

## Look up! Sfoglia il cielo con un dito: A virtual exhibition to enhance the historical astronomical atlases of the National Institute of Astrophysics

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**Summary.** — New technologies are revolutionizing various aspects of our lives, and likewise, digital tools are playing an increasingly crucial role in safeguarding, preserving, and valorising cultural heritage. The digitization of archival documents and ancient books, the development of augmented reality apps for museums, and the creation of virtual environments set in both accessible and restricted cultural or landscape contexts, are examples of the use of the new technology in the field of cultural heritage. In this context, the projects “Cosmic Pages” and “Touch the Sky” were developed. One of the main goals of these projects was the realization of the virtual exhibition *Look up! Sfoglia il cielo con un dito*. It is an effective virtual tool aimed at enhancing and giving maximum dissemination of the collection of the star atlases, cometographies, and selenographies at the INAF Observatories. This virtual exhibition was designed and realized allowing the visitors to discover, explore, and understand how our knowledge of the cosmos, the Moon, and the planets has evolved and changed with time. Using the most advanced technologies, virtual reality, 3D models, videos, etc., digital visitors can explore the scientific and cultural contents of the star and cartographic atlases.

### 1. – Introduction

According to UNESCO, heritage embodies the value of our “Cultural legacy which we receive from the past, which we live in the present and which we will pass on to future generations”<sup>(1)</sup>. It includes the inheritance of tangible (books, buildings, landscapes, monuments) and intangible (folklore, knowledge, language, and traditions) assets of a group or society. However this heritage must be protected, preserved and valued, for

<sup>(1)</sup> Definition of the Cultural and Natural Heritage, adopted by UNESCO on 16 November 1972.

future generations to be inspired. In this context the new technology can play a very important role. The evolution and integration of new technologies, such as 3D printing, artificial intelligence, virtual and augmented reality, are changing every aspect of our lives. These technologies not only have become an integral part of our daily routine, but also hold significant potential in preserving and enhancing cultural heritage, as well as captivating the imagination of younger generations. The digitization of ancient documents and books, the development of augmented reality apps for museums, and the creation of virtual realities depicting protected or inaccessible places are some examples of the applications of these new technologies in the cultural heritage field. Concepts such as virtual museums or virtual exhibitions are adopted with enthusiasm today, driven by the idea that if visitors cannot physically reach the museum, it is the museum itself that comes closer to the visitors [1]. During the Covid-19 pandemic, many institutions expanded their digital offerings through initiatives like virtual tours and smartphone apps, such as MAUTO, the app of the *Museo dell'Automobile* of Turin<sup>(2)</sup>, or Depot, an augmented reality app of the museum Boijmans of Rotterdam<sup>(3)</sup>.

The National Institute of Astrophysics (INAF) also contributed in this field with the creation of virtual tours of historic buildings, 3D models of the astronomical instruments at the Italian Astronomical Observatories, operated by INAF, and virtual exhibitions. All these tools allow virtual visitors to follow the programming of the main cultural institutions. Furthermore, new technologies play an essential role in the protection, conservation, restoration, research, dissemination and promotion both tangible and intangible cultural assets across various cultural institutions, including museums, galleries, libraries, archives, monuments, and historical sites. Within this framework, many rare books at the Italian Astronomical Observatories have been digitized and are now accessible on the “Teca digitale”<sup>(4)</sup> of the website “Polvere di stelle”. It is important to note that while digital tools and virtual technologies significantly contribute to knowledge enhancement and the improved promotion of cultural heritage, they cannot fully replace the authentic experience of visiting a museum or an archaeological site.

## 2. – The celestial atlases

Observing and interpreting the sky has always been one of humanity’s fundamental instincts. Recognizing the cyclical nature of time and astronomical events has been an action of considerable importance, even for practical purposes, started by the Chaldeans and Babylonians and passed down to the present day. Fixing and rediscovering myths, heroes, and legendary figures on the celestial vault has characterized ancient cultures and their traditions. Between the second half of the 16th century and the early 17th century, the production of illustrated scientific books spread throughout Europe. Starting from 1609, astronomical observations were no longer conducted with the naked eye but with the assistance of the telescope, introduced by Galileo Galilei. Thanks to this innovative instrument, the celestial vault revealed previously unknown details, meticulously illustrated in works of rare beauty, especially in celestial atlases that seamlessly blended art, mythology, and science. Johann Bayer’s *Uranometria* marks the beginning of the so-called “Golden Age” in the history of celestial cartography. This era saw an

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<sup>(2)</sup> <https://www.museoauto.com/app/>.

<sup>(3)</sup> <https://www.boijmans.nl/en/depot>.

<sup>(4)</sup> <https://www.beniculturali.inaf.it/teca-digitale>.



most comprehensive ones carried out today with satellites, such as Gaia and Kepler.

To enhance and give maximum dissemination to the rich collection of celestial atlases preserved in the INAF observatories, two projects have been developed: “Cosmic Pages” and “Touch the Sky”. These projects aim to make these works accessible to anyone, anywhere in the world, aware that the historical heritage can narrate the development of scientific achievements, creating opportunities for bringing science and other disciplines of knowledge together. INAF researchers, technologists and technicians with complementary skills participated in these two projects. The team included astronomers, librarians, historians of astronomy and experts in scientific communication who conducted various activities and cultural events aimed at reaching diverse user audiences.

#### 4. – The first step: The digitalizations

In the first phase of this project, we conducted an intensive cataloging effort for all the celestial atlases at the INAF libraries. Through the analysis of various atlases, we identified a particularly relevant core of these volumes capable of providing a coherent overview of the development of scientific knowledge about the Universe, the Moon, and the bodies of the Solar System. Subsequently, using the most innovative data scanning and metadating techniques, all the selected atlases were digitized by *Da.Bi.Mus.*, a branch of the University of Bari. The main goal of this group is to transfer university research results into services and products dedicated to cultural heritage. All digitalisations have been integrated into the INAF cultural heritage web site “*Polvere di Stelle*”. In this way anyone, in any part of the world, can study, read, analyse the various celestial atlases at the INAF observatories.

#### 5. – The virtual exhibition “*Look up!*”

Experimenting with new technologies to communicate the value and importance of historical heritage means reaching a large audience and creating new educational opportunities. Based on these principles, the virtual exhibition *Look up! Sfoglia il cielo con un dito*, was created. It aims to showcase and maximize the dissemination of the rich collection of celestial atlases preserved in various Italian astronomical observatories. It is a virtual exhibition accessible from any device (PC, tablet, smartphone, 3D viewers), with its primary objective being to enhance, describe, and maximize the diffusion of the entire collection of stellar atlases, cometographies, and selenographies at the INAF Observatories. As described in the previous section, the collection of celestial atlases plays an important role in the history of modern culture, representing a true milestone in the scientific revolution. The rare celestial atlases, including cometographs and selenographs, such as those by Hevelius, Doppelmayer, Flamsteed and Bode, reveal a variety of details that accurately show the evolution of the human vision of the cosmos through the centuries.

The virtual environment, created and modeled *ad hoc*, is divided into three rooms, each dedicated to one of the main themes of the exhibition: the stars, the Moon and the Solar System. At the center of each room there is a distinctive element: a celestial globe in the stars room, the Moon in the respective room, and a modern representation of Mars in the room dedicated to the Solar System. Each room is self-contained and directly connected to the others, so the user can freely choose whether to explore a single environment or follow a path that takes them through each room. Once entered into one of the rooms, the user can approach the various atlases, read and interact with them,

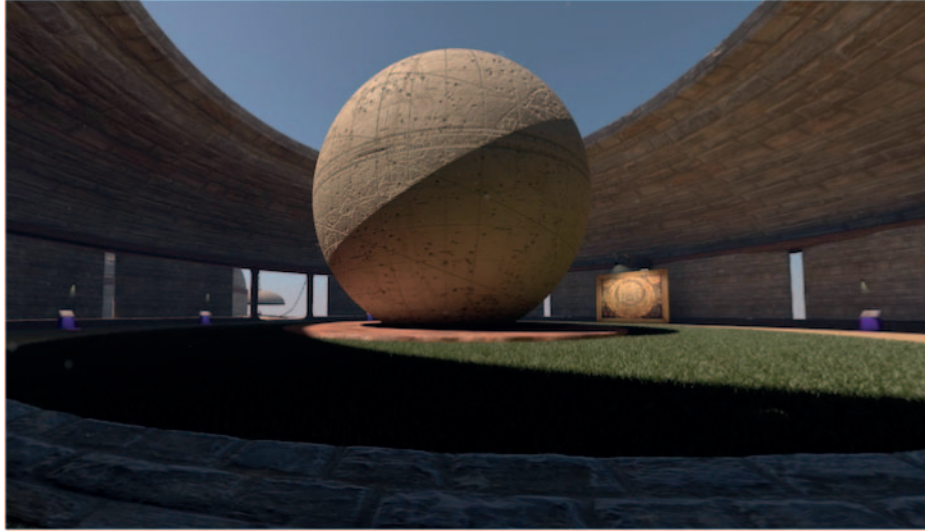


Fig. 2. – The first room of the Virtual Museum *Look up!* where the visitors can explore the evolution of our knowledge of the sky.

thanks to a series of hotspots that provide information about the atlas and the cultural context in which it was created. To achieve this, we have developed a series of videos, infographics and 3D models showcasing various celestial objects. An example of this is the 3D model, based on real scientific data of the Tycho's supernova remnant, *i.e.*, the remnant of a stellar explosion which occurred in 1572 and observed, for the first time, by Tycho Brahe and described in Bayer's atlas. Another two examples are the Saturn's rings fully described for the first time by Huygens in 1659 or the lunar phases and the phenomenon of libration presented by Hevelius in his *Selenography*. Finally, to guide users through the rooms and describe the characteristics of the various atlases, we have created a virtual guide, called Lu. Lu's voice is that of the Italian actor and dubber Luca Violini. Lu's main task is both to guide users inside the exhibition and to suggest the visitors how to interact with the various atlases by providing them with information and contents on them.

**5.1. The visual identity.** – In addition to the previously mentioned activities, we also focused on studying the graphic design of the exhibition. A central aspect of this effort was the creation of the logo, which incorporates the three key elements of the project: the stars, the Moon and the Solar System. Subsequently, we chose a distinctive color code for each of the three different rooms and for all the other graphics and visual elements related to specific environments (hotspots, buttons, etc.). This choice made the exhibition immediately recognizable, allowing the users to easily identify the various sections. The selected colors are part of a harmonious trio and include:

- purple (9300F4) for the room of stars,
- green (00F493) for the room of Moon,
- orange (F49300) for the room of Solar System.



Fig. 3. – In the exhibition we have inserted different 3D models that show different astronomical objects like the Tycho’s Supernovae remnants (on the left), the Saturn’s rings observed for the first time by Huygens, etc.

All this information then codified in a visual identity manual created and published on the project website<sup>(5)</sup>.

## 6. – The educational workshop

Using the same contents presented in the exhibition, we have realised, in collaboration with Save the Children Italia, six educational workshops, two for each section of the exhibition. One of the main purposes of these activities is to reach that part of the scholar population in major social fragility. We also want to promote and support self-determination and individual expression, regardless of personal conditions, gender, social status or culture. Through the use of the cultural heritage of Italian astrophysics, we aim to provide an opportunity for the growth and the development of new skills and passions.

These activities took place in seven “Light Points”, *i.e.*, structures created to offer a better future to children living in the suburbs at risk and in the most disadvantaged areas of cities, distributed throughout the national territory (Turin, Milan —Quarto Oggiaro, Marghera— Venezia, Rome —Ponte di Nona, Naples —Sanità, Palermo — Zen, Catania). The initiative involved the participation of more than 300 children aged between 6 and 15. To assess both the satisfaction level and the learning outcomes from the various workshops, a brief survey was administered to all participants before and after the activities, containing questions related to the covered topics. The analysis of the collected data helped understand the participants’ knowledge level and allowed us to make improvements to the activities, enhancing their engagement and efficiency. Overall, all the children found the activities extremely interesting and a comparison of the pre- and post-activity questionnaires revealed a satisfactory understanding of the various concepts examined.

## 7. – Conclusion

The virtual exhibition *Look up!* represents an important tool for diffusing scientific culture and enhancing the very rich historical heritage contained in Italian Astronomical Observatories.

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<sup>(5)</sup> <https://lookup.inaf.it/>.

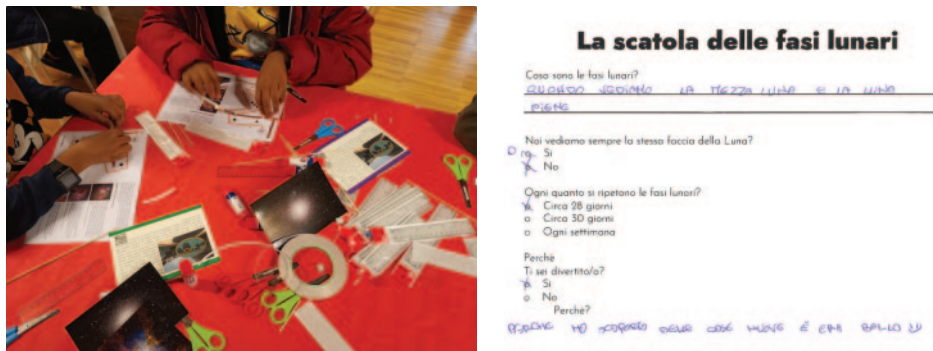


Fig. 4. – Some children during one of the educational workshops (on the left) and an example of the final test (on the right).

In addition to the exhibition, a selection of the most significant stellar atlases has been collected in a catalogue titled “Cosmic Pages: stellar atlases in Italian astronomical observatories” [3]. Furthermore, we made a documentary, titled “*Touch sky. Carte, mappe, atlanti stellari*” edited by Davide Coero Borga and Marco Cantini. This is the first documentary promoted and created by the National Institute of Astrophysics, which was broadcast for the first time on July 11th on Rai Cultura, and it is currently available on RaiPlay<sup>(6)</sup>. Despite the formal closure of the two projects, we are still working on adding new contributions and translating the entire exhibition into other languages to reach users worldwide.

The main reason that pushed us to focus our attention on this particular type of bibliographic material is the awareness that the precise representation of the sky is not a scientific undertaking concluded in the past but it is a continuous and future-oriented research. The valorisation and study of this extraordinary historical heritage constitutes not only a significant contribution to our understanding of the numerous treasures at Italian observatories, but serves as a splendid sign of continuity in the field of contemporary research in one of the noblest sciences, astronomy.

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I thank all the people who contributed and collaborated in the creation of the virtual exhibition *Look up!* and the whole project.

#### REFERENCES

- [1] PAOLINI P., BARBIERI T., LOIUDICE P. and ALONZO F., *J. Assoc. Inf. Sci. Technol.*, **51** (2000) 33.
- [2] DI GIACOMO F., FACCINI M., GARGANO M., GASPERINI A. and ZANINI V., <https://lookup.inaf.it/>, web site of the exhibition.
- [3] CHINNICI, I. and GARGANO, M., *Cosmic pages: Atlanti stellari negli osservatori astronomici italiani* (Artem editori) 2022.

<sup>(6)</sup> <https://www.raisplay.it/programmi/touchskycartemappeatlantistellari>.