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INHERITED AND PEDOGENIC MINERALS IN SOIL THIN SECTIONS. THEIR DESCRIPTION AND INTERPRETATION

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The study of inherited and pedogenic minerals in soil thin sections may yield information, often not obtainable through other methods. Although such information may be useful also in estimation of soil fertility and in soil classification, only those aspects leading to genetic interpretations will be discussed in this paper.

A study of the inherited minerals will help to identify the original parent material, and to check its homogeneity; also the presence of small amounts of allochthonous (e.g. airborne) grains may be detected. In addition to a determination of the nature of the grains, which is also possible in grain mounts or any other mineralogical technique (e.g. XRD), thin section studies of undisturbed soils allow the observation of inclusions, shapes, and especially of weathering patterns which can yield precious information on the present or past pedogenesis.

Apart from the "real" minerals, opaline bodies are often observed, such as diatoms (living in the soil or inherited from the sediment) and especially phytholites (plant opal) giving information on past and present vegetation.

In most cases the mineralogical study of a soil is restricted to the analysis of the clay fraction only. This is regrettable as larger authigenic grains in undisturbed samples however quite often irreplaceable information on the soil forming processes and the paleo-environment, revealing often the juxtaposition of several micro-environments.

Specific minerals or mineral associations are observed in different environments:

(1) in arid soils, where crystallization is mainly the result of a concentration of the soil solution through evaporation. Here a range of more or less soluble minerals, such as calcite, gypsum, halite and thenardite are observed frequently, other such as celestite, glauberite, eugsterite less commonly. Especially salt crusts are interesting study objects with a range of mineral associations.

(2) temperate soils generally do not show mineral neoformations visible in thin sections, except for calcite deposits in the deeper part of the profiles (e.g. pseudomycelium), and different associations in wet soils: goethite, lepidocrocite, siderite, pyrite and several cryptocrystalline Mn (hydr)oxides.
(3) due to an extreme leaching, strongly weathered tropical soils contain minerals of sesquioxides, such as gibbsite, hematite and goethite. In the saprolite also kaolinite booklets may be visible. Many pseudomorphs after rock minerals can be recognized as well.
(4) special situations, less dependent upon climate, occur in soils on marine clays, where mineral associations of pyrite, goethite, jarosite and/or gypsum are found, and in soils on volcanic ash with allophane and gibbsite.

As mentioned above, some minerals may occur in quite different environments, e.g. calcite, gypsum, goethite. Their habits often vary from one environment to another. Also small differences in composition of the soil solution may provoke contrasting forms. Not sufficient attention has yet been given to the diagnostic value of such habits as a way to characterize the soil environment. Little has also been published on the diagnostic value of specific mineral associations (parageneses) although this might be a promising field of research. Both mineral habits and associations, may be especially important in the case of polycyclic soils or paleosols. Attention must be given however to the juxtaposition of several micro-environments in a small volume of soil (e.g. related to the presence of roots or voids), and to the possible destruction of the least stable members of the association under new pedogenic conditions.

Apart from the traditional polarizing microscope, other optical techniques became available, such as UV-fluorescence and cathodoluminescence. No systematic data are yet available. Also other techniques, such as staining (e.g. in the case of carbonates), selective dissolution (e.g. of some oxyhydrates) and spot tests (e.g. for Mn) have not been explored sufficiently.

ZUR PRÄALPIDISCHEN METAMORPHOSE IN DEN METAPELITEN DES WESTLICHEN ÖTZTAL-STUBAI-KRISTALLINS, KAUNERTAL

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Die charakteristische KFMASH-Paragenese in den variszisch überprägten Metapeliten des westlichen Ötztal-Stubai-Kristallins im Kaunertal ist: Staurolith-Granat-Kyanit-Fibrolith-Biotit-Muskovit-Quarz ± Andalusit. Der Höhepunkt der variszischen Metamorphose wird aufgrund thermobarometrischer Untersuchungen (Gt-Bio-Thermometer, Gt-Plag-Ky-Qz-Barometer) unter Bezugnahme des Granatwachstumszonarbaues mit