PROCEEDINGS OF SCIENCE

"This is (not) Rocket Science – Citizen Science as Mission Control" - Space and Citizen Science at the Vienna Museum of Science and Technology (2022–2025)

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Since 2022, the Technisches Museum Wien (Vienna Museum of Science and Technology) has been conducting the project funded by “Sparkling Science 2.0” through the “OeAD Center for Citizen Science” in collaboration with nine partners from Austria, Great Britain and the USA. The basic idea is to reflect the current developments in space travel and to establish a research collaboration with the partners in the use of space-based resources in the New Space Age. Connecting young people with stakeholders from a wide range of fields related to “New Space” in Austria The most important research partner is “Bildungsgrätzl Schönbrunn”, an association of educational institutions for children and young people in the immediate vicinity of the museum’s location. This also strengthens and deepens the connection between the museum and the educational institutions in the area – beyond the scope of the project. The project involves more than 200 children and young people ranging from kindergarten age till graduation. The most important goal is to involve young people in the current discourse on New Space and to initiate independent research on this topic. For this purpose, a "mission control" in the form of a youth advisory board for the Technical Museum Vienna will be established as a steering committee for the project and co-curators for the exhibition "Space Habitats" within the exhibition series "weiter_gedacht_" 2025/26.

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1. Introduction

Since 2022, the Technisches Museum Wien (Vienna Museum of Science and Technology) has been conducting the project funded by "Sparkling Science 2.0"[1] through the "OeAD Center for Citizen Science" in collaboration with nine partners from Austria, Great Britain and the USA. The basic idea is to reflect the current developments in space travel and to establish a research collaboration with the partners in the use of space-based resources in the New Space Age.
The term "New Space" has become established in recent years to describe a development that could also be called "commercialisation of space travel" or "democratisation of space travel". While governments and government organisations were previously the key players in space exploration, a growing number of private companies, universities, start-ups and also smaller countries have since gained independent access to space: Space exploration and the use of space technologies will increasingly shape and influence our everyday lives. Today's children and young people in particular will be directly affected by these developments in adulthood. But with the appropriate knowledge, they can get involved themselves and have the opportunity to take an active part in shaping future technological developments and participate in research.[2]

1.1 Goals of the citizen science project "This is (not) Rocket Science"[3]:

+ Communicating basic knowledge of current developments in space travel and space use
+ Connecting young people with stakeholders from a wide range of fields related to "New Space" in Austria
+ Involving young people in the current discourse to initiate independent research into space travel
+ Drafting "pre-scientific papers" from the subject areas of the project, especially in the field of satellite technology
+ Establishing "Mission Control" in the form of a youth advisory board for the Technisches Museum Wien as a steering committee for the project and co-curators for the "Space Habitats" exhibition within the "weiter_gedacht_" 2025/26 exhibition series

2. Research partners

The role of the Technisches Museum Wien in this project also includes serving as an interface coordinating the nine various research partners to enable new research collaborations. The most important research partner is "Bildungsgrätzl Schönbrunn",[4] an association of educational institutions for children and young people in the immediate vicinity of the museum's location. This also strengthens and deepens the connection between the museum and the educational institutions in the area – beyond the scope of the project. The project involves more than 200 children and young people – ranging from kindergarten age to the age of taking the Matura (secondary school-leaving exam) – from "Kindergarten Dadlergasse" (kindergarten), "Ganztagsvolksschule Reichsapfelgasse" (full-day primary school), "Volksschule Friesgasse – Oskar Spiel Schule" (primary school), "Mittelschule Kauergasse" (lower secondary school) as well as "Oberstufenrealgymnasium am Henriettenplatz" (upper secondary school). Another partner in the field of education is the "Federal Institute for the Blind in Vienna"[5], an educational institution that provides guidance to the visually impaired and blind from kindergarten age to the age of taking the Matura (secondary school-leaving exam). As part of the inclusion effort, specific education programmes for students of different age groups are developed together within the project in collaboration with the school, exploring how the content can be integrated into research questions.

The "European Space Education Resource Office" (ESERO) is an organisation of the European Space Agency (ESA) promoting interest among young people in European space activities as well as STEM subjects in general. The Austrian department of ESERO has been domiciled at the Ars Electronica Center[6] in Linz since 2018. ESERO offers various research and education programmes for the project, ranging from the CanSat Competition to the Moon Camp Challenge.[7]

The "TU Wien Space Team"[8] is an important partner from the academic field that was founded in 2010 by students of TU Wien (Vienna University of Technology). The team mainly focuses on building rockets and has participated in numerous international student competitions. In addition, the team is developing the "SpaceTeamSat1" (STS1) CubeSat, which is also intended to serve as a platform for training and teaching content for the project. The launch of the satellite, funded by a prize from the German Aerospace Center, is scheduled for 2024.

"LIQUIFER Systems Group Gmbh"[9] is a project participant from the space industry – the Vienna-based architectural firm specialises in space applications and is involved in studies by the ESA-funded "International Habitat"[10] (I-Hab) of the "Lunar Gateway". In recent years, LIQUIFER has acquired extensive expertise in matters relating to living in space as well as building and maintaining future Moon and Mars stations and will be available for workshops on building and planning space stations as well as Moon and Mars habitats.

Eleanor S. Armstrong[11], a British scientist who teaches at Stockholm University, is an academic contributor to the project. She has studied space exploration extensively from a point of view of feminist and queer science and technology, and has also examined the representation of space in science centres and technology museums.

3. Research content

During the planning phase, we identified four current fields of research that constitute the focus of the three-year citizen science project. We were able to recruit the appropriate research partners from the fields of academia, business and education institutions:

3.1 New Space thinking ahead

Together with the TU Wien Space Team, the young citizen scientists will become active in the "New Space" themselves: They will have the opportunity to conduct and observe measurements and experiments with the STS1 satellite (launching in 2024). Orbiting Earth at an altitude of about 500 km, the satellite will serve as a research platform for students and pupils for several years. A self-built ground station will enable the partner schools to jointly evaluate the collected data.

3.2 Women and space

The percentage of women among astronauts and workers in the space sector ranges between 10% and 20%. The reasons for this are the strict gender roles that remain commonplace in this sector. Together with Dr Armstrong, the citizen scientists will be studying how gender roles are passed on at home, at school and in youth culture, for example in the form of toys, and how they continue to shape this research sector. In addition, they will also personally get to know women who have made a career in space exploration.

3.3 Moon village or Mars colony?

How and where do we want to live in the future? On the Moon, on Mars or on Earth? LIQUIFER will give the young citizen scientists inspiration for designing and equipping space stations and habitats. In a jointly designed roleplaying game, the youngsters will be practicing how to plan and successfully carry out space flight missions.

3.4 Space junk or world heritage?

With increasing space activities, the number of artificial objects in Earth's orbit is also increasing. Only a fraction of these objects are operational satellites; the rest is already space junk, which is growing in numbers every year. But as a museum committed to preserving the technical and cultural heritage of humankind, it is essential to also preserve significant artefacts of human history. In collaboration with the American NGO "For all Moonkind" [12], citizen scientists will be doing research on this subject and developing criteria to distinguish between space junk and cultural heritage.

4. Project progress

The first results of the project launched in 2022 were already presented at the 2023 "Austrian Citizen Science Conference"[13] in Linz. In the first year, all 200 children got to know the museum and its space exhibition. ESERO Austria conducted an astronomy workshop with the kindergarten children. The children of two elementary school classes were able to witness a rocket launch by the TU Wien Space Team as part of ESERO Austria's CanSat competition at Schärding Airport and attend a workshop on materials used for space travel. In addition, the children of the lower and upper secondary school were able to visit the laboratory of the TU Wien Space Team, see how a satellite is built and experience a propellant test.Establishing "Mission Control" – the future youth advisory board – with the participation of 20 pupils has proven to be groundbreaking. Over the next two years, "Mission Control" will be collaborating with the scientific partners to further deepen and develop the research approaches of the "Rocket Science" project.

References

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