CONCISE ATLAS OF THE SOLAR SYSTEM (11): PETROGRAPHIC TEXTURES AND EVOLUTIONARY PROCESSES FROM THE CHONDRITIC PARENT BODIES, MOON AND MARS.

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Introduction: We continued publishing the Concise Atlas series of the Solar System books [1-7]. In our 11th booklet we focused our studies on characteristic petrographic textures and their formation processes on parent bodies representing a size range from asteroids through Moon till Mars. We collected the most important rock types and arranged them in igneous units of their suggested geological settings in the parent body. We used petrographic microscopic studies and the samples of several collections of: NASA Lunar Sample Set, NIPR Antarctic Meteorite Set, Hungarian meteorites, NASA meteorite educational set, Eötvös University Mineralogy database of planetary analog rocks samples. We give the main examples of the 5 chapters of the textbook:

Meteorites of the chondritic metamorphous evolution. First part of the chondritic parent body evolution. Parent body, heated up by short living radionuclides: results in onion-layered body (higher T in core regions, lower T at the margins of the body). Chondritic groups (initial condition) and types (T grades), the textural sequence of thermal metamorphism are represented in this section.

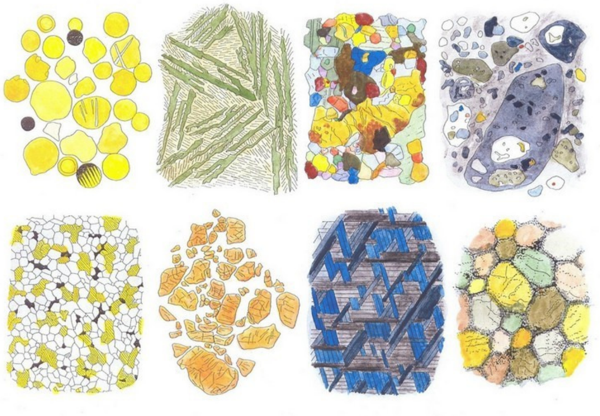
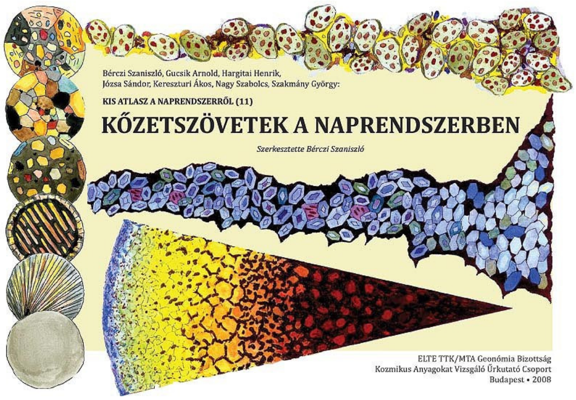


Fig. 1. The back cover shows characteristic textures: one terrestrial, three lunar and four meteoritic samples.

Meteorites of the evolved, differentiated asteroidal parent body: Second part of the chondritic parent body evolution chapter exhibits textures after the lost chondritic characteristics; textures of rocks by partial melting, migration and differentiation inside the parent chondritic body (rubble-pile, Fig. 3, and onion-shell, Fig. 5.). After transitional stages of acapulcoite, lodranite, ureilitic and mesosideritic stages: layers of differentiation appear. Two segregating materials: first the metallic/sulfide melts appear and migrate in depths, forming core (first collecting in blocks), second a low-melting point silicate (basaltic) melts migrate toward surface. Basaltic achondrites are rarely observable (except Vesta and on its asteroidal fragments) [8].

Samples and meteorites of the Moon: Basaltic sequence and anorthosites, breccias and soil samples all represent the interplay of inner and outer processes. Volcanic flow bodies with texturally layered igneous masses can be reconstructed from cooling rate. Example series: 74220 (orange spherule ca. 1000 C/min), variolitic clast of 68501 (hundreds C/day), 12002 porphyritic tx. (large olivine grains, 20 - 2000 C/hour); intergranular clast in 14305 breccia (k.100 C/week); subophitic clast in 72275,128 breccia; 70017 poikilitic texture (sector zoned cpx), 12005 poikilitic texture (zoned pyroxene oikocrysts, olivine chadacrysts). Lunar meteorites reveal new types compared to Apollo samples.



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KIS ATLASZ A NAPRENDSZERRŐL (11)

KŐZETSZÖVETEK A NAPRENDSZERBEN

Szerkesztette Bérczi Szaniszló

ELTE TTK/MTA Geonómia Bizottság
Kozmikus Anyagokat Vizsgáló Űrkutató Csoport
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Fig. 2. Face cover of PETROGRAPHIC TEXTURES IN THE SOLAR SYSTEM represents textures from chondrules through igneous bodies till a cross section of a differentiated chondritic body.

Meteorites of the Mars: Among about 50 distinct martian meteorites great number of shergottite and nakhlite samples were reconstructed as members of larger igneous bodies. Over depth or burial characteristics they also suffered modifications by impacts, (melt pockets and veins) in the igneous masses [9-10].

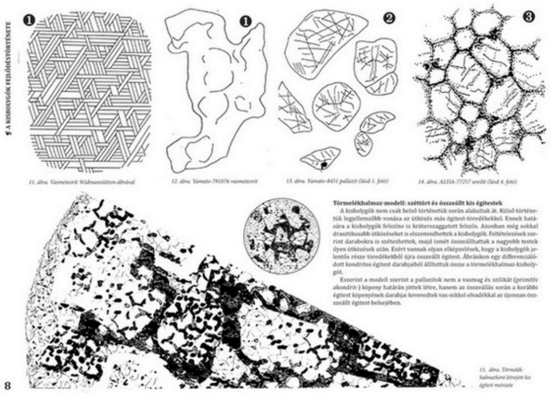

Fig. 3. Page 8 of the atlas: the rubble-pile model page.

Planetary analog rocks on Earth: Both larger units and „individual" examples represent rich set of textural types. Several of them: 1) Theo-flow in Canada for nakhlites [11], 2) basalt and peridotite inclusions for shergottites (basaltic and lherzolitic) [12], 3) komatiites with high Mg content, igneous rocks with probable counterpart on Io, Venus and Mars [13-15]. Fig. 3. Page 8 of the atlas: the rubble-pile model.

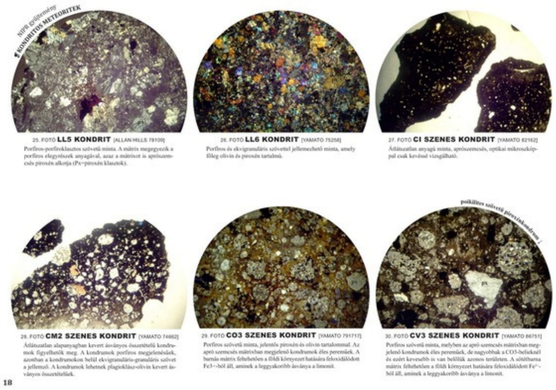

Fig. 4. Page 18 of the atlas: NIPR chondrites.

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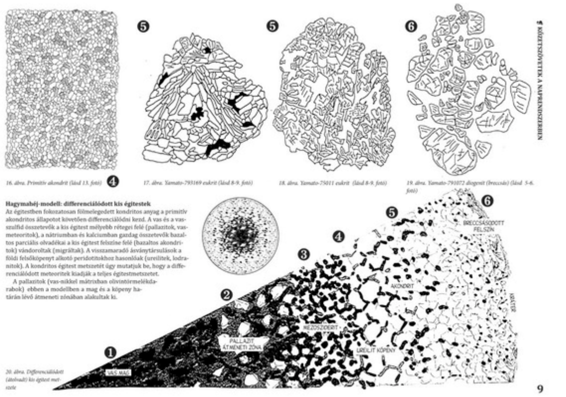

Fig. 5. Page 9 of the atlas: the onion-shell model page.

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Fig. 6. Page 19 of the atlas: Hungarian chondrites.

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