Name of research institute or organization:

Center for Space and Habitability (CSH), University of Bern (UoB)

Title of project:

Stellarium Gornergrat

Project leader and team:

Dr. Timm-Emanuel Riesen, project manager
Dr. Marco Longhitano, lead developer of pedagogical materials
Prof. Dr. Kathrin Altwegg, steering committee
Prof. Dr. Thomas Schildknecht, steering committee
For a complete list of team members and associates, please see related webpages (URL provided at the end of the report)

Project description:

The Stellarium Gornergrat is a long-term project carried out by an on-going collaboration between the Center for Space and Habitability (CSH), the Astronomical Institute (AIUB), the University of Geneva (UoG), and the International Foundation High Altitude Research Stations Jungfraujoch and Gornergrat (HFSJG). Its major focus lies with public outreach and education. The project's main goals are:

- To build bridges between science and society.
- To spark and foster the public's interest in space, space sciences, and astronomy.
- Attract young people to the field and illustrate potential careers in astronomy and space sciences.
- Help people recognize and understand different observable phenomena in the day and night sky and let them appreciate the beauty and delicacy of nature.

To achieve these goals, the partners installed and operate an observatory at the Kulmhotel Gornergrat with different instruments and hardware (see Figure 1). Improvements are still in progress and the infrastructure will be renovated in the years to come. At the end of 2016, 6 different instruments were installed and operable:

1. Allsky Camera, takes around the clock exposures of the entire day and night sky.
2. Rila 600mm telescope with a huge Field of View (FOV), ideal for deep sky objects.
3. Planet Camera (Takahashi Mewlon-250), ideal for planetary objects and small FOV.
4. Constellation Camera, ideal to depict complete constellations, asterisms, and group of constellations.
5. Look-through Telescope (Takahashi TAO-150) for guests and guided tours at the observatory.
6. A modified Celestron 8 telescope with prism to measure the astronomical seeing.

The main mode of using the Stellarium is designed to be by remote control and robotic observing which will be enabled through a pedagogical web portal, where teachers, students, and the broad public can browse and pick among different astronomical activities and schedule observations. The Stellarium automatically works through the different scheduled observations and allows a registered user to access the obtained data or status information upon completion of an observation task.

The pedagogical activities are currently being developed in German and French in 4 different levels of difficulty ranging from primary school to first year university students. Among the project's personnel are scientists and teachers that ensure that the activities are of high quality regarding astronomical content and feasibility for teachers and schools. All activities are scientifically and pedagogically peer reviewed and tested in class.

Figure 1. Available instruments at the Stellarium Gornergrat: The left panel shows the RILA main instrument (black), the Takahashi Mewlon-250 Planet Camera (blue-white), the Takahashi TAO-150 Look-Through Telescope (red-white), and the C8 Seeing Telescope. The upper right panel shows the Allsky Camera and the lower right panel shows the Canon 60Da Constellation Camera.

Achievements in 2016:

Hardware:

- The Canon 60Da (Constellation Camera) received a highly customized housing constructed in Bern that allows setting the zoom factor of the installed lens remotely by the web portal. The software driver was developed in Fribourg and the camera and housing were tested on site. There were minor problems with the motor coupling that have been solved. An interface to this instrument is currently being integrated into the web portal.
- A professional inclinometer, to keep track of the hotel and dome movement, was delivered and installed. Proper mounting required extra parts to be manufactured by our workshop for support. Initial tests showed that there was a temperature compensation problem for one of the 2 axes and the instrument was sent back to the manufacturer for refurbishment at no cost. The inclinometer is now working to our satisfaction and is producing valuable data sets.
- The Allsky Camera went through a second phase of maintenance: The 4 main resistors of the heating system had to be replaced to ensure constant heating power.
- Considerable efforts were made to renew the aged electrical parts in the lower electric cabinet (some parts over 40 years old). After a major effort to isolate faulty parts, some of the main switches and contactors were replaced, as they were responsible for faulty states, which lead to general failure states of the dome control.
- To increase the security of the facility, we also installed a new switch that allows the electric cabinet to be power cycled from afar. This minimizes the risk of losing the ability to close the dome.
- Extensive safety checks, including power failure strategies and mechanical problems have been simulated and tested to prepare the facility for actual remote ops.

- The SAIA controller and all power supplies were moved into a newly designed box that was designed and built with the support of the UoB electronics workshop (Christoph Josi). All the corresponding cabling was redone at the same time.
- One of the rain sensors needed to be replaced.

From the hardware point of view, we reached launch status in Q2 2016 and started all the local operations on site as planned.

Software and web-portal:
The Internet connection between the Gornergrat and Zermatt was reorganized in early 2016 in collaboration with the HFSJG and we moved to our own fibre. All active components, as the firewall of the hotel, were removed wherever possible. In addition, a new provider was found in Zermatt for the uplink in direction Visp. The result is a much more stable Internet connection and ~8 times better performance in speed. Regarding the web portal, we suffered a setback due to the drop out of the person in charge. Nonetheless, we are optimistic that the portal can be launched in Q1 2017.

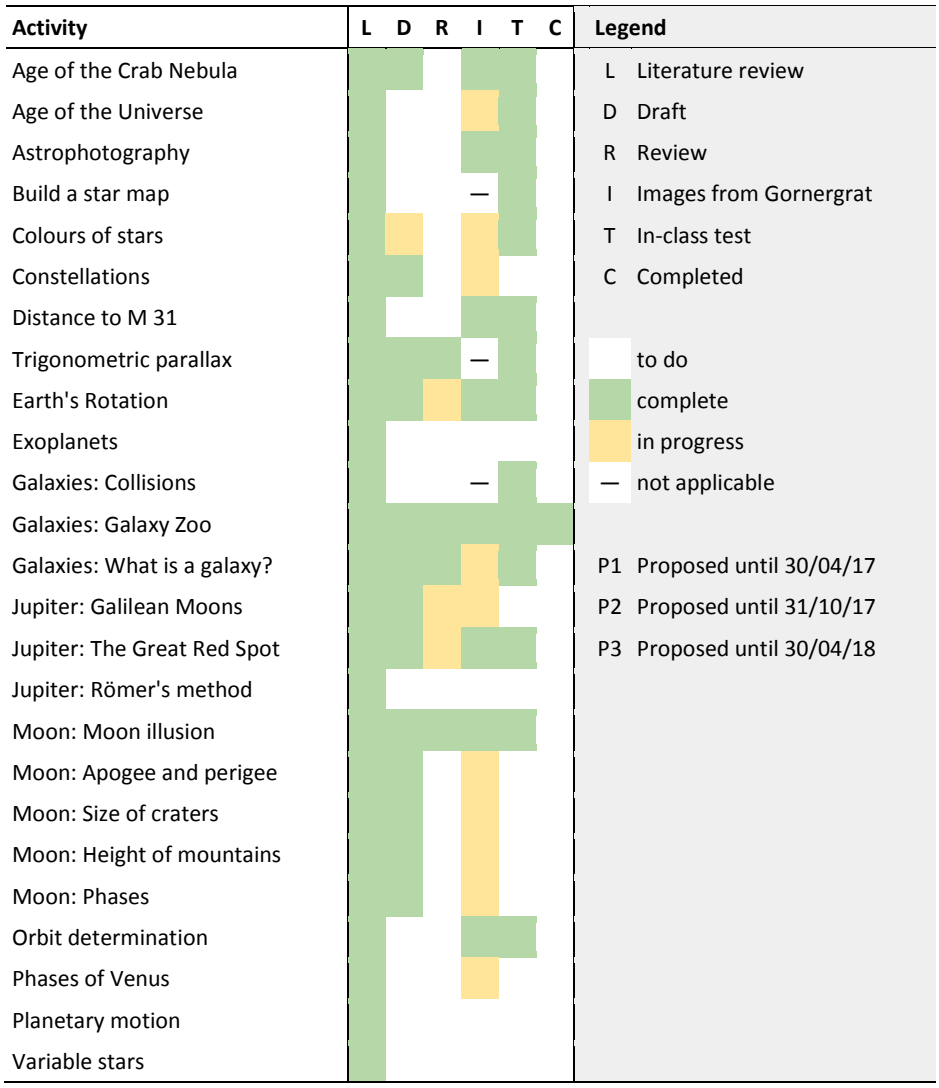
Personnel:
Sylvia Ekström in Geneva left the project for an undetermined amount of time for personal reasons. There were no other changes in personnel within the reporting period.

Milestones:
- A substantial milestone has been reached in July 2016: Being ready with all components of the Stellarium project but the web portal, we decided to launch all local activities on site. This included a new format "Space Trip", which allowed hotel guests to get guided tours and night sky observing every night during 2 weeks in October. It was a great success and more than 300 hotel guests in total joined us for this endeavour.
- Together with the "Dining with the Stars" events and other guided tours on site, a total of more than 930 people joined us for activities on the Gornergrat.
- Work with Blitz & Donner to create movies for web content to advertise the Stellarium and the Space Trip weeks.

Noticeable visits:
- Price winners of Schweizer Jugend forscht
- Swiss television "Einstein" and "Rundschau" (2 independent events)
- Federal Council Alain Berset with family
- Universitätsleitung of the University of Bern
- Retired professors of the University of Bern

Pedagogical Activities:
Much work went into further developing our pedagogical activities. A table with the current status is attached below.

Some noticeable engagements were:
- Fachmittelschule Neufeld: Special astronomy week
- Kantonsschule Uster: Special astronomy week
- Kantonsschule Olten: Special astronomy week and teacher training
- 5 Matura theses were supported in 2016. Best grades were reached for at least one of them.



Key words:

Stellarium, Gornergrat, astronomy, outreach, robotic observing, pedagogical activity, telescope, school, education

Collaborating partners/networks:

Astronomical Institute of the University of Bern (AIUB), Université de Genève (UoG), Burgergemeinde Zermatt, International Foundation High Altitude Research Stations Jungfraujoch and Gornergrat (HFSJG), Kulmhotel Gornergrat

Address:

Center for Space and Habitability
Universität Bern
Parkterasse 14
CH-3012 Bern

Contact:

Dr. Timm-Emanuel Riesen
Tel.: +41 31 631 3318
Fax: +41 31 631 4405
URL: http://www.stellarium-gornergrat.ch