P/REFERENCES OF DESIGN

FROM CABINETS OF CURIOSITIES TO DESIGN RESEARCH LABS?: HOW TO REIMAGINE NATURAL HISTORY MUSEUMS THROUGH DESIGN IN TIMES OF ECOLOGICAL CRISIS.

Lynn Harles*[ab]

a Bauhaus-University Weimar, Germany
b Museum für Naturkunde Berlin, Germany
* mail@lynnharles.com

DOI: 10.63442/XEIL8280

KEYWORDS | NATURAL HISTORY MUSEUM, DESIGN RESEARCH LAB, ECO-SOCIAL DESIGN, CLIMATE ACTION, SPECULATIVE DESIGN

ABSTRACT | This abstract delves into the overlooked realm of design practices within the context of the evolving roles of natural history museums in times of social and ecological crisis.

Natural History Museums (NHMs) have evolved from mere cabinets of curiosities to vital institutions for interdisciplinary research and education. However, faced with the urgent challenges of the climate crisis, NHMs must question their traditional exhibition spaces and their anthropocentric roles against the backdrop of biodiversity loss, invasive species and changing climates.

This study explores NHMs' complex historical roots and their need to overcome oppressive, colonial, and anthropocentric perspectives on nature. It is considering the design discipline as a stakeholder in reshaping NHMs for climate action and formulates the hypothetical question: "What if NHMs are understood as Design Research Labs for eco-social transition?" This inquiry lays the groundwork for speculative scenarios that explore the transformative potential of design and NHMs. The paper advocates for NHMs to embrace a pluriverse and more-than-human understanding of nature and become playgrounds for co-creative socio-ecological transitions. The study uses the Museum für Naturkunde Berlin as an illustrative example, highlighting innovative initiatives and collaborations but acknowledging challenges in translating visions into reality.
A central focus is on redefining NHMs as places for design-driven democracy, emphasizing the role of design in socio-ecological transformations. The paper discusses the potentials of design for sustainable transitions, highlighting current developments and the role of Design Research Labs as interfaces for NHMs. The study concludes by calling for NHMs to leverage the untapped potential of Design Research Labs, offering a pathway for NHMs to become catalysts for eco-social transitions.

1. Introduction: Rethinking Natural History Museums Through Design Research

Natural History Museums (NHMs) have undergone a remarkable evolution in the past century. Once mere cabinets of curiosities, they have transformed into essential public institutions for interdisciplinary research and educational innovation. Many Natural History Museums were established in the late 19th century – counting more than 600 institutions worldwide until today. Their purpose now extends beyond showcasing the wonders and curiosities of the natural world, dedicated to studying, preserving, and digitizing our planet's biodiversity. However, with the escalating climate crisis, these institutions must rethink their future roles, transitioning from traditional exhibition spaces to interdisciplinary hubs of knowledge transfer, collaborative learning, responsible innovation, community engagement, public debates, and policymaking (Dorfman, 2018; Bakker et al., 2020; Carnall et al., 2013). Their natural history collections give an idea about the vast biodiversity of this planet, telling unlimited stories of resilience, failure, and creative solutions to environmental challenges. Their well-curated exhibitions halls, showcasing the vast diversity of planetary life evoke great enthusiasm until today and become crucial places where people consciously engage with the unknown and unimaginable. Yet behind this lies a partly questionable past and thought patterns that need to be reconsidered.

Especially in light of pressing societal and ecological issues, such as mass extinction, biodiversity loss, species migration, changing climate, rising sea levels, food insecurities and zoonotic pandemics, there is a need for NHMs to question their complex historical roots entangled with oppressive, racist, colonial pasts and the dissemination of human-centred and Western perspectives on nature. They were a fertile ground for narrations, in which (western) humans were perceived as the dominant species. Paradoxically, Natural History Museums are the origin of an understanding of nature that is responsible for many socio-ecological challenges, for which they are now attempting to generate knowledge and solutions.

So, how can they overcome their pasts and pave the way towards a transition to pluriverse and more-than-human understandings of nature and move beyond static exhibition concepts while evolving into playgrounds for co-creative socio-ecological transitions?

This study is a thought experiment that takes a new and unforeseen perspective on Natural History Museums from the design research perspective. In this case, the design discipline is considered as an important stakeholder to shape societal and ecological transformations while including perspectives and needs of different stakeholders and communities – described as “eco-social transitions”. This highlights the systemic role of design that is negotiated against the backdrop of current socio-ecological challenges and is expanded through approaches such as Transition Design (Irwin, 2015), Eco-Social Design (Krois, 2020) or Pluriversal Design (Escobar, 2017). These approaches distinguish themselves by not aiming to develop ready-made solutions, but by using design to raise ecological and socially relevant questions. Furthermore, design research is understood as a practice-based, interdisciplinary, and participatory mode of knowledge transfer that extends beyond academic thinking (Mareis, 2011). This becomes clear through the rise of “Design Research Labs” that function as institutional hubs for knowledge production and exchange, bridging design, science, society, politics, and the economy. If the design discipline has the power to shape transitions on systemic levels, then it is worth exploring these potentials for the urgent transformation of Natural History Museums. Against this backdrop, this study poses the explorative question: "What if NHMs are understood as Design Research Labs for eco-social transition?" This inquiry serves as a foundation for exploring the potential roles of the design discipline in reshaping NHMs.

2. Challenges of Natural History Museums

Despite their importance for an ecological transition, Natural History Museums are currently facing a broad range of challenges on different levels: from dealing with their colonial pasts, anthropocentric understandings of nature, digitalization efforts, to the race against time to preserve and study biodiversity that is disappearing before it is discovered. These hurdles are the starting point of this exploratory study on the potential of design for NHMs and are summarised below.

2.1 Overcoming Colonial Pasts

NHMs grapple with their colonial past, perpetuating a Western-centric understanding of nature that compartmentalizes species within taxonomic groups, reinforcing hierarchical (Western) human evolutionary perspectives. NHMs have long been associated with racism and colonialism, as many of their collections were amassed during the height of European imperialism (Ashby & Machin, 2021; Das & Lowe, 2018; Sheets-Pyenson, 1987). This colonial legacy has led to criticisms of NHMs for their role in the exploitation and erasure of indigenous peoples and cultures, and for perpetuating a Eurocentric view of this planet. Recently, NHMs have begun to grapple with their colonial pasts in various ways. Some NHMs have acknowledged their role in colonialism and have developed action plans to decolonize their collections, exhibitions, and practices, such as the Musée des Confluence in Lyon (Green, 2019) or the Museum für Naturkunde in Berlin (Kaiser et al., 2023). Decolonial museum practices can include returning artefacts to their rightful owners or communities, employing more diverse staff and leadership, including more Indigenous and people of colour, encouraging visitors to reflect on the historical and ongoing legacies of colonialism, or providing more context for the ways in which collections were acquired and showcasing the impacts of colonialism on the peoples and cultures represented in the collections (Van Broekhoven, 2019). While the number of publications about decolonialisation in NHMs are rising, it can be observed that action plans for decolonizing Natural History Museums are not yet an integral part of current exhibitions and are seldomly part of public engagement activities.

To summarise, a look into the current exhibitions of many NHMs still perpetuates in large parts a western-centric perspective on natural history through traditional exhibition concepts that have merely unchanged since the past decade, for instance the Mineral Gallery at the Natural History Museum in London (see images below).

Dealing with the colonial pasts of NHMs requires a commitment to ongoing dialogue, reflection, and action. It also requires a recognition that colonialism is not only a thing of the past, but an ongoing and present reality that continues to shape the world and the relationships between people and institutions.

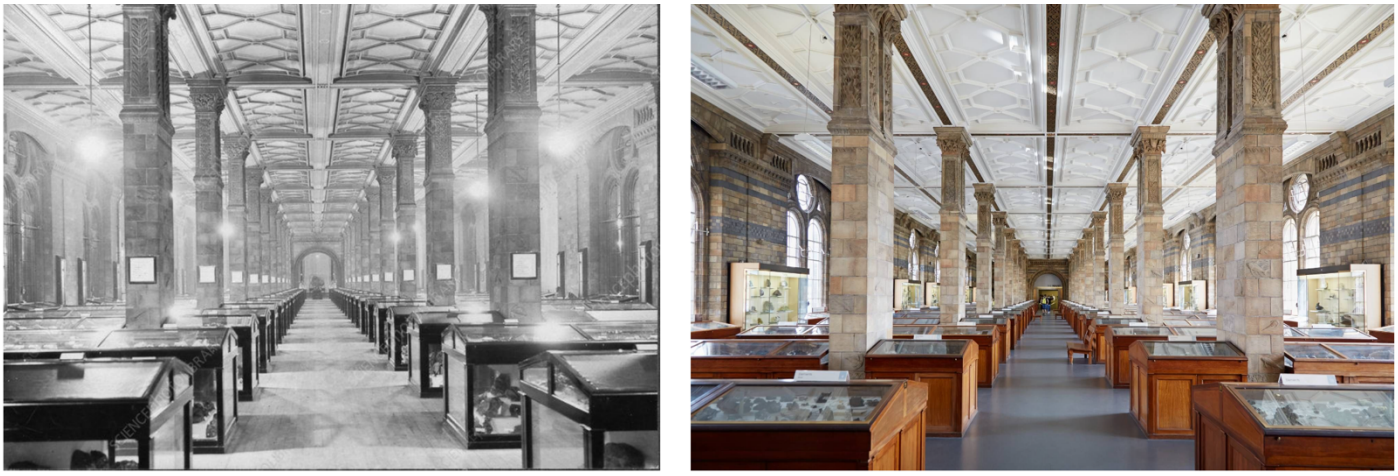

Figure 1. Mineral Gallery in London unchanged since 1881 (1923 and today).

2.2 Rethinking Anthropocentric Understandings of Nature

Natural History Museums (NHMs) have played an important role in gaining knowledge about the interconnectedness of nature, by promoting and interpreting evolutionary theory and Post-Darwinism through their collections, exhibitions, and research programs (Sterling, 2017; Winker, 2004). NHMs have helped establish evolutionary theory as a cornerstone of modern biology and emphasized the interconnectedness of all living things, challenging a human-centred view of nature and establishing a more holistic and integrated understanding of the natural world (Cameron, 2015).

However, NHMs also have a responsibility to address the ways in which their exhibitions and research programs may perpetuate a critically human-dominated and Western-centric understanding of nature. This includes recognizing the impact of the Linnaean system of classification, which has reinforced a human-centred view of nature, reflected Western cultural and philosophical assumptions, and been used to justify the exploitation and domination of non-human organisms and the natural world.

In the context of ecological crisis, it is particularly important for NHMs to take a critical approach to their exhibitions and research programs to challenge human-centred views of nature and establish a more sustainable and equitable relationship between humans, cultures and nature. This study postulates, that NHMs need to find new ways to do this by emphasizing multispecies perspectives that are challenging human exceptionalism. Furthermore, they need to embrace different ways of nature knowledge that go beyond academic knowledge-production.

2.3 Curating the Anthropocene

Against the backdrop of the Anthropocene, NHMs are facing the challenge to include present narratives of a natural history, shaped by human impacts and ecological crisis. This requires a perspective on overarching global connections and impacts of issues such as climate change and biodiversity loss, as well as a reflection of what the effects mean concretely at the local level for different communities (Cameron et al., 2013; Newell et al., 2017; (Koster et al., 2017). Climate change can have different meanings for communities based on geographical roots, values, and cultural beliefs (Hulme, 2014; Reichel, 2020). It emphasizes the moral responsibilities of museums to address socio-ecological challenges, not just by communicating scientific facts but also by engaging communities to debate what the impacts and necessary measures for the preservation of habitats and ecosystems mean for their everyday life. Natural History Museums thus also have a political responsibility, which in turn leads to the challenge of mastering the balancing act between a neutral educational institution and becoming an agent of change.

2.4 Telling Post-Natural Histories and Futures

In addition to the point above, a further challenge is to show how natural history will be written in the future. How do species adapt to a changing climate and anthropocentric habitats? And how do they expand the human-centred concept of the environment and ecosystem in natural history? Adaptation strategies in natural history can be summarized in under the acronym MAD—Migrate, Adapt, or Die. Particularly, migration and the associated invasion of species pose challenge to deal with a high number of uncertainties and unforeseeable consequences in urban and rural planning. Humans have changed the environment so profoundly that it cannot be reverted to its original state – many species have adapted to these new environments, especially observable in urban spaces. Here, Natural History Museums, as central research institutions for the study of evolution, can make a significant contribution to shaping future habitats that provide healthy environments for human and non-human beings (Bakker et al., 2020; Sterling, 2017).

However, human activities (such as urban planning, agriculture or the use of pesticides) also lead to a significant loss of biodiversity. At the same time, a development in modern biotechnology is observable, whose transformative power can have a profound impact on the evolution of life. Genetic research and

synthetic biology not only allow us to read the code of life (DNA) but also to entirely rewrite it. As a result, species could be genetically modified to adapt more quickly to new environmental conditions, however, the effects of such changes on very complex ecosystems are difficult to predict. Some research projects go even further and aim to synthetically create life or even revive extinct species (see George Church or Craig Venter). These developments merge technology, nature, and culture in a very drastic way. They write a new chapter in the natural history of the future. While such developments are already addressed through speculative design interventions in museum contexts (design and art museums, e.g. “Designing for the Sixth Extinction” by Alexandra Daisy Ginsberg), they are only sporadically explored in Natural History Museums. These developments pose a question for Natural History Museums on how they can curate possible natural histories of the future.

2.5 Digitalizing the Infinite

Today, NHMs serve as crucial repositories of genomic information, enabling scientists to unravel ecological and evolutionary knowledge using technological innovations in genetic research, to explore the museum collections in a way that was not imaginable 50 years ago. However, accessibility to the vast and expanding natural history collections remains a challenge, as the majority is hidden behind public exhibition areas and distributed to a few institutions in the western hemisphere (e.g., the Natural History Museums in Washington, Chicago, or London, Berlin). NHMs want to overcome these challenges by digitalizing their collections and adding digital information layers to the specimens and to share them on a global scale (Bakker et al., 2020).

Despite extensive digitization efforts, the full potential of these “extended specimens” (Lendemer et al., 2020) remains underutilized, as there are challenges to make digital archives accessible and to link different knowledge bases (Bakker et al., 2020). Moreover, digitization is associated with high financial costs, which often come at the expense of research. Resources are diverted that are necessary to research and expand collections. The discovery of new species highlights the vastness of the unknown. In particular, the most abundant species, such as insects and microorganisms, and invisible but very relevant actors in ecosystems, are estimated to be only marginally recorded and researched. Preserving and researching these collections is crucial, encapsulating not only billions of years of evolution but also lessons and narratives of resilience, strategy, and innovation. However, in the face of climate change, many species are dying out before they can be discovered and researched.

Above all these specific challenges, NHMs struggle with their own accessibility, aiming to attract "non-visitors" and questioning how to extend the NHM beyond the museum space. Visitors continue to enjoy consistent or increasing numbers, but NHMs remain static places with exhibition concepts largely unchanged for the past 100 years—stuffed animals, minerals, fossils, dinosaurs, and biodiversity walls. Many Natural History Museums, such as the NHM in Berlin are still based on concepts dating back to the 1890s, separating Education and Scientific Collections in the "New Museum" concept (Moldrzyk, 2015). Thus, the challenge lies in bridging science, society, and nature, evolving from occasional public engagement activities towards consistent playgrounds for participation and democracy.

3. The Future Natural History Museum – A Design Challenge?

This study underscores the role of Natural History Museums that integrate exhibition curation with ongoing research in biodiversity, the development of tools for exploration, conservation, and digitization of collections, as well as the establishment and research of educational formats targeting the inclusion of societal target groups. The NHM in Berlin (Museum für Naturkunde Berlin, MfN) serves as an illustrative example. As a former research associate at MfN, the author of this study spent over a year conducting auto-ethnographic observations about challenges and possibilities for NHMs from a design research perspective. The NHM in Berlin boasts one of the largest collections with 30 million specimens in Europe, represents an intriguing use case, as it discusses some innovative initiatives and visions (Moldrzyk, 2015; Rössig et al., 2023)– simultaneously, it shares overall challenges faced by other NHMs, making the implementation of

these initiatives difficult or very slow. Among the initiatives are architectural and strategic reconceptualisations (as exemplified by the "Zukunftsplan" and “Museum Evolution”), as well as new curatorial and collecting approaches (e.g. Moldrzyk, 2015; Sturm et al., 2022), knowledge-transfer initiatives (Weißpflug et al., 2019), and cross-cultural collaborations (as illustrated by the “Museums Lab”). Additionally, MfN Berlin promotes several projects at the intersection of art, design, and science, such as *Art/Nature Interventions* (Hermannstädter, 2019)*Mediasphere for Nature Lab*, *Experimentierfeld* (Rössig et al., 2023), *Netzwerk Naturwissen*, or the *Pollinator Pathmaker* in collaboration with Daisy Ginsberg and the LAS Art Foundation. These initiatives negotiate the future roles and relevance of the museum and demonstrate potential interdisciplinary collaboration with the art and design sector.

However, the museum faces central challenges in translating its vision of becoming an interdisciplinary hub for public engagement and nature-based innovations into reality. These challenges include those explained above, as well as structural issues such as short-term contracts and project durations due to public funding logics, bureaucratic processes, high departmental competition, rigid hierarchical structures on middle management levels, traditional organisational culture, public accessibility, and a lack of open spaces in the exhibition area for explorative formats, to name a few.

So, what is the matter with design? A significant challenge facing the potential of collaborations between design, art, and science lies in the prevalent misunderstanding of design and artistic research within institutional frameworks. Art and design are often perceived primarily as tools for enhancing science communication and public engagement, serving to make scientific concepts more accessible or entertaining to a wide audience. However, in initiatives aimed at Public Engagement within NHMs, this misconception of design proves detrimental.

Public Engagement involves fostering a mutual dialogue between society and science, aiming to address societal needs early in research and innovation processes. Yet, this objective is compromised when design is merely utilized to aesthetically enhance predetermined scientific content for a target audience. Such an approach contradicts contemporary discourses on the transformative potential of design, including Transition Design, Public Interest Design, and Speculative and Critical Design Practices, which advocate for a broader role of design in fostering societal debates.

This paradigm shift entails not only *designing for* communities but also *co-designing with* them. Therefore, for Public Engagement to serve as a vital strategic component within NHMs, the potential of design lies not in the creation of creative participation formats or exhibition concepts but rather in facilitating critical reflections on the roles of NHMs in society. The author posits that by regarding design as an agent of change within NHMs, design researchers can lead impact-oriented, interdisciplinary, and practice-based transformation processes that embrace diverse perspectives and modes of knowledge production.

Against the backdrop of the ecological crisis, which holds varied meanings for different communities, there is an urgent need for more empathetic, inclusive approaches to Public Engagement. Merely fulfilling research-political demands for increased participation risks relegating individuals to involuntary roles in sporadic outreach activities, often lacking in meaningful engagement.

To summarise, participation and involvement are essential drivers for socio-ecological transformations, particularly within public spaces such as NHMs. Therefore, the development of inclusive engagement strategies through design becomes crucial for shaping the future transitions of NHMs.

While this study addresses sensitive issues within NHMs, its aim is not solely to critique challenges but to provide space for radical reimagining from a design perspective. It proposes reconceptualizing NHMs as venues for design-driven innovations, democracy, and safe spaces for exploring collaborative visions of the future that integrate both human and non-human needs.

Furthermore, it advocates for the repositioning of NHMs as co-creative innovation hubs, where design, critical societal reflection, interdisciplinary collaborations, and radical innovations converge to generate

tangible roadmaps for eco-social transitions. These transitions address pressing issues such as biodiversity loss, rising sea levels, climate change, food security, and zoonotic pandemic diseases.

4. The Potentials of Design for Sustainable Transitions

4.1 Current Developments in Design

In summary, there is a fundamental lack of discourse on understanding and knowledge about the actual potentials of design for sustainable transformation, societal inclusion, and critical thinking within Natural History Museums. This gap exists despite ongoing discussions since the 1960s, such as the *Design Methods Movement*, *Radical Design*, or *Participatory Design*, further developed and researched today under numerous practice approaches: Social Design, Transition Design, Critical and Speculative Design, Pluriversal Design, Multispecies Design only to mention a few.

These approaches demonstrate design potentials beyond capitalist, market-driven and (western) human-centric understandings of innovation and transformation. Design plays crucial roles in transdisciplinary and transcultural knowledge transfer by including different stakeholders and approaches from science, politics, business, and ecology from the outset. The involvement of local communities plays a central role, simultaneously expanding the concept of the public towards a more-than-human-centred understanding that also involves the interests of non-human beings (Harles, 2024). Design also acts as an enabler, actively involving target groups through design-based methods to explore and shape desirable futures collaboratively, as well as to critically question technological and societal developments. The potential of design as a relevant force in societal transformation processes becomes obvious within as well outside the discipline.

On the one hand, there is a trend in student projects at interdisciplinary intersections with social and ecological sustainability, showing that emerging designers are aware of their responsibility during their education, as initiatives like the Dutch Design Week or German Design Graduates Award demonstrate. Examples include sustainable material design, critical interventions, and the design of social safe zones.

On the other hand, there is also a structural change through the increasing promotion and establishment of knowledge transfer offices at design universities and networks explicitly seeking application-oriented collaboration to tackle societal and ecological challenges. These transfer offices become essential actors for transformation processes and are often referred to as “Design Research Labs”, such as the Sustainability by Design Lab at Folkwang University of the Arts, Burg Labs at Burg Giebichenstein University of Art, DESIS Labs or the Design Friction Lab at the University of Bozen, to name a few.

Against this background, this study wants to highlight these structural, methodological, and practical approaches evolving in design discipline to showcase how they can support NHMs to transition from static intuitions to driving forces for co-creative innovations, public engagement, educational spaces, political debating grounds for nature rights, and socio-ecological transitions.

4.2 Proposing Design Research Labs as Interfaces for Natural History Museums

The paper emphasizes the untapped potential of Design Research Labs within NHMs as "platforms for collaborative inquiry based on design experiments" (Binder & Brandt, 2008), bridging the gap between lessons learned from the past, contemporary challenges, and collective imaginaries of the future. Design Research Labs seek collaboration between stakeholders from design, public, politics, science and economy and offer unexplored potentials for sustainable transitions which can be summarized through four pillars (Augsten & Harles, 2024):

- Fostering Real-life Innovations: Design Research Labs (DRLs) blend controlled lab environments with real-world scenarios, engaging diverse stakeholders for collaborative knowledge production.
- Acting Responsible and Mission-oriented: DRLs prioritize societal issues, aligning with Responsible Research and Innovation frameworks. They involve the public, marginalized groups, and non-human entities in research, fostering comprehensive, ethically sound, and sustainable innovations.
- Crafting Collaborative Images of the Future: DRLs address uncertainties by intertwining technological, societal, and ecological trends, using design-based approaches like Design Fiction and Speculative Design to facilitate discussions, anticipate future developments, and initiate societal progress.
- Promoting a Multiplicity of Knowledge: DRLs redefine knowledge production by encouraging design-based processes that go beyond traditional academic approaches. They empower both experts and non-experts, promoting shared authorship and inclusive design-based public engagement, ultimately reshaping scientific outcomes.

Against this backdrop, this exploratory paper asks whether the concept of Design Research Labs can act as an interface that bridges the societal responsibility of Natural History Museums with the transformative potentials of design. This leads to a speculative design investigation, opening up a debating ground for stakeholders from the design discipline and NHMs alike: "What if NHMs are understood as Design Research Labs for eco-social transition?" This lays the foundation for the creation of speculative scenarios that explore the transformative potential of design within NHMs.

5. Methodology

The aim of this study is to explore how Natural History Museums can be reconceptualized as Design Research Labs for climate action through speculative scenarios. Drawing on interviews, literature research, and use-case analysis, the paper explores five fields of action for NHMs by developing speculative scenarios with distinct special focuses on relevant developments within the design discipline.
As these scenarios are currently a work-in-progress, this paper gives an overview about the methodological approach, the research framework and first results of possible speculations.

5.1 Research Framework

Since the intersection between design research, design labs, and natural history museums is a subject of investigation that has received little attention thus far, this study attempts to develop its own approach through interdisciplinary integration of various theories and methods. These form the basis for scenario development. The theoretical research is built on three pillars that combine theoretical and practical concepts from museum studies, design research, and anthropology.

1. Museum Studies:
   While focusing on the Natural History Museum as the subject of investigation through design, it is pertinent to outline developments and theoretical concepts discussed in Museum Studies, that are dealing with different modes of visitor and community engagement that extend beyond one-directional science communication such as the *Metabolic Museum* (Deliss, 2020), *Liquid Museum*, the *Interrogative Museum* (Karp & Kratz, 2015)or *The Museum as Process* (Silverman, 2015). A special research focus lies in exploring discussions on science museums, particularly Natural History Museums, at the intersection of Climate Change, the Anthropocene, and future thinking (Dorfman, 2018; Cameron & Nielson, 2015; Newell et al., 2017).

These theoretical foundations provide the fertile starting ground for further explorations into what is coined by the author as *"The Museum as Design Lab."* This concept involves viewing museums not only as repositories of artifacts but as dynamic spaces for design experimentation and innovation.

2. Design Labs as Agents of Change and Knowledge Culture:
   To argue the value of the design discipline in transforming static places into hubs for participation, democracy, social innovation, and climate action, the study is based on ongoing investigation of unexplored potentials of *Design Research Labs* as agents of change (Augsten & Harles, 2024). This research builds upon the definition by Binder, who describes labs as 'platforms for collaborative inquiry based on design experiments' (Binder & Brandt 2008). This concept is currently gaining popularity within design education in the D-A-CH region through increased funded projects, such as the *Sustainability by Design Lab* at the University of the Arts Folkwang and *Burg Labs* at the Burg Giebichenstein.
3. Potentials of Speculative, Multispecies, and Pluriversal Design Approaches:
   Based on the exploration of Design Research labs, a further look onto specific methodological developments applied within these labs is crucial to pave the way towards practice-based transformative shift. These include *Critical and Speculative Design practices* (Auger, 2013; Bleecker, 2009; Dunne & Raby, 2013; Heidingsfelder, 2018), *Multispecies and Interspecies Design* (Gatto & McCardle, 2019; Haldrup et al., 2022; Harles, 2024; Mancini & Lehtonen, 2018; Metcalfe, 2015; Roudavski, 2021), and Pluriversal and *Decolonizing Design* (Escobar, 2017; Tunstall, 2013*)*. This theoretical deep dive serves as a bridge to the practical part of the research project, illustrated by a range of use-cases. The aim is to provide guidance and requirements for actions that demonstrate the impacts of design-led approaches from a strategic level to practical implementation within NHMs' programs and activities. A special focus is placed on the vast potentials of multispecies design approaches for public engagement, drawing from *the non-human turn* in humanities and social sciences (Grusin, 2015). This encompasses multispecies ethnographies, multispecies histories, posthumanism, political ecologies, among other areas (Haraway, 2013; Kirksey & Helmreich, 2010; Latour & Latour, 2007; Tsing, 2023).

In addition to the theoretical research, a further investigation use-cases at the intersection of design of design practices, museum studies, natural histories, and Anthropocene challenges is part of the research framework. Examples also include investigations on transformative concepts of Natural History Museum, such as the *Richard Gilder Center for Education and Innovation* at the American Museum for Natural History in New York, Musée des Confluences in Lyon or the Naturalis in Leiden. A detailed description of these use-case goes beyond the scope of this paper.

6. Speculations on the Natural History Museum of the Future

The following section briefly outlines four speculative Design Research Lab concepts that are currently being further developed. These initial drafts present initial possible approaches and are open for discussion.

6.1 The Pluriversal Knowledge Lab

This scenario explores the potential of Pluriversal and Decolonizing Design approaches (Escobar, 2017; Tunstall, 2019). Both concepts aim to challenge and transcend dominant Western, colonial, and anthropocentric perspectives that have traditionally influenced design practice and education. Pluriversal and decolonizing design seeks to foster a more diverse, inclusive, and equitable design environment while questioning established Western, colonial, and anthropocentric norms. They aspire to create spaces and processes that enable the coexistence and co-creation of multiple worlds, supporting the self-

determination and self-representation of marginalized communities and contributing to the dismantling of colonial and imperial structures. Additionally, both concepts are concerned with decolonizing knowledge and power structures and promoting a more diverse, inclusive, and equitable design practice and education.

This scenario will investigate how these design approaches provide methodological knowledge for scrutinizing the value of indigenous knowledge and exploring colonial legacies within Natural History Museums.

6.2 The Post Nature Lab

This scenario explores influential concepts of Discursive, Critical, and Speculative Design (Dunne & Raby, 2013; Tharp & Tharp, 2018; Heidingsfelder, 2019) that enable Natural History Museums (NHMs) to reconsider their public engagement strategies, taking action towards future natural histories defined by anthropocentric impacts and driven by significant advancements in Modern Biotechnology and Synthetic Biology. Speculative Design Practices (SDP) constitute a collective category rooted in Radical Design since the 1960s, incorporating methodologies like Speculative Design, Design Fiction, and Adversarial Design. These approaches aim to detach design from market-oriented utility, critically examining societal, technological, economic, and ecological developments. Instead of describing current conditions, they generate fictional narratives and prototypes to stimulate discourse. Recognized beyond disciplinary boundaries, SDP engages the public in scientific and technological innovations. Against the backdrop of climate change, it has the potential to connect researchers, industrial partners, and society to question post-natural developments and their implications on the natural histories of the future. SDP offers the potential to integrate speculative artifacts as a significant part of public outreach. In contrast to previous artifacts and specimens, these are not intended as passive objects of observation but encourage active participation. They bridge lessons from the past with challenges of the present through speculative imaginaries of the future.

6.3 The Nature Rights Lab

This scenario explores the potential of More-than-Human and Multispecies Design approaches (Gatto & McCardle, 2019; Mancini & Lehtonen, 2018; Metcalf, 2015) that engage with non-human agents in the design process. These diverse initiatives, spanning environmental conservation, multispecies urban habitats, coastal region enhancement prototypes, human-plant interactions, and Animal-Computer Interaction for non-human empathy, employ speculative and immersive methodologies. Contemplating socio-ecological challenges from a more-than-human perspective, they generate research questions at the intersection of multispecies ethnographies, conservation, and biological impact assessments. Actively collaborating with experts, NGOs, communities, and stakeholders fosters knowledge transfer and meaningful partnerships. By bridging theory and practice, they contribute to a nuanced approach in speculative design, addressing urgent socio-ecological challenges and translating debates into tangible actions for improvement. Furthermore, the potential of Multispecies Engagement becomes visible in policymaking and democratic processes, where other-than-human beings are considered eligible actors in democratic processes (Sheikh et al., 2023). The necessity to include non-human agents becomes evident as the notion of granting legal rights to non-human beings gains traction at governmental levels, exemplified by initiatives like the “Sumac Kawsay” in Ecuador or the “Te Awa Tupua Act” in New Zealand (Kauffmann & Martin, 2018). They encourage strengthening the political responsibility of NHMs by including other-than-human beings in discussions. In this way, NHMs can rethink public and policy engagement beyond intervention formats toward co-creative policymaking processes.

6.4 The Otherminds Lab

This scenario explores Animal-Interaction Design (Hook, 2019)anticipating the otherness of non-human beings, paving the way for human-nature-machine interactions, and learning from “otherminds,”

representing non-human forms of intelligence (e.g., plants or cephalopods). This scenario lies at the intersection of the first three scenarios above. It pushes the boundaries of the educational and research programs of NHMs, speculating on how such institutions can also position themselves as important collaborators in applied innovation research.

7. Summary and Conclusion

In reimagining the role of Natural History Museums through the lens of design research, this study delves into the evolving narrative of these institutions, recognizing their historical transformations and the pivotal juncture they face amidst escalating ecological crises. From their origins as mere cabinets of curiosities, NHMs have grown into essential interdisciplinary hubs, tasked with studying, preserving, and digitizing the planet's biodiversity.

The challenges confronted by NHMs are multifaceted, ranging from grappling with colonial pasts and anthropocentric views of nature to addressing climate futures, post-natural histories, and the digitalization of vast collections. The paper not only underscores the hurdles faced by NHMs but also introduces a novel perspective, proposing a fundamental shift – envisioning NHMs as Design Research Labs for climate action.

By framing NHMs as Design Research Labs, the study aims to explore the untapped potential of the design discipline in reshaping these institutions. Design Research Labs, as interfaces between design, science, society, and politics, are presented as platforms for collaborative inquiry, fostering real-life innovations, responsible mission-oriented actions, crafting collaborative images of the future, and promoting a multiplicity of knowledge. The paper suggests that such labs within NHMs could serve as dynamic spaces where societal responsibility meets the transformative power of design.

The challenges identified, such as overcoming colonial legacies and anthropocentric perspectives, are viewed not merely as obstacles but as opportunities for design-driven democracy and inclusive participation. The study argues for a paradigm shift, emphasizing that design should be more than an embellishment for science communication. Instead, it should play a strategic role in shaping impactful, empathetic, and inclusive public engagement processes.

In considering NHMs as potential Design Research Labs, the paper raises a speculative question: "What if NHMs are understood as Design Research Labs for eco-social transition?" This inquiry prompts exploration into the transformative potentials of design, initiating a conversation that extends beyond the traditional boundaries of NHMs. The envisioned future is one where NHMs evolve into dynamic, participatory spaces, bridging the gap between static exhibitions and collaborative platforms for socio-ecological imaginaries of the future.

In conclusion, this study serves as a call to action, urging NHMs to embrace their potential as catalysts for biodiversity conservation, environmental justice, and planetary health through design-driven approaches. The envisioned Design Research Labs within NHMs are proposed as catalysts for change, reshaping the narrative of these institutions and fostering a broader understanding of their roles in the face of complex socio-ecological challenges.

By showcasing these use-cases and speculative scenarios for contemplation, the paper not only encourages a reassessment of NHMs as Design Research Labs but also seeks to stimulate conversations about the spatial dimensions of design research and practice within emerging interdisciplinary environments like NHMs.

References

Arengo, F., Porzecanski, A. L., Blair, M. E., Amato, G., Filardi, C., & Sterling, E. J. (2017). The essential role of museums in biodiversity conservation. In *Routledge eBooks* (pp. 82–100). https://doi.org/10.4324/9781315531892-6

Ashby, J., & Machin, R. (2021). Legacies of colonial violence in natural history collections. *Journal of Natural Science Collections*, 8, 44–54.

Auger, J. (2013). Speculative design: Crafting the speculation. *Digital Creativity*, 24(1), 11–35. https://doi.org/10.1080/14626268.2013.767276

Augsten, A., & Harles, L. (2024). Fostering design research labs for public sector innovation. *On the Verge: Design in Times of Crisis, DRS Conference 2024*, Boston.

Bakker, F. T., Antonelli, A., Clarke, J. A., Cook, J. A., Edwards, S. V., Ericson, P. G. P., Faurby, S., Ferrand, N., Gelang, M., Gillespie, R. G., Irestedt, M., Lundin, K., Larsson, E., Matos-Maraví, P., Müller, J., Proschwitz, T. von, Roderick, G. K., Schliep, A., Wahlberg, N., … Källersjö, M. (2020). The global museum: Natural history collections and the future of evolutionary science and public education. *PeerJ*, 8, e8225. https://doi.org/10.7717/peerj.8225

Binder, T., & Brandt, E. (2008). The design as platform in participatory design research. *CoDesign*, 4(2), 115–129. https://doi.org/10.1080/15710880802117113

Bleecker, J. (2009). Design fiction: A short essay on design, science, fact, and fiction. In S. Carta (Ed.), *Machine Learning and the City* (1st ed., pp. 561–578). Wiley. https://doi.org/10.1002/9781119815075.ch47

Cameron, F. (2015). Theorising more-than human collectives for climate change action in museums. In *Ecologising Museums*. Retrieved July 25, 2024, from https://internationaleonline.org/contributions/theorising-more-than-human-collectives-for-climate-change-action-in-museums/

Cameron, F., Hodge, B., & Salazar, J. F. (2013). Representing climate change in museum space and places. *WIREs Climate Change*, 4(1), 9–21. https://doi.org/10.1002/wcc.200

Cameron, F., & Nielson, B. (2015). *Climate change and museum futures*. Routledge. https://doi.org/10.4324/9780203752975

Das, S., & Lowe, M. (2018). Nature read in black and white: Decolonial approaches to interpreting natural history. *Journal of Natural Science Collections*, 6, 4–14.

Deliss, C. (2020). *The metabolic museum*. H. Cantz Verlag.

Dorfman, E. (2018). *The future of natural history museums*. Routledge. https://doi.org/10.4324/9781315531892

Dunne, A., & Raby, F. (2013). *Speculative everything: Design, fiction, and social dreaming*. MIT Press.

Escobar, A. (2017). *Designs for the pluriverse: Radical interdependence, autonomy, and the making of worlds*. Duke University Press. https://doi.org/10.1215/9780822371816

Gatto, G., & McCardle, J. R. (2019). Multispecies design and ethnographic practice: Following other-than-humans as a mode of exploring environmental issues. *Sustainability*, 11(18), 5032. https://doi.org/10.3390/su11185032

Green, C. D. (2019). Natural history disavowed: Confronting colonial legacies in the Musée des Confluences. *Museological Review*, 23, 25–36.

Grusin, R. (2015). *The nonhuman turn*. University of Minnesota Press. Retrieved July 25, 2024, from https://www.upress.umn.edu/book-division/books/the-nonhuman-turn

Haldrup, M., Samson, K., & Laurien, T. (2022). Designing for multispecies commons: Ecologies and collaborations in participatory design. *Proceedings of the Participatory Design Conference 2022 - Volume 2*, 14–19. https://doi.org/10.1145/3537797.3537801

Haraway, D. J. (2013). *When species meet*. University of Minnesota Press.

Harles, L. (2024). Towards multispecies engagement in responsible research and innovation: How can we co-design for and with non-human beings? *Hazarding Design, DGTF Jahrestagung*, Lucerne.

Heidingsfelder, M. (2018). *Zukunft gestalten: Design fiction als Methode für partizipative Foresight-Prozesse und bidirektionale Wissenschaftskommunikation* [Doctoral dissertation, Universität der Künste Berlin]. https://opus4.kobv.de/opus4-udk/frontdoor/index/index/docId/1157

Hermannstädter, A. (2019). Künstlerische Interventionen im Museum für Naturkunde Berlin. https://doi.org/10.7479/YMCW-9N50/10-17.DE

Hook, A. (2019). Exploring speculative methods: Building artifacts to investigate interspecies intersubjective subjectivity. *Alphaville: Journal of Film and Screen Media*, 17, 146–164. https://doi.org/10.33178/alpha.17.09

Hulme, M. (2014). Why we should disagree about climate change. In *Climate change and museum futures*. Routledge.

Irwin, T. (2015). Transition design: A proposal for a new area of design practice, study, and research. *Design and Culture*, 7(2), 229–246. https://doi.org/10.1080/17547075.2015.1051829

Kaiser, K., Heumann, I., Nadim, T., Petersen, M., Korun, M., & Berger, F. (2023). Promises of mass digitisation and the colonial realities of natural history collections. *Journal of Natural Science Collections*, 11, 13–25.

Karp, I., & Kratz, C. A. (2015). The interrogative museum. In R. Silverman (Ed.), *Museum as process: Translating local and global knowledges* (pp. 1–10). Routledge. https://doi.org/10.4324/9781315766935

Kauffmann, C. M., & Martin, P. L. (2018). When rivers have rights: Case comparisons of New Zealand, Colombia, and India. *International Studies Association Annual Conference*, San Francisco.

Kirksey, S. E., & Helmreich, S. (2010). The emergence of multispecies ethnography. *Cultural Anthropology*, 25(4), 545–576. https://doi.org/10.1111/j.1548-1360.2010.01069.x

Koster, E., Dorfman, E., & Nyambe, T. S. (2017). A holistic ethos for nature-focused museums in the Anthropocene. In E. Dorfman (Ed.), *The future of natural history museums* (pp. 1–20). Routledge. https://doi.org/10.4324/9781315531892-3

Krois, K. (2020). The evolving master in eco-social design. In *Traversing territories: 1460 days of eco-social designing in South Tyrol & beyond* (pp. 15–20). Faculty of Design and Art, Free University of Bozen-Bolzano. https://bia.unibz.it/esploro/outputs/bookChapter/The-Evolving-Master-in-Eco-Social-Design/991006445098001241

Latour, B. (2007). *Reassembling the social: An introduction to actor-network-theory*. Oxford University Press.

Lendemer, J., Thiers, B., Monfils, A. K., Zaspel, J., Ellwood, E. R., Bentley, A., LeVan, K., Bates, J., Jennings, D., Contreras, D., Lagomarsino, L., Mabee, P., Ford, L. S., Guralnick, R., Gropp, R. E., Revelez, M., Cobb, N., Seltmann, K., & Aime, M. C. (2020). The extended specimen network: A strategy to enhance US biodiversity collections, promote research and education. *BioScience*, 70(1), 23–30. https://doi.org/10.1093/biosci/biz140

Mancini, C., & Lehtonen, J. (2018). The emerging nature of participation in multispecies interaction design. *Proceedings of the 2018 Designing Interactive Systems Conference*, 907–918. https://doi.org/10.1145/3196709.3196785

Mareis, C. (2011). *Design als Wissenskultur: Interferenzen zwischen Design- und Wissensdiskursen seit 1960*. transcript Verlag. https://doi.org/10.1515/transcript.9783839415887

Metcalfe, D. (2015). *Multispecies design*. University of the Arts London.
Moldrzyk, U. (2015). New views on nature? Renewal of natural history museums by the Berlin example. *Mnemòsine*, 8, 71–75.

Newell, J., Robin, L., & Wehner, K. (Eds.). (2017). *Curating the future: Museums, communities and climate change*. Routledge. https://doi.org/10.4324/9781315620770

Reichel, C. (2020). *Mensch, Umwelt, Klimawandel: Globale Herausforderungen und lokale Resilienz im Schweizer Hochgebirge*. transcript Verlag. https://doi.org/10.1515/9783839446966

Robin, L., Avango, D., Keogh, L., Möllers, N., & Trischler, H. (2016). Displaying the Anthropocene in and beyond museums. In J. Newell, L. Robin, & K. Wehner (Eds.), *Curating the future* (pp. 1–20). Routledge.

Rössig, W., Dietermann, B., Schultka, Y., Poieam, S., & Moldrzyk, U. (2023). Opening museums' science communication to dialogue and participation: The "Experimental Field for Participation and Open Science" at the Museum für Naturkunde Berlin. *Journal of Science Communication*, 22(4), N01. https://doi.org/10.22323/2.22040801

Roudavski, S. (2021). Interspecies design (pp. 147–162). https://doi.org/10.1017/9781108683111.010

Sheets-Pyenson, S. (1987). Cathedrals of science: The development of colonial natural history museums during the late nineteenth century. *History of Science*, 25(3), 279–300. https://doi.org/10.1177/007327538702500303

Silverman, R. A. (Ed.). (2015). *Museum as process: Translating local and global knowledges*. Routledge. https://doi.org/10.4324/9781315766935

Sturm, U., Heyne, E., Herrmann, E., Arends, B., Dieter, A.-L., Dorfman, E., Drauschke, F., Heller, N., Kahn, R., Kaiser, K., Koch, G., Kramar, N., Sánchez, A. M., Mauelshagen, F., Nadim, T., Pell, R., Petersen, M., Schmidt-Loske, K., Scholz, H., … Wagner, S. (2022). Anthropocenic objects: Collecting practices for the age of humans. *Research Ideas and Outcomes*, 8, e89446. https://doi.org/10.3897/rio.8.e89446

Tsing, A. (2023). A multispecies ontological turn? In S. Whatmore & H. Lorimer (Eds.), *The Routledge international handbook of more-than-human studies* (pp. 1–20). Routledge. https://doi.org/10.4324/9781003262619-7

Tunstall, E. (Dori). (2013). Decolonizing design innovation: Design anthropology, critical anthropology, and indigenous knowledge. In W. Gunn, T. Otto, & R. C. Smith (Eds.), *Design anthropology* (pp. 1–20). Routledge.
Van Broekhoven, L. (2019). On decolonizing the museum in practice. *Journal of Museum Ethnography*, 32, 1–10.

Weißpflug, M., Vogel, J., Hermannstädter, A., Kunkel, A., Hoffmann, A., Gallé, L., Schönert, V., Giere, P., Horstmann, B., Kroh, A., Grömer, K., & Köberl, C. (2019). The transformative potential of research in museums: Report on the 1st Global Summit of Research Museums 4–6 Nov 2018 | Museum für Naturkunde Berlin. https://doi.org/10.7479/YGBC-ZW00

Winker, K. (2004). Natural history museums in a postbiodiversity era. *BioScience*, 54(5), 455–456. https://doi.org/10.1641/0006-3568(2004)054[0455:NHMIAP]2.0.CO;2

About the Author:

Lynn Harles is a Design Researcher and PhD candidate at Bauhaus University in Weimar. Her research broadly centers on exploring unusual interdisciplinary intersections and collaborations between science, society, nature and design, in the context of climate action She was working for Fraunhofer Institute and the Natural History Museum in Berlin and is Jury member of the German Graduate Design Award.

P/REFERENCES OF DESIGN

This contribution was presented at Cumulus Budapest 2024: P/References of Design conference, hosted by the Moholy-Nagy University of Art and Design Budapest, Hungary between May 15-17, 2024.

Conference Website
cumulusbudapest2024.mome.hu

Conference Tracks
Centres and Peripheries
Converging Bodies of Knowledge
Redefining Data Boundaries
Bridging Design and Economics
Speculative Perspectives
The Power of Immersion
The Future of Well-being
Taming Entropy: Systems Design for Climate and Change
Ways of Living Together
Cumulus PhD Network

Full Conference Proceedings
https://cumulusbudapest2024.mome.hu/proceedings

ISBN Volume 1: 978-952-7549-02-5 (PDF)
ISBN Volume 2: 978-952-7549-03-2 (PDF)

DOI Volume 1: https://doi.org/10.63442/IZUP8898
DOI Volume 2: https://doi.org/10.63442/TADX4016

Conference Organisers
Moholy-Nagy University of Art and Design Budapest (MOME)
mome.hu
Cumulus Association
cumulusassociation.org