

Two subzones in the Upper Paleocene, based on different faunal assemblages are observed. The respective *Discoaster multiradiatus* communities of these subzones are discussed and statistically analyzed. A decrease in the number of rays can be shown as an evolutionary trend within this species.

Larger Foraminifera from Suhathu Beds of Simla and Garhwal Himalayas

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Abstract:

A number of thin sections of the nummulitic limestones from Subathu ($30^{\circ} 58' : 76^{\circ} 59'$), Simla Himalayas and Nilkanth ($30^{\circ} 05' : 78^{\circ} 21'$), Garhwal Himalayas, have been studied for the larger foraminifera contained in them. An attempt has been made to identify some of the species by means of accidentally oriented sections of individuals in these slides. A general examination of the nummulites and assilines has indicated that the nummulites belong to the group of *N. burdigalensis* showing affinity with *N. pernotus* SCHAUB and the assilines are comparable with *A. placentula* (DESHAYES). The assemblage also consists of *Lockhartia conditii* (NUTTAL), *L. cf. altispira* SMOUT, *L. tipperi* (DAVIES), *L. sp.*, *Assilina cf. orientalis* (DOUV.) and *A. sp.* On the whole it suggests a lower Eocene (Laki) age to these rocks.

First Report on Nannoplankton of the Upper Tertiary and Quaternary of Southern Kwanto Region, Japan

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Abstract:

The nannoplankton populations from the upper Miocene, Pliocene and Pleistocene sediments in the southern Kwanto region, Japan are described. Their stratigraphic distribution and paleoclimatic changes are discussed on the basis of the planktonic foraminiferal fauna. It is possible that three species *i. e.* *Coccolithus pelagicus*, *Coccolithus crassipons* and *Gephyrocapsa oceanica* are sensitive with regards to the paleoclimatic environments. *Gephyrocapsa oceanica* and *Discolithus stradneri* n. sp. can probably be used as stratigraphic indicators. In the studied sections, discoasters extinct at the lowermost Pliocene. A total of 11 genera, 20 species of nannofossils are determined. One species is proposed as new to science. One sample from the well known Pliocene type locality at Castell d'Arquato in Italy is examined for comparative study.

Structural Evolution of the Southern Part of the "Rastenberg" Pluton, Bohemian Massif, Lower Austria

by L. A. M. DA COSTA

Résumé:

The "Rastenberg" Pluton of the southeastern Bohemian Massif, is a roughly elliptical mass, 22 kilometers long by 10 kilometers wide, mainly composed by a coarse grained porphyritic granite and surrounded by metamorphic rocks at all sides, excepting the northern end, where it is cut by an equigranular, medium to fine grained biotite-granite, called Mauthausner Granite.

A geological survey over the southern half of the pluton shows structural and petrological quantitative areal variability within the body. The variations are connected with the relative

position of the rocks to the contact regions. From that reason arises the impossibility of describing in detail one rock type, from a particular area, as representative of the whole mass. Trend-Surface analysis would prove to be helpful and complementary of any petrogenetic theory concerning the pluton.

Macroscopic and petrofabric structural analysis reveal the necessary structural arguments for interpretations on the tectonics of the mass.

The pluton, in the mapped area, shows a HARPOLITHIC three dimensional shape, with a western floored contact underlain by metamorphic wall-rocks that dip, together with the sharp boundary plane, about 35 degrees inward the granitic body. Flow lines, represented by alignment of the phenocrysts, in conjunction with flow layers, produced by the parallel arrangement of schlieren, platy basic clots (inclusions) and biotite flakes are regularly developed in that zone. The inner part of the body is massive and seems to lack any preferred orientation of its components. Flow lines are not apparent along the eastern zone, though a strong orientation of elongated clots, with steep westward dip, imposes an anisotropy on the total fabric of the granite. Here, the contact approaches the vertical, and the body of granite is separated from the thin laminated envelope rocks by a coarse grained, strongly foliated migmatite carrying large porphyroblasts of feldspar.

The mechanical forces that have produced the preferred orientation of the quartz optic axes along the eastern border are entirely independent from the development of the flow structures, which are directly related to the direction of a moving magma.

The flow layers conform closely with the local boundaries and are caused by the mechanical friction engendered by the magmatic expansion along the contact planes. The early formed euhedral phenocrysts constitute the flow lines and show the direction of maximum elongation of the magmatic flow. The lack of a distinct preferred orientation of the phenocrysts, accompanied by a clear parallelism of the basic clots along the eastern contact regions, point to a structural area with an evolutionary behavior different from the western floored contact zones, where the magma expanded freely inclined, outward the core and over the inclined flanks of the envelope rocks. In contradistinction, along the eastern zones the movement was upward and retarded by cap-rock influences. Therefore, the flow was not free to advance and produce well-developed feldspar flow lines. However, the basic clots here (east) owe their orientation to earlier periods of magmatic emplacement, when the phenocrysts had not yet been formed, and they did not lose it after the emplacement, by the time the movement had ceased, because of the high viscosity of the granitic "mush". Continuing, the final crystallization was taking place and the phenocrysts reached their final growth in a more or less stationary medium, thence, the lack of oriented distribution among them.

The magmatic emplacement took place during the main folding of the country rocks, in a somewhat passive way, by a free-space intrusion, the name we propose for the whole process: the flow expanded and found its way out, neither by fracturing the wall-rocks in a forcible injection nor by stoping, but occupying concomitantly the free space produced by folding of the surrounding rocks. It would be mechanically improbable to suppose that the concordant sill-like contact was caused by a layered intrusion through stationary gneissic rocks. How could a granitic mush, with such a high viscosity, pull apart the bands of already formed, compact gneisses to intrude in sheets? If this were the case, the great pressures exerted for it, would have broken the country rocks, irregularly, leaving behind traces of such effects in discordant intrusions, ramifications and other signs that would reflect injection guided by fracture systems, but these signs were not detected, at least in the present state of our investigations.

If the huge metamorphic region, called "the Modanubikum", where the "Rastenberg" pluton is placed into, belongs to the old Variscian mountain belt, so does the pluton, intruded during those periods of folding.

Metasomatic and granitization-in-place theories, or any other theory that admit evolution of the "Rastenberg" mass without a magmatic point of view, do not account for the sharp contact of the western zone nor the transition between the oriented structures along the contacts and the massive core. Therefore, they are not regarded as satisfactory hypotheses.

Petrology and Structure of the Spitzer Gneiss from Dobra Area in the Bohemian Massif of Austria

by G. G. DESHPANDE ¹⁾ and ISHIK ÖZPEKER ²⁾

A b s t r a c t:

The Spitzer Gneiss forms a major unit of the Moldanubian Zone and occurs between the Rastengerger Granite to the West and the variegated series to the East, into which it gradually merges. The different types comprising the gneiss show a more or less uniform mineralogical composition with quartz 33.3%, alkali feldspar 10%, andesine 51%, biotite and accessories 5.7%. Bands of biotite rich amphibolite varying in thickness are found intercalated in the gneiss. These show plastic flowage due to squeezing and penetrate into the gneiss through fractures, sometimes in ramifying fashion. Some occurrences of dolomitic marbles and biotite muscovite gneiss containing sillimanite are also recorded. Several dykes of granite, aplite and amphibolite are found traversing these rocks.

The rocks show almost N—S-strike with steep dips and are intricately folded. They show well developed lineation. An attempt to interpret the structure of the gneiss has been made with the help of field data regarding the structural elements and petrofabric analysis.

With a view to inquire into the origin of the gneiss statistical study of zircons and spectrochemical analysis of the gneiss and amphibolite has been undertaken. The zircons show uniform elongation ratio, outgrowths and overgrowths.

Spectrochemical analysis of the typical Spitzer Gneiss and elongation ratio of zircons indicate 'Ortho' origin whereas the intercalated amphibolite is found to be of mixed-'Ortho-para'-origin. The analysis confirms 'Ortho'-origin of the amphibolite occurring in the form of dykes.

On the basis of the field evidence and data collected in the laboratory various views regarding the genesis of these rocks are critically discussed. The authors feel that the gneiss was formed by the metamorphism of 'Ortho' material and intercalated amphibolite from the basic tuffs.

Geology of Krumau Area

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A b s t r a c t:

The present paper records the results of the investigation of the Para-rock series "Paragesteinserie" outcropping around Krumau along the Kamp Valley in the Waldviertel (Niederösterreich). The area mapped in the scale of 1 : 10,000, represents a part of the highly metamorphosed Moldanubicum crystalline series of the southern Bohemian Massif.

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