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Similar or Different? Configurations of Authenticity Across Museum Types

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ABSTRACT

Authenticity is traditionally regarded as playing a crucial role in museums, science centers, and memorials. However, despite this fact, authenticity has very different meanings in different (institutional) settings. This complicates shared communications across museum practices. To address this, an international network (BILAD) comprising practitioners from diverse museums, along with museum education and learning researchers, has committed to exploring how authenticity can be conceptualized across various museum contexts. This article presents the results of intensive discussions within the network. In a first step, key theoretical approaches and research findings on authenticity are outlined and four core facets of authenticity are defined. Building on this foundation, it then examines configurations of authenticity in different types of museums and discusses these findings comprehensively. This cross-theoretical and cross-setting integration of different approaches and research findings offers an analytical framework of the topic of authenticity.

1 | Introduction

Viewing authentic objects, having authentic experiences, meeting real scientists, and visiting authentic sites—these are all experiences that are at the core of informal learning settings such as museums, science centers, and memorial sites. Most of these institutions consider providing authentic experiences as a core issue for their existence (Evans et al. 2002; Watson and Werb 2013). However, publications that advocate for or discuss the relevance of the authentic or real within these specific settings do not converge on a common, broader understanding of

authenticity. In fact, authenticity may refer to something being real, original, being of historical significance, being unique, being of high monetary value, being of natural origin, having full functionality, being complete or having had an existence or significance outside of the informal setting itself (Evans et al. 2002; Frazier et al. 2009; Hampp and Schwan 2015; Newman and Bloom 2012).

Accordingly, different types of museums may interpret authenticity differently. For example, a work of art may be considered authentic if it is an original, whereas the authenticity

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of a dinosaur fossil may be related to its history and natural origin. In both examples, the authentic can be contrasted relatively easily with the inauthentic. A replica of a painting may be indistinguishable but holds a different value and tells a different story, while a dinosaur skeleton constructed only of fabricated parts or bone casts seems of lesser value than one that contains (mostly) fossilized bones. This brings us to the main question of the present article: Regarding notions of authenticity, what is the common ground across museum types and, complementary, where do natural history museums, science and technology museums, science centers, art museums and memorials differ?

1.1 | Exploring Notions of Authenticity via a Multidisciplinary Network

In 2021, a network of 19 museum practitioners and museum learning researchers was formed, funded by the German Federal Ministry of Education and Research (www.bilad.org; authors of this article). Specifically, the network comprised seven international practitioners from two countries representing five different types of museums, including science museums, science centers, natural history museums, art museums, and cultural heritage (particularly memorial) sites, and 12 international museum education and learning researchers from four countries. The premise for the network is based on the observation that while different museum fields may have core concepts in common, there is often a lack of direct exchange about respective views on these topics. Instead, they all mainly stay within their scientific domains and museological communities with specialized research groups, conferences, and journals. There are few occasions for discourse and information exchange across the boundaries of their field—one being the annual meeting of the *Visitor Studies Association*, another the *Curator* journal. Accordingly, the main intention of the BILAD network is to provide a form of *agora*, an open marketplace where concepts such as authenticity, informal learning, or advanced empirical methods can be debated, fostering awareness of the broad spectrum of understandings in different museum areas. To discuss and advance a shared understanding of the concept of authenticity, the members of the BILAD network met physically three times over a three-year period (2022–2024) in Munich and Tübingen, as well as in seven online meetings. All meetings were protocolled and documented, with the content and results of discussions distributed as a shared text within the group. The essence of these intensive debates on the theoretical concept of authenticity and on practical experiences with authentic museum exhibits is presented in this co-authored article.

A desire to experience authenticity has been repeatedly found to be a feature that attracts visitors to museums (Moussouri 2007; seeing “the real”, Packer and Ballantyne 2002; Pekarik et al. 1999). Further, the relevance of authenticity for the perceived value of museum visits has been shown to hold rather uniformly across museum types (Schwan and Dutz 2020). In addition, relationships between the digital and the reproduced and the authentic, while underexplored, are gaining increased interest among researchers and practitioners (Brida et al. 2014; Land-Zandstra et al. 2023; Schwan et al. 2017). The goal of the network was to address these issues and to investigate how

authenticity may be conceptualized across the various museum fields.

The exchange was structured along a set of five questions, including “What constitutes authenticity in your type of museum?”, “Where does authenticity end and inauthenticity begin in your field/institution?”, “What is the relationship between the original and something closely resembling the original (but not being original) in your field/institution?”, “How is authenticity presented or staged in your field/institution?”, and “What are the perspective and/or expectations of the visitors regarding authenticity in your field/institution?”.

This article summarizes the main ideas that emerged from the discussion with the aim of reflecting on different concepts and facets of authenticity at play across different types of informal learning institutions. It should be noted that practitioners reflect not only on their own museum but also on the broader field of their respective museum type. In this way, we aim to contribute to advancing and differentiating present notions of authenticity in the field. A common understanding of authenticity is important not only for communication between researchers and museum practitioners, but also for the exchange between museum practitioners in different kinds of museums, such as art museums, science museums, and historical sites. Beyond that, it helps to identify relevant future research questions and guides the formulation of hypotheses that can be tested empirically. Further, the four facets of authenticity presented in the following allow for tailoring empirical settings that systematically vary specific facets of authenticity and apply specific measures to grasp visitors’ experiences of authenticity in more detail. Lastly, a more precise notion of authenticity is necessary to establish causal connections between the realization of authenticity in a specific museum design and visitors’ cognitive processes. However, our aim is not to impose a single overarching definition of authenticity. Instead, we propose an analytical framework for identifying how different facets of authenticity are configured across museum types.

The article is organized into two sections: The first section provides a condensed overview of theoretical approaches to authenticity and outlines a set of four general facets of authenticity that constitute an analytical framework for characterizing different museum types regarding their conception of authenticity. The second section prototypically describes various museum types along the framework’s facets. The article concludes with theoretical and practical implications.

2 | In Search of Common Ground: Core Facets of Authenticity

In general, a distinction can be made between several ways to view authenticity (van Gerven et al. 2018). On the one hand, the *ontological objectivist stance* considers authenticity an innate and objective feature of an object or site, mostly related to its originality or realness. In particular, the authenticity of an object is given if a seamless historical trajectory from present to the object’s origin can be established. This is typically done by experts in the respective field (e.g., archaeologists, paleontologists, technical historians, etc.), who scrutinize all available

evidence (material analyses, documents, etc.) about the object to determine its authenticity. Accordingly, the notion of 'objective' authenticity focuses on the physical features of an object, and it implies a sharp distinction between the authentic and non-authentic. On the other hand, a *constructivist view* considers authenticity to be socially and culturally constructed and dependent on the context of an object, and one's individual perspective or expectations. In the constructivist view on authenticity, there is no sharp distinction, but rather a continuum between the authentic and the non-authentic. Note, though, that a constructivist view of authenticity does not negate that an object or setting may have the features that experts would denote as authentic; it would merely add that this "objective truth" does not matter if it is not shared or understood as such, and it would also question the power structure that determines criteria for and ultimately makes the call of whether something is authentic. Instead, the approach not only recognizes that different experts (and different methodological approaches) may come to different authenticity judgments but substantially expands the circle of those who participate in socially negotiating the authentic status of an object.

van Gerven et al. (2018) proposed a third view of authenticity, psychological essentialism, as a way to overcome the limitations of the other two views. This *essentialist view* considers objects to have an underlying essence that determines their authenticity. The underlying essence is related to the object's history, material properties, aesthetics, and creator. It combines the effects of material properties (being of a certain material, containing traces of use) with psychological constructions such as the value we place on the object's unique history. The essentialist view enables us to explain why certain objects are valued for their link with a certain person or historical moment, a link perceived as embodied in an object, such as the fact that a historical pen has been used by a famous scientist. Thus, its authenticity may be more highly valued than the same historical pen without special ownership. Psychological essentialism combines objectivist and constructivist notions of authenticity and may therefore serve as a useful starting point for a nuanced analysis of the role of authenticity in the field of museums and exhibitions. A related perspective on authenticity is being developed by Kisiel et al. (2022), who suggest that a variety of interrelated factors that include the physical nature of an object or setting, its sociocultural context, the perception of these factors and characteristics of a person jointly influence whether and to what degree something is seen as authentic, and the impact that perspective has on experience and outcomes.

Based on the discussions of the BILAD network, four facets were identified that characterize current notions of authenticity in museums, namely (1) that authenticity is not confined to objects, but also refers to persons, places, phenomena, and activities; (2) that, from a visitor's point of view, authenticity may be ascribed to entities that are not necessarily "original" but also to entities that "feel to be true"; (3) that authenticity is not dichotomous but is scaled; and (4) that attribution of authenticity is not only determined by characteristics of the object at hand but is strongly influenced by its context of presentation, the specific forms of staging, and the personal context of the visitor, including prior knowledge, experience, attentiveness, and engagement.

2.1 | Authenticity Refers to Objects, Persons, Activities, Phenomena, and Places

Since at least the opening of the first interactive science center in San Francisco in 1969 and gaining further momentum through the "participatory turn" (Simon 2010), museums offer visitors a broad range of experiences and activities beyond their collections on display (Gorman 2020). Accordingly, notions of authenticity now encompass not only objects but also persons, activities, phenomena, and places. In addition, to capture the diversity of authentic elements found in museums, this extension is complemented by a differentiation of the umbrella term "authentic objects".

Starting with material things, Thiemeier (2015) distinguishes between works, specimens, and witnesses as different types of authentic objects. According to Newman and Bloom (2012), authenticity is given to a work with a certifiable origin based on a unique creative act (performance) and a degree of physical contact with the creator (contagion). Authenticity of works triggers unique aesthetic experiences that cannot be reproduced by other forms, with artworks as typical examples (Newman and Bloom 2012, but see Specker et al. 2023). For specimens, authenticity is defined by representativeness and prototypicality, "representing examples typical of a specific species, technique, or material" (Thiemeier 2015, 402). Because specimens serve as a vehicle of information, the distinction between original and copy becomes secondary, "provided that a copy can display all the relevant characteristics in the same quality" (Thiemeier 2015, 403). But, on the other hand, in natural history museums the first find of a species, the so-called holotype, plays a prominent role, because the description and name of a new species is based on a reference to its original holotype. As witnesses, authentic objects function as sources and emotional objects, tell stories through their traces, and can serve as evidence. Due to their connection with a historical situation or person, witness objects are closely associated with various visitor experiences of becoming connected to history, such as Benjamin's notion of aura (1936/2008) or Latham (2013).

Extending the definition of authenticity, Newman and Smith (2016) distinguish person-related authenticity from object-related authenticity. For museums, such person-related authenticity includes visitors being guided by contemporary witnesses (such as former coal miners as guides in a historic mining site or in a mining museum; Price and Rhodes 2022) or coming in contact with scientists. In the latter case, this may not only mean speaking with scientists but also watching them performing science-related activities (Meyer 2011; Moussouri and Roussos 2013). Authentic science-related activities can also be performed by the visitors themselves, which is typical for carefully designed hands-on experimentations with phenomena (like the Bernoulli effect) in science centers or in out-of-school labs in science and technology museums (Achiam et al. 2016). Furthermore, museums might engage their visitors in citizen science projects, having them partake in real research studies (National Academies of Sciences, Engineering, and Medicine 2018; Pierroux et al. 2020).

Finally, authenticity can also be attributed to the location of a museum or exhibition. This is evident for memorial sites and

historic houses but may also hold true for other types of museums, such as art exhibitions located at the former living place of an artist or museums of science and technology located in a former industrial building. Research indicates that the awareness of being at an authentic place may influence visitors' affective and cognitive processing of information (including material objects) related to the site (Ries and Schwan 2023a).

2.2 | Authenticity Is Attributed to Entities That "Feel to Be True"

Echoing Benjamin's (1936/2008) notion of aura, Latham (2013, 3) argues that encountering authentic objects may evoke a so-called numinous experience characterized by "a holistic uniting of intellect and affect, with a direct link to the tangible and symbolic nature of the object, a feeling of being transported, and intensely profound connections with the past, self, and spirit". The approach posits that these experiences are strongly coupled to authentic artifacts and become lost with material copies or digital reproductions because the trajectory that continuously links the historical origin of an artifact with its present state is diminished (Jeffrey 2015). In addition, regarding digital reproductions, Jeffrey (2015) describes five characteristics that further impede the experience of aura, namely lack of physical location, lack of substance, no degradation, infinite reproducibility, and lack of ownership. However, despite these impediments, Latour and Lowe (2011) adopt a stance emphasizing that the experience of aura does not necessarily get lost through copies but depends on the quality of the copy itself. That is, carefully crafted copies may well contribute to the aura of a certain exhibit (for similar arguments see Kenderdine and Yip 2018).

Indeed, museums and other informal settings often make use of replicas and reconstructions. In art museums the notion of authenticity has been blurred, for example, by curating art exhibitions on forgeries and by attributing art forgeries the status of an original (e.g., "originals" by the famous art forgers Beltracchi or van Meegeren). Indeed, Pye (2016) discussed the 'signature' conservators can leave when restoring objects and how the conservation process inevitably changes them. This is particularly important in the case of contemporary artworks, such as 'time-based media' for example, where the nature of the collection makes the role of conservators as well as other specialists such as computer scientists and electricians, key in assembling and displaying them (Jimenez et al. 2022). There are even highly successful exhibitions that do not show any original objects, but rely solely on replicas (e.g., the Tutankhamun exhibition <http://www.tut-ausstellung.com/en/>). Similarly, at historical sites and memorials, reconstructions can play an important role in establishing authenticity (ICOMOS 2013).

Accordingly, Grayson and Martinec (2004) proposed a distinction between indexical and iconic authenticity. Whereas indexical authenticity refers to a material or an object being original (in contrast to a copy), iconic authenticity refers to an object that corresponds to the expectations of a viewer based on their prior knowledge. In other words, iconic authenticity is given if an object, person, activity, or place appears and functions as in its original state, implying the possibility of "authentic reproductions" (Bruner 1994). Iconic authenticity underlies

traditions of multisensory approaches in exhibition designs to enhance the experience of authenticity ("it feels, sounds, smells real or true"). Moreover, by fostering a sense of presence, immersive virtual and hybrid reality environments, such as virtual reality and augmented reality, have substantially expanded notions of what is experienced as authentic (Pierroux et al. 2019; Di Giuseppantonio Di Franco 2022; Kuchler 2021; Lee et al. 2020).

Several studies have shown that both originality (i.e., indexical authenticity) and appearance (i.e., iconic authenticity) contribute to visitors' overall evaluation of objects (Hampp and Schwan 2015; van Gerven et al. 2018). In a survey study in nine German museums, including museums of science and technology, of natural history, and of cultural history, visitors declared that they are willing to accept copies as substitutes of original exhibits, if, for example, the original does not exist anymore, is too delicate to be displayed, or is important for completing an exhibition (Schwan and Dutz 2020). Interview studies at a science and technology museum showed that visitors have a distinguishing view of authentic objects and copies, emphasizing that authenticity does not matter if a replica is 100% true to the original, if its underlying functions and mechanisms can be understood, or if it is linked to an interesting story (Hampp and Schwan 2014). Moreover, in line with Bruner's (1994) notion of "authentic reproductions," studies have shown that reconstructions of heritage sites contribute to visitor's perception of authenticity (Jones et al. 2018; Nam et al. 2023).

One may ask whether the interplay between indexical and iconic authenticity can also be extended to phenomena and activities. Whereas sites with a focus on historical events of the last 50–80 years often work with contemporary witnesses, cultural heritage sites of earlier historic periods must rely on re-enactments and costumed interpretation that mimic the conditions of a historical period in terms of tools, clothing, and behavior, which have been found to evoke a deeper sense of the past (Brædder et al. 2017; Malcolm-Davies 2004). Issues of indexical and iconic authenticity are also relevant for settings that include visitor-controlled experimentation or laboratory-like settings, such as science centers or natural history museums. For example, some hands-on experiments in science centers demonstrate physical, astronomical, chemical, or biological phenomena as they occur in reality. In contrast, others might mimic science phenomena by simulation, such as traveling through space demonstrations in a Planetarium. Although to the best of our knowledge, no empirical study has directly investigated whether such processes are perceived as being authentic, indirect evidence comes from studies that show their immersive character (Achiam et al. 2019; Uchida and Peng 2018) or from studies that indicate a close positive relation between immersion and perception of authenticity (Nam et al. 2023). Also, whereas visitors' participation in citizen science projects in museums' open research labs can be considered as "true" scientific activities that contribute to science's progress, other activities, such as digging for fossils in a prepared sandbox, merely simulate scientific activities but may nevertheless be perceived by the visitors as performing "true looking" authentic scientific procedures (Achiam et al. 2016).

2.3 | Authenticity Is Scaled

In consequence, authenticity should be considered on a spectrum or as graded (Hohenstein and Moussouri 2018), that is, instead of asking whether something is authentic or not (which can be appropriate at times), more often the better question is how authentic something is, or to what degree authenticity is experienced and if it is of significance for the museum visitor. For natural history museums, Chalk (2020) has proposed a taxonomy of exhibits along the dimension of material (i.e., indexical) authenticity, ranging from living animals over spirit specimens and skeletons to taxidermy and models. A second taxonomy refers to visual (i.e., iconic) authenticity, ranging from live animals, dioramas and complete creatures to incomplete creatures, preserved organisms (e.g., herbarium sheets) and specimens (e.g., fossils out of context). Taking modern art exhibitions as another type of museum it was found that graded concepts of authenticity also play an important role. Photographs and prints are classified according to their connectedness to the artist, with so-called vintage prints being a first specimen or series produced by the artists themselves, whereas later prints or re-prints by other persons count as being increasingly less authentic. This is also reflected in studies that show consumers prefer prints with lower serial numbers over higher numbers (e.g., in case of Warhol prints; Smith et al. 2016). Regarding historic places, Venturini (2020) showed that curators acknowledge different degrees of authenticity and that they try to rely on objects that belonged to a historic house and its owners, but combine them with period pieces (i.e., “intermediate” authentic objects from the same period, but not directly linked to the house) and reproductions to give the impression of authenticity “even if this often entails reliance on less genuine objects” (Venturini 2020, 157).

Regarding activities, Achiam et al. (2016) have emphasized that activities in museum education programs are based on authentic scientific activities but undergo a process of transposition. That is, “the practices of scientists are appropriated from the domain of research and transformed and translocated into the domain of education”. This does not mean a degraded scientific practice but a re-organization of the practice with the goal of making it more accessible. Such transformations in terms of adaptation to the level of knowledge and engagement of different audiences, including simplification and idealization, also play an important role for the design of demonstrations of phenomena and hands-on experiments in science centers. Thus, for educational reasons, scientific activities in science centers and museums may range from performing “true” scientific activities to merely simulating scientific activities, depending on the extent of educational design transformations necessary for making the phenomenon or activity comprehensible and accessible. It is particularly appropriate to analyze what of the activity still represents the authentic and link it to visitors’ outcomes such as engagement, fascination, meaning-making, and learning.

2.4 | Attribution of Authenticity Is Influenced by Context and Staging

It is not only the objects, places, persons, activities, and phenomena per se that determine perceived authenticity in museums but also the different kinds of scene setting and staging.

To begin with, the very act of crossing the threshold of a formal entrance to a museum indicates to visitors “the staging of a cultural act” (Parry et al. 2018, 2) that is built on expectations and trust of authenticity. Hence, visitors are implicitly encouraged to perceive objects and sites in that way. Specifically, museums “are structured according to their own rhetoric, a rhetoric which seeks ... to persuade the visitor that what is being seen and read is important, beautiful and/or true” (Silverstone 1994, 166). Similarly, Azoulay (2019, 59) argues that the apparently neutral “protocols for handling and salvaging art objects” are historically taste-making activities derived from imperial definitions of value and authenticity that have denied the “diverse political and cosmological formations” that frame an object’s fabrication but also an original interpretation. Today, an understanding of artworks as being open to interpretation is more prevalent.

Nonetheless, museums do draw on a broad range of alternatives to frame the authentic experience, deciding not only *what* to present but also *how* to present it, both upon the visitor’s arrival and during the visit (Hede and Thyne 2010; Parry et al. 2018). Typical strategies of scene-setting that may enhance visitors’ perception of authenticity include the presentation of selected objects on a museum’s website, declaring certain objects in a gallery highlights (e.g., by inclusion in audio guide tours), making objects prominent by placement and lighting conditions, and putting objects into specifically staged context (Parry et al. 2018). Other interests in contextualization are more discipline-specific, such as science museum’s galleries that try to reproduce the atmosphere of a certain setting (e.g., the mine at the Deutsches Museum, <https://www.deutsches-museum.de/en/museum-is-land/exhibitions/mine>), art museums allowing to haptically explore original artworks (Christidou and Pierroux 2019), and the uses of dioramas in natural history museums, which vividly reproduce certain habitats with their fauna and flora implying a high degree of iconic authenticity (Chalk 2020; Reiss and Tunnicliffe 2011). Similarly, although not empirically tested, we speculate that performing scientific tasks in a laboratory-like setting such as a museum’s open lab should increase visitors’ perceived authenticity of the activity.

3 | Configurations of Authenticity at Different Museum Types

When considered in conjunction, combinations of these aspects may form particular configurations that can be seen as prototypical for specific types of museums. For example, natural history museums focus on the presentation of specimens (e.g., a grizzly bear), are liberal with regard to the addition of non-original elements (e.g., taxidermies filled with metal structure, use of glass eyes etc.), have developed some strategies of impressive staging (e.g., dioramas), and offer appropriately designed science-related learning activities in open labs or educational programs. In contrast, art museums focus on the presentation of solitary works, are highly restrictive to the addition of non-original elements and rely on subtle forms of staging (e.g., texts, mounting, lighting), while historical sites are based on the authenticity of a place, often add non-original elements (e.g., reconstructed architectural elements) and make use of personal staging (e.g., costumed interpretation), to name a few examples. Moreover, science centers and science and technology museums

prototypically focus on activities such as experimenting or exploring through interactives, allowing visitors to engage with phenomena in more or less authentic ways.

Accordingly, in the following section we will describe and discuss the four facets of authenticity mentioned above with regard to prototypical configurations of authenticity in various museum types, including natural history museums, science and technology museums, science centers, art museums, and historic sites. These examples speak to the constitutive aspect of authenticity, whereby meaning is determined by the communities associated with the disciplines these museums represent (Hohenstein and Moussouri 2018). The constitutive notion of authenticity also reminds us that its meanings and the conventions that govern them can change as ideas evolve.

3.1 | Natural History Museums

Exhibits in natural history museums range from living animals, taxidermied animals such as a rabbit (Bunce 2016) and fossils of dinosaurs (van Gerven et al. 2018) to rocks and minerals. Therefore, in natural history museums, arguments for ascribing authenticity to objects will mostly relate to their natural origin as they were parts of the natural world before they became collection items. As these objects are often representatives of a certain biological species or geological formation, they conform to Thiemeyer's (2015) specimen type of authenticity. Special importance is attached to so-called holotypes, upon which a new species was described. Because of their irreplaceability, these holotypes fulfill the authenticity criterion of uniqueness (Hampp and Schwan 2014). In addition, when the individual history of natural objects is in focus, they can also be assigned to the type "witness" (Thiemeyer 2015). Within a psychological essentialism view of authenticity, these "witness" objects may be considered more authentic than others because of their unique history, such as the polar bear Knut from the Berlin Zoo. Due to their emotional charge and connection to history, such natural objects can thereby develop an aura or numinosity (Latham 2013).

However, objects from nature usually undergo modifications by humans in the course of preparing them for exhibition. Therefore, natural history museums deploy strategies to de-emphasize the human agency involved to maintain the visitors' perception of naturalness and authenticity, trying to keep a balance between indexical and iconic authenticity. A taxidermied animal, a dinosaur skeleton with many cast bones added, or a diorama with a carefully arranged array of species that typically cannot be found at a single spot in wilderness may therefore be considered not to be completely authentic because of the high degree of human intervention. Scientific authenticity in the sense of the object's naturalness thus gives way here to authenticity in the sense of lifelike representation, with naturalness corresponding to indexical authenticity and lifelike representation to iconic authenticity according to the distinction of Grayson and Martinec (2004).

Based on the graded nature of authenticity in natural history museums, Chalk (2020) describes the degree of material (i.e., indexical) authenticity as an interplay of natural features (natural composition of materials, individuality of the specimen,

completeness, lack of change) and artificial interventions (loss of life, loss of parts, use of artificial materials, typicality). Similarly, the degree of visual (i.e., iconic) authenticity depends on the interplay of visible natural features (living creatures, display of naturalistic surroundings, life-like staging) and visible artificial features (display in an unnatural context, visibility of museum work, incompleteness). At the inauthentic end pole of the spectrum, several reasons exist to display replicas instead of authentic objects in the exhibitions. Replicas may be chosen to make a collection more complete, to enable visitors to touch and handle objects that are too fragile, to show objects that are very rare or to replace objects that cannot be preserved (de Kluys et al. 2024).

Often, the authenticity of natural history objects is emphasized through the physical context within the museum display. Museums not only try to mount fossils or taxidermied species in the most natural and "correct" way (Senter and Robins 2015) but also use dioramas to illustrate the way an animal could have led its life or could have interacted with other animals (see, for example, the dioramas at the Museum König, <https://digital.museum-koenig.de/unser-blauer-planet/>). In the context of visitor engagement with dioramas, Ash (2004, 94) found that one of the topics that family conversations focus on is the 'qualities of living things, based on distinctions of alive versus dead, or real versus manmade'. This finding is common across other types of natural history settings such as museums and aquaria (Ash 2002) leading the author to suggest to address these topics in the design of exhibits; this is what she refers to as 'authentic multiple entry points' (Ash 2004, 97). More recently, digital technologies, including large wall projected animations, simulations, virtual reality and augmented reality are increasingly used to re-contextualize exhibits (Kenderdine and Yip 2018). Even almost extinct species are brought to life for visitors through technology (e.g., the Lost Rhino exhibition by Alexandra Daisy Ginsberg, NHM, London). Bringing out its individual history may also increase the perceived authenticity of an object (Reiss and Tunnicliffe 2011). For example, in Naturalis Biodiversity Center, in the Netherlands, the authenticity of a *T. rex* fossil (<https://www.naturalis.nl/en/over-ons/media-onze-experts-beantwoorden-graag-alle-persvragen/persdossier-naturalis-t-rex>) is highlighted by individualizing the dinosaur through giving it a personal name and presenting its individual life story (e.g., she had a bone disease). In addition, the story of how this fossil was excavated, prepared, studied and mounted has also been presented to the audience, adding another context-based "layer" of authenticity.

Finally, person- and activity-related authenticity play an increasingly prominent role in natural history museums, for example, in open labs or behind-the-scenes visits during which scientists or taxidermists provide insights into their work (Gorman 2020). Also, science-related activities in which scientific work (e.g., the identification of species in a citizen science project), scientific phenomena (e.g., an earthquake simulator), or the behavior of living beings can be experienced by visitors play a major role in the development of knowledge in the natural history museum (Wagensberg 2005). In this context, multisensory elements come into play, where living creatures, geological formations, or natural phenomena can be perceived with all senses for an authentic impression (such as listening to animal voices or haptically

exploring furs, bones, or rock types; Hampp et al. 2025; Knutson et al. 2016; Rowe and Kisiel 2012).

3.2 | Science and Technology Museums

The main focus of science and technology museums is on machinery and instruments from all fields of science and/or technology presented for educational purposes. Objects may either be exemplars of a certain device and thereby conform to Thiemeyer's (2015) authentic specimens or have a particular history (e.g., being used by a famous scientist) and thereby conform to authentic witness. Technical and scientific objects in museums were usually objects in use, that is, their state and condition changed throughout use: objects were improved to get more powerful, got other (later electric/electronic) regulators, were repainted to fight corrosion or fit more recent fashions. When presented at a museum, the challenge is which state to show: The state of construction, the main use state, or the state the object had when entering the museum. For example, many museums restore the cars so they look as if they would just have left the factory, however current 'Zeitgeist' is more to present them in a "used look", creating different relations between indexical and iconic authenticity. By and large, wear and tear on objects promotes the perception of authenticity, as the story an object has to tell becomes more prominent.

Science and technology museums also face a tension between presenting authentic objects and explaining their function. Here the general transformation of science and technology museums from education-orientation towards conservation of cultural heritage becomes apparent. Instead of severing original objects (as was done in the 1970s/1980s) to give visitors a look inside the machinery to better understand its function, today visualizations, videos, or (AR) projections on the object are used instead, which help to keep authentic objects in their original state.

While original objects are the rule, when used for educational reasons or to present a more complete collection, prominent objects might also be presented as replicas. Replicas may even acquire a status of authenticity due to their own history of making and using. An example is a replica of the moon rover from NASA's Apollo 15 mission in the Deutsches Museum in Munich (<https://digital.deutsches-museum.de/en/digital-catalogue/collection-object/2019-407/>), where the original is still on the moon and there are only very few technical models that stayed on Earth for training and technical support. Another example is a large collection of models that interpret Leonardo da Vinci's own drawings at the Leonardo Galleries of the National Museum of Science and Technology Leonardo da Vinci in Milano, Italy (Giorgione 2009, 2015, Giorgione 2019; <https://collezioni-online.museoscienza.org/esposizioni/gallerie-leonardo-vinci>). Models have traditionally been used to evidently explain concepts, phenomena or functions of machinery or processes. These models can be seen as authentic, original objects in their own right; their attributed authenticity relates to their uniqueness as well as to the educational purpose of their creation within the specific historical moment and discourse.

Except for science and technology museums at historic sites, like old power plants or big industrial monuments, the objects

are presented spatially decontextualized. However, the lack of authentic context is compensated for in different ways. The classical way is to add information via additional media, such as text labels, video or VR/AR. Here, different facets of the object can be presented, increasing the object's perceived authenticity—from the original working context, to societal implications to the story of how the object came to the museum. Dioramas are a special way that science and technology museums add context to exhibits, showing an object in a scale model with all its surroundings allows the visitor to immerse in the (miniature) world of the time and situation of its use. Another way is recreating a life-size setting that strongly resembles the original context of use, like the mining exhibition at the Deutsches Museum (<https://www.deutsches-museum.de/en/museum-is-land/exhibitions/mine>). It is worth noting that authenticity is also associated with visitor familiarity with particular types of objects and collections. For example, an evaluation of the Information Age Gallery in the Science Museum in London showed that visitors were less familiar with the real scale of objects such as satellites and, consequently, they could not determine if an object was authentic or a model unless it was clearly stated (Fisher 2015).

In addition to contextualization of objects, staging of exhibits is used to signal the exclusivity of some original (i.e., indexical authentic) objects, either through the exhibition architecture, for example, placing an outstanding exhibit on a colorful platform in the middle of the room (the famous "red velvet cushion"), by marking objects with a "highlight" or "masterpiece" badge, or by making them part of a highlight tour in the media guide or in a book collecting the masterpieces of a museum.

In science and technology museums, authenticity also includes persons, activities, and phenomena. To bring visitors in contact with professionals from science and technology, interpretations can be given by staff with a corresponding background. If a trained toolmaker explains the tooling machines, a deeper understanding and connection to the exhibits can be formed. Talking with scientists in the (education/open) lab or at science communication events in the museum can also offer multiple dimensions to gain authentic experiences. 'Coming in contact' means creating informal contexts of dialogue in which visitors and scientists share views and learn from each other, and where values and opinions are negotiated so that both sides can reassert the importance not only of science and technology in our lives but also of building a common ground for exchange between the scientific community and civil society. It is the "physical contact with the creator" enriched by the uniqueness of the moment and encouraged by the creation of dialogue contexts for the flow and sharing of ideas that contribute to authenticity in a museum setting.

Another facet of authenticity is the science (and technology) education practice of engaging visitors in first-hand experiences, that is, demonstrations or experiments in science museums' education labs. Many education labs (especially for school audiences) are designed to deliver an "authentic" environment making students feel as if they are working in a real science lab when using original laboratory-style workbenches and equipment or by wearing white lab coats.

3.3 | Science Centers

Sometimes referred to as “second generation science museums” (Bradburne 1990; White 2019), science centers have a strong focus on interactive exhibits. In traditional science and technology museums, interactive exhibits have also played an important educational role and served the purpose of illustrating and explaining underlying principles of (historical) objects. The Deutsches Museum in Munich is a prime example of this approach. At the same time, however, interactive science center exhibits have shifted the meaning of authenticity within their exhibitions. Many interactive exhibits in science centers continue to have a strong learning focus and do not make any claim about originality or authenticity. Nevertheless, science centers assert that visitors do have authentic experiences by using interactive exhibits which are meant to profoundly enhance the understanding of the phenomena, ranging from the effects of basic natural laws to technological principles. Prototypical examples are hands-on exhibits, because some phenomena (such as those that deal with forces) are best experienced by touch and interaction. Visual phenomena (such as optical illusions) can be experienced visually, while some other phenomena can best be experienced with the help of simulations. Because there are large differences in pedagogical simplification of the same phenomenon designers of interactive exhibits must decide whether they aim to mirror a real, live phenomenon in all its complexity and “messiness” or to purify the phenomenon by simplification to facilitate not only the impression of an authentic experience, but also for comprehension and understanding.

Thus, interactive science center exhibits shift the notion of authenticity by highlighting the (ephemeral) phenomenon instead of pointing to a material “authentic object”, by drawing attention to and encouraging the experiences and perceptions of the visitors while interacting with the phenomena, and by referring to “nature” as the “true originator” of the phenomena instead of singling out individual scientists or inventors. Consequently, interactive exhibits are experienced as more authentic: (a) the more powerfully, stronger and clearer an effect is demonstrated, (b) the more directly and fully it is perceived by the visitors, (c) the more visitors that actively participate and (d) the “closer” the phenomenon is to nature (or a scientific/technological principle).

Science centers have created their own culture of display in which the interactive exhibit and its related phenomenon are supposed to stand on their own in an often reductionist, isolated and open manner (Bradburne 1990; White 2019). As a consequence, science centers have been described as department stores of scientific principles, and, despite some modifications in recent decades, “science centers continue to be planned based on the traditional pattern of cluster of hands-on exhibits about science and scientific principles (the single largest exhibit topic is physics)” (Bradburne 1998, 238). Accordingly, the quality of a science center and the experiences it provides are often assessed by reference to the authenticity of its interactive exhibits. However, authentic historical objects are increasingly used in science centers, influenced and shaped by narratives, scenography, and design to enhance visitors’ experiences. These increasingly mixed or hybrid exhibitions use the notion of authenticity in more than one way; authentic objects are combined with

authentic phenomena, both integrated in the notion of authentic visitor experiences.

3.4 | Art Museums

In art museums, the notion of authenticity is focused on the concept of (art-)“work” in its various forms. In its most basic interpretation, an artwork is considered to be authentic if an artist has created it in a unique creative act with a high degree of physical contact (Newman and Bloom 2012). Authenticity is strongly related to the notion of an individual distinctive style and has been linked with the idea of progression of art through innovation (in artistic techniques, themes, theoretical underpinnings). In this sense, the impressionist painting “Impression, soleil levant” by Claude Monet is a prototypical authentic artwork because it is unique, it was physically created by an artist with a highly distinctive style, and it introduced a new way of seeing and painting scenes that is considered a founding masterpiece of Impressionism. However, at least since the 19th century, art has begun to critically reflect and question each characteristic associated with the authenticity of artworks. This includes questioning uniqueness by serial art, physical contact by conceptual art, creativity by readymades, the distinction between original and copy by appropriation art, and permanence by the Fluxus movement, to name just a few examples. Accordingly, some scholars have emphasized the role of the institutional “art-world” in defining and authenticating artworks (Danto 1964; Dickie 1997) and the impact of physical context (art museums and galleries as art defining settings) on the attribution of authenticity (Groys 2008).

In other words, in contemporary art theory, it is well accepted that if a work is acquired or exhibited in an art museum then it is authentic ‘art’ - the institutional aspect is key: experts determine whether works are ‘fakes’ for example, and whether they are a new and original contribution to the field of art. For example, against the background of artists as individual “geniuses”, similar works from successors or less-known artists often count as less authentic pieces even if they fulfill criteria of a creative act with a high degree of physical contact. Also, artists have been re-valued, thereby moving up or down the scale of authenticity. In addition, art museums have also made great efforts to exclude forgeries from their collections and exhibitions by reconstructing a seamless line of provenance and by use of advanced analytic technologies. However, even obvious non-authentic (in the sense of being not created by the claimed artist) artworks may acquire the status of authenticity, as the works of Beltracchi or van Meegeren demonstrate.

In addition, the impact of printed reproductions on the authenticity of the reproduced artwork has been intensively discussed since Benjamin’s (1936/2008) famous essay on the artwork in the era of technical reproducibility, including the ‘mechanics’ of digitization and more recently, artificial intelligence. For example, emphasizing vintage prints in exhibiting photographic art or transforming digital artworks into non-fungible tokens (NFTs) can be seen as an attempt to re-introduce uniqueness (as an important characteristic of traditional definitions of authenticity) into the field of infinitely reproducible forms of art (Chohan and Paschen 2023).

Regarding the impact of contextualizing and staging authentic artworks, two partially conflicting lines of exhibition design can be found. On the one hand, in traditional art, religious artworks in cathedrals and private palaces were removed from their original settings, framed, and presented to the public in art museums, thereby losing their original context. This has prompted Latour and Lowe (2011) to question the asserted superiority of authentic artworks in non-authentic settings (art museums and exhibitions) over high quality “non-authentic” artwork copies in authentic settings. The de- or re-contextualization of artwork in museum galleries is further enhanced by use of “white cube” interiors isolating the artworks against a “neutral” background. All art museums nonetheless practice authentication strategies and the use of authenticity signals, primarily through labels (provenance, artist name, date of birth/death, title and year of work), wall texts with curator’s/experts’ statements, guidebooks and multimedia resources (Pierroux and Qvale 2019), or documentation of scientific authentication via X-ray and material analysis. In addition, ropes and barriers keep visitors at a safe distance, all rooms are guarded and observed, and the most famous authentic artworks are positioned at central points in a gallery and are highlighted in orientation maps and digital guides.

Besides the artworks themselves, persons and activities also serve as sources of authenticity in art galleries. In particular, art exhibitions bring the audience in contact with “authentic” artists, from the presence of artists in vernissages or as interpreters to Marina Abramovic’s concept of artists as artwork. In addition, some art museums have developed open labs, where visitors can watch experts conserving and restoring artworks. Finally, visitors may also engage in “authentic” artistic activities and become part of an artwork, as in Happenings and other types of performance art or digital interactive installations as prototypical examples.

3.5 | Historic Sites and Memorial Sites

The presence of historical traces suggests that cultural heritage sites and memorial sites are authentic places that serve as material anchor points for the history (Jin et al. 2020). Historic sites use the same ground and, in some cases, the same buildings as the historic events to which they refer. Thus, they seem to be more authentic places for conveying history than museums or monuments that have a neutral location.

However, today’s cultural heritage sites and memorial sites are primarily multilayered and superimposed places, which influence the concept of authenticity and the associated discourse. What presents itself on the grounds of the Sachsenhausen memorial, for example, is an ensemble of building structures originated and modified at different times. But it is not only the overall impression of the site that is affected: even in the case of individual buildings it is hardly possible to speak of an “original condition”. If one of the typical wooden barracks can be found, they are often reconstructed.

In consequence, according to a narrow definition of authenticity, in which there exists a specific original state, a historical site cannot be authentic due to the constant change of the places and

buildings across periods of time. For example, because concentration camps were already constantly changed during the Nazi era and also in the years afterwards, it is impossible to define an “original state.” Even if such a state could be specified, it would be irretrievably lost due to the many changes that it underwent, losing its iconic authenticity.

However, suppose authenticity is defined as “authentically verified” in the sense of indexical authenticity. In that case, it becomes highly significant for today’s memorials, since they are located at the sites of the crimes and serve there as sites of evidence of the crimes that took place (Schmid 2011). In the case of historic battlefield memorials, for example, what is still authentic on site would probably be answered here with “actually nothing anymore”. And yet, the place itself, that is, the temporal-spatial coordinates of the experience, would be attributed a certain authentic effect, provided that visitors have relevant prior knowledge about its historical dimension or are informed at the site through panels, multimedia offers or personal guides (Ries and Schwan 2023b).

Since layers of time coexist at a historical site, a curatorial and restorative preselection of what is to be presented takes place institutionally. Although the fact that historical sites typically present architectural elements and objects from different periods side-by-side may prompt visitors to critically reflect on their notions of authentic historical places, most often anything that is not clearly new/modern is perceived as one overarching historic period (Price et al. 2016). The layers of time thus require explanation, and breaking these down is thus one of the central points of informal learning at cultural heritage sites and memorial sites.

Cultural heritage sites and memorials also display authentic objects, such as furniture or everyday items. Here, another ambivalence of authenticity can be found in that German concentration camp memorials refuse to display objects from the NS regime to avoid devotional material that can be misused and misinterpreted by Neo-Nazi groups. In other words, whereas the authenticity of objects is usually seen as desirable, under certain conditions, there are concerns about its overwhelming and misleading character (Knoch 2020).

Both at cultural heritage sites and memorial sites, the boundaries between authentic and non-authentic buildings and objects are always shifting. Buildings at historical sites may range from being mostly in their original, unrenovated state to having undergone comprehensive conservation to more or less large reconstructive additions to pure reproductions, representing the whole spectrum of indexical and iconic authenticity (Ries and Schwan 2023b). Recently, this spectrum has been broadened by introducing Augmented Reality and Virtual Reality applications, which contribute a heightened iconic authenticity of “looking true” via digital models and overlays of historical situations (Bekele et al. 2018).

For historical sites from recent periods, opportunities to come in contact with authentic witnesses are also important. Typical examples are tours of former prison inmates at German Democratic Republic memorial sites or former steel workers at an industrial heritage site. In addition, historic events may be

staged in the form of pageantries, reenactments, or living history (Agnew et al. 2019). In places of more distant historical periods, costumed interpretation is often used as a means of enhancing iconic authenticity and the sense of being part of what it felt like at that time (Pierroux et al. 2020). The aim is to foster a deeper understanding of a place's history, the living conditions in a historical period, or a particular historic event by recreating as closely as possible a historic situation in terms of its people, their clothes, tools, and behavior. Regarding interpretation, a first-person mode can be distinguished from a third-person mode (Douglas et al. 2018). While during first-person interpretation, "interpreters assume the role of an actual person and speak and act in character" (Douglas et al. 2018, 34), "during third-person living history the interpreter may use period dress and idiom but moves freely in and out of time periods" (Douglas et al. 2018, 35).

4 | Discussion and Conclusions

Against the background of psychological essentialism, we first identified facets of authenticity that, according to the discussions in our interdisciplinary BILAD network, were considered relevant across various types of museums and other informal learning settings:

1. authenticity is not confined to objects, but also refers to persons, places, phenomena, and activities;
2. authenticity may be ascribed to entities that are not necessarily "original" but also to entities that "feel to be true";
3. authenticity is not dichotomous but is scaled;
4. attribution of authenticity is not only determined by characteristics of the object at hand but is strongly influenced by its context of presentation, the specific forms of staging, and the personal context of the visitor, including prior knowledge, experience, attentiveness, and engagement.

In a second step, five different types of museums and informal learning settings—that is, natural history museums, science and technology museums, science centers, art museums, and historical places and memorials—were considered in terms of these facets to identify particular configurations of authenticity that are indicative of these different types of informal learning settings. We focused our description on "mainstream" forms of setting types, but we certainly acknowledge that there is great variability within these types and that such configurations undergo substantial changes throughout time.

As a main result, we find that all four facets of authenticity play a key role in the different types of museums. In particular, we find that it is not only authentic objects, but also persons and activities that contribute to authenticity in museums and exhibitions. We also find that all setting types apply a scaled rather than binary notion of authenticity, including entities that would not be considered "authentic" at first sight, such as models, digital reconstructions or installations demonstrating scientific phenomena. Finally, all types of museums make use of various strategies of staging and contextualizing objects in order to make their authenticity salient to visitors. However, references to "authentic objects" in these different settings may relate to very different

phenomena. Both Grayson and Martinec' (2004) distinction between indexical and iconic authenticity and Thiemeyer's (2015) categories of work, witness, and specimen provide a useful categorical structure, but there are many more differences to consider. For example, a copy of an artwork in an art museum (in the sense of a copy of a painting made by a different artist) is different from a copy of a fossil in a natural history museum (in the sense of a cast). Also, the boundary between the original and the artificial is differently defined in the various museum types. While in a natural history museum a taxidermy animal typically counts as authentic, although it is stuffed with artificial material, a mechanical device in a science museum with only the casing remaining (its cavity filled with arbitrary material) would almost certainly not count as authentic. In contrast to museums with their focus on authentic objects, science centers stress the role of authentically demonstrating scientific principles and phenomena, and historic houses and memorials place particular emphasis on personal authenticity in terms of contemporary witnesses and experiencing the past. Finally, due to the self-referential character of modern and contemporary art, art museums are seen as embracing a more nuanced notion of authenticity compared to other museum types. In our view, description along these four aspects of authenticity may be fruitfully applied on the level of individual museums but may also be extended to other types of informal learning settings not addressed in the present article, including zoos, botanical gardens, local history museums, open-air museums, or ethnographic museums, among others.

In our analysis, we focused on the perspectives of the museums, represented by curators, exhibition designers, and museum educators in our network. Consequently, as a next step, the present framework should be expanded to the visitors' view (for an overview on studies about visitors' perception of objects, see e.g., Hohenstein and Moussouri 2018, 146–155). Do visitors perceive authenticity in a similarly nuanced way? Do they acknowledge differences among museum types concerning authenticity? How do visitors weigh iconic authenticity against indexical authenticity? Does the perception of authenticity translate into authentic experiences? In recent years, a number of empirical studies have contributed to our knowledge about visitors' perception of authenticity. Some studies have found that visitors' impressions of authenticity are based on different criteria for specific types of museums (e.g., archaeological museum vs. art museum, Brida et al. 2014). However, other studies revealed that visitors show a differentiated notion of authenticity that is largely similar across different museums types, preferably attributing authenticity to originals (e.g., fossils), but are also open to the use of copies as substitutes for authentic originals (Bunce 2016; Hampf and Schwan 2014, 2015; Schwan and Dutz 2020; van Gerven et al. 2018). However, to the best of our knowledge empirical studies that systematically investigate various facets of authenticity are still lacking. In our opinion, the present approach may provide an analytical framework for the development of a coherent research program but also for practitioners.

To sum up, we hope that the present framework stimulates an interdisciplinary exchange about the commonalities and differences of authenticity across museum types, helps to acknowledge the fluidness of boundaries between the authentic and the non-authentic, enlarges the notion of authenticity beyond

objects to people, places, activities and phenomena, and helps to develop a consistent empirical strategy to investigate the impact of these facets of authenticity on visitors.

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