediscovered and re-evaluated as counterparts to accelerating progress and industrialization, which materialized in factories that sliced through European landscapes.¹² When, in the twentieth century, factories themselves turned into ruins

during periods of deindustrialization, they became static remnants of accelerations past.

Ruins of high-tech facilities make for complicated sites of memory but often engaging sites of historical education. Progress and tradition complement each other in explanations of the collective experience of change. Jörn Rüsen famously defined history as “the narrative construction of meaning about the passage of time”.¹³ Innovation, continuity, or caesura are all core themes of this process in modern times, particularly apparent via changes in technology and its social significance. While the notion of progress is embedded in a specific form of linear historical narrative in which the present allegedly improved the past (the concept of improvement having different meanings at different times to different people), the critical analysis of the notion of technological progress needs to take into account the ideas, images, and myths of technology as an explanation of the changes and caesurae in modern history.¹⁴ Countless academic studies have shown that innovation was rarely one-directional, but many inventions were forgotten, infrastructures deteriorated, and high technologies (that is, research and development-intensive systems such as high-speed transport, nuclear energy, electronic communication, and weapons) were rarely the most essential. Yet the history of technology, and of high technology in particular, has been used across different systems of governance to underpin claims of legitimacy, both as a historical background narration and as evidence of ideological superiority.¹⁵

Framed as an unpolitical and inevitable force of change (but tied to concepts of utopia or dystopia, or to the goals and means of economic growth), technological progress has always been a deeply political concept. At former places of progress, this act of making sense of the past, however, often fails. Outside of regions that highlight their industrial heritage, such as the Ruhr, shut-down factories or mines were rarely musealized. Instead, they have been discovered by enthusiasts as lost places and can be described as what Aleida Assmann has termed “ghost places” that come into being when traditions of giving sense to things and established ways of narrating the past are interrupted. In Assmann’s words, “Whenever a tradition has disappeared, ‘ghost towns’ arise, that give free rein to the imagination or bring back what has been suppressed.”¹⁶ Indeed, many sites of modern weapons research and production have not become an integral part of collective memories. They are located in remote areas and are difficult to access. Nature takes these places back; many are simply ignored or forgotten. Places of forced labor, weapons production, and concentration camps can sometimes only be reconstructed or imagined via historical maps and statistics.

Bunkers and wartime underground tunnels can still be found across Europe, often sturdy constructions resisting demolition.¹⁷ Paul Virilio has studied the cultural significance of bunkers built by the Organisation Todt

during the Second World War at the French Atlantic coast. His bunker archaeology reads these modern architectural forms as epitomes of total warfare.¹⁸ Yet in the context of memory, it is important to realize that even archaeological endeavors that try to rediscover, explain, and reveal different strata of meaning of these remains risk failure. In Germany, the history of bunkers, related to experiences of aerial warfare and slave labor, was mostly ignored until the 1970s. In France, bunkers stood for the German occupation and were often destroyed, left to nature, or turned into sites of dark tourism. Attempts to (naively) “rediscover” these places as “authentic” sites, to deal with their history, or to turn them into museums or other places of public and collective memory have faced obstacles and disputes. In his contribution to this special issue, “When Fascination Obscures Fate: Narratives of Technology vs. Forced Labor at the Bunker ‘Valentin’,” Marcus Meyer examines myths about technology that were conspicuously present and absent at the same time. At the Valentin Bunker, it took political effort over several decades to establish a memorial with a permanent exhibition and a pacifist and educational approach.

Representing Warfare

Military history museums have struggled to implement critical perspectives, either because of propagandistic aims, private funding from defense industries, or their deep ties to collective narratives or traumata. In 2000, Barbara Kirshenblatt-Gimblett observed a shift toward criticism of ideology and a “new honesty” about the “darker side of human society” in European and American museums since the 1990s.¹⁹ Yet while technology exhibitions have also adopted this openness toward ambiguity, they have often reduced it to a simple ambivalence of civilian and military use, especially in European exhibitions on the Cold War.²⁰ In other cases, interest groups fought over interpretations and could not find any compromise. During the 1990s, proponents and opponents of nuclear weapons established alternative exhibitions within the same building at the Bradbury Science Museum.²¹ The infamous Enola Gay controversy at the National Air and Space Museum in Washington prompted political actors to intervene to stop the debate on the American nuclear bombing campaign in Japan.²² In his contribution, “The Smithsonian’s National Air and Space Museum and ‘The Romance of Technological Progress,’” Michael J. Neufeld, who was involved as curator at the time, explains both the power dynamics and the unpolitical, yet consensus-creating “romance” of technology that prevailed at the museum during the 1990s.

Implicitly related to the exhibition in Washington is a different place of progress, Hiroshima, which is juxtaposed as the “uncanny” site of use.

Indeed, the various case studies in this special issue reveal that while “dead” objects have been used to explain histories of innovation, they have been seen to be unable to illustrate victimhood and violence without extensive contextualization.²³ As Eva Zwach and Thomas Thiemeyer have pointed out, displaying technological objects and weapons has continued to serve as a method of avoiding difficult political questions or the depiction of human victims—either because the museum did not have pedagogical staff to carry out research and education about contexts and to handle delicate objects and photos showing violence and dead bodies or because it wanted (first and foremost) to show off its valuable material objects to visitors who are interested in technology.²⁴ Anne-Katrin Ebert has argued for transdisciplinary research on objects and their histories in museums of technology.²⁵ This holds true especially when it comes to weapons. As early as in 1987, Kurt Möser observed a key dilemma when artifacts of warfare were displayed in exhibitions. He noted that weapons as museum objects always required an elaborate explication of their complex technological backgrounds as well as their historical use and ethical dimensions.²⁶ However, while tanks and airplanes offer chances to address key social and political issues concerning technology use, museums still struggle to tell stories that make these complex issues accessible and visible.

Stephan Jaeger has analyzed how the Second World War has been displayed and shown at various museums, such as the Bundeswehr Military History Museum in Dresden, the Museum of the Second World War in Gdańsk and the Imperial War Museum in London, in similar ways yet via diverging narratives.²⁷ In his contribution to this issue, “Ambiguous Narratives of World War Technologies in Contemporary Military History Museums,” Jaeger compares these approaches and argues that although there has been an extensive transnational exchange of methods in the making of exhibitions, national perspectives still prevail when it comes to making sense of war.

Persistent gender imbalances in the study of the history of technology have also transcended into technology museums, as shown by Daniela Döring and Hannah Fitsch and, in a comprehensive analysis, by Anna Döpfner.²⁸ Military history museums are no exception. Jay Winter has bemoaned that this imbalance complemented the “fetishization of weapons” and often precluded museums from becoming true places of “contestation and interrogation.” While Winter proposed “representations of populations at war,” Robert Ehrenreich and Jane Klinger have suggested to “let the artifacts speak,” especially in the case of non-technological personal items, such as wedding rings discarded before an execution, that contextualize the experience of war and victimhood.²⁹

Museums and Technology as Heritage

The cultural institution of the museum dates back to the nineteenth century, when the ideas of progress, temporal acceleration, and the nation state shaped European societies.³⁰ At that time, museums of technology were conceived as temples of modernity, used to promote national achievements and to improve the social standing of engineers.³¹ Nowadays, those museums are also understood as educational institutions allowing public debate on the past and future roles of science and technology in society.³² However, museums of technology are often slow to adapt to social or cultural changes or to new political and ecological challenges.³³ What happens when cultures of memory are unstable or are distorted by radical political or societal processes that change the meaning of the artifacts in collections? Museums of technology contribute to shaping national or regional identities or the self-conceptions of professional groups, but in settings in which diverse social groups participate from all over the world, this simple relation of memory, artifact, and identity has grown much more complex. How can museum exhibitions enable visitors to understand the multiple layers of meaning when they encounter artifacts outside of their original contexts?

While history museums generally “function as institutions of social memory with a potential public role in constituting what members of any given society understand as their cultural heritage,” museums of technology focus on explaining machines and technologies and their uses and consequences.³⁴ The history of technology can also be found in regional history and industry museums, which have been highlighting social aspects of innovation since the 1970s and have been ever popular destinations of school trips.³⁵ Technological objects and sites have been functionalized to display narratives of progress. However, as the contributions to this special issue prove, attempts by governments and interest groups to create “places of progress” have not only consolidated narratives of modernity but also contributed to their disillusionment and critique, although not always deliberately.

Local clashes of diverging interpretations and memories have forced various museums and heritage sites to mediate or engage actively in controversies. Some have found new roles as educational institutions that use technology as jumping-off points to address more complex historical and ethical problems. One such museum is the Peenemünde Historical Technical Museum. Located on the German coast of the Baltic Sea, Peenemünde was the site of a development and testing ground for airplanes and rocket weapons as well as of labor camps during the Second World War and became accessible to the public only after German reunification in 1990. In his contribution, “Peenemünde Contested: Remembering Second World War Technologies in Rural East Germany from 1984 to 1992,”

Daniel Brandau explains how and why residents and former military officers attempted to establish a local technology museum and to attract visitors after the fall of the communist East German state but were caught in a controversy of a national and even international dimension when industrial and political actors joined in to plan a fifty-year anniversary celebration of the first A4/V-2 rocket flight. The dilemma of separating “positive” histories of progress from histories of mass destruction and warfare remains relevant up until today.³⁶

Studying the Remembrance of Technologies

This thematic issue argues for a thorough scholarly investigation of the changing cultures of memory of modern technologies. Exhibitions, too, should enable visitors to reflect upon their own preconceptions and to understand how memory and values have been ascribed to technological objects. In the case of the European industrial heritage that boomed in the 1970s, a simple identification with former objects of work and production seems no longer sufficient or even risks producing mere nostalgia. In a postindustrial society (or at least one increasingly constituted by immaterial forms of work and knowledge), only a small percentage of people still work in cotton mills, steel mills, or mines (the traditional places of progress that have often been musealized).³⁷ This does not mean that industry museums have become superfluous but rather that the idea of a simple constitution of workplace identities no longer functions and that expanded and reflective concepts and approaches are required when social and cultural conditions change.

Places of progress attract a wide range of visitors and enthusiasts—from engineers and local residents to school classes and tourists from diverse political and social backgrounds. Likewise, this issue is not only aimed at historians but can also be of interest to artists, designers, scientists, and museum professionals. As we discovered during the *Meta-Peenemünde* project, it is fruitful to combine the history of science and technology with problems of memory and museum work in order to understand and possibly integrate dimensions of memory in the conception of museum exhibitions, and to take into account the question of how diverging and controversial memories were created, debated, and changed over time.³⁸ This can also help uncover how exhibitions themselves depended on the social and political conflicts related to key technologies.

Karin Königsberger has shown how societal debates on nuclear energy influenced and changed the design of the energy and physics exhibitions at the Deutsches Museum in Munich.³⁹ Similar challenges and conflicts can be observed when energy regimes change and put into

question established technologies of oil production or coal mining. Can this knowledge of changing perceptions and memories of key technologies (such as nuclear energy, atomic bombs, or fossil energy) be integrated into the design of museum exhibitions so that its changing social and political meaning can be accessible for visitors? Lise Camilla Ruud and Erik Thorstensen analyze such a case in their contribution, “‘We Must All Be Ready for Major Changes’: Visiting *Climate for Change* at the Norwegian Petroleum Museum,” and explain how this current exhibition confronts a history of national success and prosperity by focusing on its representations of agency, its notions of the global, and its imaginations of the future.

The study of the remembrance of high-tech sites and objects as a cultural phenomenon integrates the history of technology and questions of public history. Dominant narrations often do not fully consider or even suppress the rich and multifold meanings of these sites for diverse groups of actors. Memories give meaning and shape identities, regardless of whether they relate to established historical narratives. They go beyond historical fact and are not necessarily based on coherent narrations or texts but on various sensory, visual, and auditive channels, on media, and on diverging values and opinions. They relate to the meta level where myths, memories, and traditions are created, appropriated, and reinvented.

Memories are diverse, personal, generational, local, and often emotional and impact the meaning and value of artifacts exhibited in museums of technology. When meanings change, a museum has to adapt the contents of its exhibitions around collections that often remain the same. In order to respond to this challenge, museums can reflect upon their own history, thematize collective memories concerning objects and collections and explain how practices of displaying tanks, rockets, cars, or railways relate to national, regional, local, and specific group identities. This can make processes of assigning meaning to technological objects accessible and understandable to museum visitors as well.

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Notes

1. Pierre Nora, "Between Memory and History: Les lieux de mémoire," *Representations* 26, Spring (1989): 7–24.
2. The term was originally coined by Christine MacLeod, referring to the public remembrance and veneration of inventors and their significance to modernism and nationalism (particularly in Britain before the First World War). Christine MacLeod, *Heroes of Invention: Technology, Liberalism and British Identity, 1750–1914* (Cambridge: Cambridge University Press, 2007).
3. The conference, "Places of Progress? Re-Evaluating the Sites of High-Tech Controversies" (Technical University Braunschweig, 16–18 September 2019), was organized by Daniel Brandau and Constanze Seifert-Hartz as part of the project "*Meta-Peenemünde: Das Bild der rüstungstechnischen Versuchsanstalten im kulturellen Gedächtnis*," which was based on the cooperation between Christian Kehrt (Technical University Braunschweig) and Philipp Aumann (Historical Technical Museum Peenemünde) and funded by the Volkswagen-Stiftung in the program "Research in Museums." We would like to thank our student assistants Silja Fitschen, Birgit Wienand, and Daniel Middeke; Helmut Albrecht, Ulrike Jureit, Martin Lücke, Gerhard Paul, Achim Saube, and Leonore Scholze-Irrlitz for their invaluable support and advice; Adelheid Wessler, Celina Adrion, Jens Rehländer, and Wilhelm Krull at the Volkswagen-Stiftung; Kai Hampel, Thomas Köhler, and Daniela Teschen-dorff at the HTM Peenemünde. We also wish to thank those conference speakers and participants who contributed to our discussions yet could not be represented in this limited issue: Karena Kalmbach, Christian Götter, Robert Bramkamp, Dirk Schreiber, Verena Butt, Beate Winzer, Stefan Hördler, Patryk Wasiak, Jana Bruggmann, Andrew Cross, Anna Piotrowska, Maurits Ertsen, Marie-Luise Heuser, Rajendra Thakur, Joachim Block, and Katarzyna Jarosz.
4. Jan Assmann, "Communicative and Collective Memory," in *Cultural Memories: The Geographical Point of View (Knowledge and Space 4)*, ed. Peter Meusburger, Michael Heffernan, and Edgar Wunder (New York: Springer, 2011), 15–27.
5. Nora, "Between Memory and History: Les Lieux de Mémoire," 7–24.
6. Reinhard Bernbeck, "Lieux de Mémoire and Sites of De-Subjectivation," in *Between Memory Sites and Memory Networks: New Archaeological and Historical Perspectives*, ed. Kerstin P. Hofmann and Ulrike Sommer (Berlin: edition topoi, 2017), 253–278, here 255; see also Cornelia Siebeck, "Erinnerungsorte, Lieux de Mémoire," Version: 1.0, in *Docupedia-Zeitgeschichte*, 2 March 2017, accessed 17 March 2022, http://docupedia.de/zg/Siebeck_erinnerungsorte_v1_de_2017. DOI: <http://dx.doi.org/10.14765/zzf.dok.2.784.v1>. In 1998, the German historian Jürgen Danyel argued that German sites of memory could not just copy the more self-contented French concept of national remembrance but had to be marked by conflict and tension, with the Reichstag Building or the Leipzig Monument to the Napoleonic Battles revealing inherent ambivalences as prototypical German sites of memory (*Erinnerungsorte*). Jürgen Danyel, "Unwirtliche Gegenden und abgelegene Orte? Der Nationalsozialismus und die deutsche Teilung als Herausforderungen einer

- Geschichte der deutschen 'Erinnerungsorte'," *Geschichte und Gesellschaft* 24 (1998): 463–475, here 464. Under the title "Erinnerungsorte," various volumes by German publisher C.H. Beck have collected and explained German and European sites of memory by going beyond physical spaces and particularly by including notions or linguistic terms, such as *Mitläufer* (Nazi followers), but upholding its normative approach via this selection nevertheless. See *Deutsche Erinnerungsorte* (3 vols.), ed. Étienne François and Hagen Schulze (Munich: C. H. Beck, 2012); *Europäische Erinnerungsorte* (3 vols.), ed. Pim den Boer, Heinz Duchhardt, Georg Kreis and Wolfgang Schmale (Munich: Oldenbourg, 2012).
7. Christoph Cornelißen, "Erinnerungskulturen in Stein. Nationaldenkmäler in Demokratien seit der Amerikanischen Revolution," in *Denkmäler demokratischer Umbrüche nach 1945*, ed. Hand-Joachim Veen and Volkhard Knigge (Vienna: Böhlau 2014), 37–60, here 49.
 8. *Ibid.*, 54.
 9. Jürgen Zimmerer, ed., *Kein Platz an der Sonne. Erinnerungsorte der deutschen Kolonialgeschichte* (Frankfurt am Main: Campus, 2013).
 10. Exceptions from environmental history studies include *Ökologische Erinnerungsorte*, ed. Frank Uekötter (Göttingen: Vandenhoeck & Ruprecht, 2013). On the cultural history of technology, see Martina Heßler, *Kulturgeschichte der Technik* (Frankfurt am Main: Campus, 2012).
 11. Eric Hobsbawm, "Introduction: Inventing Tradition," in *The Invention of Tradition*, ed. Eric Hobsbawm and Terence Ranger (Cambridge: Cambridge University Press, 1983), 1–14, here 1.
 12. Siebeck, "Erinnerungsorte."
 13. Jörn Rüsen, *Historische Orientierung. Über die Arbeit des Geschichtsbewußtseins, sich in der Zeit zurechtzufinden* (Köln: Böhlau, 1994), 8.
 14. Discussions on the concepts, narratives and places of "modernity" cannot be fully represented here. See, for an overview, Alexa Geisthövel and Habbo Knoch, eds., *Orte der Moderne. Erfahrungswelten des 19. und 20. Jahrhunderts* (Frankfurt: Campus, 2016).
 15. David Edgerton has argued that even during the Second World War, the horse-drawn carriage was still more essential to the war effort than advanced weapon systems, such as rockets. David L. Edgerton, *The Shock of the Old: Technology and Global History Since 1900* (London: Profile Books, 2008).
 16. Aleida Assmann, *Cultural Memory and Western Civilization: Functions, Media, Archives* (Cambridge: Cambridge-University Press, 2011), 12.
 17. Silke Wenk, "Bunkerarchäologien. Zur Einführung," in *Erinnerungsorte aus Beton. Bunker in Städten und Landschaften*, ed. Silke Wenk (Berlin: Links, 2001), 15–37.
 18. Paul Virilio, *Bunkerarchäologie* (Vienna: Passagen, 2011).
 19. Barbara Kirshenblatt-Gimblett, "The Museum as Catalyst" (keynote address, "Museums 2000: Confirmation or Challenge," conference organized by ICOM Sweden, the Swedish Museum Association and Swedish Travelling Exhibitions/Riksställningar, Vadstena, Sweden, 29 September 2000, 9), citation in Jennifer Bonnell and Roger Simon, "'Difficult' Exhibitions and Intimate Encounters," *Museum and Society* 5, no. 2 (July 2007): 65–85, here 65.

20. Samuel Alberti and Holger Nehring, "The Cold War in European Museums: Filling the 'Empty Battlefield'," *International Journal of Heritage Studies* (2021), accessed 1 September 2021, <https://doi.org/10.1080/13527258.2021.1954054>.
21. Bryan Taylor, "Revis(it)ing Nuclear History: Narrative Conflict at the Bradbury Science Museum," *Culture and Organization* 3 (1997): 119–145.
22. On the Enola Gay controversy, see Vera Zolberg, "Museums as Contested Sites of Remembrance: The Enola Gay Affair," *The Sociological Review* 43.1 (May 1995): 69–82; Stanley Goldberg, "The Enola Gay Affair: What Evidence Counts When We Commemorate Historical Events?," *Osiris* 14.1 (1999): 176–186; and Michael J. Neufeld's account in this special issue.
23. Thomas Thiemeyer, "Grenzpfähle der Tabuzone: Vom schwierigen Umgang mit Krieg, Gewalt und toten Körpern im Museum," *Historische Anthropologie* 18 (2010): 220–231, here 221.
24. Eva Zwach, *Deutsche und englische Militärmuseen im 20. Jahrhundert: Eine kulturgeschichtliche Analyse des gesellschaftlichen Umgangs mit Krieg* (Münster: LIT, 1999), 217; Thomas Thiemeyer, *Fortsetzung des Krieges mit anderen Mitteln. Die beiden Weltkriege im Museum* (Leiden: Brill 2010), 226. Another dimension of this debate derives from the question whether exhibitions should be allowed to overwhelm visitors emotionally. While traumatic experiences have little didactic value, contextualized depictions of suffering have been considered to be powerful tools that may break silences, particularly those shrouding war and genocide. See Karl Heinz Pohl, "Wann ist ein Museum 'historisch korrekt'? 'Offenes Geschichtsbild,' Kontroversität, Multiperspektivität und 'Überwältigungsverbot' als Grundprinzipien musealer Geschichtspräsentationen," in *Museum und Geschichtskultur: Ästhetik—Politik—Wissenschaft*, ed. Olaf Hartung (Bielefeld: Verlag für Regionalgeschichte), 273–286.
25. Anne-Katrin Ebert, "Ran an die Objekte! Ein Plädoyer für das gemeinsame Erforschen und Sammeln von Objekten in den technischen Museen," in *Provokationen der Technikgeschichte. Zum Reflexionszwang historischer Forschung*, ed. Martina Heßler and Heike Weber (Paderborn: Schöningh, 2018), 229–258.
26. Kurt Möser, "Militärgeschichte- und Technik im Technikmuseum," *Kritische Berichte* 3/4, (1987): 66–75.
27. Stephan Jaeger, *The Second World War in the Twenty-First-Century Museum. From Narrative, Memory, and Experience to Experientiality* (Berlin: De Gruyter, 2020).
28. Anna Döpfner, *Frauen im Technikmuseum. Ursachen und Lösungen für gendergerechtes Sammeln und Ausstellen* (Bielefeld: transcript, 2016); Daniela Döring and Hannah Fitsch, eds., *Gender Technik Museum. Strategien für eine geschlechtergerechte Museumspraxis* (Berlin, 2016). The gender imbalance in the history of technology is also addressed by Martina Heßler, "Das Öffnen der black box. Perspektiven der Genderforschung auf Technikgeschichte," in Döring and Fitsch, *Gender Technik Museum*, 19–38, and Heike Weber, "Von 'Lichtgöttinnen' und 'Cyborgfrauen'. Frauen als Techniknutzerinnen in Vision und Werbung," in *Konstruierte Sichtbarkeiten. Wissenschafts- und Technikbilder seit der Frühen Neuzeit*, ed. Martina Heßler (Munich: Brill, 2006), 317–344.

29. Jay Winter, "Museums and the Representation of War," *Museum and Society* 10, no. 3 (November 2012): 150–163, here 162; Robert Ehrenreich and Jane Klinger, "War in Context: Let the Artifacts Speak," in *Does War Belong in Museums? The Representation of Violence in Exhibitions*, ed. Wolfgang Muchitsch (Bielefeld: transcript, 2014), 145–154, here 145 f.
30. Jürgen Osterhammel, *Die Verwandlung der Welt. Eine Geschichte des 19. Jahrhunderts* (Munich: Beck, 2010, 5th edition, Historische Bibliothek der Gerda Henkel Stiftung), 37–40.
31. Wilhelm Füßl, *Dokumente zur Geschichte des Deutschen Museums. 1903–2003*, (CD-Rom, Deutsches Museum, Munich); Wilhelm Füßl, *Oskar von Miller. 1855–1934; eine Biographie* (Munich: Beck, 2005).
32. Karen Königsberger, "Vernetztes System"? *Die Geschichte des Deutschen Museums 1945–1980 dargestellt an den Abteilungen Chemie und Kernphysik* (Munich: Utz, 2009), 2; Frank Uekötter, "Proxy Wars: The Deutsches Museum and the Peaceful Atom," *Technikgeschichte* (2022) 89, no.1 (63–86).
33. Susanne Hauser, "Anmerkungen zum Industriemuseum," in *Industrie- und Technikmuseen im Wandel. Perspektiven und Standortbestimmungen*, ed. Hartmut John and Ira Mazzoni (Bielefeld: transcript Verlag, 2005), 160.
34. Bonnell and Simon, "'Difficult' Exhibitions," 65.
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