

Researching/Teaching the unique nature of Astronomy at the Planetarium

We are looking for one phd-candidate that will combines two elements: a PhD project (60%) and member of the teaching staff at the Brussels Planetarium (40%). The combination is envisioned to be supportive of both the research project and the teaching efforts at the Planetarium.

PhD-Project (60%)

In science education students are introduced to scientific concepts, theories and laws, to formulas, notation and constants, to experiments, methods and demonstrations. However, students are also introduced to the process of science, to what science is (and is not), how science works (and doesn't work), what science can do (and cannot do)... In short, they are introduced to what is usually dubbed "the Nature of Science" (NoS). A nuanced understanding of NoS is important to meaningful participation in societal debates on issues with a scientific basis (*e.g.* energy production and consumption, climate change, COVID-19 vaccination, *etc.*). While NoS is an important part of science education, it is often overlooked or downplayed. It is thus no surprise that students (and teachers) often misunderstand NoS or have an unnuanced vision of it.

NoS has been researched extensively in the context of formal education (schools or higher education). The present position will extend this to researching the teaching of NoS in informal settings. Specifically, it is about investigating how the planetarium can be used to teach visitors about NoS (with a specific focus on astronomy). To do so, however, the first part of the project focuses on demarcating elements in which astronomy is unique.

Part I: Demarcating astronomy

This line of research will pertain to the features that make astronomy unique (or peculiar) with respect to other sciences (*e.g.* physics, chemistry, *etc.*) or to « Science » (as a generic term). For this first part, there are several open questions in the philosophy of astronomy that can be studied to zone in on the demarcation between astronomy and other sciences. The focus of the research will be determined in collaboration with the supervisors. Examples of research topics include, but are not limited to:

- Unlike experimental sciences, astronomy is a science that relies heavily on observation. How does this, almost exclusive, reliance on observation for empirical validation impacts astronomy as a science?
- Astronomy is highly interdisciplinary. It combines physics, chemistry, mathematics, computer science, geology, biology, psychology... Can astronomy be reduced to these other disciplines? If not, where does it fit into the branches of science?
- Astronomy is considered a gate-way science. It is awe inspiring and, on a surface level, easily accessible for the general public and for children. However, for some, astronomy may also be directly linked or even confused with its pseudo-scientific ersatz (like astrology) or sci-fi. How does this impact the general public's appreciation and understanding of astronomy as a science?
- Astronomy is the oldest science and has been at the center of several historical scientific revolutions. What can the history of astronomy teach us about science (*e.g.* through notorious

episodes about the ambiguous status of *ad hoc* hypotheses, scientific realism, ideological biases, *etc.*)?

- What can astronomy teach us - if it can at all - about the nature of space, time, causation, laws of nature, *etc.*?

Part II: Communicating about the nature of astronomy

In the second part of the project the goal is to figure out how this demarcation between astronomy and other sciences can be used to illustrate an aspect of NoS, and to research how the planetarium can optimally use its affordances to educate visitors. Both quantitative and/or qualitative educational research methods are possible. Examples include, but are not limited to:

- Planetarium shows are, due to the technical limitations, often highly scripted. What should be included in these scripts and show preparations to increase visitors' thinking about NoS? This can be answered, in part, through a design-based research approach in which teaching sequences are developed for planetarium educators (worldwide). This is done in iterative cycles from idea to prototype to tested end-product (with dedicated testing and research in each cycle).
- In formal science education NoS is typically introduced through interactive activities (*e.g.*, discussions). To what extent do interactions between educators and visitors during presentations stimulate visitors thinking about (aspects of) NoS? And, how can this be increased?
- Historically planetariums had a central optical projector. Nowadays many planetaria have a digital projector system. This allows them to project full dome films on a wide variety of topics. Which NoS aspects are present in full dome films typically presented at planetaria?
- Visits to a planetarium are typically limited to one or two hours. Any intervention is hence very limited. What do visitors retain after their visit regarding astronomy and NoS?
- The Planetarium in Brussels has an exhibition hall with interactive digital exhibits (multi-touch table, digital globe, VR-experience are already running, a hologram display will be added). How can NoS be introduced to visitors using these exhibits?

In brief, this project will add to research about NoS in two ways. The first part is more academic and theoretical and adds to the philosophy of science (astronomy in particular). The second part of the project is more practice oriented and empirical and adds to practices in informal science education and science communication. The close connection with the planetarium and the observatory throughout the project will allow for grounded results.

Educator at the Brussels Planetarium (40%)

The candidate will be responsible for

- Guiding groups of the general public through astronomical phenomena in and the beauty of the night's sky, as well as operating the digital projector system to show full dome films;
- Teach astronomy concepts to school groups (either primary or secondary education, to be determined in collaboration with the planetarium director) with the help of the digital planetarium functionalities;

- Participate to the creation of full-dome modules for the astronomy lessons and of hands-on workshops;
- Implement educational content for the interactive exhibits (interactive multi-touch table, digital globe, VR experience); and
- Assist in the organization of outreach and educational events.

According to the needs, the candidate will be asked to aid in the general tasks of the Planetarium, including possible presence during week-ends and holidays.

Profile

Candidates have a master diploma, or be in a position to obtain a master diploma within 3 months after the dead-line, in one of two areas:

- astronomy, physics or equivalent (e.g., mathematics or engineering),
- educational sciences, science education, science communication or equivalent (e.g., a teacher degree), or
- philosophy, ideally the philosophy of science.

If your master was awarded outside of Belgium, the Netherlands and the Grand-Duchy of Luxembourg, you will need a certificate to demonstrate the equivalence of your degree (see https://www.belgium.be/en/education/equivalence_of_diplomas) before we can offer you a contract.

Additionally, candidates

- are able to demonstrate interest in the other areas described above;
- are interested in conducting theoretical and empirical research;
- are able to work systematically;
- can work independently and in a team;
- can interact with children, adolescents, teachers and educators;
- can communicate about the research (on a more technical or theoretical level); and
- are fluent in French and English, additional fluency in Dutch is considered a plus.

Job application procedure

The candidates should send a CV and an accompanying motivation letter, with possibly a reference letter, no later than April 14th, 2023, to jan.sermeus@planetarium.be and Olivier.sartenaer@unamur.be with a copy to hrrob@oma.be.

For more information you can contact

Prof. dr. Jan Sermeus via jan.sermeus@planetarium.be

Prof. dr. Olivier Sartenaer via olivier.sartenaer@unamur.be

Working conditions and job-offer details

The student will be paid on level SW1.

The contract offered is initially 2 years but can be extended, given positive evaluation of both aspects of the position, twice up to a maximum of 6 years.

The candidate will take up the PhD program at UNamur. Details regarding the expectations and regulations can be found [here](#).

Regular presence at the Planetarium (at least 2 days a week) is mandatory.

Information about the Brussels Planetarium and the UNamur

The [Planetarium](#) of the Royal Observatory of Belgium in Laken is one of the oldest (inaugurated in 1935 for the Brussels International Exposition) and one of the largest (23m dome, 350 seats) planetariums of Europe. It is open 363 days of the year, welcoming approximately 25 000 general public visitors to experience 360° full dome films, events and spectacles focused on astronomy. The planetarium also hosts dedicated lectures to explain the night's sky and astronomical concepts and events to 25 000 students of all ages (kindergarten, primary, secondary and higher education). The planetarium also serves as an outreach facility for the Space Pole in Uccle, i.e. the [Royal Observatory of Belgium](#) (KSB-ORB), the [Royal Meteorological Institute of Belgium](#) (KMI-IRM) and the [Royal Belgian Institute for Space Aeronomy](#) (BIRA-IASB). As such visitors can learn about seismology, climate change, atmospheric science and much more in addition to astronomy and astrophysics.

The University of Namur has 40 different programs at the Bachelor, Master and Doctorate levels, and welcomes over 4,900 students in six Faculties: Arts, Law, Economics, Social Sciences and Business Administration, Computer Science, Medicine and Sciences. Its reputation is based on the quality of its education, the availability of its professors and sufficient resources to ensure maximum chances of success for each student: introduction to study techniques, preparation courses, small group work, course materials available on-line, personalized assessments...

Unique in Europe, the Department of Science, Philosophy and Society gathers professors who have a dual background in both social and exact sciences. It proposes a critical reflection on the assumptions, methods and results of science and technology, as well as the ethical, social, political and religious issues of their development.

Recently, upon the impetus of one of its new faculty member, Prof. dr. Olivier Sartenaer, the department has opened a line of research about science education and communication, with a focus on the role of public understanding of the nature of science appraised from the perspective of epistemology/philosophy of science.