Geoethics: Proposal of a geosciences-oriented formal definition and future planetary perspectives

Jesús Martínez-Frías*

**Centro de Astrobiologia, CSIC-INTA, associated to the NASA Astrobiology Institute, Ctra de Ajalvir, Km. 4, 28850 Torrejón de Ardoz, Madrid (Spain)*

Geoethics has gained importance in recent decades in the context of geosciences and their interdisciplinary links. Despite the term being used with various meanings, Geoethics was born in 1991 at the junction of Ethics and Geology. Dr. Vaclav Nemec (since 2004 Vicepresident for Europe of the Association of Geoscientists for International Development - AGID[1], Head of the AGID Working Group for Geoethics) is considered the father of this discipline. Geoethics has been accepted by both Earth and Social Sciences because the necessity of an appropriate ethical attitude to the whole geosphere and of a critical analysis of geoethical dilemmas and finding ways how to solve them (Nemec dixit)[2]. A geosciences-oriented formal definition of Geoethics is proposed here.

Geoethics is a key discipline in the field of Earth and Planetary Sciences, which involves scientific, technological, methodological and social-cultural aspects (e.g. sustainability, development, museology), but also the necessity of considering appropriate protocols, scientific integrity issues and a code of good practice, regarding the study of the abiotic world. Studies on planetary geology (sensu lato) and astrobiology also require a geoethical approach.

Since the foundation of astrogeology[3] (alternatively known as planetary geology) by Dr. Eugene M. Shoemaker in 1963, there has been a real scientific and conceptual extrapolation to Space of the classical geological topics (e.g. study of terrestrial analogs), which is marking the objectives and roadmaps of the planetary missions. Geology is an evolving, living discipline, which is interrelated with other areas and fields of knowledge, and the new emerging aspects from its connections also have potential applications to such scenario beyond our planet. This is the case of Geoethics. At present, space agencies, through the well-established Planetary Protection requirements[4], are committed to exploring space preventing all types of biological contamination, and preserving the planetary conditions mainly considering biological and bioethical issues[5]. Thus, it is also proposed to take into account the significance of the geoethical issues in Planetary and Space Research *sensu lato*, emphasizing the connotation, advantages and interdisciplinary approach of their original definition, and incorporating them as a fundamental part of planetary geology studies. It should widen the classical concept of Planetary Protection, bearing in mind, besides the organics-bearing perspective, the abiotic nature and all features of the planetary bodies and their planetary geodiversity. Other additional scientific aspects related with solar system research (e.g. study of asteroids, meteorites and impact-related materials, astrobiology) could also benefit from it.

[1] http://www.bgs.ac.uk/agid/
[2] Nemec, V. & Nemcova, L. (2008) *33rd Internacional Geological Congress*, Oslo, August 6-14th.
[3] http://astrogeology.usgs.gov/
[4] http://planetaryprotection.nasa.gov/
[5] Arnould, J. & Debous, A. (2008) *Advances in Space Research* 42-6: 1089-1095.