







# Enlighten the Marvels: a new journal dedicated to natural history museums, collections and their role in interpreting a changing world

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## Abstract

This editorial celebrates the launch of the journal *Natural History Collections and Museomics* and outlines its primary goals: to serve as a platform for exploring the roles and functions of natural history museums, addressing their opportunities and challenges, and investigating the applications of the scientific collections they curate. The collections and their associated skilled workforce serve as powerful means to study global diversity and, crucially, foster its knowledge, description, conservation, and potential.

**Key words:** Collections, museomics, natural history museum, new journal



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Natural history museums (NHMs), including independent herbaria, are commonly regarded as true bastions of knowledge, conservation and education (Bakker et al. 2020). Within their walls, they house relevant scientific collections that narrate and help understand the story of the Earth's evolution, adaptation, bio- and geodiversity. These collections usually include a wide array of elements and materials called “voucher specimens” (Huber 1998), amongst which fossils, minerals, preserved (sometimes live) animals, plants and fungi, as well as human artefacts, photographs, acoustic recordings, tissue samples etc., each of which helps to paint a detailed picture of our past and offers useful tools for understanding the present and interpreting the future (Fischer 2015).

Amongst other things, the natural history objects collected at various times in different geographical areas, preserved with multiple methods according to their specificity, could be crucial in investigating the effects of various contemporary threats, including climate change, introduction and diffusion of invasive exotic species, pollution and other anthropogenic impacts (English et al. 2018). They are also crucial in tracking the spread of emerging diseases, including zoonoses (Colella et al. 2021). NHMs contain irreplaceable and invaluable collection items, documenting extinction process and provide relevant material for molecular studies and other cutting-edge analyses that allow a better comprehension of the



living world (Wandeler et al. 2007; Costello et al. 2013). Moreover, the taxonomic activity carried out through the study of museological collections is also a crucial process for reducing the so-called discovery and description gap. To date, only about 2 million species have been described out of an estimated 12 million species of animals, plants and fungi living on the planet (Mora et al. 2011; Wiens 2023), although further estimates report a much higher number, going from 563 million to 2.2 billion species, if insect parasites, commensals and other species-specific organisms (including bacteria, apicomplexan protists, microsporidian fungi, nematodes and mites) are taken into account (Li and Wiens 2023).

Curators and collections managers working in museums usually wear many hats, being responsible for the continued preservation of collections, the delivery and exposure to the world, as well as being global diversity scholars and policy-makers, bringing together fundamental and critical expertise. It is they who ensure the care, cataloguing and conservation of and access to collections and often manage a team of equally skilled collection technicians and students. These professionals collectively steward and curate collections data and care also for FAIR (Findable, Accessible, Interoperable and Reusable) data (Wilkinson et al. 2016; Alves 2024). Their work also involves scientific research aimed at discovering and documenting new species, to better understand existing ones and study natural phenomena. Curators and collection managers are also people's educators, who are committed to disseminating scientific knowledge to the general public through exhibitions, conferences and publications (Mujtaba et al. 2018). They are also the main experts of often neglected disciplines, taxonomy and nomenclature, which serve as the basis to describe and name new species and eventually re-assess the known ones (Gippoliti et al. 2024; Páll-Gergely et al. 2024). Curators and collections managers are also on the frontline in learning and implementing new techniques for long-term storage and preservation of collections, crucial for promoting biodiversity and data curation actions, because they allow for more accurate and comprehensive data collection and interpretation for future scenarios (Rohwer et al. 2022).

These methods, developed for and using natural history collections data, not only logically improve the quality of the data collected and shared, but also their interpretation and application, making land management and conservation actions, as well as collection management, more effective and sustainable. At the same time, collections of non-biological materials (such as minerals, geological specimens and meteorites) and fossilised organisms give us valuable resources for interpreting the history of our planet: they offer a unique window into the past, allowing scientists to study Earth's formation, its natural resources and the climatic changes that have occurred over millions of years (Jackson 1999). Through the study of these natural materials, museums are unique institutions that can contribute to a better understanding of geological and environmental dynamics, providing essential data for the conservation and management of natural resources (McCarter et al. 2001).

Despite the enormous potential for natural history collections and their people to assist with addressing real-world issues today, resourcing often tells another story. A chronic lack of staff, the shortage of funds in many facilities, coupled with the economic difficulties, particularly of small institutions, can seriously undermine their effectiveness (Alberch et al. 1994). This is, for example, evident particularly in countries where a centralised museum was never created and where small museums (and annexed collections) are often part of local administrations not



particularly apt in managing scientific collections and research activity (Andreone et al. 2014), but worrying concerns are also reported for larger institutions (Naggs 2022). The growing shortage of funding for curators means that many collections remain uncatalogued and unstudied and that voucher specimens do not receive the best care necessary for their preservation. Lack of funding limits the ability of museums to update their facilities, acquire new exhibits and fund scientific research. The parallel lack of interest often results in budget cuts and a lack of appreciation of the educational and cultural potential of museums. In addition, consider the vital work that museums do to promote and carry out research activities around the world to discover and describe the unknown and make research reproducible. In such a sense, voucher specimens are a precious treasure that need to be adequately conserved and valorised (Rocha et al. 2014)

When NHMs are primarily considered tourist attractions instead of research institutions, their educational mission may be compromised. It is essential that governments and civil society recognise the importance of natural history museums and invest more in the necessary resources for their operation. NHMs need visible allies and we call for other disciplines, university departments, industry and governments to stand up and actively support the care and development of collections and the collective expertise and data connected across them. Modern technologies and the rapid development of science make it possible to apply new transformative methods and approaches to the study of collection materials, which may reveal important information from an innovative and evolutionary point of view. Museomics, a term coined by Stephan Schuster and Webb Miller, which refers to a large-scale survey of DNA from museum collections (Fong et al. 2023), is one such approach. For the clarification of various systematic, phylogenetic and evolutionary questions, it is sometimes important to examine the DNA of verified voucher specimens, including, where feasible, type specimens or using other non-destructive analyses, such as CT-scans, 3D imaging and radiographs (Betz et al. 2007). At the same time, the collections are subject to gradual obsolescence, sometimes even destruction as a result of force majeure. Therefore, it is also important that they are digitised, a procedure that helps increase their exposure, allows a greater accessibility and shows value of the collection, making them more accessible (FAIR) to the wider scientific community. Such a modern approach is the Extended Specimen Approach (ESA) – a new method that goes beyond the physical specimen to include the historical information stored in the collection, linking to new research metadata and digital data, such as images and value-adding to voucher specimens (Palandačić et al. 2024).

The new-born journal, *Natural History Collections and Museomics* (NHCM), offers a chance to share and amplify the aspects, needs, values and potential of natural history collections, the institutions and the people behind the collections through our voices and those of our allies. Collections of study materials in natural history museums and herbaria are fundamental to scientific research and reproducibility and the conservation of natural resources. Journals represent a unique resource and tool for enhancing and disseminating this knowledge globally. Combining these resources, NHCM may be one tool to explore and advance the extended specimen concept, serving as a scholarly platform for the publication and dissemination of knowledge based on such new approaches to natural history research and collection management. The editorial board of the journal brings with it experience as collections staff, conservationists and



multidisciplinary scientists, crucial for ensuring the cutting-edge presentation highlighting the value of museological collections. These experts bring a wide range of skills spanning several disciplines, enabling an integrated and innovative view of collections. With this in mind, the launch of this new cutting-edge journal represents a good opportunity to publish data, visions and opinions within the international scientific framework. This journal is dedicated to the research, discussion and innovation of natural history museum collections, showcasing both the opportunities and the difficulties and problems affecting many museums and natural history collections institutions. By promoting the exchange of knowledge, ideas and best practices between museum professionals, researchers, allies and enthusiasts, the journal will contribute to a deeper understanding, a strategic voice and greater appreciation of natural history and its impact on society. The journal will also host a wide range of scholarly contributions, including research articles, reviews, case studies, methods, letters and perspectives on a variety of topics related to natural history institutions and their collections and associated expert roles. Thanks to the open access model at no cost to authors or readers, published research is accessible to a global audience, promoting inclusivity and international collaboration in the field of natural history.

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## Additional information

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The authors have declared that no competing interests exist.

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### Author contributions

All authors have contributed equally.

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## Data availability

All of the data that support the findings of this study are available in the main text.

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