THE ROLE OF ANALOGY AND EXCLUSIVENESS IN PLANETARY GEOLOGY; K. Beneš, Institute of Mining and Geology, 710 00 Ostrava, Michálkovická 72, Czechoslovakia

Comparative studies show the terrestrial planets to be varied not only in basic physical-astronomical properties such as the size, mass, average density, dynamics of rotation, distance from the central source of radiation but also in their graded geologic histories exemplified by primitive or advanced stages of development. It can be observed that in the course of planeary evolution two groups of forces, processes, were at work. While the one was common to all terrestrial planets without exception, the Moon included, the other led to their slower or faster diversification. It is evident that the background of similarities and dissimilarities of planets forms a phenomenon of duality well expressed by the principle of unity in diversity.

The first aspect of the said duality is represented by the rule of analogy. The rule refers to the repeated occurrence of certain types of structures and mechanisms on the surface of more than one planet. It further refers to the same forces either of internal or external origin at work. In a more concrete sense the analogies refer to the impact craters, ring basin, meteoritic erosion, crustal spliting, sheets of lava, scarps, fossa-like strucures a.s.o. Analogies use not to be strict equivalents because of differences in planetary environments.

The second aspect of duality is being manifested by processes or structures entirely specific occurring on one planet only. Convincing examples are the absolutely unique nature of geochemical cycles on Earth, the so called chaotic terrains on Mars, anomalous pt conditions on the surface of Venus a.s.o.

Inherent to all terrestrial planets are the following properties and processes:

1. similar composition of the planetforming material,
2. early intense impact cratering accompanied by impact tectonics,
3. production of magma plus magmatic differentiation,
4. volcanism and degasation,
5. seismic activity and tectonics of endogenic origin.

Manifestations introduced in points 3, 4, and 5 had unequal intensity in time and unequal duration as well. As already known, the lithospheres of small bodies became stabilized and quasi atectonic in shorter intervals of time. Their faster rate of cooling is being manifested by a high average age of crustal components and lower degree of differentiation. Small terrestrial bodies arriving much sooner to a dormant stage of evolution seem not to be potential bearers of life in any planetary system. Medium size and larger planets show higher ranks of geologic and tectonic mobility. The high mobility of Earth, most likely the highest among all terrestrial planets, is plainly documented by the still persistent rise of new portions of melted material to the surface, by plate tectonics and active volcanism along with periodical seismic disturbances. Thus, at its progressive stage of evolution our mother planet represents a body with a vivid style of planetary metabolism, though perhaps slowly decreasing in time.

The principle of unity within diversity is expected to be valid also in other planetary systems around the stars similar to the Sun.