Silurian non-calcified algal flora from the Kalana Lagerstaette, Estonia

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The non-calcified algal floras were probably widespread in the Paleozoic seas, but this view can be proved with exceptionally preserved fossils only.
The non-mineralized or weakly calcified algal species are rarely preserved and have been found in few Lagerstaetten only. Therefore the extent of their stratigraphic ranges and richness of their geologic history has probably been strongly been underestimated.
Up to now only 14 species of non-mineralized algae have previously been reported from the entire Silurian System around the world.

The Early Silurian algal Lagerstaette in Kalana, Estonia, has revealed rich non-mineralized algal flora, which on the basis of external morphology are assigned to Rhodophyta and Chlorophyta. Most of the material occurs within the light to dark brown organic-rich, microlaminated, partly dolomitized limestones.
Kalana quarry in Central Estonia is by far the richest and best preserved algal deposit in the Early Paleozoic. In the Kalana material we can distinguish at least ten morphological species. This marks a considerably higher diversity than has been documented in the Cambro-Silurian strata up to now.

The most common algal fossil in these shelf carbonates is a red algal species *Leveilleites hartnageli*, which was originally described by Foerste in 1923 from roughly coeval sediments in southern Ontario, Canada.

The thalli of this type are up to 7 cm high, with a 1-2 mm wide axis. Each specimen has 10-20 primary branches, most of them about equal in length and 12-25 mm long. These branches bear 10-30 so called tufts, consisting of 20-30 up to 1 mm long laterals and arranged in either side of the 1st-order laterals. We are able to designate two distinct macroscopic phases (a haploid and diploid phase) of the life cycle of *Leveillites*.
Many algal fossil of Kalana - *Medusaegraptus* sp., *Chaetocladus* sp., *Inopinatella* sp., and *Cymopolia* sp. - belong to the green algae of the order Dasycladales. Dasyclads are unicellular and radially symmetrical macroalgae with siphonous organization. This highly diverse group has a long geological history, but is dominated by calcareous forms.

The fossil evidence from the Kalana Lagerstaette suggests, that some of the algae may have maintained their basic morphology almost unaltered for over 400 million years, with the main innovation being the extracellularly laid calcium carbonate skeleton and the algal floras were probably widespread in the Paleozoic seas.

Non-geniculate coralline algae and foraminifers as main constituents in microfacies types of 'Leitha Limestone', Middle Miocene, north-eastern Leithagebirge, Austria

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The Historic Quarry Project aimed at the identification and investigation of natural stones that proved historically important for buildings and monuments by means of linking their quarry provenance with their applications. In this respect, Leitha Limestone, being one of the most famous building stones in Vienna, Bratislava and Graz, was chosen. To fill the blind spot due to the military inaccessibility of abandoned quarries distributed between Kaisersteinbruch and south of Bruck/Leitha these were selected for investigation and a

permitted field trip carried out. Moreover, quarries in the Ruster Hills (e.g., so called Roemersteinbruch St. Margarethen) and in southern Styria (subsurface Roemerbruch Aflenz) were also part of the excursion. Further samples of Leitha Limestone quarries from Nußdorf (Vienna) and Pfaffenberg (Deutsch-Altenburg) were studied for comparison.

Carbonate microfacies analysis of 70 thin sections by stereo microscope was applied, quantity estimations are based on comparison charts.

From the 30 quarries that were subject to general survey, rock samples were taken for macroscopic identification and some of them chosen for preparation of thin sections. From 12 of these quarries additional cores (35 mm diameter, up to 15 cm long) were drilled. The core samples served for geophysical and geotechnical laboratory tests and for thin sections as well.

The field investigations and quarry descriptions contribute to the mineral raw-materials archive and database of the Geological Survey. Based on the available geological maps the Leitha Limestone succession covers a basement relief, which occurs as topographical heights, called Schieferberg, Zeilerberg and Königsberg with Semmeringquarzit and Middle Triassic dolomite and with the latter cropping out as erosional and quarry relics south of Kaisersteinbruch. Although the map differentiates between Badenian 'Leithakalk' and Sarmatian 'detritaerer Leithakalk', this was not obviously recognizable in the field.

The thin sections were grouped according to their microfacies characteristics and resulted in: Micro-breccias and conglomerates with reworked dolomite basement rocks, (par-)autochthonous bioclastic corallinacean-bryozoan boundstones as well as bryozoan-serpulid boundstones, pack- and rudstones with mainly corallinacean algae and eventually rhodolithes, well sorted grain- and rudstones (detrital calcareous sandstones) with varying amounts of corallinacean algae, bioclasts, foraminifers and lithoclasts. Occasionally important are mixed carbonate-siliciclastic types. Few samples are dominated by molluscs. Some textures, cements and diagenetic features are indicative of special environments. Concerning the coralline algae flora, up to now, mainly *Lithothamnium*, *Lithophyllum* and *Sporolithon* were recognized.

A preliminary age differentiation between Badenian and Sarmatian is mainly based on foraminifers and the occurrence of ooids.

It can be concluded that the microfossil record in the thin-sections from these isolated samples could be identified to a limited extend. The resulting microfacies types were tested for their regional extent. For further investigation, the significance of these samples should be proven as they should serve for recognition in stone monuments, and for lithostratigraphical contribution.

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Microbial carbonates in Miocene reefs in the Mahakam Delta in East Kalimantan, Borneo, Indonesia

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Microbial carbonates are deposits that form by the activity of bentic microbial communities. Microbialites usually form domical, columnar or conical structures and can