

**EXPERIMENTS AND FIELD WORKS WITH NASA LUNAR SAMPLES AND TERRESTRIAL ANALOGUES BY THE HUNVEYOR SPACE PROBE MODEL.** T. N. Varga<sup>1</sup>, M. Héricsz<sup>1</sup>, M. Franko<sup>1</sup>, Á. Nagyházi<sup>1</sup>, I. Magyar<sup>1</sup>, T. P. Varga<sup>2</sup>, Sz. Bérczi<sup>3</sup>, Gy. Hudoba<sup>4</sup>, S. Hegyi<sup>5</sup>, <sup>1</sup>Eötvös József High School, H-2890 Tata, Tanoda tér 5. ([mirene@freemail.hu](mailto:mirene@freemail.hu)), <sup>2</sup>VTPatent Kft. H-1111 Budapest, Bertalan L. u. 20. Hungary ([info@vtpatent.hu](mailto:info@vtpatent.hu)), <sup>3</sup>Eötvös University, Institute of Physics, H-1117, Budapest, Pázmány P. s. 1/a. Hungary ([bercziszani@ludens.elte.hu](mailto:bercziszani@ludens.elte.hu)), <sup>4</sup>Budapest Polytechnic, Regional Information and Education Center, H-6000, Székesfehérvár, Budai út, Hungary ([hudoba.gyorgy@roik.bmf.hu](mailto:hudoba.gyorgy@roik.bmf.hu)), <sup>5</sup>Pécs University, Dept. Informatics and G. Technology, H-7624 Pécs, Ifjúság u. 6. ([hegyis@tkk.pte.hu](mailto:hegyis@tkk.pte.hu))

**Summary:** With the application of NASA Lunar Samples and thin sections we made a similar experiment by the Hunveyor space probe model, and we found terrestrial analogue place and materials for execute the experiment and field works for educational purposes.

**The field of our studies:** For developing new concepts and technologies it is required to acquire or develop proper practical, and material knowledge. In space and Moon research it is continuously required to pass on already known information, so the development of space educational-promotional systems is always an issue. By utilizing the Lunar Samples and thin sections, we were able to execute some similar experiments of those experiments which was first produced by the Surveyor in the 1960s on the surface of the Moon.

**The Lunar Samples:** Real lunar rock and soil samples according to an international agreement are available in a limited quantity in the Eötvös University, by loan from NASA Johnson Space Center. The Lunar samples are used also in High School education, and there are several group of high school students, who focus on the analyzation of these samples, and study the methods required for the analyzation.

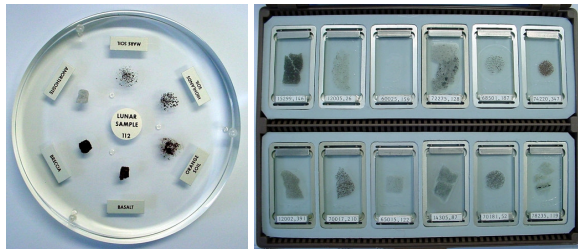


Fig 1. The available NASA Lunar samples NASA disc 112, and a collection of 12 thin sections.

**Materials and sources:** Basalt (Apollo 11,12,15,17), Anorthosite (Apollo 16), Breccia (Apollo 11,12,14,16,15,17), Soil samples: Orange soil, (Apollo 17), Highlands soil (Apollo 16), Mare soil (Apollo 11,12,15,17).

**The Hunveyor space probe model:** In the education of space exploration there is a Hungarian innovation, the Hunveyor space probe model, which is based on the concept of the Surveyor Lunar lander. In the Eötvös József High School, Tata we are building and working with a Hunveyor space probe model and we also conduct experiments with its utilization since 2007. During these experiments we try to model those, which were executed already on real planetary surfaces or on the Moon.

**Preparation for the experiment:** We had to find a place of our analogue experiment, which is similar to the Surveyor 3 landing site, and which contains proper Moon analog material. The Surveyor 3 was landed on the Ocean of Storms on the Moon. The Apollo 12 landed nearby to it in 1969. The Surveyor 3 has been landed on the rim of a small crater, and

the local materials were found in the vicinity: breccias, basalts, debris basalt soil, regolith. In the collection available for us there are two thin sections, which originate from this location, these are No. 12002,391 and No. 12005,26.

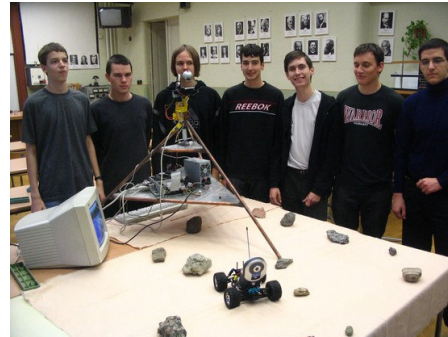


Fig 2. The Hunveyor model with the group of students in the Eötvös József High School

As an analog site we chose the basalt mine of Diszel, Balaton-Highlands, in middle of Hungary, because of the terrain's similarity to Lunar surfaces, and the basalt local material. The basalt and its debris of this place has several similarities to the original Lunar environment, too.

**The process of the experiment:** We equipped the Hunveyor model for optical observation of the nearer-farer objects with a rotatable camera was placed on the top of the model. We recorded and rated the pictures. Because of the limits of our self-made equipment our experiments were mainly focused on optical observation, and studies of the external analogue environment and materials.

**Conclusion:** Paralel with the field works the visual analization of lunar samples, and analization of thin sections in petrographic microscope was carried out. In comparison with terrestrial basalt samples we could observe how fresh is the appearance of Lunar samples, e.g. basalts, because the lack of atmosphere and water vapour affecting terrestrial counterparts. It was also observed how sharp is the fragmentary grains of the Lunar basalts.

**Summary:** The analization of Lunar samples and the Moon analog field work helped students to get real experiences and understand the ways of space exploration better, and made the teaching of technology and science related subjects easier.

**References:** [1] Sz. Bérczi, et al. (1998): *LPSC XXIX*, #1267; [2] Sz. Bérczi, et al. (1999): *LPSC XXX*, #1332; [3] Sz. Bérczi, et al (1999): *LPSC XXX*, #1037; [4] Hegyi S. et al. (2000): *LPSC XXXI*, #1103; [5] Diósy T. et al. (2000): *LPSC XXXI*, #1153; [6] Roskó F. et al. (2000): *LPSC XXXI*, #1572; [7] Bérczi Sz. Et al (2001): *LPSC XXXII*, #1100; [8] Kovács Zs. I. et al. (2001): *LPSC XXXII*, #1130;