Open Science and Museums

A Position Paper by
Museo Galileo - Istituto e Museo di Storia della Scienza

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Purpose

This document aims to present the current position and vision of the Museo Galileo about Open Science and to provide elements about the ongoing reflection of our Museum on this topic.

We wish with this document to foster the debate with interested national and international institutions on the contribution that museums and cultural institutions can provide to Open Science, and to promote cooperation on this topic.

Open Science in cultural institutions: a timely discussion

While many definitions and interpretations of Open Science exist, in the context of this document we align with the definition provided in the UNESCO Recommendation on Open Science[1]:

> *"Open Science is defined as an inclusive construct that combines various movements and practices aiming to make multilingual scientific knowledge openly available, accessible and reusable for everyone, to increase scientific collaborations and sharing of information for the benefits of science and society, and to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community. It comprises all scientific disciplines and aspects of scholarly practices, including basic and applied sciences, natural and social sciences and the humanities, and it builds on the following key pillars: open scientific knowledge, open science infrastructures, science communication, open engagement of societal actors and open dialogue with other knowledge systems."*

In line with UNESCO's definition of Open Science, we consider the term "Science" as including all disciplines and academic practices.

As indicated in the UNESCO's Recommendation, Open Science has a broad perimeter:

- both in terms of types of actors and institutions participating in the reflection about Open Science and contributing to it, as for example knowledge actors such as museums and cultural institutions;
- and in terms of focus areas, which have been shifting from concentrating mostly on data and outputs of science and research, to taking into account also other types of content and knowledge, including the processes "behind" science and research (such as processes linked to the design, evaluation and communication of science, as indicated in the UNESCO's definition of Open Science).

In this context:

- the reflection and debate on Open Science in the museum and cultural sector is highly topical, and is resulting, on a national and international level, in initiatives,

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[1] UNESCO Recommendation on Open Science, UNESCO 2021. Available online at this link: https://unesdoc.unesco.org/ark:/48223/pf0000379949.locale=en through the UNESCO Digital Library website. Document code: SC-PCB-SPP/2021/OS/UROS, 10.54677/MNMH8546.

strategies and collaborations aimed at deriving guidelines and principles for Open Science adapted to the specificities of cultural institutions;

- the definition of what constitutes "data" or "information" in the cultural domain is not straightforward: hence, we think that a specific reflection about the perimeter of "open content" in the cultural and museum domain is needed;
- to the best of our knowledge, there is also no consensus in the cultural heritage sector on the approach to be taken with respect to making data available, in relation also with the limitations and constraints related to the sharing of some specific content.

In this document, we do not aim to provide an answer to these questions, but instead present our own vision about Open Science and how we are contributing to it.

The Museo Galileo: our identity and our vision on Open Science

Our identity

The Museo Galileo - Institute and Museum of the History of Science, located in Florence, houses one of the most important collections of ancient scientific instruments in the world: among the more than a thousand objects on permanent display are all the instruments designed and built by Galileo Galilei [1564 - 1642] that have come down to us, including the two telescopes and the objective lens of the telescope with which the Tuscan scientist discovered the moons of Jupiter, as well as the precious Medici and Lorraine collections.

Thanks to the valuable collections preserved in the archives, a rich specialized library and the digitized works on the institutional website, the Museo Galileo offers multiple tools for historical and scientific research.

In addition to pursuing its strictly museum and educational purposes, the Museo Galileo is also active in the following areas:

- documentation and research in the field of the history of science and technology
- publication of specialized monographs and of an international journal on the history of science
- organization and production of initiatives (events, conferences and exhibitions) for the dissemination of scientific culture
- activities related to the library and the archives, etc.

We therefore have a double mission, as a museum and as a research institute, with the research activities having been carried out since the creation of the Museum.

As a direct consequence of our interpretation of our role as a public service operator, and in line with our status as a non-profit organisation[2] which also receives public funding, we have always been committed to making accessible everything that is publicly funded, in compliance with regulations in force and with any specific legal restriction.

Our long-standing "open" approach is demonstrated by several of our activities and commitments, such as:

- **Sharing with the public information and the results of our activities.**

  We share information through various channels, for example:

    - the Museum's institutional website[3], which is constantly updated, and the more than one hundred related websites dedicated to History of Science exhibitions and research projects.

    - In particular, in the institutional website, the section "Transparent Administration"[4] where we report, in accordance with legal obligations,

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[2] In Italian: *Ente morale senza scopo di lucro*.
[3] Link: https://www.museogalileo.it/en
[4] Link: https://www.museogalileo.it/it/amministrazione-trasparente.html

our action plans, our internal guidelines such as our Code of conduct, the Service Charter and our Gender Equality Plan, our detailed reporting and monitoring information, and in general all useful information to support an approach of transparency and accountability to the public;

- ○ our Youtube channel[5], which makes accessible videos of various types, from presentations of our collections and halls to educational videos on the life of Galileo Galilei, from presentations of our projects to recordings of events and workshops held at the Museum;

- ○ our institutional social media accounts[6], having the objectives of promoting the knowledge about the Museum and its features to a broad audience, communicating timely Museum opportunities and events, and helping to create communities interested in the Museum;

● **Making data and content of our collections progressively available, in compliance with the relevant legal constraints.**

We have already carried out some pilot projects in this regard, such as:

- ○ the publication of more than 300.000 records[7] in Linked Open Data (LOD) format through the OpenData portal[8] of the Tuscany Region and through the Datahub of the Open Knowledge Foundation[9];

- ○ the participation in the "Wikipedian in Residence" project, that we joined in 2016 together with three other Italian museums. As a result of the project we made some images[10] and videos[11] available in Wikimedia Commons[12];

● **Realising ad hoc initiatives geared towards categories of the public with specific needs.** As examples and with no claim to exhaustiveness, we mention the following initiatives:

- ○ the specific projects and activities we have been organising since many years for the blind or visually impaired people (activities ranging from tactile paths to workshops)[13], with the aim of allowing everyone to visit

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[5] https://www.youtube.com/@museogalileofirenze/

[6] Namely, our Twitter account: https://twitter.com/museogalileo; our Facebook account: https://www.facebook.com/museogalileo; our Instagram account: https://www.instagram.com/museogalileo.

[7] In the context of the Museal Innovation - New ERgonomic Visit Approach (MINERV@) project, the Museo Galileo converted a dataset according to Linked Open Data (LOD) principles, specifically data from Museo Galileo's Cumulative Database on the catalogue of instrument and machine collections displayed in the museum rooms, the catalogue of the library, archival materials and photographic collections, the Italian Bibliography of the History of Science, and the Galilean Bibliography (https://www.museogalileo.it/it/archivio-news/120-archivio-news-2015/1175-dataset-museo-galileo-in-datahub-okf-e-in-opendata-regione-toscana-it.html).

[8] https://dati.toscana.it/dataset/banca-dati-museo-galileo-strumenti-libri-fotografie-documenti

[9] https://old.datahub.io/organization/museogalileo

[10] https://commons.wikimedia.org/wiki/Category:Images_from_Museo_Galileo

[11] https://commons.wikimedia.org/wiki/Category:Videos_created_by_the_Museo_Galileo

[12] https://commons.wikimedia.org/wiki/Main_Page

[13] This effort will be strengthened by the agreement signed in 2022 between the Tuscany Region, the Italian Union of the Blind and Visually Impaired People (*Unione Italiana Ciechi e Ipovedenti*) and the Museo Galileo, to spread the knowledge of the Braille code and to promote new activities for improve the access to education and culture for blind or visually impaired people: https://www.toscana-notizie.it/-/scienza-e-braille-firmato-acc

our spaces and collections independently[14];

- ○ our participation in the *Musei Welcome Firenze*[15] network, together with other 6 Florentine museums, with the goal of diversifying our audience.

Therefore we consider that, in terms of engagement and efforts, **our Museum was already "open" even before the beginning of our current reflection on Open Science.**

We think, however, that **our current commitment towards "openness" can be strengthened and better communicated if we formally reflect on what it means to have an "open" approach as a museum and research institution, as well as what it concretely means for our Museum.**

Our position

In the last months we have been carrying out a reflection on Open Science both involving our internal community, to take into account the inputs and suggestions of all our staff through an "open" process, and exchanging with national and international museums and institutions engaged in a similar process.

As an institution constituted for *"the pursuit of civic, solidarity and socially useful purposes through the performance of activities in the general interest"*[16], **we think it is our duty to take into consideration the indications and drives coming from our reference areas (i.e. the cultural institutions and the world of research) and the policy indications, for a more open and enhanced sharing of information, data, and cultural content.**

The first broad result of such a reflection is the observation that **the characteristics of the museum environment, with its vast diversity of preserved content, data, objects, and with a variety of different approaches, bring a greater complexity to the debate on open science in and by museums.**

We think that the different characteristics of museums and cultural institutions are an asset that should be translated into specific approaches and contributions to Open Science.

For this reason, **our reflection about how to contribute to Open Science has been guided by the analysis of our characteristics and strengths and is therefore an expression of our identity and mission.**

Moreover, we think that it is important to debate any hypothesis and intuition, in line with the scientific method that we uphold and contribute to diffuse.

Therefore, **we will not uncritically assume that everything that is "open" is "good"**, but **we will discuss and identify, case by case, the conditions and criteria for which an "opening" process can lead to a positive impact.**

For example, just providing an open access to our data and content is not enough for the data to be useful: given the specificity and complexity of our data and collections, **we think that it is our responsibility to provide also our expertise-driven interpretation of data, and information about the process behind it, to make sure that**

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[14] Further information is available on our website at the link: https://www.museogalileo.it/en/museum/learn/museum-activities-for-the-general-public/99-inclusive-education.html

[15] https://www.museiwelcomefirenze.it/welcome/

[16] As declared in the Museum Statute, accessible at the link: https://www.museogalileo.it/images/amministrazione/MG_statuto_2021.pdf.

the data is actually useful and used.

The key principles of our vision

We present below the **key principles of our vision on what it means to be "open" for the Museo Galileo**, along with their rationale and some examples of how we are already putting these principles into practice.

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1. Openness as exchanges between the academic community and the public

Our Museum is an "open space" fostering bilateral exchange and feedback between the academic community and the broad public.

As Museo Galileo, our engagement and vision about open science is shaped by our specificity as an institution with a "double identity", acting both as a Museum and as a Research Institute.

Our activities as Museum connect us to citizens and to the general public, and our engagement as a Research institute links us to the academic community: therefore, a characteristic that we want to stress and valorise with our engagement towards Open Science is our positioning as an actor at the intersection of these two worlds, to facilitate their exchanges and understanding. We commit to continue to foster exchanges between researchers, curators and conservators, with respect to future exhibitions and research activities.

An example of how we translate this principle in practice is given by the interplay between our research activities and our exhibitions: our research results guide the design of many of our exhibitions, thus ensuring that, on the one hand, our public is kept informed of the latest research results, and on the other hand that our researchers are always aware of the importance of sharing and making their research results understandable to the public.

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2. Openness as resource to support research

One of the key objectives of our engagement towards Open Science is to provide additional resources and tools to advance and support research.

With our reflection about Open Science we aim to further support our research community by reducing the barriers to access our data and research products.

In line with this key commitment:

- **Galilæana**[17] (our international scientific journal focused on the history of Renaissance and early modern science and on topics relating to the life, scientific work, achievements and legacy of Galileo) **became an online open-access journal starting in 2023**[18]**;**
- we are working to **improve the interoperability and internal structure of our data.** Such a process is ongoing: its objective is to improve, by means of a semantic system, the usability of our data, so that they can be accessed and queried also in different ways with respect to the purposes for which they were

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[17] https://gal-studies.museogalileo.it/index.php/galilaeana
[18] The first Volume published in Open Access is available on the website of Galilæana at this link: https://gal-studies.museogalileo.it/index.php/galilaeana/issue/view/1/1.

originally created. This process is the first step to subsequently align our data to the *FAIR (Findability, Accessibility, Interoperability, and Reusability)* principles.

3. Openness as community of practice

Interest in Open Science will be strengthened if the reflection is approached also as a community effort of museums, cultural institutions and policy stakeholders, to foster exchanges of good practices and mutual learning.

We aim to keep building and strengthening links with national and international museums and institutions interested in Open Science, to contribute to the development of a "community of practice" for Open Science in museums.

As an application of this principle, **in May 2023 we organised in our premises the webinar and workshop "Open Science in and by Museums: current visions and the path ahead"[19], that involved different actors (museums already engaged with Open Science practices, national experts in Open Science not operating in the Galleries, Libraries, Archives and Museums (GLAM) sector, regional science museums, etc)**, with the aim of providing a space for discussion between different museums and institutions interested and engaged in the application of Open Science.

4. Openness as inclusion

We aim to further "open" our Museum to diversify our visitors and to take into account the requests of the public with special needs, in order to reach and engage with as wide an audience as possible.

This principle is in line with the statement, that we highlight below in italics, in the new museum definition by the International Council of Museums - ICOM[20], that we fully share and embrace:

> **"A museum is a not-for-profit, permanent institution in the service of society that researches, collects, conserves, interprets and exhibits tangible and intangible heritage. *Open to the public, accessible and inclusive, museums foster diversity and sustainability.* They operate and communicate ethically, professionally and with the participation of communities, offering varied experiences for education, enjoyment, reflection and knowledge sharing".**

We commit to provide adequate solutions to the demands of our public with special needs. For example, we do understand that our visitors with special needs wish not only to be able to visit our Museum, but also to do it autonomously. We will account for these inputs by continuing to adapt the visiting conditions of our Museum for all publics.

Moreover, we commit to continue producing content oriented to the public with special needs, such as the Braille guide book with tactile images and an audio guide for the

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[19] https://www.museogalileo.it/it/eventi-e-news/2472-open-science-in-and-by-museums-current-visions-and-the-path-ahead.html. The recording of the webinar is accessible on our YouTube channel at this link: https://www.youtube.com/watch?v=6Ze_wOF3omA.
[20] Approved in Prague, on 24 August 2022 by the Extraordinary General Assembly of the ICOM: https://icom.museum/en/resources/standards-guidelines/museum-definition/.

blind or partially sighted visitors[21], or the free app designed to support the deaf or hard of hearing visitors during their visit[22].

> **5. Openness as process**
> Our approach about "openness" takes into account also the process behind our activities.

We think that the process to reach a result is as important as the result itself. For this reason, any reflection about "opening" content and information will also involve the methodology and process behind it.

Applications of this principle are **our will to be transparent regarding the decision-making processes of the curators that lead to the design of an exhibition;** or **our commitment to document and share also the process leading to the creation of an "object**" - be it a catalogue, a data or an exhibition.

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[21] https://www.museogalileo.it/en/museum/learn/museum-activities-for-the-general-public/99-inclusive-education/823-blind-or-partially-sighted-visitors.html
[22] https://www.museogalileo.it/en/museum/learn/museum-activities-for-the-general-public/99-inclusive-education/822-deaf-or-hard-of-hearing-visitors.html

Our future steps and perspectives

As Museo Galileo, we do think that the reflection on Open Science is useful both to improve internally, and to support even more the understanding and appreciation of our contribution in developing a knowledge society.

For this reason, the next steps of our reflection will include both internal and external objectives.

A long-term strategy for Open Science

Our reflection on how to contribute to Open Science translates also into **a reflection about how to improve our internal processes and adapt our future objectives**. For this reason, **we aim to define our own long-term strategy for Open Science**. This means building an operation plan together with our community, according to the five principles defined before, and defining our goals and commitment, the expected results and the corresponding timeline.

Dedicated resources and governance

Guaranteeing adequate resources and setting up a dedicated governance are key factors to secure the successful implementation of our Open Science strategy.

To guarantee the necessary resources for the implementation of this strategy, we will work towards attracting resources, as well as committing our own resources.

We will create an internal governance body to guarantee an effective coordination and follow-up of our efforts towards the achievement of goals for each of the five principles presented before.

Fostering a dialogue with the interested institutions and stakeholders

In view of the above so far, we think that more questions, rather than answers, emerge in these relatively early phases of a global reflection about open science in the GLAM (Galleries, Libraries, Archives and Museums) sector.

This translates into an **important opportunity to involve interested institutions and stakeholders in trying to collectively provide answers and guidelines that can foster the advancement of Open Science in the cultural sector, in our country and abroad**. Moreover, thanks to our double missions and expertise and to our collaboration links with two Italian Ministries (the Ministry of Culture and the Ministry of University and Research), we can proactively contribute to establish guidelines and inform coordinated actions.

Therefore, we wish to further foster exchanges between the national and international communities, policy-makers and the strategic decision levels, and in particular to **work together with other institutions and stakeholders towards establishing guidelines to support Open Science in museums and research and cultural institutions.**

Acknowledgements

We would like to acknowledge the contribution of our community and of our staff to the ongoing reflection about our Open Science principles and practices.

We would like to thank the museums and institutions that in 2022 agreed to have an exchange with us about their activities and vision of Open Science:

- Museo Nazionale della Scienza e della Tecnologia Leonardo da Vinci[23],
- Rijksmuseum Amsterdam - National museum of the Netherlands[24],
- The Natural History Museum Vienna[25],
- The Berlin School of Public Engagement and Open Science / Museum für Naturkunde Berlin[26].

We would like to thank the participants to the workshop *"Open Science in and by Museums: current visions and the path ahead"*[27], that we organised in May 2023, for their feedback and contributions to the discussion:

- Laura Ronzon, Ida Morisetti - *Museo Nazionale della Scienza e della Tecnologia Leonardo da Vinci*[28],
- Serafina Carpino - *Museo Italiano di Scienze Planetarie*[29],
- Marco Leone - *Museo di Storia Naturale del Mediterraneo*[30],
- Donatella Lippi - *Museo della Fondazione Scienza e Tecnica*[31],
- Stefano Dominici, Giulia Dionisio - *Sistema Museale dell'Ateneo Fiorentino*,
- Sara Di Giorgio - *Consortium GARR - Group for the Harmonisation of the Research Network*[32],
- Donatella Castelli - *Institute of Information Science and Technology "Alessandro Faedo", National Research Council of Italy (ISTI-CNR)*[33],
- Katrin Vohland - *The Natural History Museum Vienna*[34],
- Ana Faustino - *The Berlin School of Public Engagement and Open Science / Museum für Naturkunde Berlin*[35].

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[23] https://www.museoscienza.org/en
[24] https://www.rijksmuseum.nl/en
[25] https://www.nhm-wien.ac.at/en
[26] https://www.publicengagement.berlin/
[27] https://www.museogalileo.it/it/eventi-e-news/2472-open-science-in-and-by-museums-current-visions-and-the-path-ahead.html
[28] https://www.museoscienza.org/en
[29] https://www.fondazioneparsec.it/it/il-museo-di-scienze-planetarie/
[30] http://musmed.provincia.livorno.it/
[31] https://www.fstfirenze.it/en/
[32] https://www.garr.it/en/
[33] https://www.isti.cnr.it/en/
[34] https://www.nhm-wien.ac.at/en
[35] https://www.publicengagement.berlin

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