ROVING TO MARS FORM PANNON CSILLAGDA – PLANETARY SCIENCE EDUCATION AND OUTREACH IN HUNGARY. Boros-Olah M.[1,2] [1]Pannon Csillagda, H-8427 Bakonybél, Szt. Gellért tér 9., Hungary; [2]Nagy Karoly Astronomical Foundation (e-mail: boros.olah.monika@gmail.com).

Introduction: The Pannon Csillagda was established to provide high level scientific popularization and education in planetary and space science [1], regardless the actual weather conditions opposite to public observatories. The institute consist of three units: exhibition, observatory with telescopes and planetarium. Demonstrators are educated persons with established background knowledge and experience in science and popularization together. This abstract is to report on some planetary science related outreach methods and equipments used there.

Figure 1. Earlier design plan of the Pannon Csillagda

Methods: The Pannon Csillagda is owned and maintained by the Balaton Upland National Park, is open for the public 6 days of a week in the warmer half of the year. It was visited by 35000 persons in 2012, mostly by groups, often from schools. Summertime many tourists visit it, in spring and autumn school classes come usually. The staff is 5 full-time persons and 2-3 part-time university students in summertime.

Exhibition: In the Pannon Csillagda the permanent exhibition presents topics starting from the history of telescopic planetary observations until recent spacecraft missions. Completing this information, a telescope set provides opportunity for nighttime observation of the objects presented in the exhibition, while daytime solar observations are realized with H-alpha solar screens. In the planetarium popularization movies and a virtual sky are projected 6-8 times of a day.

Planetarium show: The planetarium has a 8 m diameter dome, two projectors with HD system. The visitors could choose from 4 movies: Oasis in Space (about the Solar System including astrobiology related issues [2,3]) and movies about black holes, life of stars, the national part in the area and a special movie for young children. Beside movies the virtual sky is often projected to explain the daily motion, lunar phases, location of planets etc.

Meteorites: in the Solar System hall a 21,5 kg part of the Gibeon iron meteorite is installed (Figure 2.). Beside the meteorite the visitors could experience ancient telescopic observations of planets and the Moon, together with large circles on the ground representing mirror diameters of the largest telescopes today.

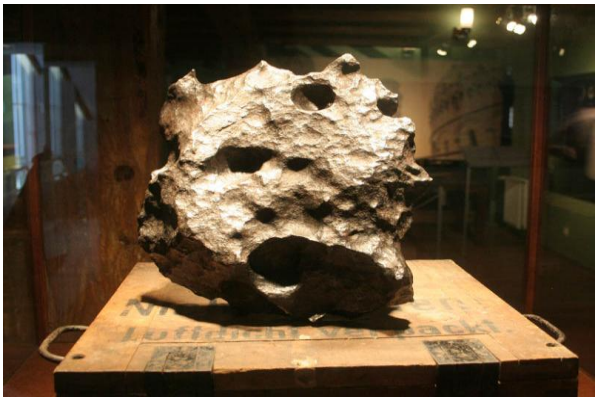

Figure 2. A large fragment of the Gibeon meteorite

Next to the meteorite specimen, the atmospheric entry process can be seen by video recordings from bright fireballs (Figure 3. top), and a large poster of the Berringer crater (Figure 3. bottom) to visualize the consequence [4] of a large impact on the Earth.

Figure 3. Fireball videos (top)
and an impact crater (below) on the Earth (NASA)

The Moon and lunar landings section of the exhibition presents basic knowledge on the Moon (craters, regolith, sky view without atmosphere etc.) including general knowledge on the Apollo expeditions together with an installed space suit. The interconnected items of this exhibition section can be seen in Figure 4.

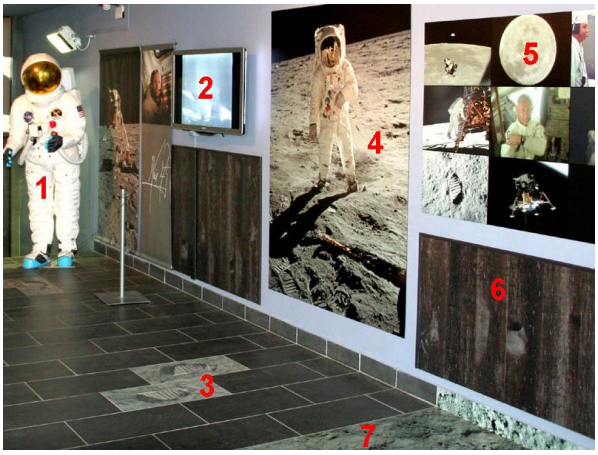

Figure 4. The "Lunar corner": Apollo landing and surface activity videos (1), spacesuit (2), Armstrong's footsteps (3), portrait of a standing astronaut (4), remote surface and panorama images (5, 6) view of the lunar surface from above on the floor (7) (NASA)

Model of Opportunity rover (Figure 4.) with 1:1 ratio is installed in the Mars section [5]. The real sized model is used to explain the basics of the rover, focusing on what is necessary for "survival" in the Martian environment, energy production, challenges of exploration [6], data broadcast toward the Earth etc. Next to the rover posters provide additional information on the surface characteristics of Mars, about current water ice [7], past and possible present liquid water [8,9,10].

Figure 4. Model of Opportunity rover (image: Páth Dániel)

Observatory at the top of the building is equipped with 40 cm diameter Meade LX200 ACF, 25 cm diameter Meade LC200 ACF, and Meade 127/953 ED APO telescopes plus a 100/800 Lunt LS100THa/B1800 solar telescope (Figure 5.). An observing terrace is also installed for naked eye and binocular observations where visitors could see and find the targets themselves with the help of demonstrators.

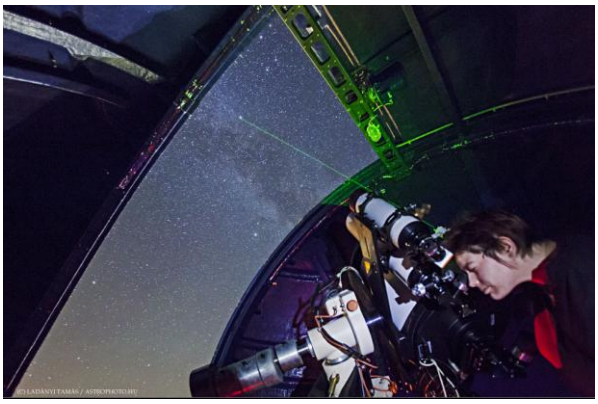

Figure 5. After the Mars exhibition and the Opportunity model, a look on real Mars with the telescope (image: Ladányi Tamás)

Conclusion: Based on the linked topics at the exhibition halls, planetarium and the observatory, the visitors receive a complex program on planetary sceince, and spend 1.5-2 hours in the institute. Nice example on the interconnected topics can be described using the Opportunity rover: the real sized model gives knowledge on how the probe looks like and works under Martian conditions; with panoramic images of Mars visitors can "feel" themselves like on the Red Planet. The demonstrator uses the posters to describe how it would look like to be on the planet (temperature, pressure, gas composition, sky view, exotic conditions etc.). The demonstration is completed by the historic overview of different Mars probes from the past. The movie in the planetarium provides the context for Mars: how other planets in the Solar System differs from it and what are the common properties. Finally the visitor can have a look at Mars with his/her real eye through a telescope from the top of the observatory.

Acknowledgment: The Pannon Csillagda was supported by the Széchenyi Terv, Balaton-Bakony Geopark and the Balaton-felvitéki Nemzeti Park.

References: [1] Kereszturi, Hyder 2012. *JGHE* 36, 499-525. [2] Kereszturi 2012. *Astrobiology* 12(6): 586-600. [3] Mizser et al. 2007. 38th LPSC #1523. [4] Kereszturi 2011. Asztrobiológia. *MCSE*, Budapest. [5] Kereszturi 2012. Mars – fehér könyv a vörös bolygóról. *MCSE*, Budapest. [6] Kereszturi 2011. *Acta Astron.* 68, 1686-1701. [7] Kuti et al. 2009. Földtani Közlöny 2009/4, 139(4), 395-402. [8] Kereszturi 2005. *JGR* 110, E12S17. [9] Kereszturi, Rivera-Valentin 2012. *Icarus* 221, 289-295. [10] Kereszturi 2007 *Légkör* 52(2), 12-17., 52(3), 6-9.