

Mysterious nodules found on the Sinemurian limestones of the Tunežice quarry (Manín Unit, Peri-Klippen Zone, Slovakia)

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Abstract. Tunežice quarry exposes Sinemurian sandy limestones of the Manín Unit. The limestones are known for their selectively silicified fossils, mainly the oyster *Liogryphaea arcuata*. Recently ochre-coloured nodules have been found in the quarry, resembling fossils of sessile organisms. They were considered to be stromatoporoids, or rather columnar chaetetids due to their radial fibrous structure. The material of the nodules was firstly supposed to be also siliceous. However, there it is also a similarity to fibrous gypsum. To check this possibility, the material was treated with hydrochloric acid. After drying up, typical newly formed needles often arranged in an echinoid-like manner were revealed which is a typical indicator of gypsum. The insoluble residuum contained a silty admixture composed exclusively of zircon grains, which indicates that the studied material is an artefact which originated likely during drilling in the quarry. Gypsum drill mud is used in some special drilling methods; zircon is utilized as an abrasive material. Thin-section analysis showed perfectly crystallized gypsum fibres with evenly dispersed zircon which indicates that the silt was stirred before the material solidified. The fibrous gypsum is penetrated by thin veinlets of clear blocky calcite, indicating some longer time span of crystallization (perhaps several years).

INTRODUCTION

Tunežice quarry exposes Sinemurian sandy limestones of the Manín Unit in the Váh River valley (Fig. 1). The quarry, established in 1970, is still active and it was one of the stops during the field trip of the Jurassica VIII conference in 2009 (Schlögl *et al.*, 2009). The limestones are characteristic by their selectively silicified fossils, mainly oysters *Gryphaea* and burrows *Thalasinoides*. The fossils are commonly covered by an ochre-coloured material (Schlögl *et al.*, 2009, figs. 27, 28). Recently, similarly coloured nodules have been found at one place in the quarry base (Fig. 2A, B) within steeply dipping beds of the dark

sandy limestones of the Trlenská Formation (see definition by Bujnovský *et al.*, 1979), in the interval with *Gryphaea* bivalves and *Thalasinoides* burrows (beds 120–360 in Schlögl *et al.*, 2009). The nodules have generally irregular oval to potato shape. Their dimensions range from 3 to 15 cm. They were arranged mostly on bedding planes or on planes perpendicular to the bedding (Fig. 2B, C), i.e. they are not related to stratification. The nodules resemble fossils of some sessile organisms (Fig. 3A, B). Originally they were considered to be stromatoporoids, or rather columnar chaetetids due to their radial fibrous structure (Fig. 3C, cf. Stanton *et al.*, 2016, figs. 5–8).

The material of the nodules was of unknown origin. Firstly it was supposed to be siliceous, just like in the selec-

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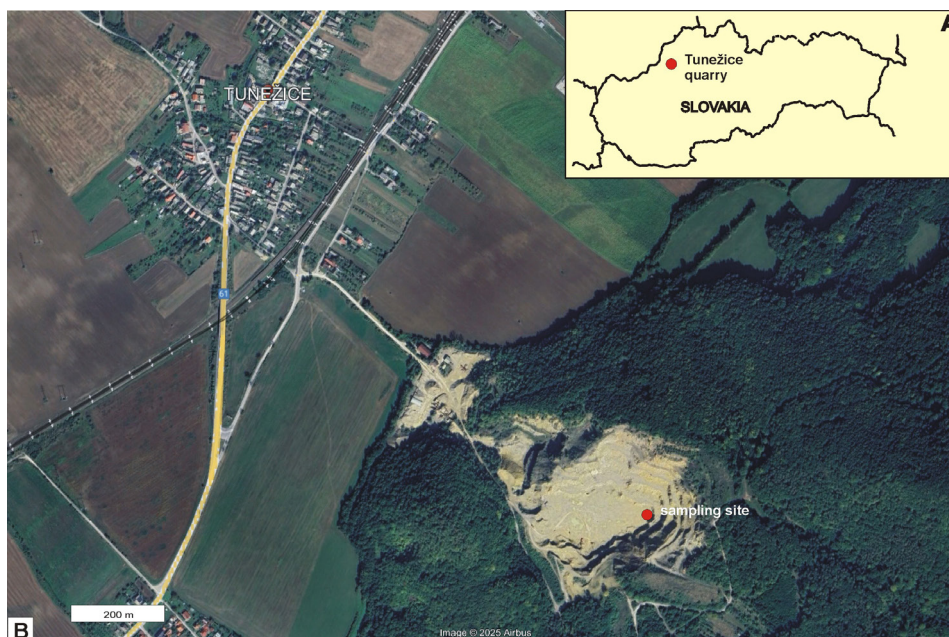


Fig. 1. Position of the examined locality

A. Position of the examined locality within the frame of Slovakia. **B.** Position of the sampling site in the southern Tunežice quarry. Photo: Google Earth, 2025

tively silicified fossils. However, it is also similar to fibrous gypsum. To check this possibility, a simple test was performed. The material was scratched to a thin-section glass and treated by a diluted hydrochloric acid (Rost, 1956). They were also studied petrographically in standard 2.5×4.5 cm thin-sections.

RESULTS

After drying up, typical newly formed needles often arranged in echinoid-like manner (Fig. 4A) were revealed which is a typical indicator of gypsum. However, the residuum also contained a silty admixture composed exclusively of zircon grains (Fig. 4B). Thin-section analysis showed perfectly crystallized gypsum fibres with evenly dispersed zircon (Fig. 4C) which indicates that the silt was stirred before the material solidified. The fibrous gypsum is penetrated by thin veinlets of clear blocky calcite (Fig. 4D, E), indicating a prolonged time span of crystallization (perhaps several years).

DISCUSSION

The results clearly indicate that the discovered nodules are artefacts which likely originated due to drilling in the

quarry. Gypsum drill mud is sometimes used in some special drilling methods (Braga, de Oliveira Freitas, 2024); zircon is sometimes used as an abrasive material (e.g., <https://www.jnjunda.com/Zircon-sand.html>). The management of the quarry was not able to explain the origin of the nodules. Also, literature retrieval did not bring any data from other quarries worldwide.

CONCLUSIONS

The ochre-coloured nodules found in Tunežice quarry, which have been firstly considered as fossils were subjected to petrographic analysis and chemical treatment. They revealed that they in fact represent artefacts which most likely originated from drill mud, as they consist of gypsum and abrasive additives of zircon grains. Although the described objects are not directly related to geology as such, it is necessary for geologists to be aware of their existence and not to be mistaken as fossils.

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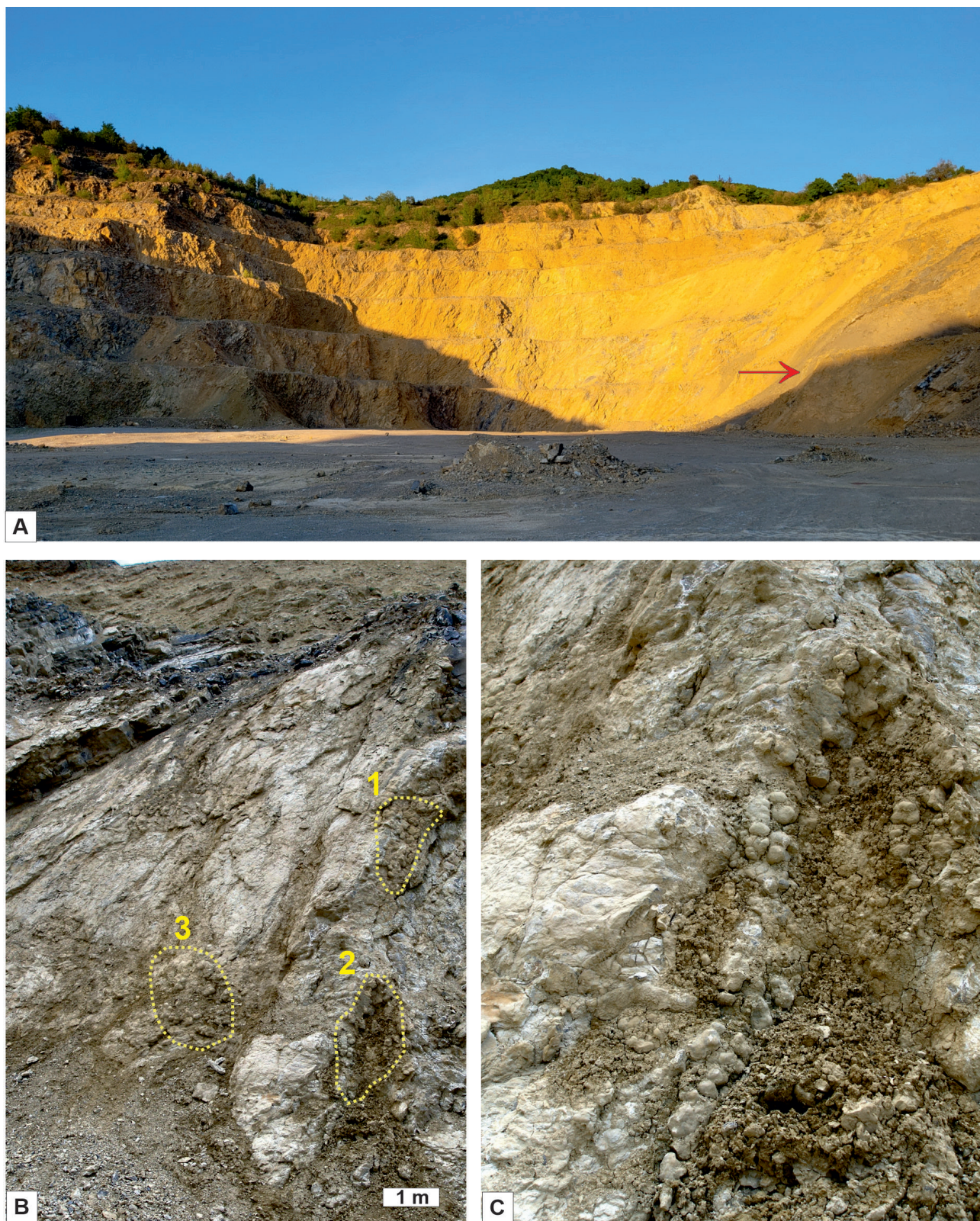


Fig. 2A. Location of the studied nodules in the Tunežice quarry. B. Position of nodule clusters on the limestone bed. C. Detail of the cluster 2

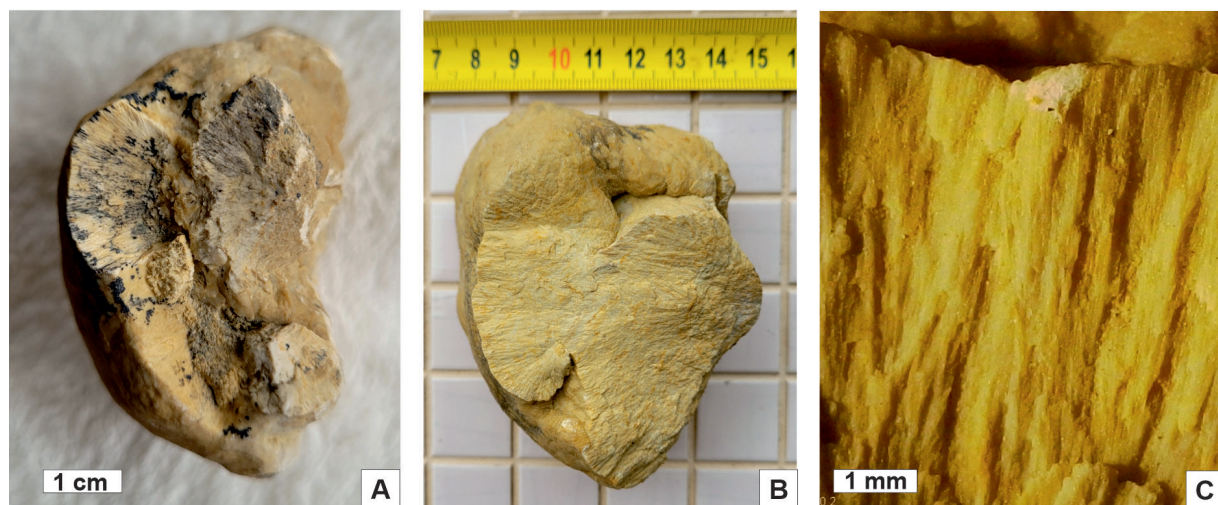


Fig. 3A, B. Macrophoto of the nodules. C. Fibrous structure on the surface of the broken nodule

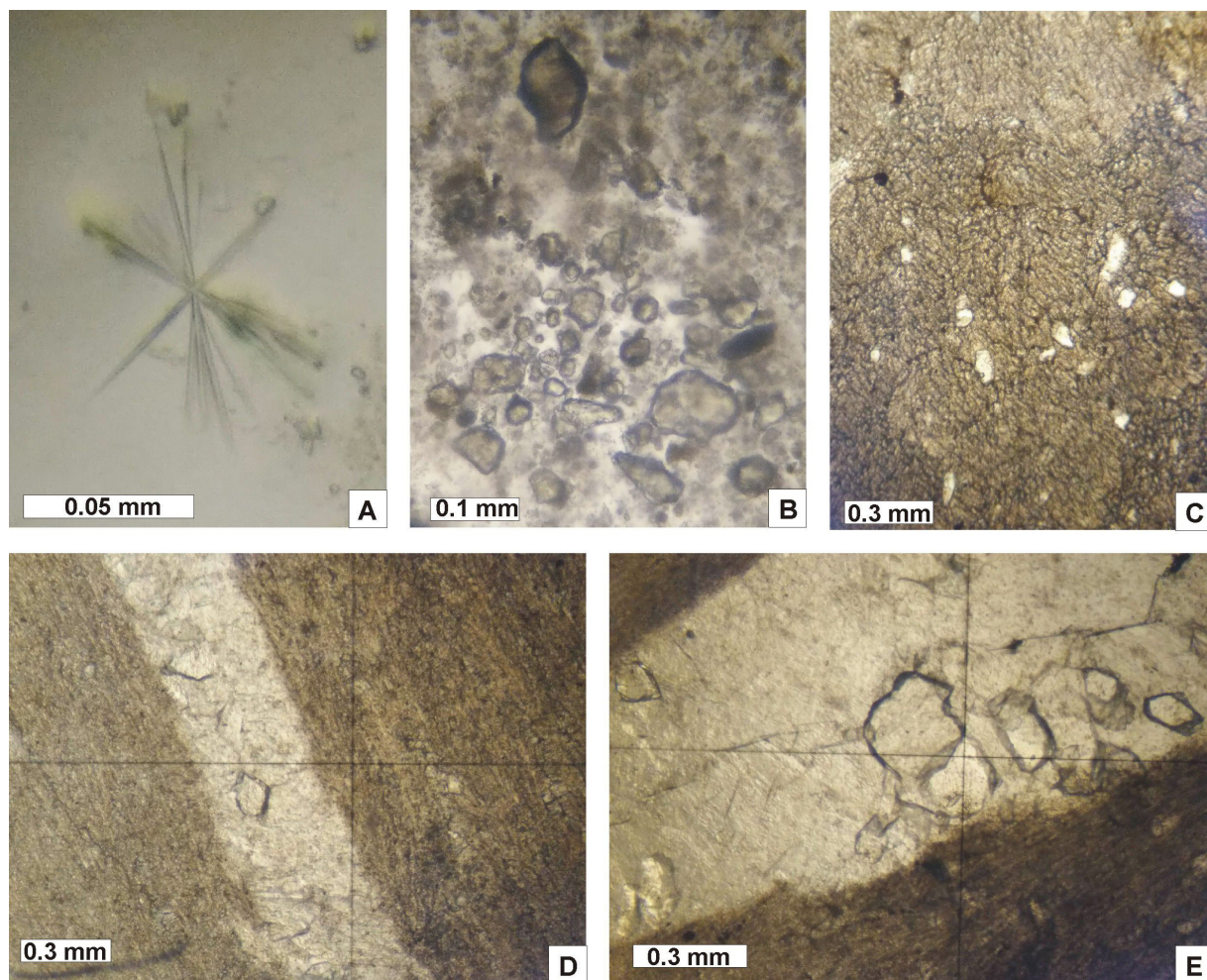


Fig. 4A. Newly precipitated gypsum needles after treatment of the material in hydrochloric acid. B. Insoluble residuum consisting of zircon grains. C. Thin-section photo showing evenly dispersed zircon grains among gypsum fibres. D, E. Newly-formed veinlets of clear blocky calcite cutting the gypsum material

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