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Eucaryots and Procaryots from the Early Proterozoic (2.04 GA) phosphorites from Pechenga Greenstone Belt

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Finds of authentic remains of eucaryotic organisms remains in ancient (Early Proterozoic and Archaean) rocks are of great significance for understanding of the history of development of organic world on the early stages of the Earth and for evaluation of Earth environments of this time. Numerous indications on the early appearance of eucaryots (and even multicellular eucaryots) in the Earth history often were put in doubt or were rejected, as a rule, without sufficient argumentation or with absolute absence of any arguments. In this connection the results of investigation of the early rocks of Kola Peninsular (one of the most ancient phosphorites of the world) are very interesting. Till recent time phosphorites from Archaean and Early Proterozoic deposits were practically unknown. Now the appearance of ancient marine phosphorites is dated by 2.04 GA. These phosphorites occur as numerous rounded, soft-deformed, clasts in fine-pebble intra-formational conglomerates, forming two separate c. 200 m-thick turbidite fans within the 1000 m-thick OM- and sulphide-rich turbiditic greywackes of the Pilgujärvi Formation in the Pechenga Greenstrone Belt, NW Russia. Carbonate-fluorapatite is the main mineral in the phosphorite clasts and OM, framboidal and micronodular pyrite, as well as inclusions of quartz and chlorite are additional components. Many clasts show micro-layering with a variable degree of soft-deformation, implying that they were derived from non-lithified, bedded phosphorites. They contain rich and diverse biogenic microstructures, among them newly found and described eucaryotic microstructure (Pechengia melezhiki, insertae sedis) and various microbial microstructures interpreted as cyanobacteria, represented by fil-

amentous (1-3 m in diameter, 20 m in length), coccoidal (0.8-1.0 m) and ellipsoidal or rod-shaped microfossils (0.8 m in diameter, around 2 m in length) which morphologically resemble modern Microcoleus and Siphonophycus, Thiocapsa, and Rhabdoderma, respectively, that have been reported from alkaline or saline environments. No principle differences have been found between microfossils described from Cambrian and Phanerozoic and the 2004 Ma phosphorites. The very finding of eucaryots and phosphorites suggests the presence of high level of O2 in atmosphere of that time. This research forms part of the Russian Academy of Sciences program “Origin and Evolution of the Biosphere” and the ICDP FAR-DEEP. Financial support came from the Geological Survey of Norway and RFBR grants 05-04-48008 and NSH-974.2003.5.