Transformative Interactive Experience at Specola Margherita Hack for Enhanced Public Engagement in Astronomy

Marco Citossi[1], Giulia Iafrate[1]
[1]INAF - Italian National Institute for Astrophysics

Figure 1. The SMH exhibit.

Abstract

The Specola Margherita Hack - SMH (Figure 2) merges cutting-edge technology with historical insight to revolutionize astronomical education and public engagement. The ground floor features an interactive, multilingual multimedia exhibit that not only chronicles the astronomical observatory's extensive history but also integrates immersive technologies such as a 3D-projection of the historical Reinfelder telescope and interactive touchscreens for digital exploration. Upstairs, a state-of-the-art 60 cm reflecting telescope provides visitors with direct, unmediated views of the cosmos, complemented by a dome-integrated projection system for interactive celestial simulations. These enhancements have significantly increased visitor engagement, establishing the observatory as a premier destination for immersive educational experiences in astronomy.

Figure 2. The Specola SMH.

Introduction

The Specola Margherita Hack, named in honor of the renowned Italian astrophysicist Margherita Hack, has undergone a transformative renovation to celebrate the centenary of her birth in 2022. This observatory, situated in Trieste, Italy, now stands as a beacon of public outreach and education in the field of astronomy, utilizing augmented reality (AR) and other cutting-edge technologies to provide an unparalleled educational experience [1].

Interactive Exhibits

On the ground floor, visitors are introduced to a newly designed historical and informative multimedia exhibition (Figure 1).
This exhibit traces the history and scientific achievements of the astronomical observatory of Trieste, dating back to its founding at the nautical academy in 1753.
A key feature of the exhibition is a virtual 3D model of the historical Reinfelder telescope, one of the most significant scientific instruments from the late 19th century. This model is projected onto a central base in the room, providing a tangible connection to the past through modern technology [2][3].

The first floor houses a new state-of-the-art 60 cm Ritchey-Chrétien telescope, providing visitors with direct and unparalleled observations of celestial bodies (Figure 3). Complementing the main telescope are two smaller refracting telescopes.

In order to engage school groups during school time, we've equipped the dome with a Coronado SolarMax II, a 9 cm achromatic refractor with a 15 mm blocking filter with sub 0.7 Å (H-alpha) bandwidth filtering dedicated to detailed solar observations.
The dome's internal surface could be transformed into a large planetarium using a high-definition projector and custom diverging lens. This setup ensures continuous engagement, even in adverse weather conditions.

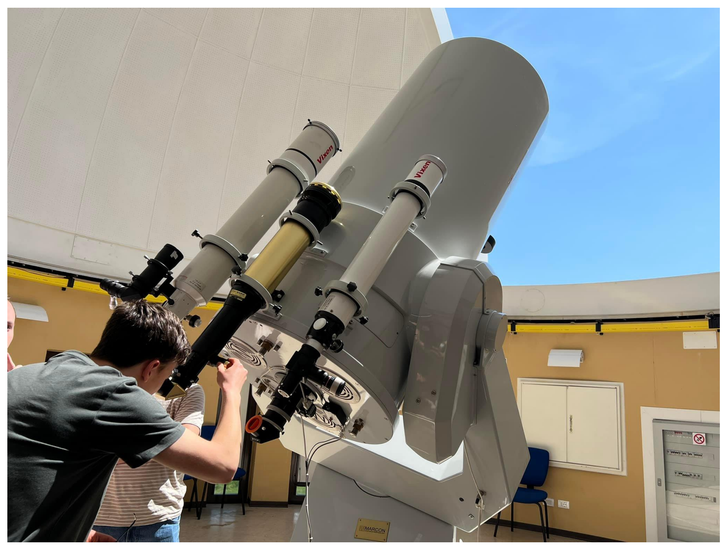

Figure 3. The 60 cm RC by Marcon Telescopes company.

Immersive Learning

The observatory utilizes a highly interactive and immersive strategy to engage the public in astronomy, especially through:

Augmented Reality (AR): offers deeper understanding and exploration of astronomical phenomena, bridging history and modern technology.

3D-Projection: showcases the Reinfelder telescope, immersing visitors in its historical context and enriched content by enabling virtual interaction with historical instruments and documents.

Educational Programs: designed for all audiences, from school children to amateur astronomers.

Interactive Touchscreens: enable hands-on engagement with digitized historical documents and scientific data.

Hands-on Exhibit: The interactive exhibitions allow all visitors to engage directly with the displays. Every instrument is designed to be touchable, ensuring that everyone, regardless of ability, can experience real objects and phenomena firsthand.

Inclusivity and Accessibility: the exhibition is accessible in four languages: Italian, English, Slovenian, and German, ensuring inclusivity for a diverse audience. The observatory is accessible to people with disabilities.

Dome Projection System: enhances learning with dynamic presentations of celestial events.

Immersive Technologies: enhanced educational experiences, making astronomy accessible and engaging for all ages.

Conclusions

The post-renovation Specola Margherita Hack has attracted around 4,000 visitors annually and stands as a testament to the transformative power of modern technology in the field of astronomical education and public outreach.

By merging historical insights with advanced technological tools, the observatory offers a unique and engaging educational experience that fosters a deeper understanding of the universe.

As the field of astronomy continues to evolve, the Specola Margherita Hack will remain at the forefront, inspiring future generations and contributing to the global conversation on space and science education.

Contacts

Marco Citossi
marco.citossi@inaf.it
Giulia Iafrate
giulia.iafrate@inaf.it

Website: https://www.oats.inaf.it

References

[1] Iafrate G., (2023), Organizzazione, gestione e svolgimento visite per scuole e pubblico alla rinnovata specola M. Hack nell'anno 2022.
[2] Iafrate G., Gasparo F., (2023), Progettazione e realizzazione del nuovo percorso storico-divulgativo multimediale della specola M. Hack.
[3] Chen, C.-C., Chen, H.-R., & Wang, T.-Y. (2022). Creative Situated Augmented Reality Learning for Astronomy Curricula.