

**PLANETOLOGY RELATED ASPECTS IN UNIVERSITY EDUCATION OF GEOGRAPHY AND ENVIRONMENT.** C. Patkos, J. Mika, A. Gucsik, T. Juhasz, E. Homoki, M. Polgari, Z. Utasi and I. Pajtok-Tari, Eszterhazy Karoly University, H-3300 Eszterhazy sq. 1, Eger, Hungary. E-mail: mika.janos@uni-esztrhazy.hu

**Introduction:** The poster comprehends those aspects of planetology, which are educated in geographical and environmental curricula of the Eszterházy Károly University of Eger (Hungary) given in the heading. More specifically, it covers six curricula: Geography BSc (GB), environmental studies BSc (EB), Geography MSc (GM), Teacher of Geography MA (TG), Teacher of Nature and Environment MA (TE) and Environmental Education Program in the PhD School of Educational Sciences (PhE).

Partial similarity (common subjects) are seen between GB and GM vs. TG, as well, as between EB vs. TE. Otherwise, the curricula developed independently from each other. Except the Geography MSc, accredited and run in English, all these curricula are held in Hungarian.

The Main Campus of the University is located in Eger, Hungary, but there are other campuses spread in three further towns in East-Hungary, with a further unit established for nation-wide educational researches in the capital city, Budapest.

The key mission of the University is training prospective teachers for the public education, but there are many disciplinary BSc and MSc curricula which are not related to teacher training.

The number of all students is around seven thousand. All kinds of education, tackled by this Abstract, are performed in Eger, counting ca. 55 thousand inhabitants (not considering the students if they do not constantly live there).

The Institute of Geographical and Environmental Sciences consists of three Departments: Dept. of Physical Geography and Geo-informatics, Dept. of Social Geography and Regional Development, Dept. of Environmental Sciences and Landscape Ecology. Number of full professors involved in the education is four. There are seven associate professors, though two colleagues are vice rector and vice dean among them. We have six adjunct professors to hold our subjects. The number of assistant professors or PhD students belonging to the staff is four. Several further colleagues responsible for individual subjects are not mentioned.

**Structure of the Abstract:** The planetology related subjects will be classified into five groups:

- (I) Basic sciences taught for the Earth but with respect to our wider environment, the Solar System and the whole Universe.
- (II) Science on the Earth but with respect to the Solar system.

- (III) Research methodology which is focused to the Earth but applicable for wider sense, in the Universe.
- (IV) Earth-Space interactions: depleting resources of the Earth solved by the Space, potential risks for the Earth threatening from the Space.
- (V) Training prospective teachers to include the planetary scope into the public education.

Group (I) is obviously represented by introductory and advanced courses in Mathematics and in Physics. Kinematics of the planets around the sun, i.e. the track along the ellipse, or laws of Kepler are good and often cited examples. For introduction to Chemistry the need for planetary contents is not obvious, but relation between mass number and chance for spontaneous production of the various materials is a part of the subject. As concerns Biology, conditions of life established for the Earth are valid also for the rest of the Universe.

Group (II) is certainly led by the Astronomical Geography, which deals both with astronomy of the Solar system and history of the Universe in detail. Orientation here in the Earth beneath the bright sky is also a core part of this subject. Further subjects, i.e. History of the Earth and the Life, General Geology and Earth History, or History of Geography and Earth Sciences help the students to see the processes in time as well as in synchronism with the human culture. Leaving these historical aspects aside, the subjects of Volcanology and of Energy Resources of Our Planet helps to understand formation of the minerals in connection with the past conditions in the Earth. The stability of solar irradiance together with its short-term fluctuation is mentioned in the course of Applications of Solar Energy. Besides these theoretical possibilities, the on-site practices Earth Values and Geo-Parks as well as Geo-Parks and Geo-Sites of the World are very good opportunities to demonstrate and to further explain all cosmic events which are saved in these sites and made them famous. Another subject, called Paleo-ecology can only be understood in small reminiscences in the classroom, if the students could perceive similar events on-site.

Group (III), teaching planetology related research methods, collects diverse subjects. Mineralogy and Petrology applies methods for elaboration of any known mineral in the same way as it should be done with any stone from the Earth. Environmental analytics teaches careful chemical operations to get information about the composition of the object in question. At the master level, the subject Modeling and Simulation

opens wide scope to deal with complex processes of the Universe. Furthermore, the alternatively selectable subject Elaboration of data remotely sensed from satellites introduces the students into the world of multi- and hyper-spectral sensors also applied in the planetary sciences. Besides the above subjects two further possibilities are the Research Seminar, which can also be chosen from planetology related measurements of e.g. meteorites and which is organized in biannual scientific competitions all over Hungary. Finally, the subject Geography in English always contains authentic cosmic texts besides the more Earth and environment related ones.

First side of Group (IV), Earth-Space interactions, is represented by subjects, which demonstrate which materials are we run out here in the Earth. Subject Renewable Energy Sources points at the alkali Earth metals needed for devices of various renewable resources. Subjects of Waste Management, Reuse and Recycling point at the possibilities of obtaining these materials on the Earth. The rest should be found somewhere in the Space. The other side of this coin is set of the risks coming from the space. In the geography MSc we have three relevant subjects all of them in the Risk and resource analyst specialization. They are Lithosphere and Soil, as Risk and Resource, Physical and Chemical Interactions in the Geospheres, Learning from Occurred Catastrophes of the World and Hungary. Majority of these dangers are of Earth origin, but solar eruptions, meteorite incidences or unexplained events can also be mentioned.

Let us start the Group (V) with a similar subject already from the Doctoral School where one of the five programs is Environmental Education. Following a set of risks from cosmic origin, collected by Jha [1], we warn the students of the course Pedagogy of Treating Resources and Environmental Risks about the potential problems. According to the given list, several threats are related to the Space: cosmic gamma ray, asteroid incidence, solar storms, galactic collision, space debris, etc. Another set of three subjects in the Doctoral School deals with Age Specifics of Environmental Education, divided according to typical age of the different school class-groups (7-10 years, 11-14 years, 15-18 years). Students of these subjects obtain information on the possibilities of including space knowledge into the school subjects.

**International Summer School for the Planetary Sciences:** Based on the above-mentioned qualifications as well as circumstances, it is already planned to open a new session in organizing some international summer schools of the Planetary Sciences starting in August of this year. It is a purpose of this school above to have a week-program including introductions to different

fields of the Planetary Sciences such as Planetary Morphology, Meteoritics, Cosmochemistry, Meteoritics and Space Technology for the Planetary Missions as well. It is also planned to have several field trips during the term of the summer school to visit the Permian/Triassic Boundary, Astronomical Observatories, etc.

#### References:

- [1] A. Jha (2011): The Doomsday Handbook: 50 Ways the World Could End. Quercius Editions Ltd, UK