**ON THE POSSIBILITY OF A CRYPTO-BIOTIC CRUST ON MARS BASED ON NORTHERN AND SOUTHERN RINGED POLAR DUNE SPOTS.** *A. Horváth (1,2), T. Pócs (3), T. Gánti (4), Sz. Bérczi (5), E. Szathmáry (4,6);* (1) Budapest Planetarium of Society for Dissemination of Scientific Knowledge (planet@mail.datanet.hu), H-1476 Budapest Pf. 47; (2) Konkoly Observatory, H-1525 Budapest Pf. 67; (3) Eszterházy Károly College, Dept. of Botany, H-3301 Eger Pf 43. (colura@ektf.hu); (4) Collegium Budapest (Institute for Advanced Study), 2 Szentháromság, H-1014 Budapest; (5) Eötvös University, Dept. G. Physics, Cosmic Mat. Sp. Res. Gr. H-1117 Budapest; (6) Eötvös University, Dept. of Plant Taxonomy and Ecology, H-1117 Budapest, Pázmány 1/a. Hungary;

**Introduction:** We developed our model of dark dune defrosting process by studies in two directions. Firstly, we compared the *dark dune spots* in the Southern and in the Northern Polar Regions. This study showed that the northern dark spots forming during early spring period have various shapes, only rarely circular, in contrast to those of southern one. Secondly, we analyzed terrestrial desert and dry rocky surfaces: they are frequently covered by *cryptobiotic crust (CBC)*. This cover consists of consortia of various extremophilic bacteria (mostly cyanobacteria).

**Defrosting phenomena on dark fields in the Northern polar region**: Large regions are covered with dark dune materials on Mars and although they are distributed across the whole planetary surface; the phenomenon we study is associated with the dark fields in the Polar Regions. Because of the precipitation of the frost in autumn and winter [1], the defrosting phenomenon in spring is very well observable on these surfaces because these surfaces give good background when defrosted regions lost their light frost cover. Our earlier studies were done in the Southern Polar Region where the dark dunes exhibit only smaller patches which occur mainly inside the craters [2, 3]. Dark dune fields form a wide belt around the north pole of Mars, too; these are more extended and the frosting-defrosting phenomenon is more complex in the North than in the South.

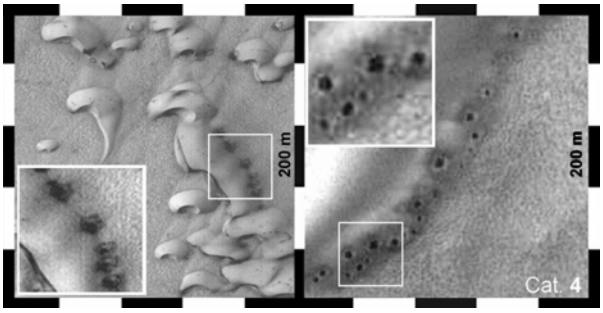


***Fig.1** Comparison of dark dunes of the Northern (left: Chasma Boreale, 359.1°E, 84.7°N, SP2-53807, Ls=26°) and Southern (right: 344.9°E, 64.9°S, M02-02175, Ls=156°) Polar Region on Mars*

In the Southern Polar Region the defrosting pattern of the frosted surfaces is dominated by mainly circular or concentric ringed Dark Dune Spots. In the Northern Polar Region we observed that during the defrosting period the shape of the dark spot formations is varied [4]: they form lineaments, grids, fan-shaped, wind-blown and circular features ([5] call them Martian Zoo). It was surprising to observe that in the northern region only a small number of circular or ringed dark dune spots were found. The smaller number of circular dark spots in the Northern Polar Region may be explained by meteorological differences between the Northern and Southern seasons. The Southern springs are warmer (ca. 30 K degrees) because Mars is in its pericentrum.

**Cryptobiotic crust on Earth**: The terrestrial cryptobiotic crust (CBC) can be well observed in dry regions, in soil or rocky surfaces [6] and even on the surface of wood too. One of us (T.P.) studied them in various deserts all over the world and now we show them from the deserts of central *Australia*. It has violet-brown color due to the *scytonemin pigment* of cyanobacteria, which are the most important components of this crust. This dark pigment is accumulated in the gelatinous sheath of the cyanobacteria and it is protecting the living cells and its assimilating pigments from the overdose of intensive UV radiation, and in such a way makes the survival of the cells possible. *Scytonemin* is the most successful against the deteriorating effect of long UV-A radiation. The protective role of this pigment was studied mainly by [7, 8, 9]. Other cyanobacteria, especially those living in the CBC of rock surfaces, have gloeocapsin another protective pigment which has intense reddish-violet color. In fact, cyanobacteria cells also have an internal protective system too, first of all in the form of *mycosporin*-like compounds (MAA), which are colorless, water-soluble amino acid derivates. MAA is most effective against the shorter wavelength UV-B radiation [10]. Because the cyanobacteria are capable to survive also in extreme cold or heat, and also dry conditions, it is probable that, according to this analogous situation, they also could survive the hard Martian conditions as it was proposed already by *Friedmann* [11].

**The life cycle of Crypto-Biotic Crust**: The cyclicity of the life activity of the CBC consortia is surprisingly similar to the process that we have proposed for the cycle of the DDS-forming hypothetical MSOs in our model. *CBCs begin their cycle when they get moisture.* Then for a period they are active and photosynthesize, until they gradually dry out. So they show life

activity only during the wet period of one or two months.

*The life cycle of MSOs begin when sun is rising* and the frost is melted at the bottom of the frost cover *so MSOs get moisture*. Their later active life cycle is restricted to the short wet periods of late winter early spring, when the water is probably present. After one-two months of active period the MSOs dry out and wait for the next wet defrosting period.

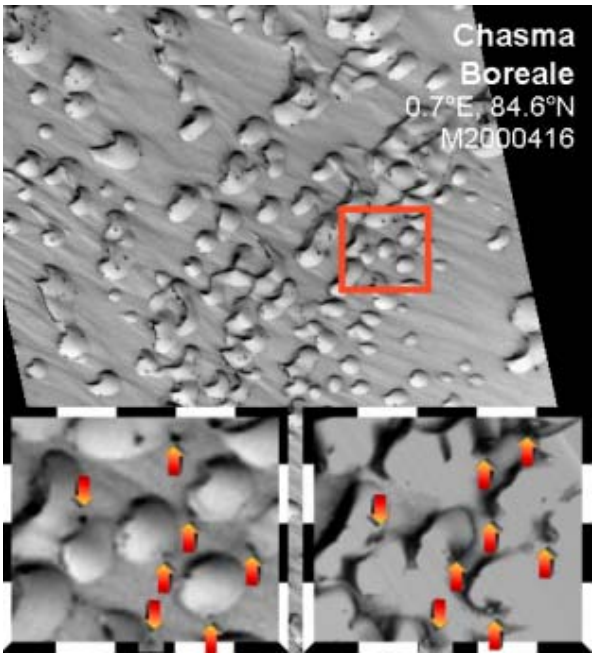


***Fig.2** Frost covered dark dune field in the Northern Polar Region on Mars. The two enlarged frames show the defrosting changes during spring. Dark dune spots are visible in the frames with one month difference.*

**Summary:** On the basis of observations about the life cycle behaviour of CBC consortia on Earth and MSOs on Mars we suggest that cyanobacteria-like organisms are considerable candidates for Martian Surface Organisms [12]. If such *CBC-type cover of extremophiles bacteria exist on the dark dunes on Mars, then they could live only below the surface of the frosted ice cover*, because water can be present only below the frost cover. Such *CBC-type extremophile bacteria* could survive the cold and dry periods (summer, autumn) without the frost cover, in a dried state. When the frost layer begins heated up by absorption of sunlight, CBC-MSOs produce water from the frost, grow and reproduce through photosynthesis. This way CBC-MSOs can generate their own living conditions (liquid water and water vapour can also contribute to sustain this form of life).

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