

# Unisphere after three years of operation

**Tomáš Gráf**

Silesian University in Opava  
[tomas.graf@physics.slu.cz](mailto:tomas.graf@physics.slu.cz)

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This article summarises the experience from the first three years of operation of the Unisphere spherical projection at Silesian University in Opava, Czech Republic. In addition to our operational experience, we describe our creative activities and future plans for the Unisphere Studio.

## Who are we, and where are we?

Silesian University is located in Opava, a historic city in Silesia, Czech Republic. The University includes the Institute of Physics, which is focused mainly on relativistic astrophysics and is one of the top scientific institutions in Europe. In addition, the Institute focuses on science communication using immersive media.

## History of the Unisphere

The idea of building a planetarium at the University was under consideration for many years, but in 2015, it was decided to use a large empty space in the attic of the main building of the Institute for this purpose. The suspended projection dome has a diameter of 8 metres, can accommodate 50 spectators and is equipped with a projection system with

stereoscopic projection capability. We additionally built a studio to create shows for spherical projection and secured funding through the use of the EU Structural Fund programmes. The inauguration ceremony took place in November 2019.

The planetarium's name was not only intended to declare that it would be a spherical projection with a wide range of uses but also allude to its connection to the university and academic environment. Therefore, the name Unisphere consists of the prefix UNI (e.g., university, universe, uniqueness) and then the first letters of the phrase: **S**cience **P**opularisation **H**ub for **E**ducation, **R**esearch and **E**ntertainment.

## Operation of Unisphere

In 2021, the Institute of Physics was spun off from the original Faculty of Arts and

Sciences as a cutting-edge research facility; the Unisphere was completed under the auspices of the Faculty but is now operated by the Institute of Physics.

Since the Unisphere is intended as an academic planetarium, its main purpose is to teach university students and produce spherical shows. The initial shows were all rectangular projections onto the dome but shifted to include spherical shows in 2020. As a secondary function, we also operate the planetarium for high school students and the general public. Also, the content focuses not only on astronomy and astrophysics but also on other natural sciences, in addition to history, art, photography and music, all in 2D or stereoscopic form.

After the inauguration and the launch of the first shows, which included four of our own shows, the Covid-19 pandemic began in March 2020. It has been two challenging years, but our small team at Studio Unisphere has kept going, creating a new visual style and a website<sup>1</sup>. Tickets for public shows are sold through the university e-shop.

Some relevant parts of the undergraduate and graduate courses are also run in the Unisphere, such as Astronomy Proseminar, Fundamentals of Astronomy and Astrophysics, Practical Astronomy, Popularising Astronomy, Communicating Science, as well as courses on Planetarium Shows and Full-dome Shows.

Shows for high school students are run according to their demand; these groups can book tickets online via the form on the Unisphere website.



**Figure 1:** The audience during the opening ceremony of the Unisphere in November 2019. Image Credit: Ondřej Směkal



**Figure 2:** General view of the projection dome and auditorium of Unisphere. Image Credit: Ondřej Smékal

### Overview of shows

The shows offered consist of several types of performances:

- Purchased classical or stereoscopic shows, such as *Dream to Fly*; six shows in total.
- Shows that are distributed for free, for example, through the Fulldome Database<sup>2</sup> (e.g., *Two Small Pieces of Glass* and *From Earth to the Universe*

by ESO and others); about 15 shows in total.

- In addition to the classic fulldome shows, the Unisphere also hosts live lectures that take advantage of spherical projection. A total of about 10 lectures have taken place under the dome.

We prepare posters for public events for the month's programming and individual lectures. The posters employ our own visual style. Since 2023, our activities for the general public are also supported by city grants.

### Overview of other activities

Among the non-traditional events in the Unisphere, we must also mention the Astronomy Olympiad. This culminates here each year in a national three-day finale, partly held in Unisphere. The national finals are held in March for the top 20 students in years 3 and 4 of secondary school and in May for younger secondary school students. In the Unisphere, the finalists always solve practical astronomy and night sky orientation problems.

The operation of the Unisphere has been possible for three years thanks to the "Lifelong Learning" project, and within its framework, we have started official cooperation with some domestic and foreign universities.

We have also become experts in the field of non-formal education and have produced distance learning texts, including *How to*

*create spherical projection for (non-)formal education*, a 270-page text that focuses on acquiring the skills needed to create different types of informal education shows in relation to the individual needs of the target audience. In addition, we created how-to texts for other topics, ranging from creating an exhibition to creating an AV show for (non-)formal education. Currently, these resources are only available in Czech<sup>3</sup>.

### Studio Unisphere and in-house production

The core team of the Unisphere consists of eight people with a complimentary variety of expertise. Unfortunately, none of the positions at the Unisphere are full-time. This makes producing shows significantly more difficult.

From the beginning, in addition to our core team, we have employed trained university students on a freelance basis to help with the day-to-day operations for high school students and the general public.

### The first projects

The first independent projects included the creation of four shows about night sky orientation during the year.

The next projects<sup>4</sup> of the creative group were the production of 10 short fulldome shows on very advanced astrophysical topics, from black holes to space missions and exoplanets.

Although these are very demanding topics in terms of content, for financial reasons, the visual aspect of these shows was very simple. We made the most of the capabilities of our projection system's environment and the rectangular image composition onto a sphere.

In the following production stage, we decided to rework one of these shows into a better fulldome format with the original graphics. We chose a script about binary stars and created a new visual design. The show, *Journey to the Binary Stars with AIDA*<sup>5</sup>, takes place aboard a fictional spacecraft during a journey to the Alpha Centauri system. The basic properties of the different types of binary stars are communicated through a conversation between the astronaut and the onboard artificial intelligence, AIDA.



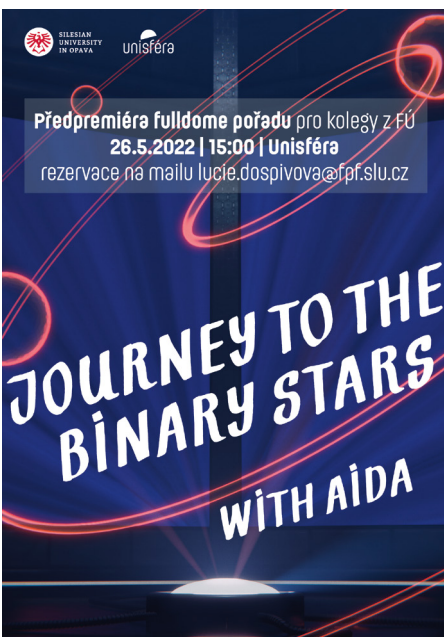
**Figure 3:** An example of a poster promoting an event (in this case, a lecture) in the Unisphere. Image Credit: Adam Hofer



**Figure 4:** Members of the Studio Unisphere team at FFB 2022 in Brno. The festival included the premiere of the fulldome show *Journey to the Binary Stars with AIDA*. Image Credit: Unisphere

## Future plans

The Studio Unisphere team is currently developing a family show with the working title *Wannabe Spider*, about an opilone that wants to be a spider, which will be completed during 2023. Another developing idea is a show about geology with the working title *Journey to the Center of the Earth*. However, we are still early in the development stages of this project and are still working to prepare a script.



**Figure 5:** Poster of the show *Journey to the Binary Stars with AIDA*. Image Credit: Patrik Bařon



**Figure 6:** The new terrace for astronomical observations for students and the public. The dome of the automated telescope, WHOO!, is visible in the left part of the image. Image Credit: Tomáš Gráf

It is important to remember that one of the primary functions of the Unisphere is to be a digital planetarium to discuss astronomical and astrophysical topics. For this reason, the University constructed an observing terrace for students and purchased a new telescope. We intend to take advantage of the combined capabilities of both facilities, the WHOO! (**W**hite **H**ole **O**bservatory **O**pava) and the Unisphere, and offer the possibility to observe the sky after the show or possibly to broadcast images from the observatory's telescope directly onto the Unisphere dome.

In the future, we hope to present topics through multiple forms of media, including the fulldome show, a VR experience, and a video game.

## Acknowledgements

The core team of Unisphere currently consists of Viky Kurečků (D6 programming, modelling and VR), Lucie Dospivová (operations logistics, administration, translations), Patrik Bařon (artist, animator, creative), Adam Hofer (projection technology, D6 programming), Ondřej Smékal (filmmaker), Jan Novotný (astrophysicist, scriptwriter), Jan Hladík (astrophysicist) and Tomáš Gráf (astronomer, group leader, production manager, scriptwriter).

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The studio used to create shows for spherical projection was built using funds from the EU Structural Fund programmes (CZ.02.2.67/0.0./0.0/16\_016/0002503).

## Notes

- <sup>1</sup> Learn more about the Unisphere at their website: [https://unisfera.slu.cz/index\\_eng.php](https://unisfera.slu.cz/index_eng.php)
- <sup>2</sup> The Fulldome Database can be accessed at this link: <https://www.fddb.org/>
- <sup>3</sup> For access to the resources created by Unisphere, follow this link: <https://www.slu.cz/fpf/cz/layout/3442>.
- <sup>4</sup> The shows are available in Czech, but the script texts are also available in English upon request. For more information, contact the lead author at [tomas.graf@physics.slu.cz](mailto:tomas.graf@physics.slu.cz).
- <sup>5</sup> *Journey to the Binary Stars with AIDA* is available in Czech and English upon request. For more information, contact the lead author at [tomas.graf@physics.slu.cz](mailto:tomas.graf@physics.slu.cz).

## Biographies

**Tomáš Gráf** is a Czech astrophysicist, astronomy populariser and university teacher. Since 2015, he has been working at Silesian University in Opava, and since 2017, he has been the Vice Dean for Strategy and Development at the University's Faculty of Philosophy and Sciences. In addition, Gráf is the head of the WHOO! observatory and the Unisphere.