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THE GEOLOGY OF THE SOUTHERN PART OF THE NORTH ARM MOUNTAIN MASSIF, BAY OF ISLANDS OPHIOLITE COMPLEX, WESTERN NEWFOUNDLAND WITH APPLICATION TO OPHIOLITE OBDUCTION AND THE GENESIS OF THE PLUTONIC PORTIONS OF OCEANIC CRUST AND UPPER MANTLE

by

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Figure 7K - Typical fine-scale layering in the transition zone. Finely interlayered uniform dunite and anorthosite layers having sharp phase contacts.

Figure 7L - Photomicrograph of finely interlayered chromitite (with interstitial partially serpentinized olivine) and monomineralic clinopyroxinite.

Figure 7M - Postcumulus wehrlite layer containing large oikocryst of clinopyroxine with olivine as the 'primocryst' phase. Monomineralic dunite layers occur above and below this unit in adjacent outcrops.

Figure 7N - Alternating uniform layers of anorthositic gabbro and melanocratic gabbro with sharp ratio contacts.

Figure 7O - Micropegmatitic gabbroic layer (right) in sharp contact with a fine-grained gabbroic layer (left). Modal proportions do not change significantly across the form contact.

Figure 7P - Trough-like structure with variable senses of truncations. Trough-fill is composed of wehrlite.

Figure 7Q - 'Cross-bedded' sequence of troctolite layers, some of which show modal stratification.

Figure 7R - Possible disharmonic 'slump folds' having curviplanar axial surfaces.

Figure 7S - Typical wavy inch-scale layers alternately rich in pyroxene and plagioclase.

Figure 7T - Wavy inch-scale layering with regular larger scale layering in background.

Figure 7U - Local antiformal and synformal growth structures superimposed on dominantly parallel sets of inch-scale layers.

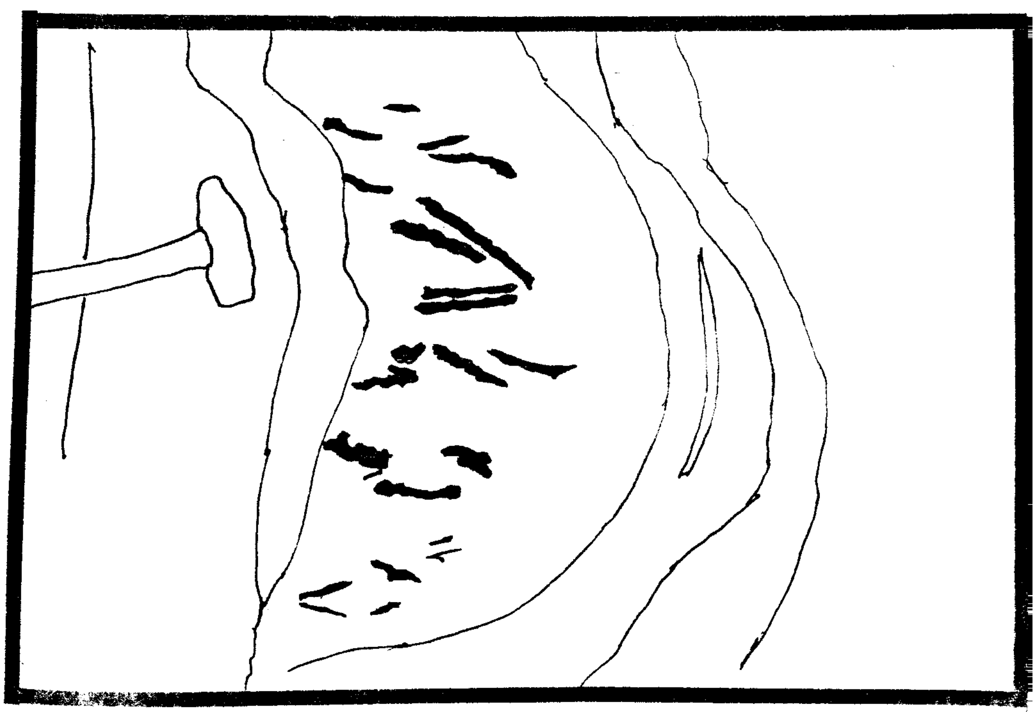
Figure 7V - Massive fine-grained gabbro in sharp contact with an inch scale layered sequence having local irregularities. Note, however, that layer contacts to the left and right of these irregularities are planar and apparently undeformed.

Figure 7W - A series of antiformal and synformal growth structures described by inch-scale layers irregularly decreasing in amplitude both upward and downward.

Figure 7X - Antiformal growth structure with extreme amplitude.

Figure 7Y - Comb layer (center) with elongate branching olivine crystals oriented at a high angle to the layering plane.

Figure 7Z - Mound-shaped or reef-like growth layer with oriented olivine grains indicating an *in situ* origin.



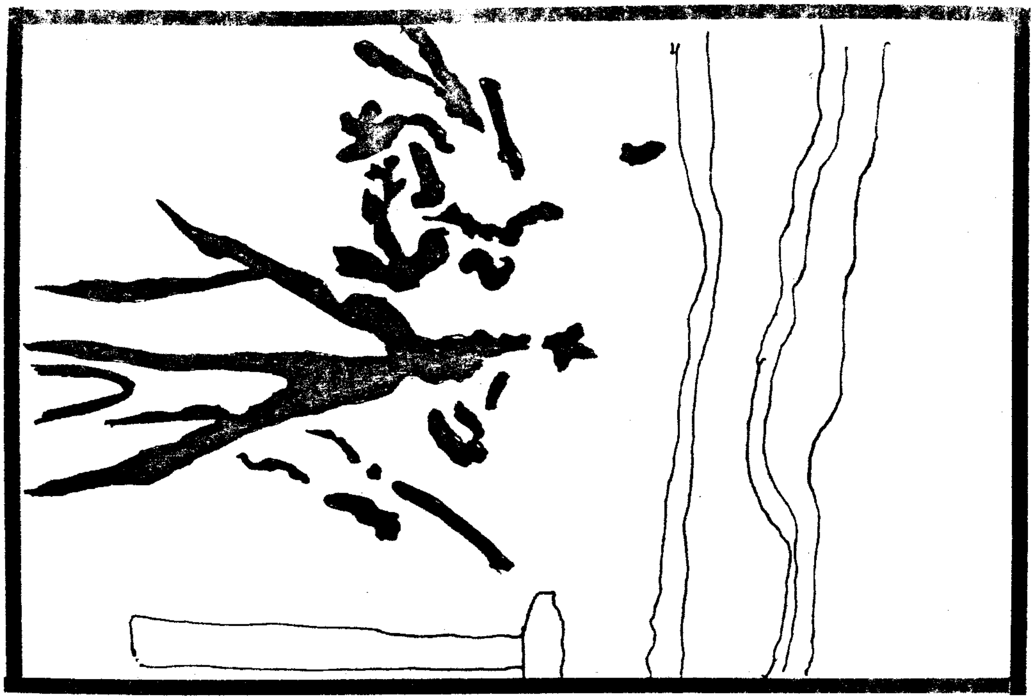


Figure 7AA - Highly oblique (i.e., originally sub-vertical) comb layer with large oriented, elongate and branching olivine crystal (center) flanked by other 'apparently' smaller branching olivine crystals. Large olivine crystal (dark) branches to the southwest indicating its growth direction from the northeast solidified margin of a former magma chamber.

Figure 7BB - Laterally discontinuous alternating layers of dunite, feldspathic dunite (dark) and gabbro (light) within the mafic/ultramafic transition zone.

Figure 7CC - Finely interlayered and laterally discontinuous troctolite and anorthosite layers in the layered gabbroic unit.

Figure 7DD - Discontinuous layers of coarse-grained gabbros and leucogabbros and fine-grained troctolites in the layered gabbroic unit.

Figure 7EE - Branching layers of leucogabbro (light) with alternating melanogabbro (green) and dunite (brown) layers.

Figure 7FF - Examples of single layers that change orientation by approximately 90° on a mesoscopic scale. Uniform anorthositic layers (light) alternate with gabbroic layers (dark). Individual layers change orientation abruptly and become progressively thinner to the left side of the photo. Layers are thickest where their orientation parallels the regional mean orientation of layering and systematically thins toward the left where they become highly oblique to the regional trends. Rocks appear undeformed on a mesoscopic scale and in thin section igneous textures are well-preserved suggesting a nondeformational origin for the structure. This structure possibly developed due to inhomogeneities in the growth rates along the margin of the magma chamber.

Figure 7GG - Example of layers that change orientations and branch. Although the photo seemingly depicts trough-like structure by defined branching leucocratic layers, the structural underlying rocks are to the left in the photo and overlying units to the right (i.e., the opposite sense expected by facing directions for typical sedimentary trough structures. This structure may have also formed by irregular layer growth along the bounding surface of the chamber.

Figure 7LL - Photomicrograph of typical isotropic gabbro showing randomly oriented plagioclase laths.

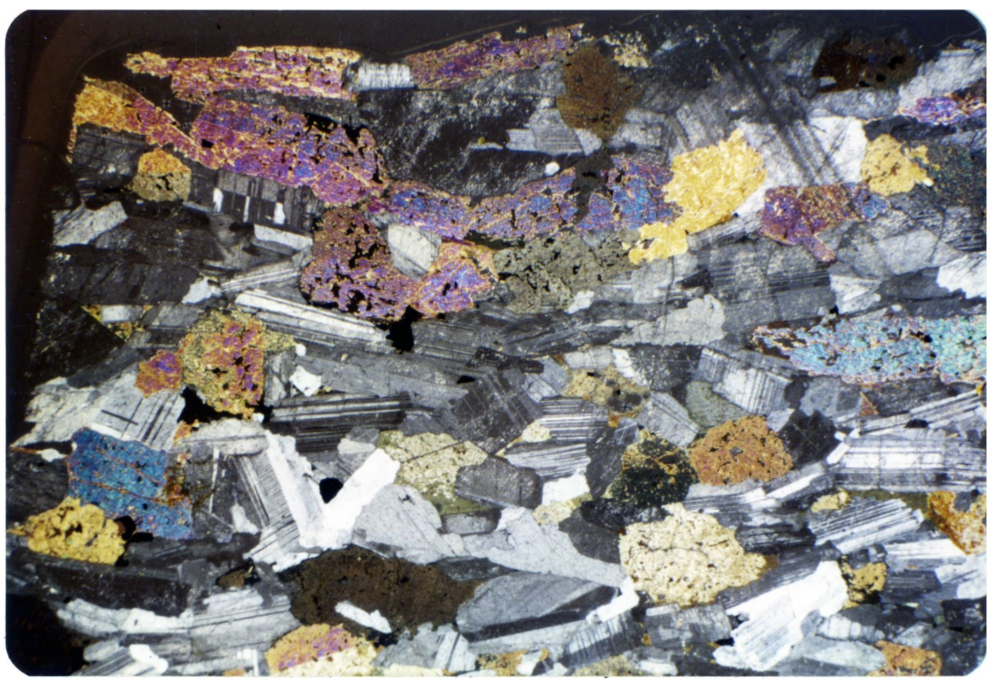
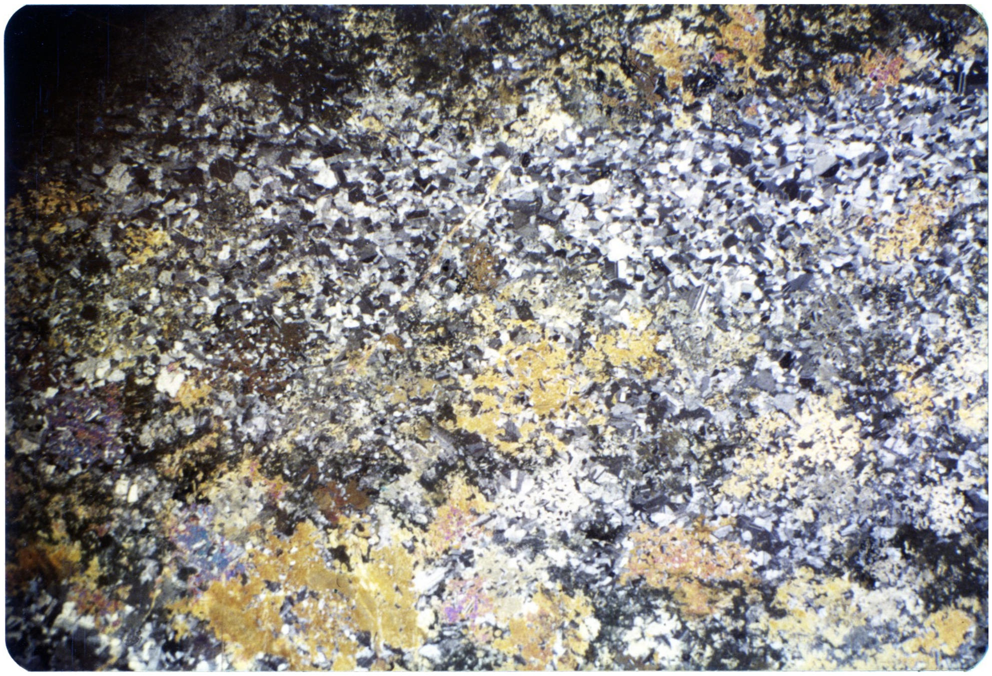
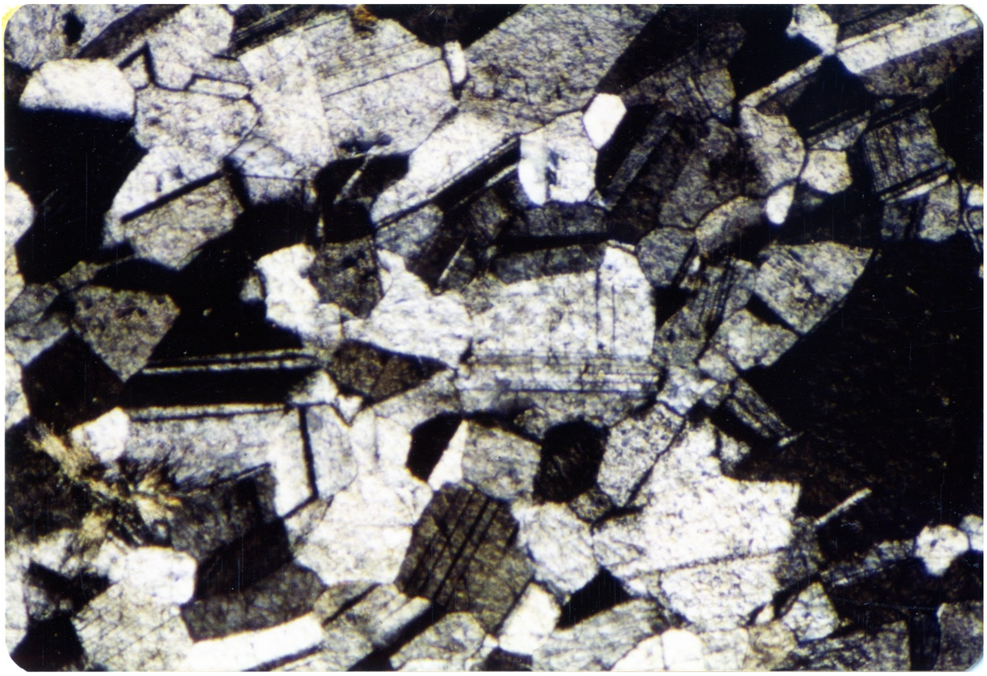


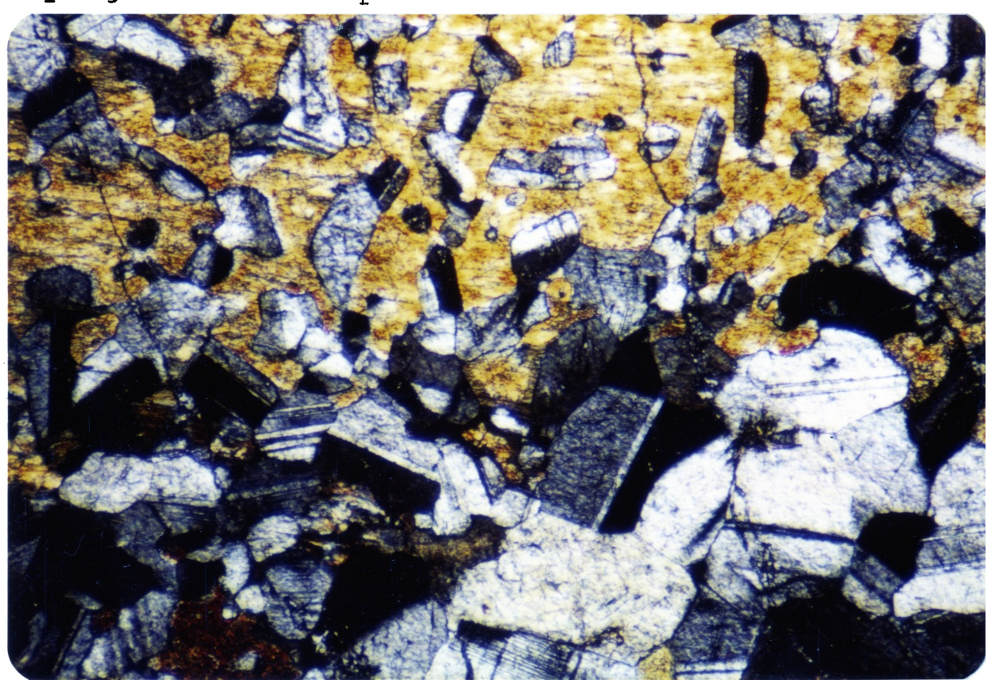
Figure 7MM - Photomicrograph of isotropic gabbro with weak planar alignment of tabular plagioclase.



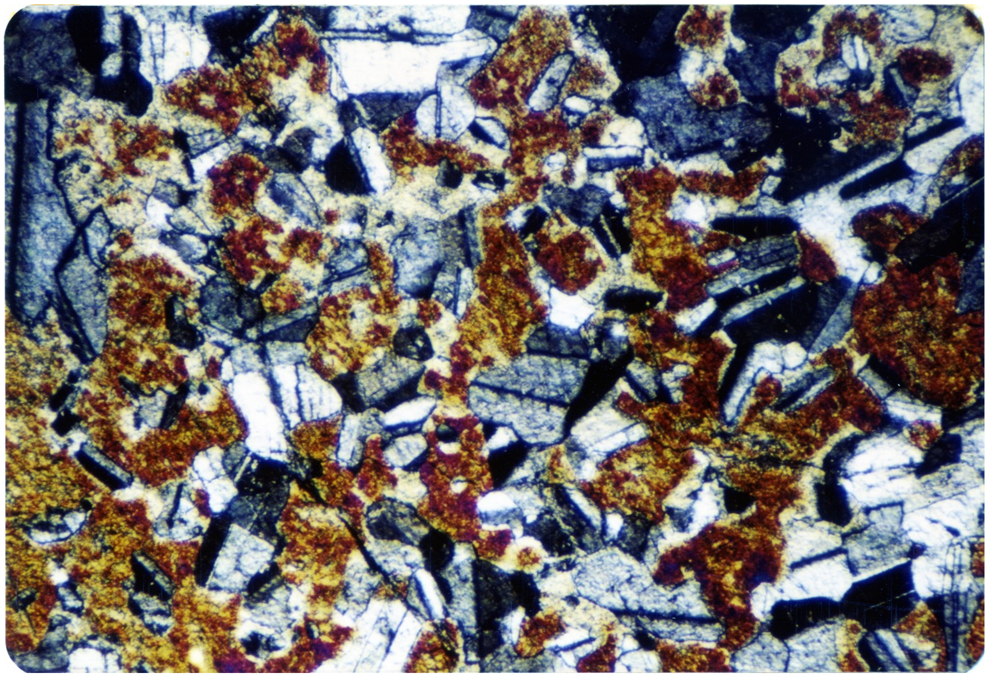
a) Photomicrograph shows overall character of rock which consists of thinly interlayered poikolitic gabbro heteradcumulate (upper and lower parts of the photograph) and monomineralic anorthosite adcumulate (center). Note patchy distribution of clinopyroxene oikocrysts occluded by monomineralic plagioclase zones in gabbroic layers.



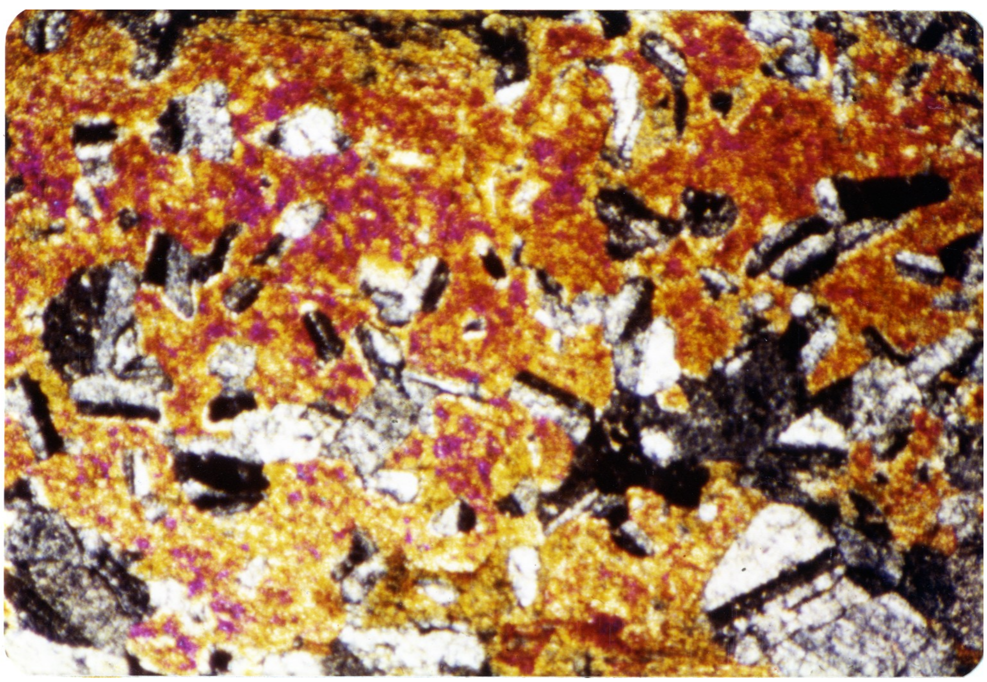
b) Photomicrograph of anorthosite adcumulate interval between clinopyroxene oikocrysts showing mutual interference of relatively large unzoned plagioclase grains without an accompanying mesostasis phase.



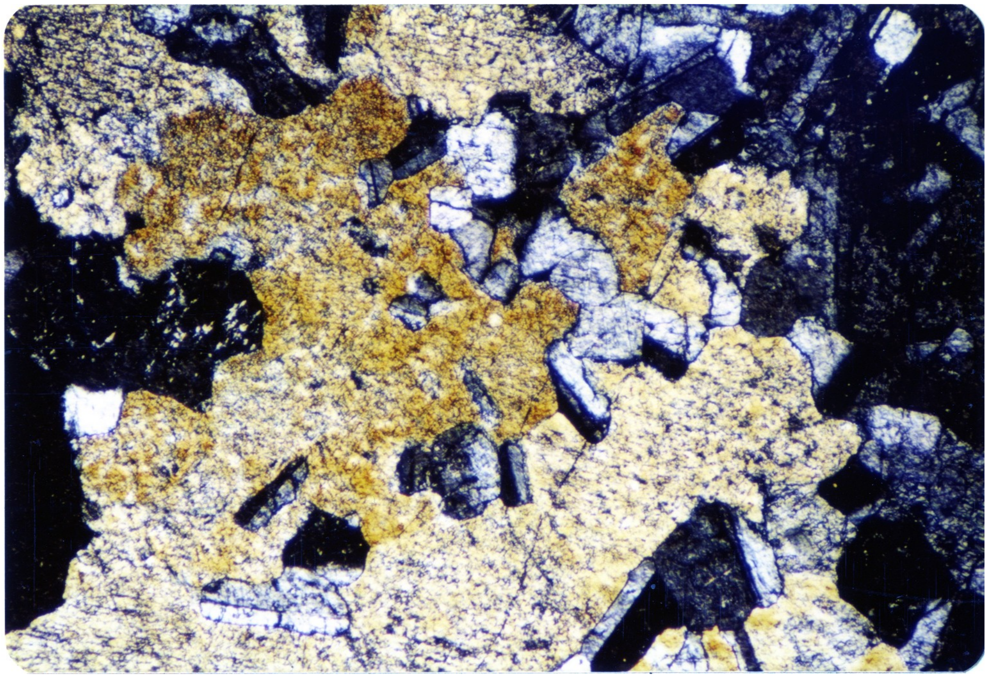
c) Photomicrograph showing boundary between a single occluded clinopyroxene oikocryst and monomineralic plagioclase adcumulate with obvious drastic reduction in the average diameter of plagioclase grains as the oikocryst is entered. Optically continuous pyroxene locally extends to small interstitial regions with the dominantly coarse grained plagioclase-rich portion of the rock indicating that the clinopyroxene crystallized _in situ_.



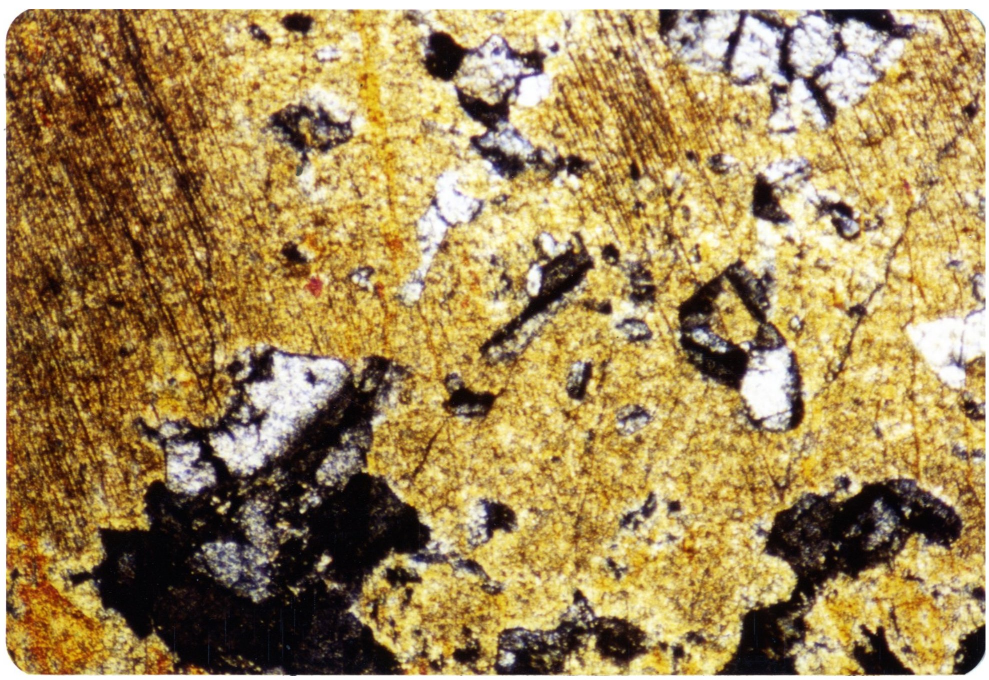
d) Example of a single clinopyroxene oikocryst in which the included plagioclase approximates a self-supporting matrix with abundant grain-grain contacts; note, however, that plagioclase grains appear clustered.



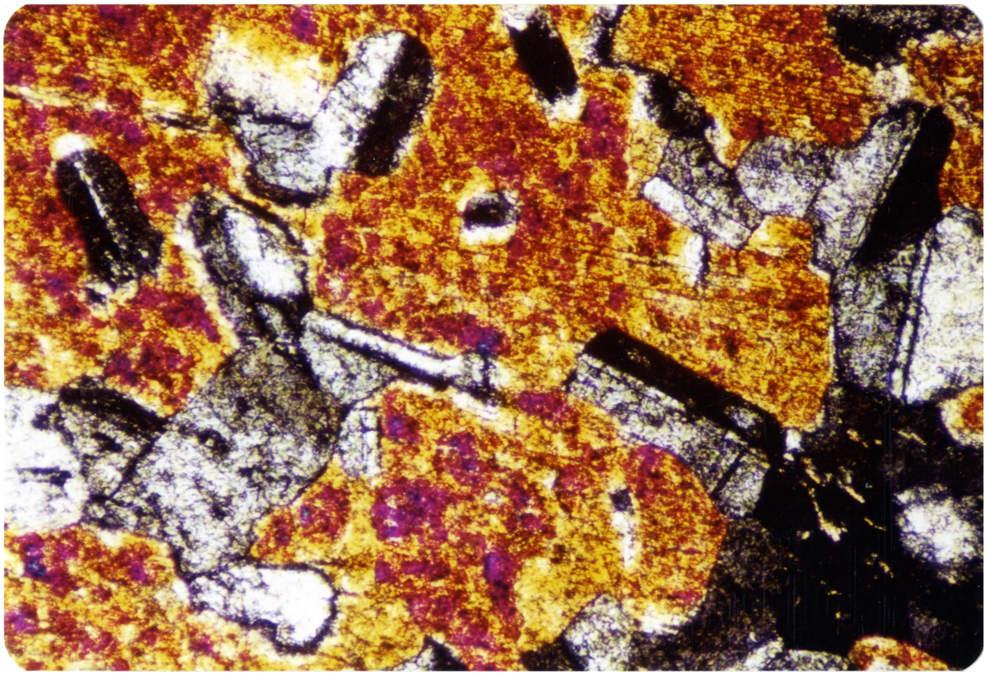
e) Example of a single clinopyroxene oikocryst in which included plagioclase grains or clusters 'float' in the pyroxene and do not appear to be a self-supporting framework of crystals.



f) Example of a single oikocryst relatively free of plagioclase grains. Plagioclase could not have formed a self-supporting framework of cumulus crystals before growth of clinopyroxene oikocryst. Included plagioclase occurs, for the most part, as clusters of several grains or in pairs and triplets.



g) Clinopyroxene oikocryst relatively free of included plagioclase. Abundant small nuclei of plagioclase are non-systematically distributed with respect to larger plagioclase grains or aggregates within the oikocryst and many grains have cuspate anhedral shapes which may indicate retarded nucleation and rapid growth of clinopyroxene coincident with rapid nucleation and retarded growth of plagioclase.



h) Clinopyroxene oikocryst including plagioclase clusters with some subhedral to euhedral plagioclase laths as well as plagioclase with anhedral shapes probably indicating that local mutual growth of clinopyroxene and plagioclase as opposed to resorbtion (Jackson, 1971) of plagioclase is responsible for mutually interferring boundaries and the relatively small size of included grains.

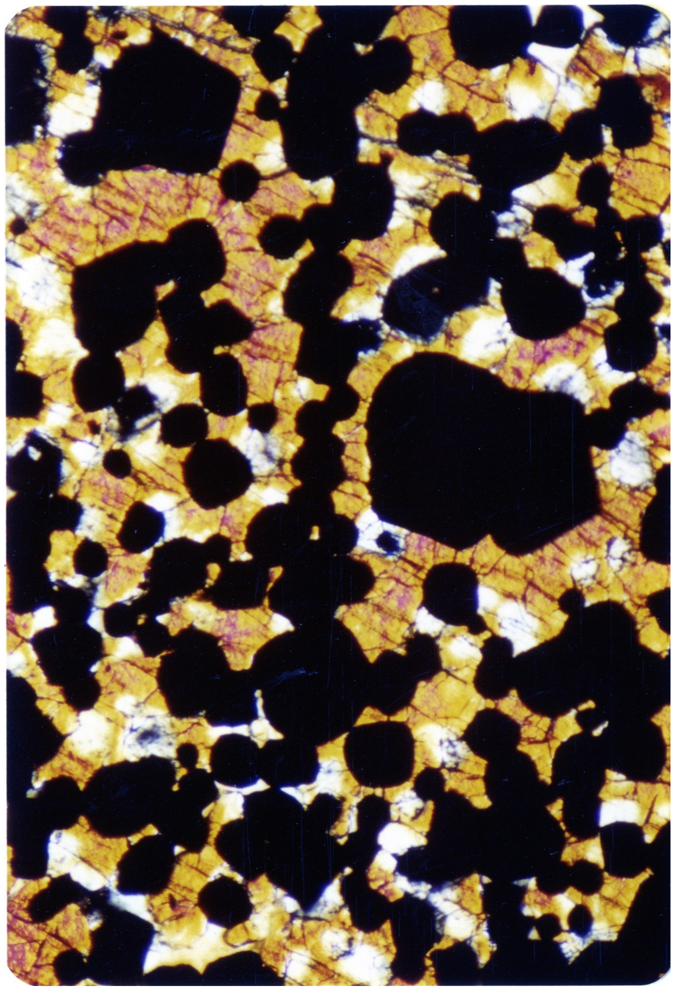
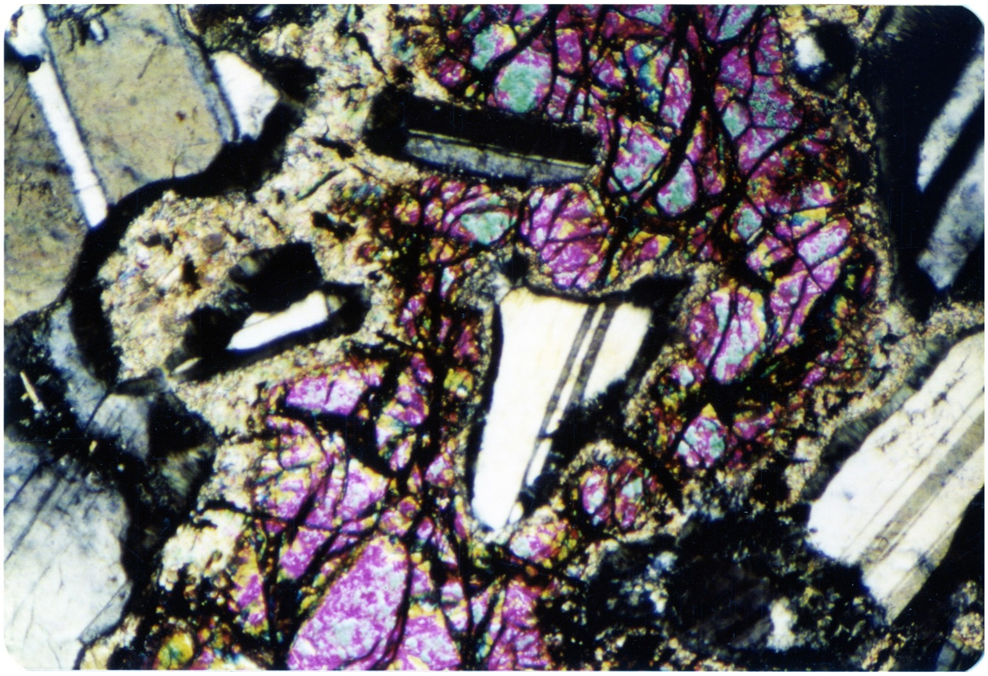


Figure 700 - Photomicrograph of chromite 'heteradcumulate' showing well-developed chromite chain texture. Chromite grains occur in long single chains or intersecting chains and clusters within an optically continuous pyroxene oikocryst. Texture is possibly the result of heterogeneous self-nucleation of chromite on pre-existing chromite grains.

a)



<u>Figure 7PP</u> - a) Photomicrograph of a dominantly plagioclase-pyroxene adcumulate with strong preferred dimensional orientation of prismatic clinopyroxene and rectagnular plagioclase grains. A rare olivine oikocrysts occurs at the top of the photograph as a mesostasis phase that includes plagioclase grains having a much smaller average diameter compared with the remainder of the rock which lacks mesostasis phases. b) Portion of the olivine oikocryst (partially altered) with relatively small plagioclase inclusions (see discussion in text).

b)

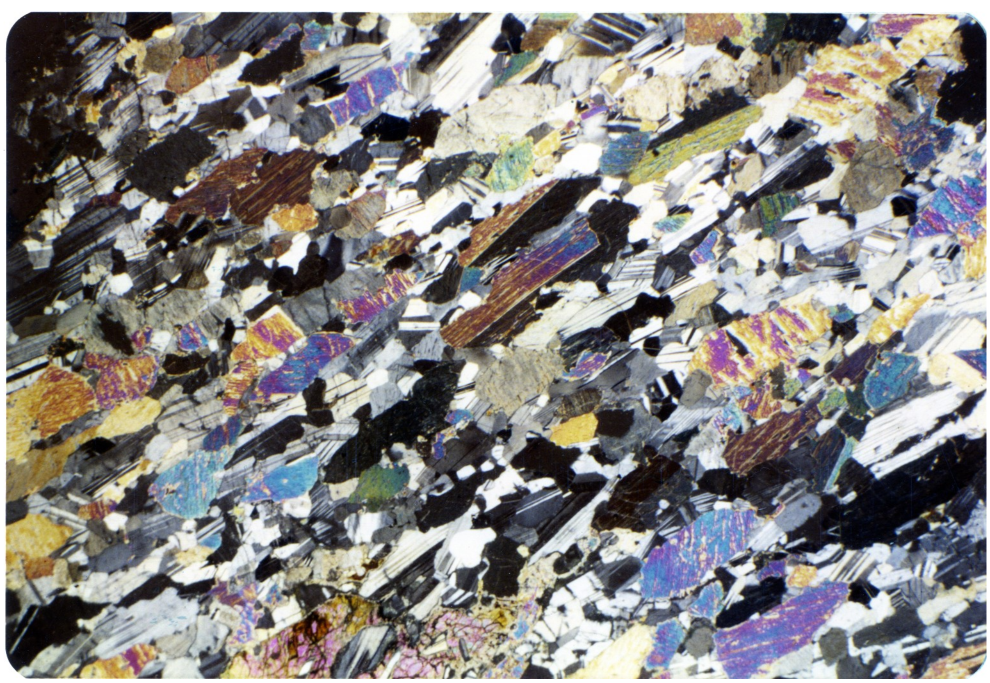


Figure 7RR - Thin sub-vertical dikelet cutting obliquely across gabbroic layering of the transition zone. Dikelet contains laterally discontinuous, fine scale igneous layering of gabbro, clinopyroxenite and anorthosite symmetrically developed parallel to the margins of the dikelet (see discussion in text).