



# Moon Impact, a geological story.

## PRESENTATION FOLDER

**EXHIBITION**

**19 MARCH - 20 JUNE 2021**

**BRASOV ART MUSEUM**





Malachite  
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## THE IMPACT PROJECT

Razvan Caracas  
Computational mineralogist - CNRS (Lyon) & CEED (Oslo).  
in collaboration with Sarah T. Stewart (UC Davis)

The IMPACT team studies the condensation of the Earth and the Moon from the protolunar disk, which formed in the aftermath of the giant impact. The team works on the thermodynamics of the disk, on the behavior at the atomic level of the melts, gases and supercritical fluids that dominate the protolunar disk, and on the state of the early Earth and Moon.

The IMPACT project is financed by the European Research Council (ERC, via grant agreement no. 681818, 2016/2020).

The IMPACT team is made of:

- \* Natalia Solomatova, post-doc: volatiles in the protolunar disk
- \* Mandy Bethkenhagen, post-doc: multi-scale simulations of fluids
- \* Tim Bögels, PhD student, The Mg-Fe-Si-O system
- \* Anais Kobsch, PhD student, Crustal silicate systems,
- \* Zhi Li, PhD student, Iron-based alloys;
- \* Renata Brandelli Schaan, PhD student, Volatiles during the Giant Impact.

## THE EXHIBITION

On March 19th, 2021 we will launch the itinerant international exhibition “Moon Impact – a geological story” at the Museum of Art, Brasov, Romania. The exhibition tells the story of the Giant impact and the Moon formation in the context of the geological evolution of the Earth and of the solar system.

Over almost 200 square meters of exhibition you will be able to learn about the formation of the solar system, about the Giant Impact that generated the protolunar synestia, and about the ever-growing complexity of the mineral realm. You will admire distant proto-planetary disks, you will see animations of giant impacts and you will peek into the atomic secrets of the formation of the first atmosphere of the Earth. The exhibition is realized in collaboration with the Faculty of Geology of the University of Bucharest who provides the largest part of the samples in the exhibition.

The science moments, in order, speak about:

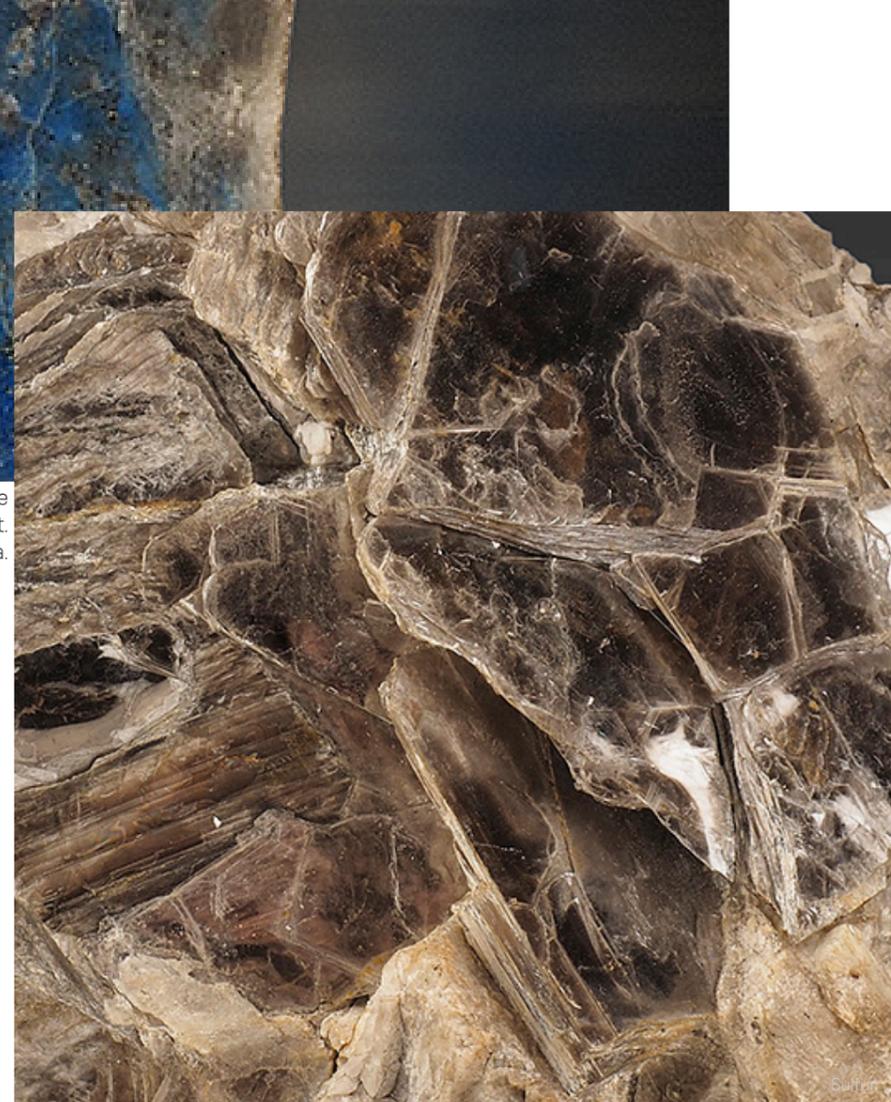
1. Formation of the solar system
2. The Giant Impact, the formation of the Moon, and the early Earth
3. The mineralogical and geological evolution of the Earth
4. Anthropocene

Quartz  
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Muscovite  
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## THE TEAM

Dr. Razvan Caracas |  
Senior Researcher - CNRS  
**CURATOR**

Léna Martin - CNRS  
**MUSEOGRAPHE**

### IMPACT team:

Natalia Solomatova, Mandy Bethkenhagen (postdocs),  
Tim Bögels, Anaïs Kobsch, Zhi Li, and Renata Schaan (PhD  
students).

### SCIENTIFIC COMMITTEE:

- \* Dr. Mirel Bârlan, Astronomer at the Observatory of Paris, France
- \* Prof. Carmen Gaina, Director of the Center for Earth Evolution and Dynamics, (CEED), University of Oslo, Norway, member of the European Academy
- \* Dr. Mioara Manda, Programme Manager for the Solid Earth Observation of the French Spatial Agency, CNES, France, member of the European Academy
- \* Prof. Sarah T. Stewart, Professor at the University of California Davis, USA
- \* Prof. Stephanie Werner, Professor at the University of Oslo, Norway, member of the Norwegian Academy

Graphic designer:  
Lucie Colin

Carpenter and scenography:  
La Fabrique | BLOX Usinage Plastiques | Varia France | Fixart | CCMJ

Production audiovisual Science Today: Simulating Solar System Formation  
California Academy of Sciences.

and Marie-Jeanne Barrier, Samantha Barendson, Antoine Blancon, Vincent Brault, Sebastien Buthion, Laurent Courtaud, Eric Debayle, Pascal Duchanaud, Cécile Dupré, Charlotte Glessler, Rémy Grünblatt, Benedicte Lanza, Emmanuela Mattioli, Antonela Neacsu, Franck Petit, Bruno Reynard, Belkasssem Yassini.

## AKNOWLEDGMENT

First, we would like to thank Dr. Radu Popica, director of the Braşov Art Museum and all the team of the museum, who helped us realizing the exhibition.

We address our most sincere and warm thanks to Profs. Alexandru Andrasianu, James Badro, David Dobson, Andra Filiuță, Gheorghe Ilinca, Denisa Jianu, Iulia Lazar, Captain Moore, Loreta Munteanu, Adrian-Iulian Pantia, Lucian Petrescu, Gheorghe C. Popescu, Mihai E. Popa, Renata Schaan and Reidar Trønnes for assisting with the making of the collection of minerals and rocks.

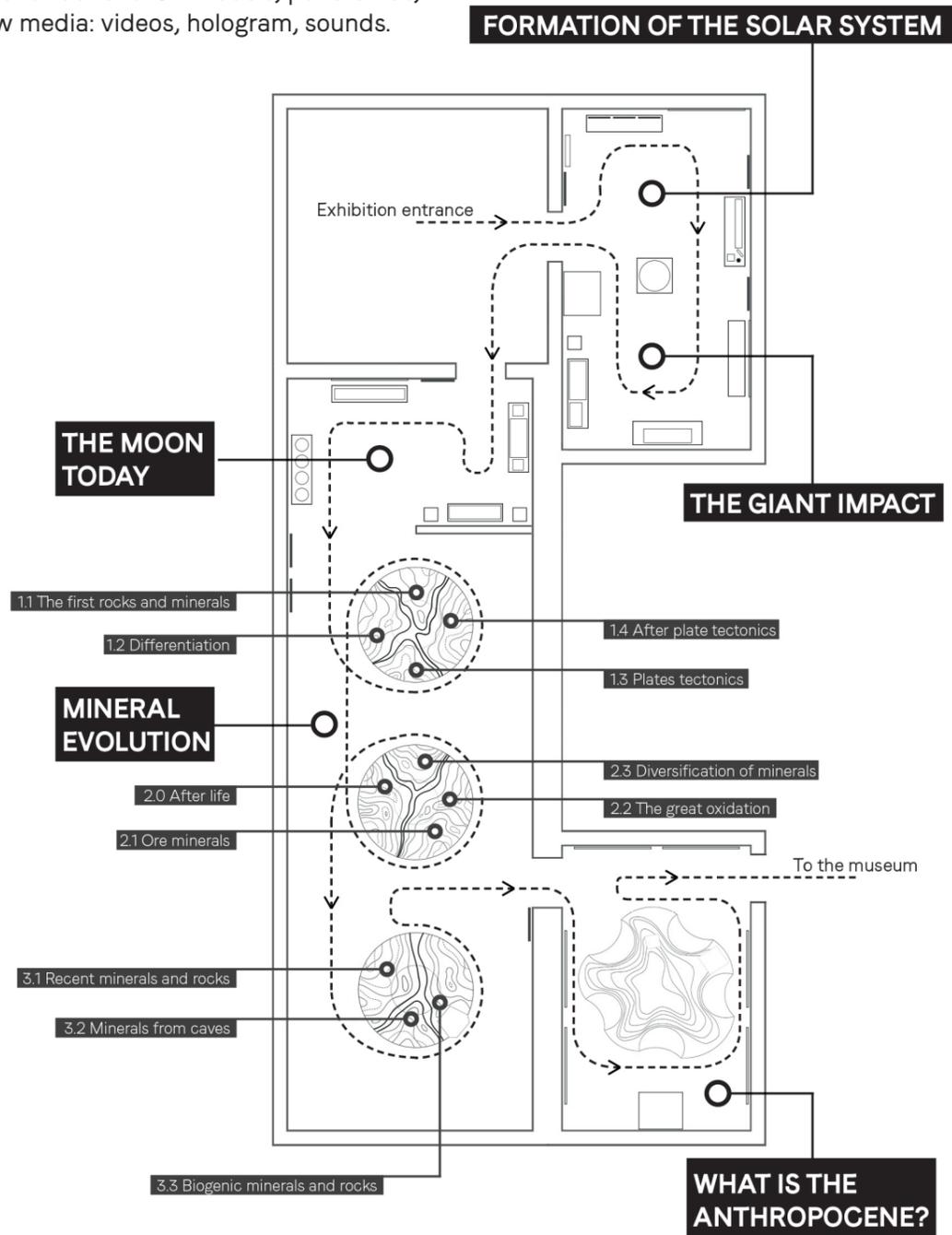
Our thanks go to the people who shared their knowledge with us and especially to: Elizabeth Cottrell, Simon Lock, Sarah T. Stewart, Stephanie Werner.

The realization of the exhibition was funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (grant agreement no. 681818 - IMPACT, ERC Consolidator Grant to R. Caracas). We acknowledge support from the Marie Skłodowska-Curie actions with the project xICE (grant no. 894725).

This exhibition aims to raise awareness of science among new audiences. This is a (re) discovery of the history of our immediate universe through the prism of geology: formation of the solar system, formation of the moon, diversification of the mineral world, interdependence of life on Earth and the presence of minerals, human influences on the mineral environment (Anthropocene, accumulation of plastic waste), etc.

### COLLECTIONS

- geological collections: rocks and minerals;
- objects and mediation tools: texts, iconographies, facsimiles;
- reconstructions: 3D models, panoramas;
- new media: videos, hologram, sounds.



### PROGRAM

After a brief presentation of the path inside the exhibition, several tools help the visitor: reading of labels with chemical formulas, differentiating between digital simulations and artistic interpretations, etc.

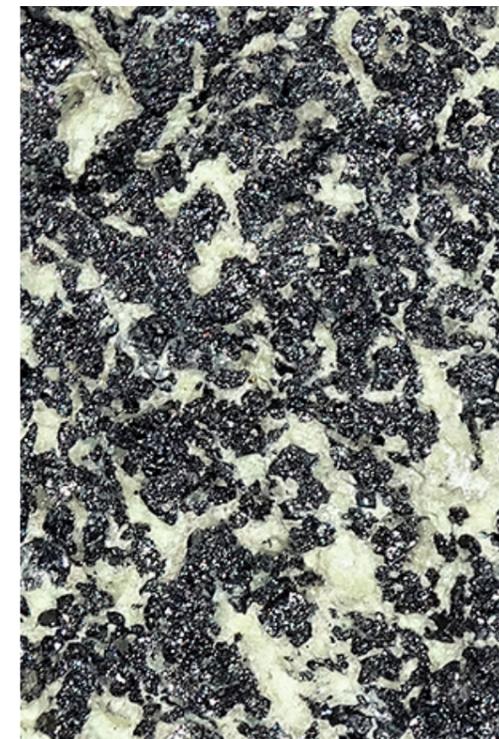
#### ◇ FORMATION OF THE SOLAR SYSTEM



Allende meteorite  
Coll. CNRS | Impact.

This first part starts with the explanation of the formation of our solar system. By way of introduction, an excerpt from a documentary produced by the California Academy of Sciences is broadcasted on a screen. This is a short description of the process of formation of the solar system. We synthesize three main stages of this phenomenon thanks to three backlit photographs.

We also highlight the multitude of other solar systems: our solar system is not unique. A patchwork of photographs of planetary systems, taken using the ALMA telescope, illustrates this idea. The sequence of mineral condensation within the solar system is explained in a showcase. A user-accessible microscope connected to a screen offers live zoom-ins of minerals in a slab of a chondrite meteorite.



Chromite  
Coll. CNRS | Impact.

### ◇ THE GIANT IMPACT

The second part of the room addresses the Giant Impact and the formation of the Moon. A showcase exhibiting meteorites links this part to the previous one. With the help of a giant poster, a mediation table identifies and explains the main steps of the Giant Impact and the formation of the Moon. Then the visitors discover a 3D holographic projection of a synestia (protolunar disc) and explore its very particular volumes.

A nearby showcase explains the condensation of the protolunar disc. In addition to geological samples, 3D prints resulting from calculations by the Impact team, offer a microscopic view into the conditions and materials of the synestia. An unprecedented experiment created by the professor David Dobson (University College of London) shows the mechanism of core formation in telluric planets.



### ◇ MINERAL EVOLUTION

The visitors continue their journey by discovering in more detail the geological and mineralogical evolution of our planet. This long chronological process is presented on three circular tables. They illustrate an important diversity of geological collections. Shape, size and color, all highlight the multitude of rocks and minerals present on Earth. Special focus is made on particular phenomena such as the appearance of plate tectonics or the phase of oxygenation of the Earth's atmosphere. Several representative paleontological samples enrich this display.



Lava  
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Industrial slag  
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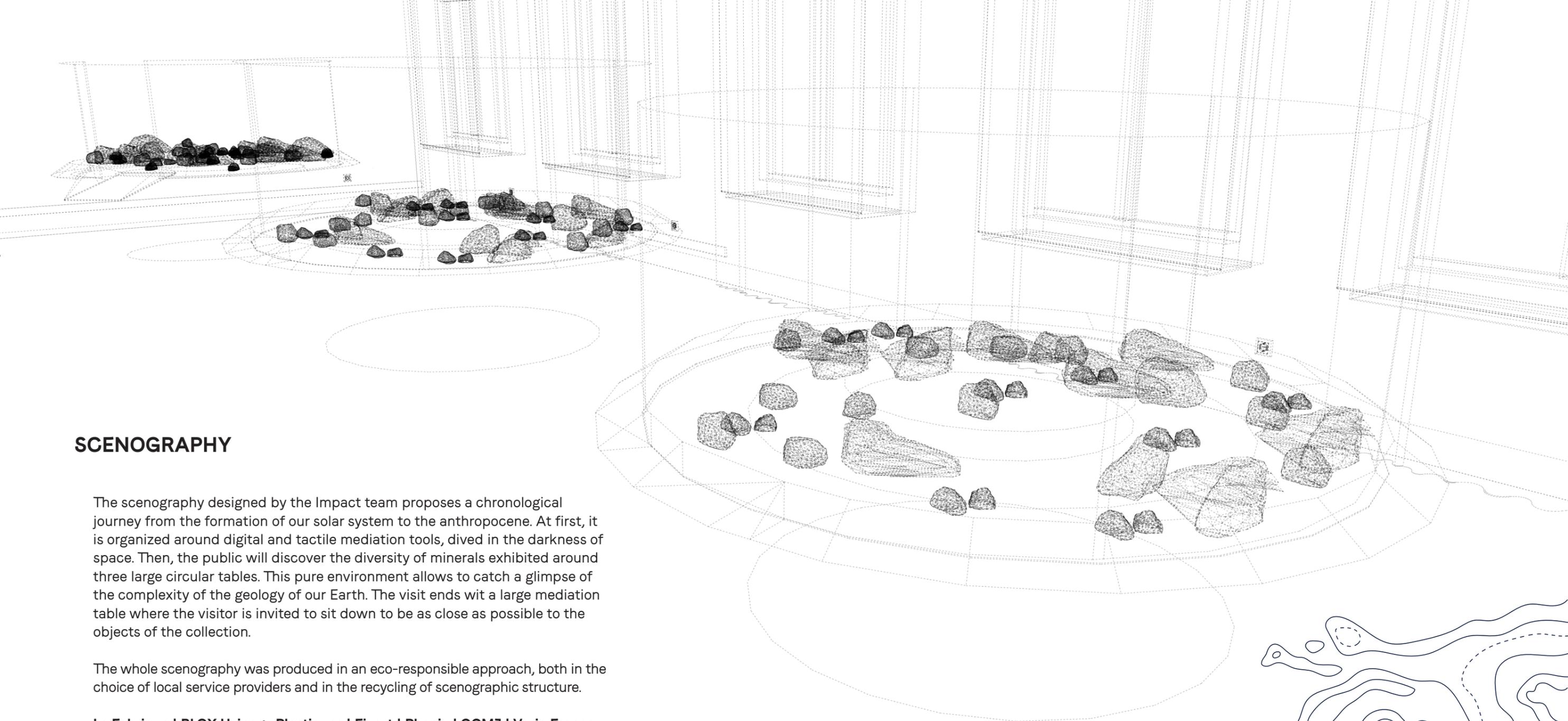
### ◇ THE MOON TODAY

This part begins with an exploration of the geology of the Moon. A giant poster accompanied by a mediation table presents natural samples similar to what can be found on the Moon. A mediation interface allows visitors to understand the difference between a volcano crater and an impact crater; two 3D prints show corresponding structures. Then the notion of life tracer is explained, which also ensures the link between the Moon and the Earth. A mediation table serves as an introduction to this section by highlighting several differences in minerals and rock.

### ◇ SOCIETY AND MINERALOGY

The journey ends with addressing the issue of the Anthropocene. It is about highlighting certain links between mineralogy and the evolution of civilization or how Humans have gradually changed the environment. Around a central table, visitors can discover different aspects of the Anthropocene, from the leveling of soils to the accumulation of plastic in the oceans, which even generated a new rock type.

This last section of the exhibition highlight that mineralogy is an active but evolving science. For example we highlight certain novel research techniques by exhibiting an aerosol sampler, which is a prototype of the one currently present on the international space station (ISS).



## SCENOGRAPHY

The scenography designed by the Impact team proposes a chronological journey from the formation of our solar system to the anthropocene. At first, it is organized around digital and tactile mediation tools, dived in the darkness of space. Then, the public will discover the diversity of minerals exhibited around three large circular tables. This pure environment allows to catch a glimpse of the complexity of the geology of our Earth. The visit ends with a large mediation table where the visitor is invited to sit down to be as close as possible to the objects of the collection.

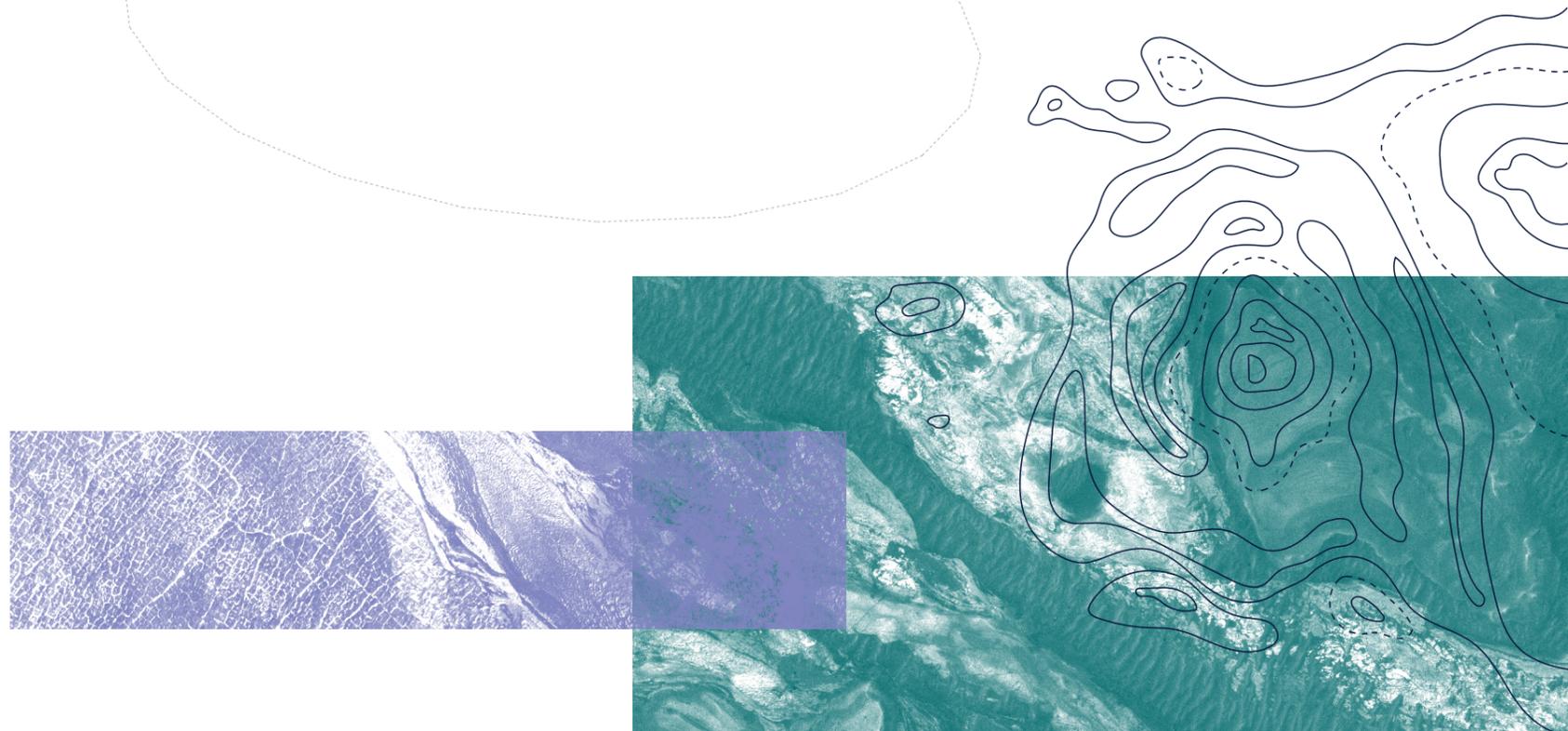
The whole scenography was produced in an eco-responsible approach, both in the choice of local service providers and in the recycling of scenographic structure.

**La Fabrique | BLOX Usinage Plastiques | Fixart | Phenix | CCMJ | Varia France**

## GRAPHIC DESIGN

Imagined by the graphic designer Lucie Colin, the visual identity of the exhibition is built around the notion of diversity, texture and mysterious and fascinating materials. The graphic environment proposes to dive into the «space matter».

**Lucie Colin** - Graphic designer eco-friendly



## BRAȘOV ART MUSEUM

The museum is located in the downtown across the road from the central park. The National Gallery, the museum's permanent exhibition, is housed in six rooms located on the first floor. The permanent exhibition highlights the local Transylvanian art environment throughout history. The exhibition includes artwork created by artists connected to Brașov, beginning with portraits of Saxon patricians and ending with post-war paintings.

<http://www.muzeulartabv.ro/>



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**Muzeul de Artă**  
Bulevardul Eroilor 21  
Brașov 500030

**INFORMATION**  
March 19 - June 20, 2021

**Opening hours:**  
Tuesday to Sunday  
until 31 March - 09am-17pm  
from 1 April - 10am-18pm.

## AROUND THE EXHIBITION



### ◇ GUIDE FOR GROWN-UPS

We offer a small guide with the main elements of the exhibition free of charge to accompany the public during their visit.

Available in English and Romanian.

> Available for download from [www.expo-moonimpact.eu](http://www.expo-moonimpact.eu)

### ◇ GUIDE FOR CHILDREN

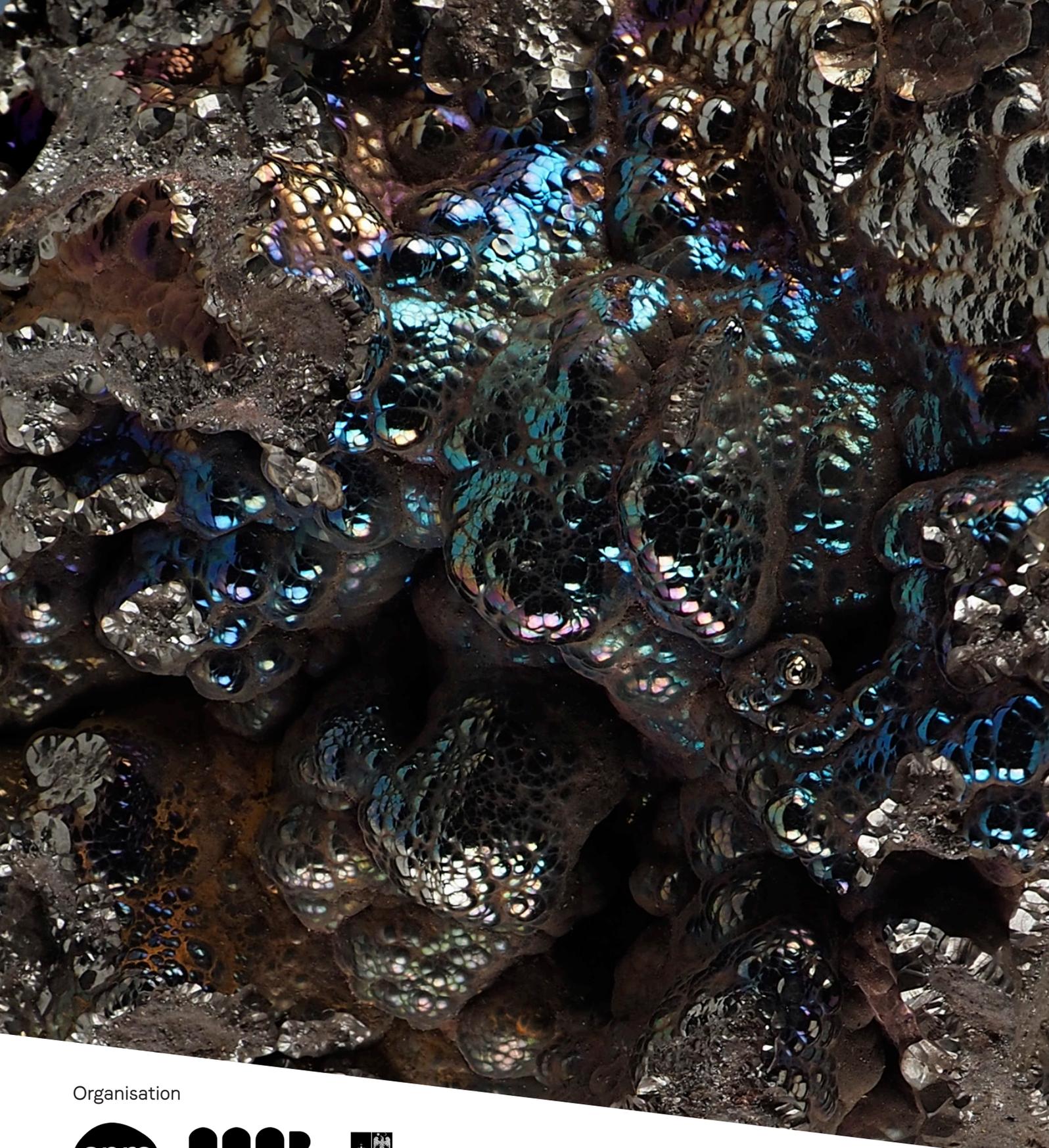
Guided by the famous astronomer Vera Rubin, the children (6-12 years old) will discover the main themes of the exhibition around amusing scientific anecdotes. They will then be able to test their knowledge in small games.

Available in English and Romanian

> Available for download from [www.expo-moonimpact.eu](http://www.expo-moonimpact.eu)

### ◇ EXPO-MOONIMPACT.EU

A dedicated website accompanies the exhibition. The general public will find in it the natural continuation of the experience at the museum. The website will also be a gateway for general practical information, like schedule changes, health measurements, itinerary of the exhibition, etc, and will contain a selection of photographs of samples. The mediation tools such as a visit guide and a children's booklet, can be downloaded free of charge.



## Organisation



set up by the Impact project team under the tutelage of the Lyon Laboratory of Geology (CNRS / ENS de Lyon / Lyon1 University).

## Partners



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*La pas prin Braşov*