UNUSUAL GUIDEBOOK TO TERRESTRIAL FIELD WORK STUDIES: MICROENVIRONMENTAL STUDIES BY LANDERS ON PLANETARY SURFACES (NEW ATLAS IN THE SERIES OF THE SOLAR SYSTEM NOTEBOOKS ON EÖTVÖS UNIVERSITY, HUNGARY). Mörtl M.[1], Földi T.[2], Hargitai H.[3], Hegyi S.[4], Illés E.[5], Hudoba Gy.[6], Kovács Zs.[7], Kereszturi A.[3], Sik A.[3], Józsa S[8], Szakmány Gy.[8], Weidinger T.[9], Toth Sz.[10], Fabriczy A.[11], Bérczi Sz.[12], [1]Eötvös University, Dept. G. Chemistry, H-1117 Budapest, Pázmány 1/a, Hungary, [2]FOELDIX, Budapest, Irinyi J. u. 36/b. Hungary, [3]Eötvös University, Dept. Phys. Geography, Budapest, Pázmány 1/c, [4]Pécs University, Dept. Informatics/ Technology, H-7625 Pécs, Ifjúság u. 6. Hungary, [5]Konkoly Observatory, H-1525 Budapest, Pf. 67. Hungary, [6]Budapest Polytechnic, Kandó Kálmán College of Engineering, 6000-Székesfehérvár, Budai út. Hungary, [7]Berzsenyi College, Dept. Technology, H-9700 Szombathely, Károlyi G. tér 4. Hungary, [8]Eötvös University, Dept. Petrology and Geochemistry, Budapest, Pázmány 1/c, Hungary, [9]Eötvös University, Dept. Meteorology, Budapest, Pázmány 1/a, [10]eWorld Hungary Kft., 1026 Budapest, Garas u. 1. [11]Eötvös University, Teachers Tr. College, H-1126 Budapest Kiss. J. altb. u. 42, Hungary, [12]Eötvös University, Dept. G. Physics, Budapest, Pázmány s. 1/a, Hungary, (bercziszani@ludens.elte.hu)

Introduction: We compiled a new atlas in the series of the Solar System Research [1] with Microenvironmental Studies of landers on Planetary Surfaces. The main chapters were a) field petrology and geography of the deserts, b) rock surface textural studies, c) landing on Venus, d) impacts around the landers, e) charateristics of water formed surface on Mars, f) man on the Moon: Apollo, g) micrometeorological measurements on Earth and Mars, h) electrostatics of the thin planetary atmospheres, i) measurement of the atmospheric chemical composition, j) biological measurements of Vikings [2].

This is the 6th member of our lecture note series. With this little atlas our aims were to give background for construction of Hunveyor experiments on the basis of succesful programs of Surveyors, Lunas, Vikings, Apollos, Veneras, and the Pathfinder and to show details of some of their main experiments. But the main benefit of this booklet is that experiments and impressions in **any terrestrial geological and petrological field work studies in this human size and scale can be used up for comparisons to the observations of the planetary landers**: panorama studies, rock size frequency, visible textures of hand specimens, positions reached by geological process, etc. In this respect our new atlas is an unusual guidebook to terrestrial field works studies in geology.

a) Field petrology and geography of the deserts: Comparison of the landing site rocky garden around Surveyor-7 and Pathfinder allows to study the size frequency of rocks, the analysis of rock surface textures and to imply the processes which formed these rocks. While on these two landing sites for Surveyor-7 on the Moon impact fragmentation and ejection was the main process [3], for Pathfinder on Mars the floods of the Ares Valley transported and rounded the rocks [4].

b) Rock surface textural studies: The good resolution of the Pathfinder images made it possible to find various rock forming processes to imply. There were found vesicular rocks (probably igneous origin) stratified textures (metamorphic or sedimentary origin) and brecciated textures (impact brecciation?). Comparison with rock surfaces in terrestrial deserts (Arizona Desert rocks i.e.) made it evident that strong winds with transported sand may scrape many of the surface pattern on the Pathfinder's rocks. Comparison with the wind-tails and dune directions in the vicinity of the landing site showed their origin from winds in the past [5].

c) Landing on Venus: Surface rocks and panoramas on Venus were studied by the Venera space probes. Considering the rocky surface desert photographic panorama of Venera 9 it is rather similar two that of Pathfinder's with scattered eroded rocks embedded in the soil. However the great refraction in the dense atmosphere produces different perspective as compared to Mars. Two other Venera probes (13, 14) landed on lava flow surfaces [6]. Data of their X-ray fluorescence measurements referred tholeiitic and in the other landing site komatiitic composition. These reference were used when we compiled the rock gardens in the test-terrain of our Hunveyor experimental university landers [7].

d) Impacts around the landers: In this chapter we give wide range of descriptions and comparisons where terrestrial field works (with shatter cones) were also involved (Haughton, Vredefort, Tswaing). We may call them Field Works on Analog Sites, too, as known programs on Devon Island and impact related meteorite collections on Antarctica and other cold and in the hot deserts. [8, 9, 10]

e) Charateristics of water formed surfaces on Mars: In our human panorama scale this chapter is a vision: what kind of phenomena can be observed by a rover which travels along a Martian riverbed. It begins it route at the river's upper flow and observes with its camera the fresh slides on the riverbank from some tens of meter distance and at the same time observes the characteristics of the sediments below its wheels in some centimeters distance. Then it studies the events which can be observed while going along the river during the some 100 kilometers of the planned trip from the origin of the river till its delta (this chapter foresees the next volume of the series which will study the rover missions to the planets).

f) Man on the Moon: Apollo: This chapter is describing a real field work on another planetary surface. Many details of the field works are told in this chapter about Apollo astronaut's activities and many details of the lunar regolith, rock samples, their textures, types,

formation processes. In the back cover rock samples and astronaut tools show more details and - at the same time - give (indirectly) list about tools necessary to a good field trip for students in preparations for their terrestrial field works [11].

g) Micrometeorological measurements on Earth and Mars:

A terrestrial meteorologic station is standing in the Bugac Puszta in Kiskunság, Great Plain, Hungary and this station is measuring 25 parameters continuously. Its structure and data resembles in many instruments to those measured by Pathfinder's Sagan Memorial Station on Mars or earlier Vikings. Not only the terrestrial and Martian atmospheric boundary layer models are compared, but the temperature runs for some days/sols on the higher (1.4 m Pathf. and 1 m Bugac) and on the lower (0.9 m Pathf. and 0.1 m Bugac) measuring levels. On the basis of data and models the renormalized scale height for the boundary layers (about 3 times higher on Mars as compared to the Earth's atmospheric corresponding structures) can be shown [12].

h) Electrostatics of the thin planetary atmospheres: After describing the pioneering measurements of Surveyor-5 and the Apollo LEAM experiment we show the main transport processes [13, 14]. We also describe that instrument which is based on these processes, however not with such a "random electrodes" like in the case of charged particles of the lunar quasiatmosphere. That instrument is Foeldix-1, which is shown in another works, i.e. [15].

i) Measurement of the atmospheric chemical composition: This chapter gives a detailed description of the gaschromatograph and the mass-spectrometer unit which is the most frequently used instrument in atmospheric composition measurements. Although not strongly connected to classic field work activities this chapter foreruns the planetary geology age when the Apollo type field works will be the most exciting for students, with various instrumental technologies.

j) Biological measurements of Vikings: Biology is among the main programs on Mars. This was initiated by the Viking experiments. This way the last chapter has many roles. It shows the most complex new discipline in planetary activities and also it connects the geological type planetary field works to the yet not prepared but in the future planned biological planetary field work atlas. In this chapter we show the 3 experiments [16] and at the end we propose students to plan participation in space science education programs from biology side: cellular biology is the next to be involved in lander experiments on Hunveyor too. Finally we mention that next year hopefully 3 landers on the Mars shall extend this last chapter very much. When closing this abstract the MER-1 Spirit is succesfully beginning its work.

Summary: This sixth Little Atlas of the Solar System not only connects the planetary petrographic and geologic field works with those of the laboratory Hunveyor robotic construction and its Husar rover program but gives a new approach possibility to the recent terrestrial geologic field works too: it gives a guidebook which teaches the students by seeing back to the Earth from the planetary surfaces, after so much exciting experiences by robotic landers on these planetary worlds.

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