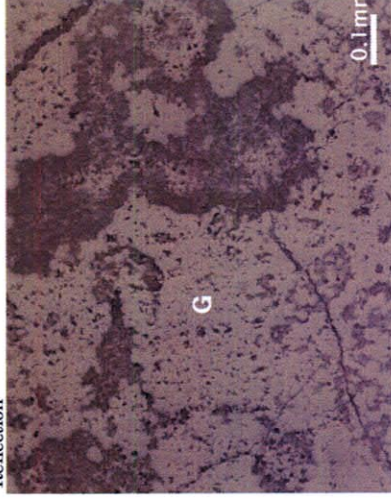
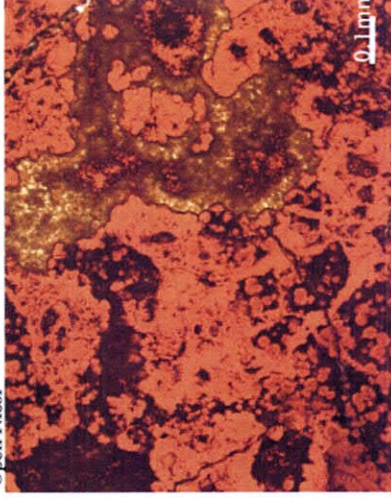


Ser. No.	09			
Sample No.	05SMC12AD16 PS05			
Rock (ore) Name	: Strongly altered rock			
Hand Specimen	Black massive limonite / goethite. Massive and it dose not show any particular texture. Pores of 1 to 2mm across are scattered and milky white calcite is rarely found filling pores of less than 1mm across. It has smooth surface and it does not attach to hand.			
Reflection Microscope Texture	: massive to oolitic			
Ore Minerals	goethite			
Mineral	Shape	Grain Size	Abundance	Descriptions
Goethite	massive to oolitic	—	85 %	
Gangue Mineral				
Polarization Microscope Clastics				
Mineral	Shape	Grain Size	Abundance	Descriptions
Matrix				
Mineral	Shape	Grain Size	Abundance	Descriptions
Alteration				
Secondary Minerals:	Quartz mosaic of 0.01 to 0.1mm across occurs filling pores of goethite. Some of the quartz fills fracture, showing vein appearance..			
Mineral	Shape	Grain Size	Abundance	Descriptions
Quartz	fragment	0.01 ~ 0.1 mm	7 %	Some of quartz fill fractures, showing vein appearance.

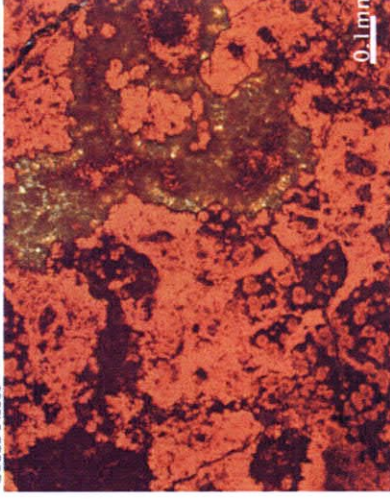
Reflection



Open Nicol

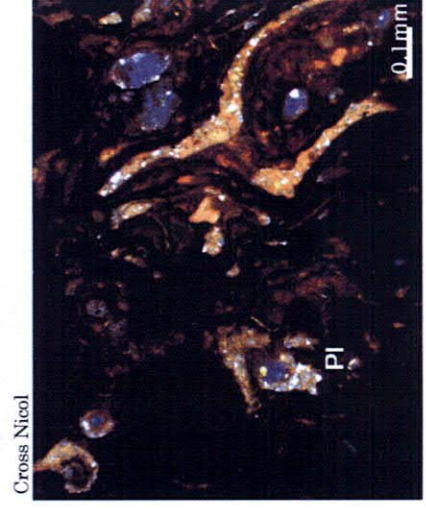
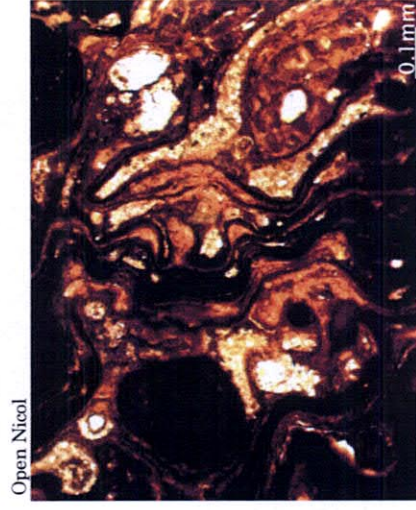
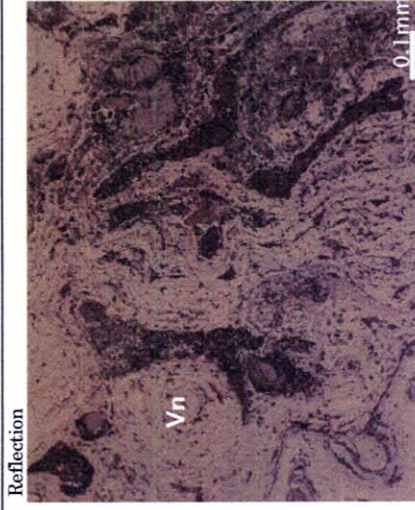


Cross Nicol

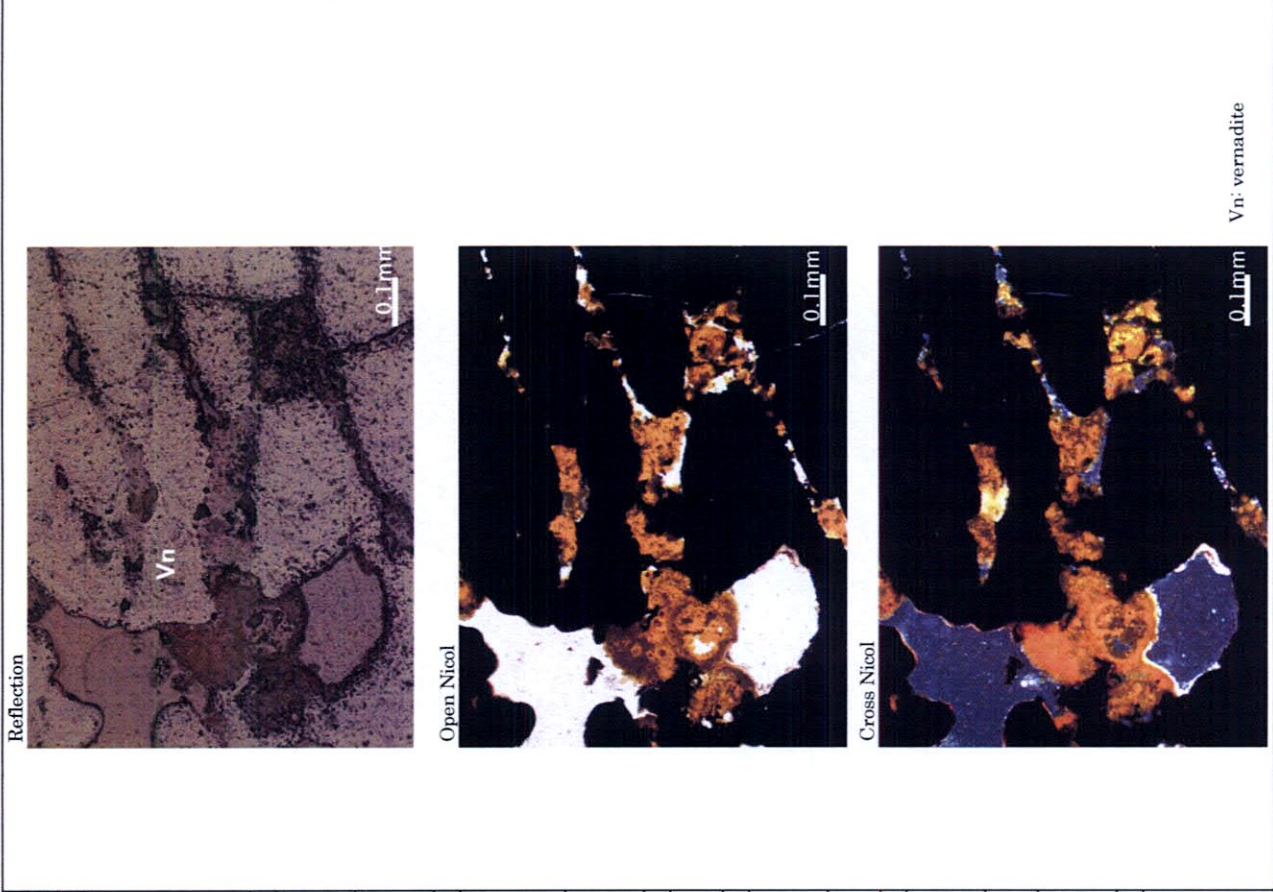


G: Goethite

Ser. No.	10			
Sample No.	05SMC12AD29 PS01			
Rock (ore) Name	: Manganese Crust			
Hand Speciment	3 X 3cm platy fragments of manganese crust. It is black and massive with botryoidal surface of 2 to 3mm across. In lower part, a layer with scattered distribution of pale brownish gray calcareous fillings of 1 to 2mm across occurs showing relatively sharp contact with upper part without calcareous fillings. In the upper part, abundant pores of less than 5mm across filled by limonite occur in the network band of 2 to 3 mm wide. It has relatively smooth surface and it does not attach to hand.			
Reflection Microscope				
Texture	: Spotted to colloform.			
Ore Minerals	manganese oxides (vernadite)			
Mineral	Shape	Grain Size	Abundance	Descriptions
Vernadite	Spotted to colloform	—	60 %	Broad peak at vernadite 2.4Å.
Gangue Mineral				
Polarization Microscope				
Clastics	Limestone with basalt fragments contact to manganese oxides. It includes basalt fragments and crushed grains of plagioclase.			
Mineral	Shape	Grain Size	Abundance	Descriptions
Quartz	fragments	0.01 ~ 0.05 mm	1 %	Volcanic origin
Plagioclase	fragments	0.01 ~ 0.2 mm	5 %	Volcanic origin
Limestone	shapless	~ 8 mm	20 %	Attached to Mn oxides with sharp contact
Volcanic rocks	Sub-angular to sub-round	0.2 ~ 2 mm	3 %	Included in limestone. Consists of rectangular plagioclase and cryptocrystalline groundmass.
Matrix				
Mineral	Shape	Grain Size	Abundance	Descriptions
Alteration				
Secondary Minerals				
Mineral	Shape	Grain Size	Abundance	Descriptions

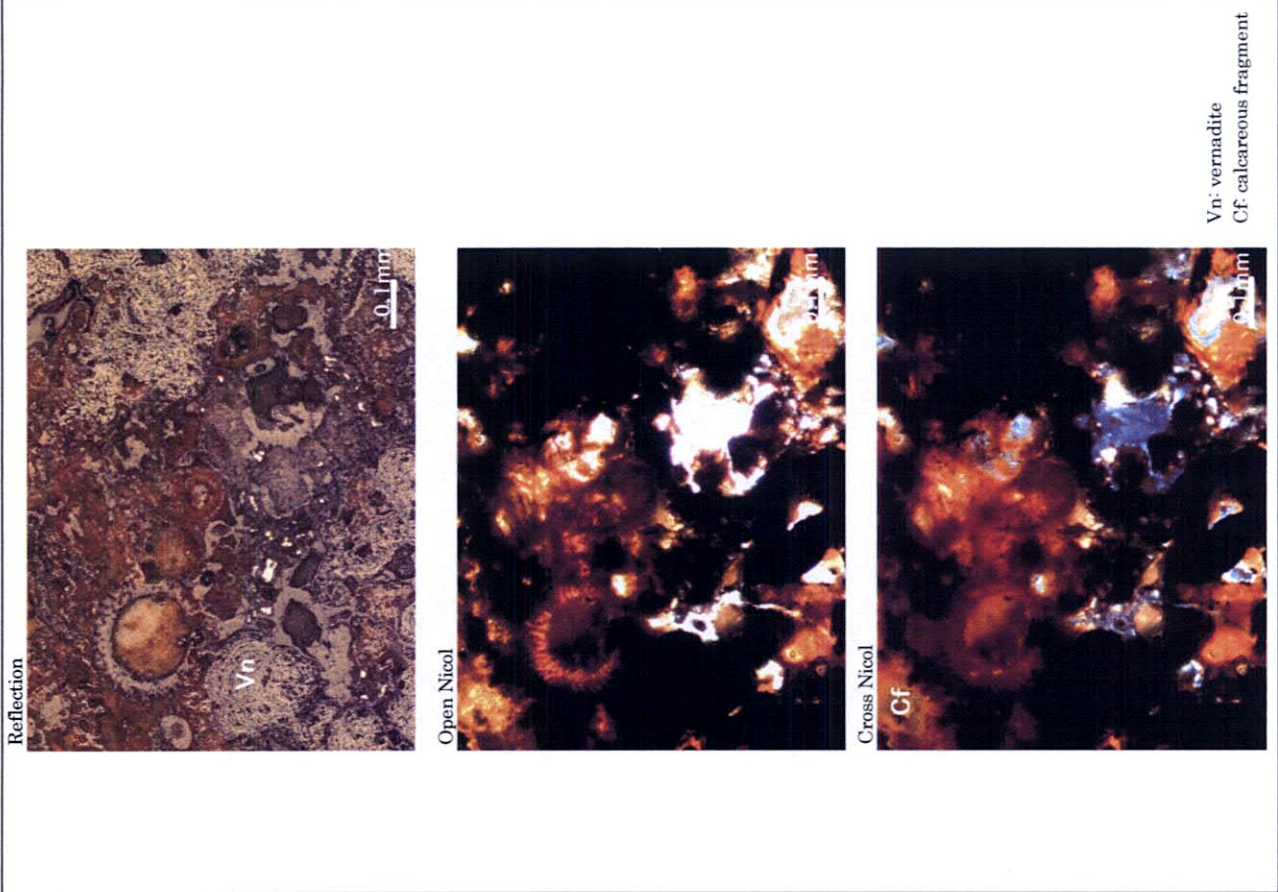


Vn: vernadite  
 Pl: plagioclase



Ser. No.	11			
Sample No.	05SMC12AD29 PS06			
Rock (ore) Name	Manganese Crust			
Hand Specimen	7cm long cross section of manganese oxides. It is black to pale brownish gray, and pores of 2 to 3mm across are irregularly distributed. Limonite is attached in some of the pores. In upper layer from the surface to 5cm, pores of less than 5mm across are filled by calcareous fillings (fragments of carbonate rock?). The surface is slightly granular, it attaches to hand.			
Reflection Microscope				
Texture	massive to colloform abundant pores.			
Ore Minerals				
Manganese oxides (vernadite)				
Mineral	Shape	Grain Size	Abundance	Descriptions
Vernadite	massive to colloform	—	55 %	Broad peak at vernadite 2.4 Å.
Gangue Mineral				
Polarization Microscope				
Clastics	Fragments of quartz and plagioclase of volcanic origin and basalt occur in interstices of Mn oxides.			
Mineral	Shape	Grain Size	Abundance	Descriptions
Quartz	fragment	0.01 ~ 0.02 mm	<1 %	volcanic origin
Plagioclase	fragment	0.01 ~ 0.2 mm	5 %	volcanic origin
Volcanic rock	sub-round	~ 0.4 mm	<1 %	Plagioclase phenocrysts of 0.02mm across occur.
Matrix				
Mineral	Shape	Grain Size	Abundance	Descriptions
Alteration				
Secondary Minerals				
Mineral	Shape	Grain Size	Abundance	Descriptions

Vn: vernadite



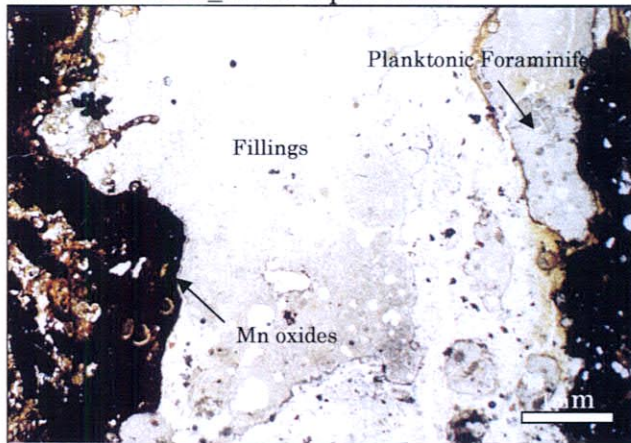
Vn: vernadite  
Cf: calcareous fragment

Ser. No.	12			
Sample No.	05SMC12AD29 PS07			
Rock (ore) Name	: Manganese Crust			
Hand Specimen	7cm long cross section of manganese oxides. It is black to pale brownish gray, and pores of 2 to 3mm across are irregularly distributed. Limonite is attached in some of the pores. In upper layer from the surface to 5cm, pores of less than 5mm across are filled by calcareous fillings (fragments of carbonate rock?). The surface is slightly granular, it attaches to hand.			
Reflection Microscope				
Texture	: Colloform Partly shows shapless and pores are common.			
Ore Minerals	Manganese oxides (vernadite)			
Mineral	Shape	Grain Size	Abundance	Descriptions
Vernadite	Colloform	—	65 %	Broad peak at vernadite 2.4Å.
Gangue Mineral				
Polarization Microscope				
Clastics :	Crushed quartz and plagioclase of volcanic origin and limestone fragments occur in interstices of Mn oxides.			
Mineral	Shape	Grain Size	Abundance	Descriptions
Quartz	fragments	0.02 ~ 0.06 mm	1 %	volcanic origin
Plagioclase	fragments	0.02 ~ 0.08 mm	3 %	volcanic origin
Limestone	shapless	—	20 %	Foraminifera of 0.2mm across occurs.
Matrix				
Fe-K-Al Silicates				
Mineral	Shape	Grain Size	Abundance	Descriptions
Fe-K-Al Silicates	cryptocrystalline to amorphous	—	5 %	Coexists with Mn oxides in some of the fractures.
Alteration				
Secondary Minerals				
Mineral	Shape	Grain Size	Abundance	Descriptions

**Plate V Carbonate Rocks**

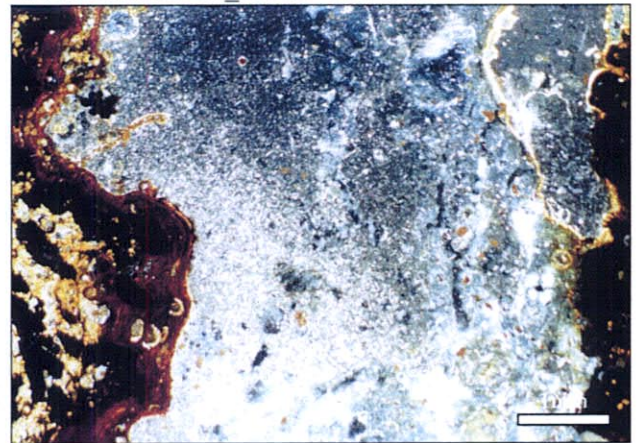
— **Micrographs** —

05SMC12AD15\_FR01: Open Nicol

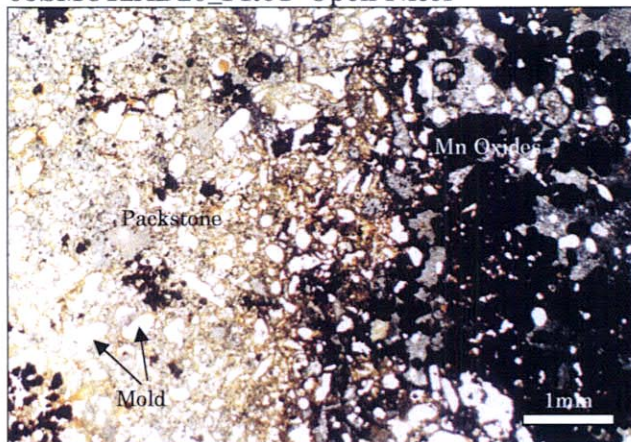


Fillings of Sediments

05SMC12AD15\_FR01: Cross Nicol

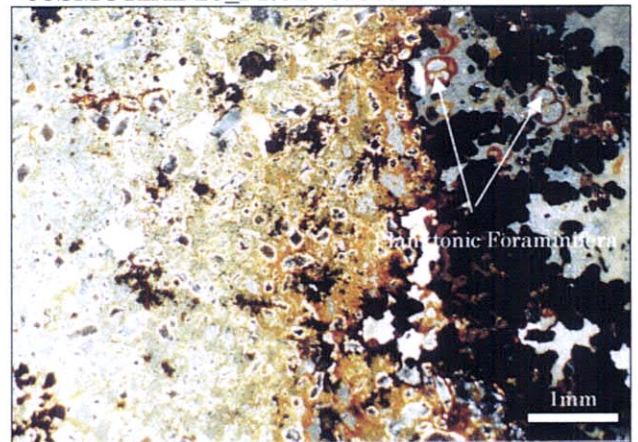


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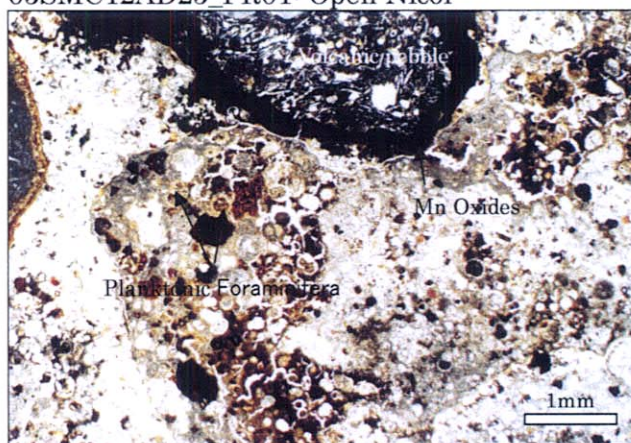


Porous bioclastic packstone and Mn oxides of the boundary

05SMC12AD20\_FR01: Cross Nicol

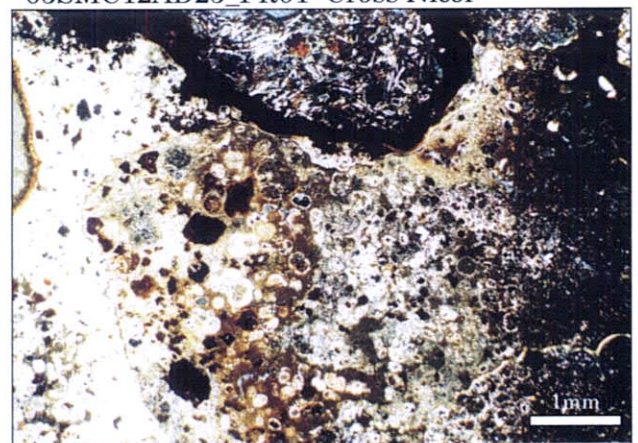


05SMC12AD25\_FR01: Open Nicol

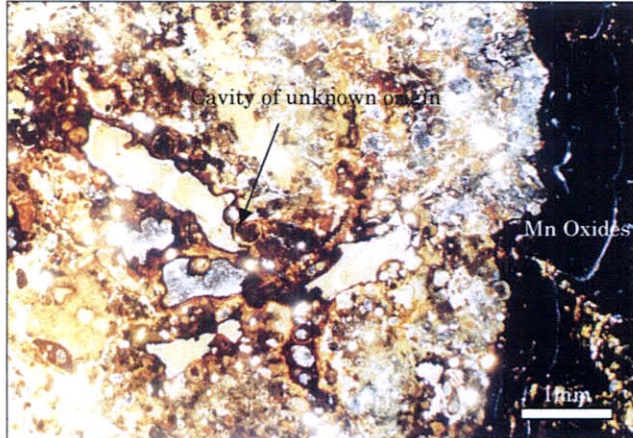


Pebbles of volcanic rock and bioturbation

05SMC12AD25\_FR01: Cross Nicol

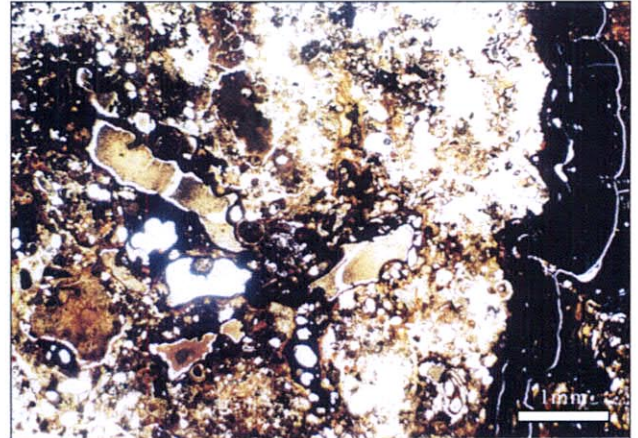


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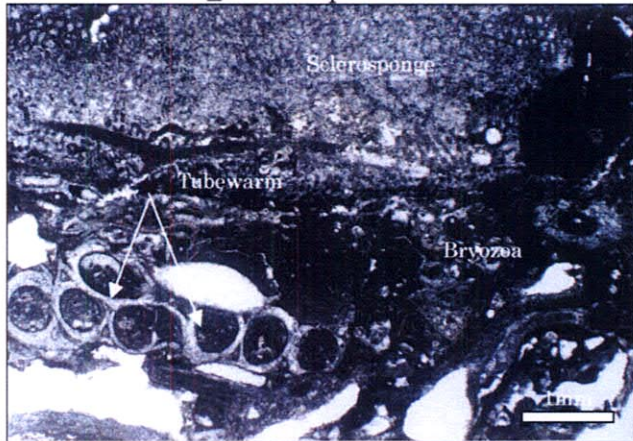


Cavity of unknown origin

05SMC12AD29\_FR01: Cross Nicol

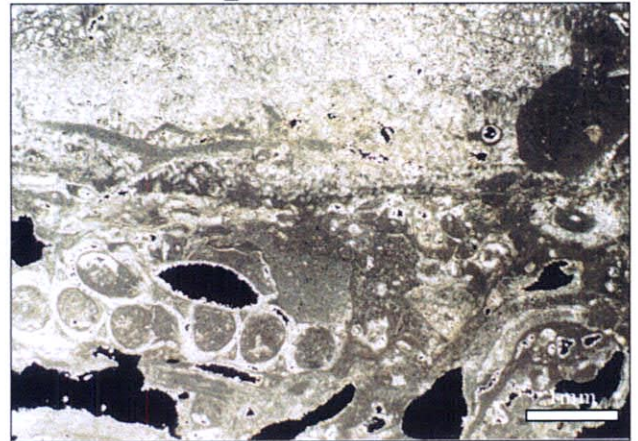


05SMC12AD29\_FR02: Open Nicol

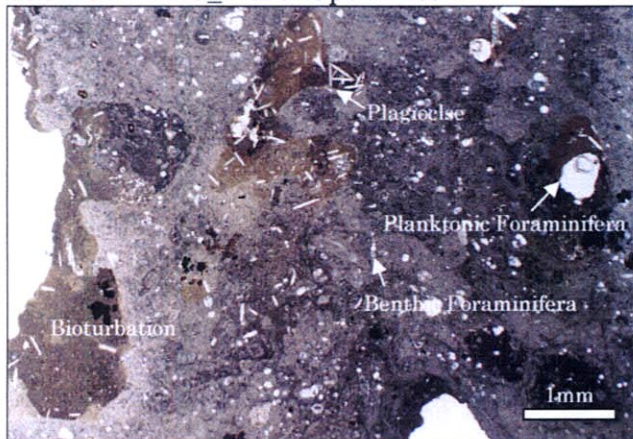


Sclerosponge and other organisms

05SMC12AD29\_FR02: Cross Nicol

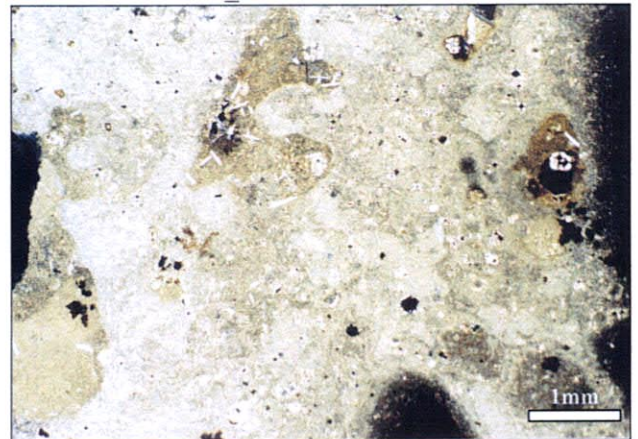


05SMC12AD29\_FR03: Open Nicol

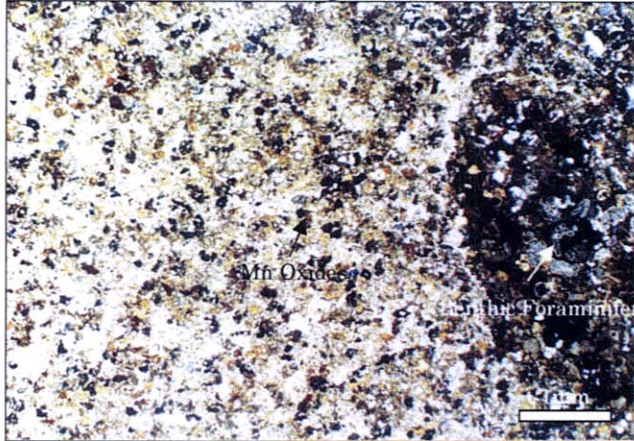


Foraminiferal pack/wackestone

05SMC12AD29\_FR03: Cross Nicol

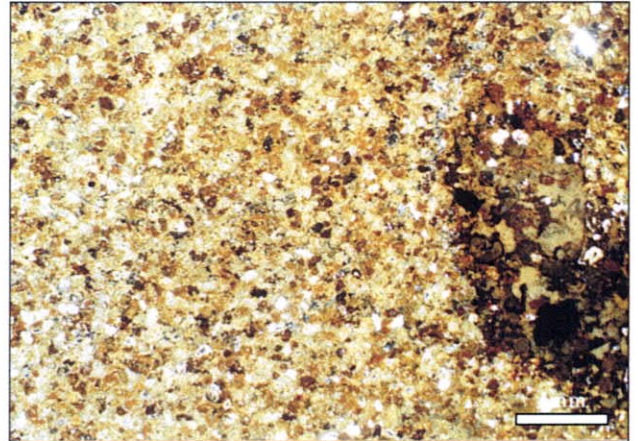


05SMC13AD15\_FR01: Open Nicol

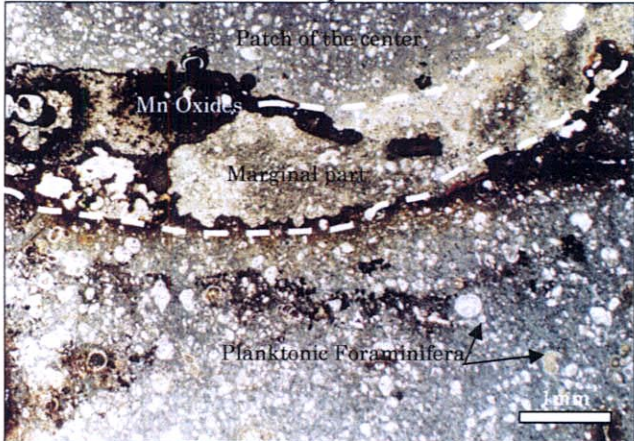


細粒砂岩

05SMC13AD15\_FR01: Cross Nicol



05SMC13AD15\_FR02: Open Nicol



Large patch of the center

05SMC13AD15\_FR02: Cross Nicol

