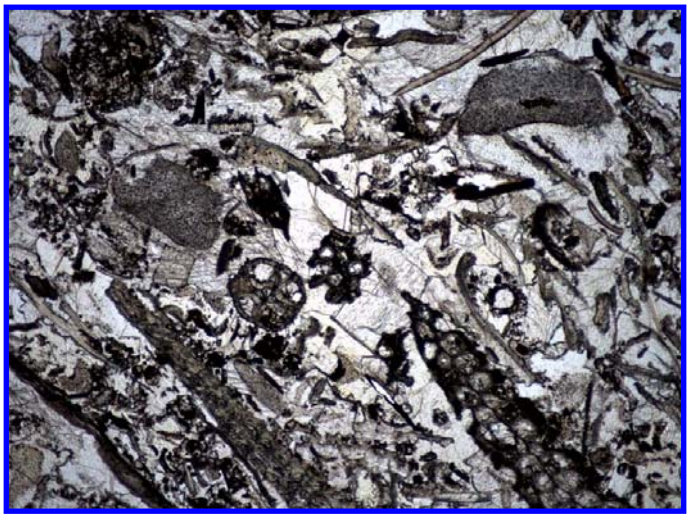
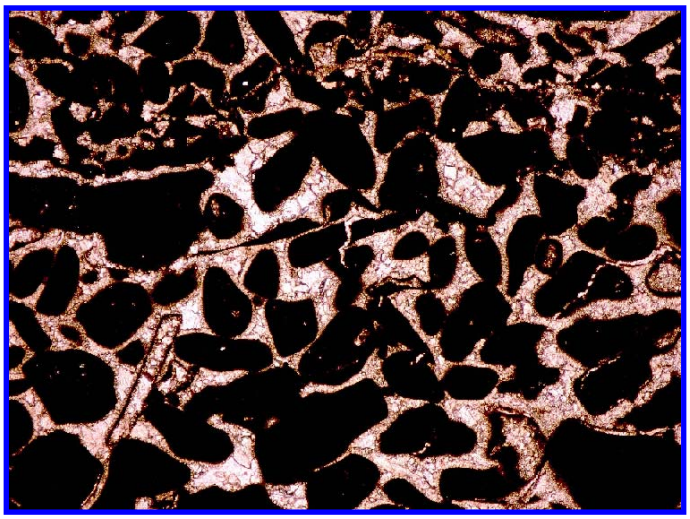
Cementation

Equant Calcite Spar



Equant Spar, Example #1
Pennsylvania, Mercer County, McKnight Well

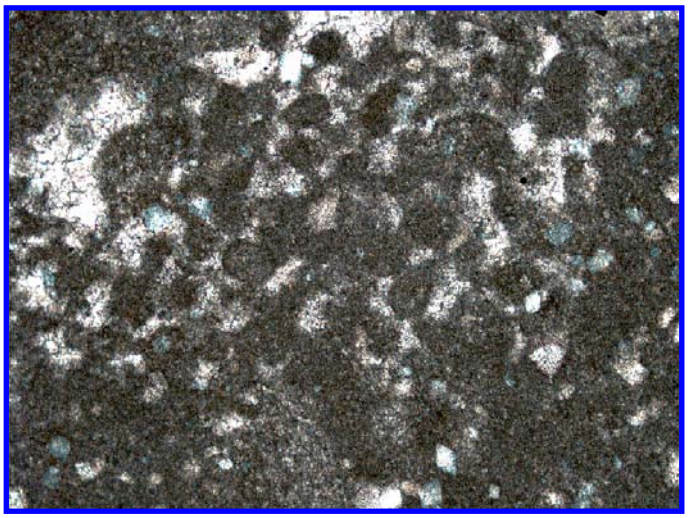
The cement crystals filling the pore space of this skeletal grainstone are very “clean” and equal in size.



Equant Cement, Example #2
West Virginia, Wood County, Black River Formation, 9951 ft

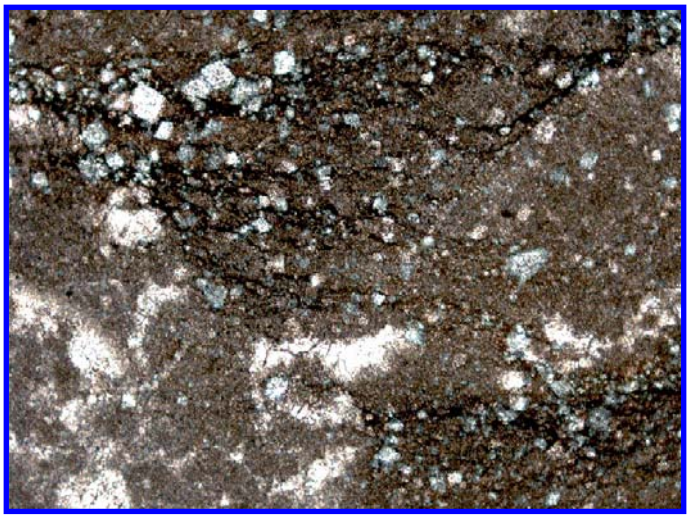
In this intraclastic grainstone from the Black River Formation in West Virginia the primary pore-filling cement is equant spar. Close observation of this thin section reveals two generations of cement an early prismatic fringe around the intraclasts and the later equant spar cement.

Peloidal Cement



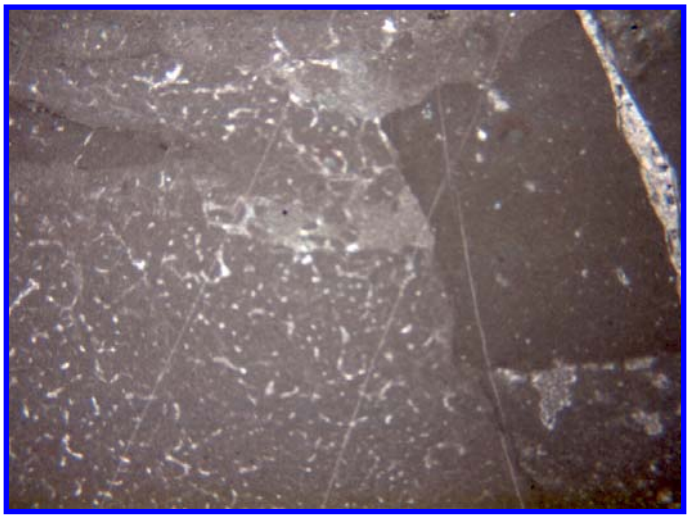
Peloidal Cement, Example #1
West Virginia, Wood County, Black River Formation, 10018 ft

This is a typical example of a peloidal cement in the Black River Formation in West Virginia. Notice that the neospar is not evenly distributed throughout the section, but the peloidal or clotted texture is evident throughout.



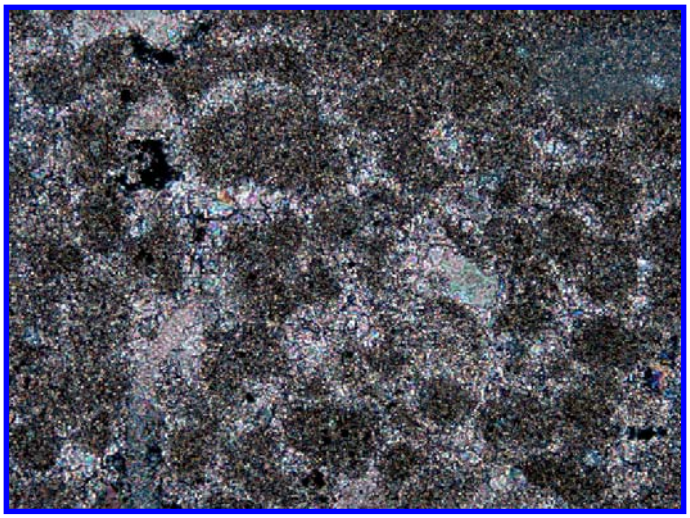
Peloidal Cement, Example #2
West Virginia, Wood County,
Black River Formation, 10034 ft

In this section the most distinct peloidal texture is evident in the lower left corner of the slide. In addition to the peloidal cement there are also wavy argillaceous laminations with associated dolomite crystals.



Peloidal Cement, Example #3
Pennsylvania, Union Furnace outcrop

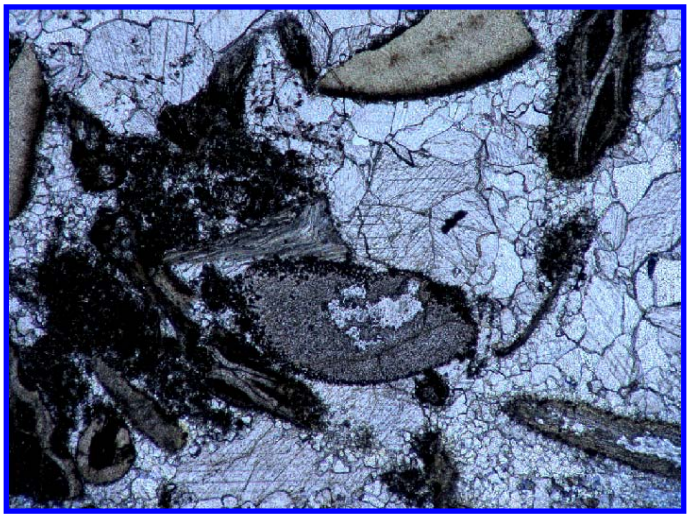
The clotted texture of this mudstone shows the partial development of peloidal cement. Notice the somewhat rounded grains with sparry material in between. Further neomorphism will result in textures similar to those observed in the other peloidal cement slides.



Peloidal Cement, Example #4
West Virginia, Wood County,
Black River Formation, 10054 ft

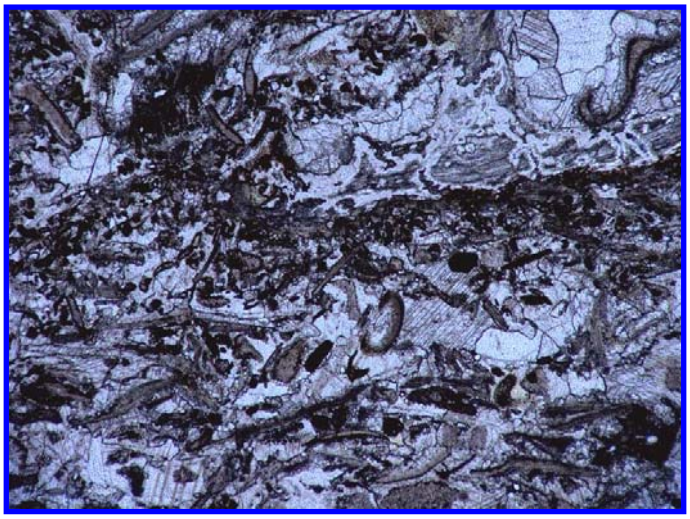
This peloidal cement was photographed under crossed polars. Notice the fuzzy grain boundaries between the peloids and the neospar

Drusy Spar



Drusy Spar, Example #1
West Virginia, Wood County,
Trenton Formation, 8495 ft

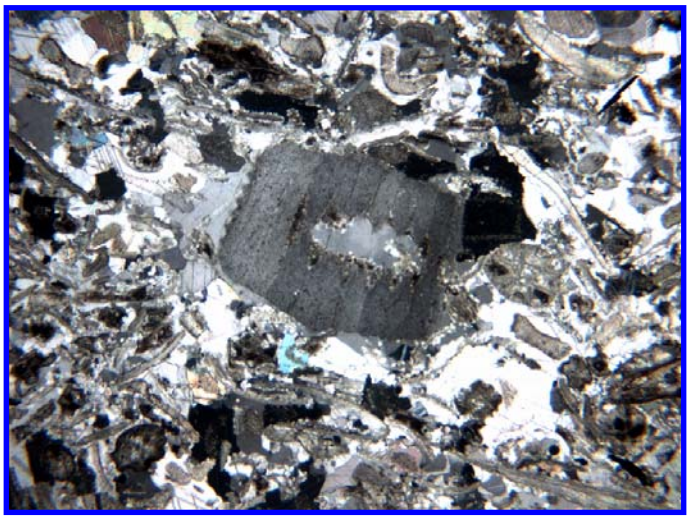
Notice the different crystal sizes in this drusy calcite spar cement. The smallest crystals occur close to grain boundaries and larger crystals are more common toward the center of the pore.



Drusy Spar, Example #2
West Virginia, Wood County,
Trenton Formation, 8530 ft

The primary intergranular material in this photo is drusy calcite spar. This cement type is recognized by increasing calcite crystals size toward the central portion of the pore.

Poikilotopic Spar



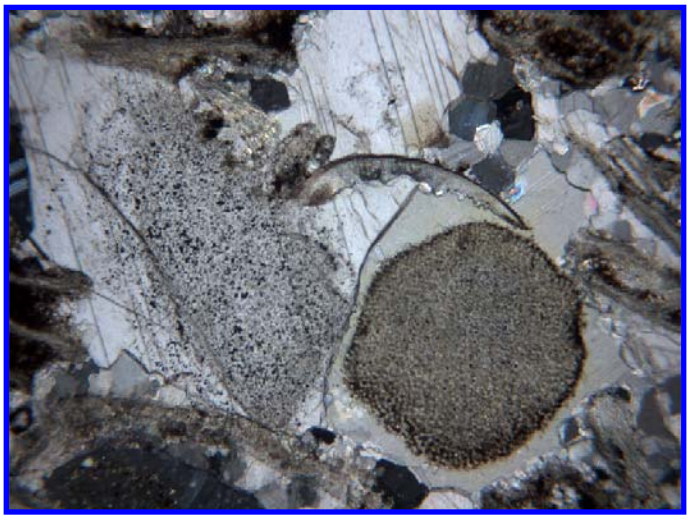
Poikilotopic Spar, Example #1
Pennsylvania

Poikilotopic textures are recognized in this crinoid rich grainstone. Notice the smaller echinoderm fragments that are encompassed by a single clean calcite crystal.

Poikilotopic Spar, Example #2
Pennsylvania

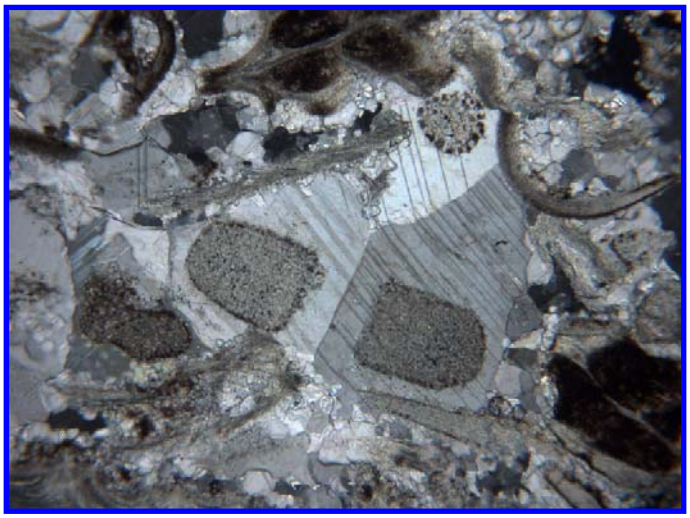
This skeletal grainstone is similar to above, also containing smaller grains encompassed by large calcite crystals.

Syntaxial Overgrowth



Syntaxial Overgrowth, Example #1
Pennsylvania

The syntaxial overgrowth on this crinoid grain is very clear in thin section. The calcite spar is very clear and clean.



Syntaxial Overgrowth, Example #2
Pennsylvania

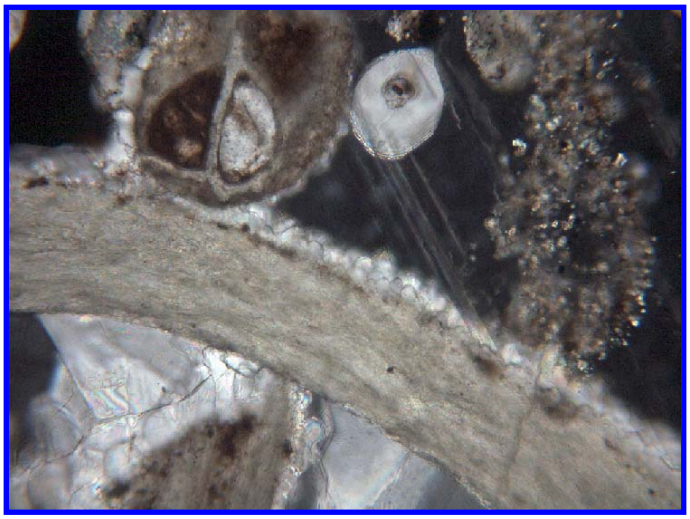
Two echinoderm fragments have large syntaxial overgrowths in this skeletal grainstone. Typical calcite cleavage patterns are very obvious on the overgrowths.

Prismatic fringe, Example #1
West Virginia, Wood County,
Trenton Formation, 9524 ft

Prismatic fringe cements are evident on both the large mollusk grain and the intraclast in this wackestone. The fine-grained material surrounding the fringe suggests that these cements were generated early in the diagenetic history of this rock.

Prismatic fringe, Example #2
West Virginia, Wood County,
Black River Formation, 9951 ft

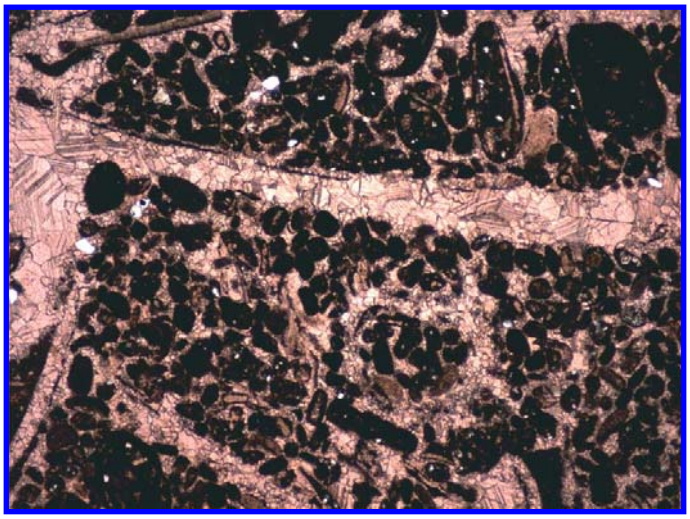
Fringe cements are very common on the edges of the peloidal intraclasts and skeletal grains present in this grainstone. These fringes have been followed by another generation of coarser pore filling calcite spar.



Prismatic fringe, Example #3
Pennsylvania

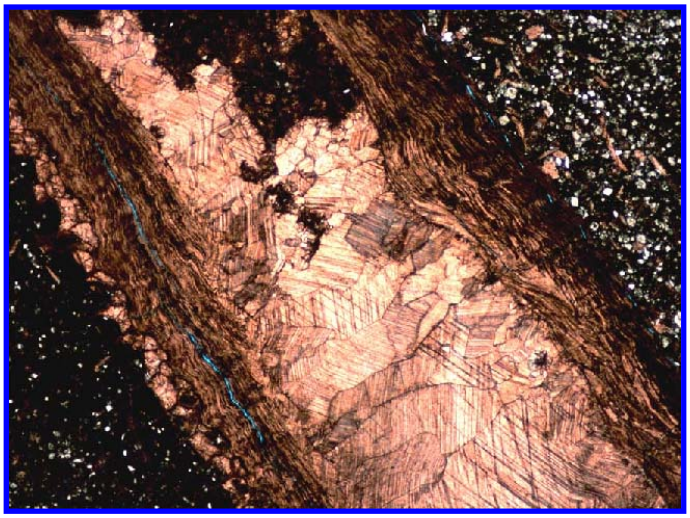
Prismatic fringe cement is very evident on this brachiopod grain under high magnification. Notice there is a second generation of coarse calcite spar filling the pores after the generation of the prismatic fringe.

Intragranular Spar



Intragranular Spar, Example #1
Pennsylvania
Trenton Formation

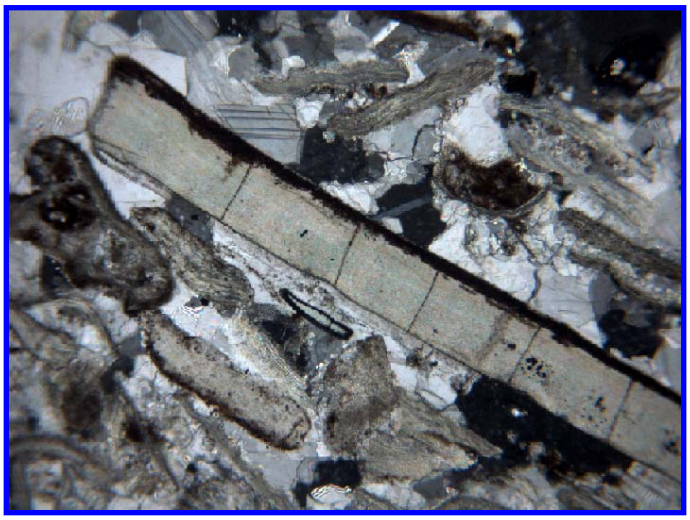
The central portion of this peloidal grainstone contains coarse calcite spar. The shape of the spar suggests that a skeletal grain, most likely a mollusk, was dissolved and replaced with coarser intragranular calcite. Notice the intergranular cement in this rock is much finer.



Intragranular Spar, Example #2
Pennsylvania
Trenton Formation

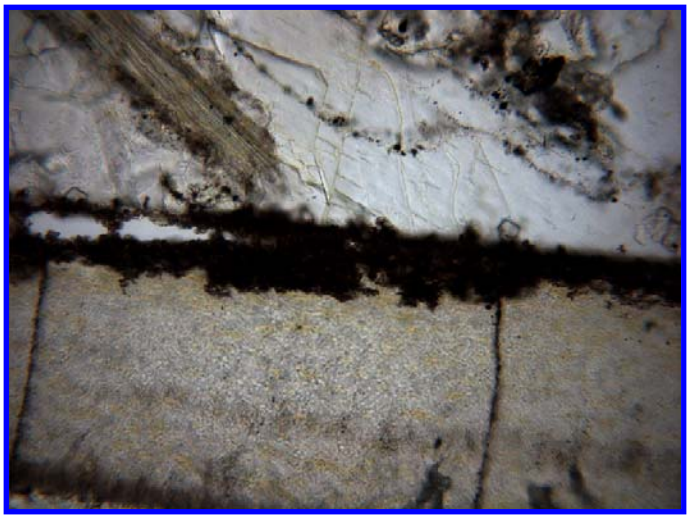
The microstructure of this large mollusk grain has been preserved on the outer edges of the grain, but the internal portion of the grain has been replaced with coarse calcite spar.

Micritization



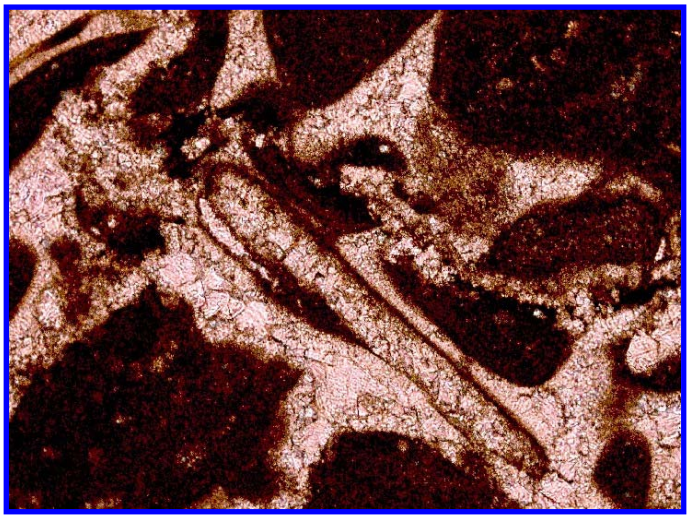
Micritization, Example #1
Pennsylvania
Trenton Formation

The upper edge of this brachiopod has been extensively micritized. The dark color results from the filling of these microscopic bores with micrite-sized cement.



Micritization, Example #2
Pennsylvania
Trenton Formation

This is the same micritized brachiopod as shown above, but the photo was taken at higher magnification. Note the individual bores visible in the micritized grain.



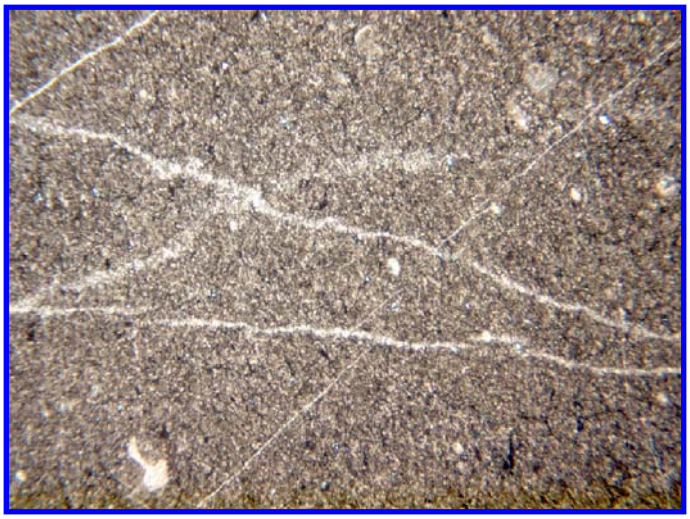
Micritization, Example #3
West Virginia, Wood County
Black River Formation, 9951 ft

A micritic envelope is the only thing that remains of the elongate skeletal grain present in the center of this thin section. The original microstructure of the grain has been obliterated by diagenesis, but the micritic envelope maintains the original shape of the skeletal grain.

Micritization, Example #4
West Virginia, Wood County
Black River Formation, 9655 ft

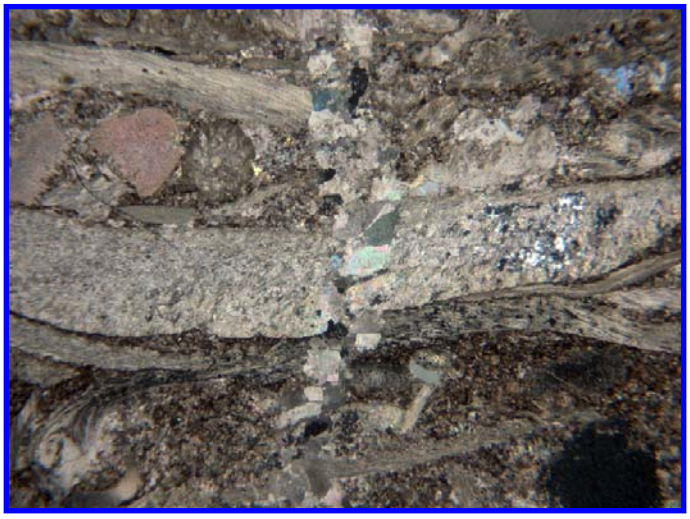
Micritization is clearly visible on the large mollusk grain in this thin section. Notice the individual borings that have been filled with micrite.

Fractures



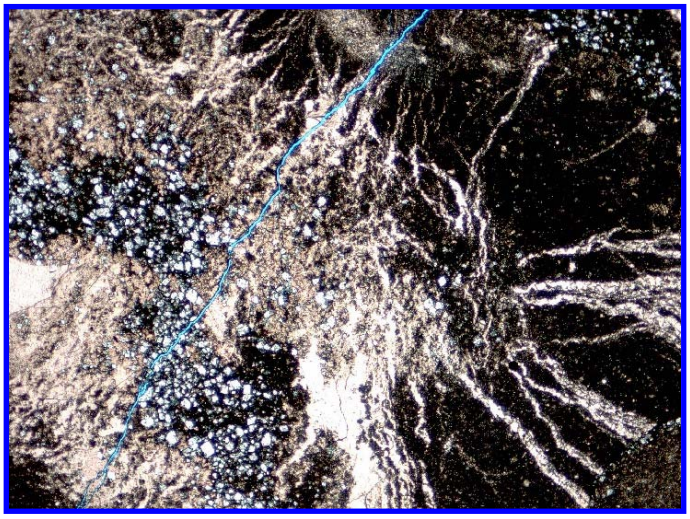
Fractures, Example #1
Pennsylvania, Union Furnace outcrop
Trenton Formation

There are several different fracture orientations in this wackestone. All of the fractures have been closed by calcite precipitation.



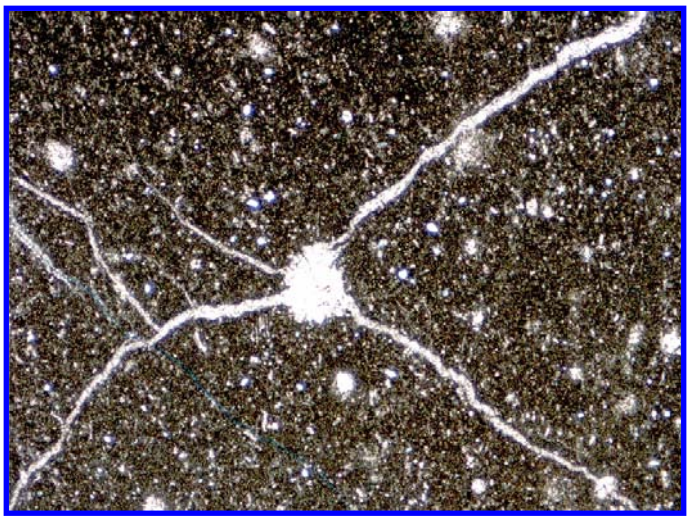
Fractures, Example #2
Pennsylvania, Union Furnace outcrop
Trenton Formation

There is one large fracture cutting across this slide vertically. There is slight offset of the large skeletal grains that the fracture cuts across. The fracture has been filled with sparry calcite.



Fractures, Example #3
West Virginia, Wood County
Black River Formation, 9880 ft

The majority of the fractures in this section are randomly oriented in a somewhat radial pattern. The radial fractures have been filled with sparry calcite. There is also a large open fracture cutting across the length of the slide.



Fractures, Example #4
West Virginia, Wood County
Black River Formation, 10162 ft

The fractures in this mudstone/wackestone radiate out from the center of the section. All of the fractures have been closed with calcite.

Fractures, Example #5
Pennsylvania, Union Furnace outcrop
Trenton Formation
Black River Formation, 9655 ft

There is a large open fracture in this skeletal packstone. There is some mineralization (white material) along the fracture, but not closing it.

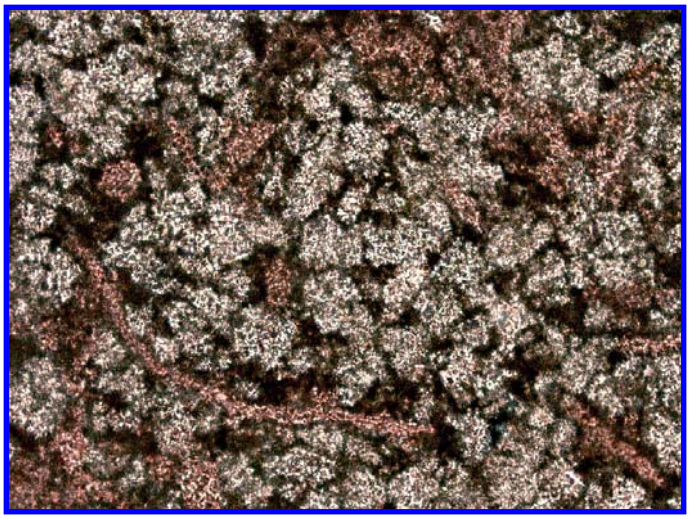
Neomorphism

Neomorphism, Example #1
West Virginia, Wood County
Trenton Formation, 9538 ft

There is only neospar evident in this thin section. The lack of skeletal grains suggests that this rock was completely comprised of micrite prior to neomorphism.

Neomorphism, Example #2
West Virginia, Wood County
Trenton Formation, 9593 ft

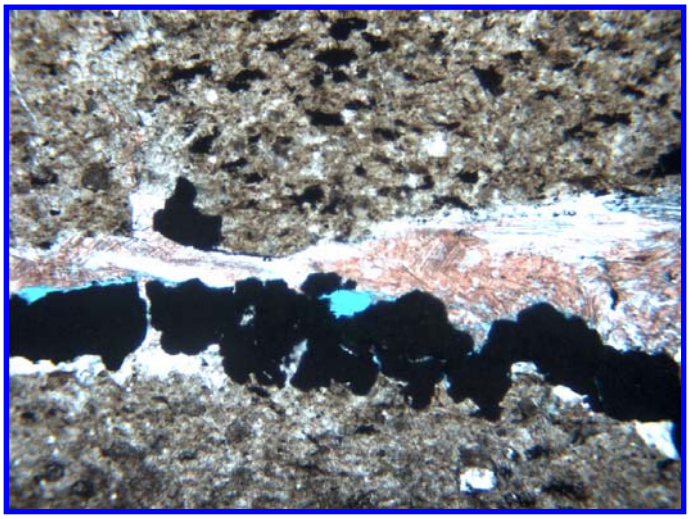
This thin section is also dominated by microspar, although there are some remnants of skeletal grains. The skeletal remnants suggest that the rock was originally a wackestone. There is some micrite preserved between the neospar grain contacts.



Neomorphism, Example #3
West Virginia, Wood County
Trenton Formation, 9795 ft

The neospar in this thin section is slightly coarser than that observed above. There are also more abundant skeletal remnants present.

Pyrite



Pyrite, Example #1
Pennsylvania, Union Furnace outcrop
Black River Formation

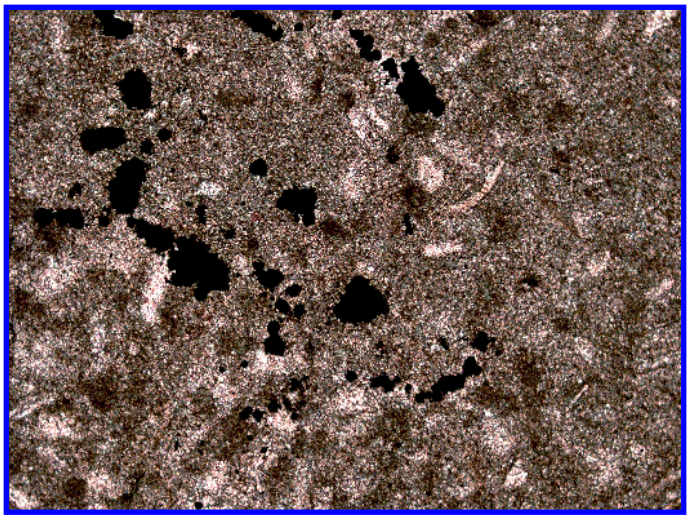
Pyrite is often concentrated along laminae or fractures such as in this photograph. Notice there is also calcite precipitating in the fracture.

Pyrite, Example #2
West Virginia, Wood County
Black River Formation, 9819 ft

In this photomicrograph of a mudstone/wackestone the pyrite appears to be filling a vug or replacing a skeletal grain. The central portion of the grain/vug is filled with sparry calcite.

Pyrite, Example #3
West Virginia, Wood County
Trenton Formation, 9560 ft

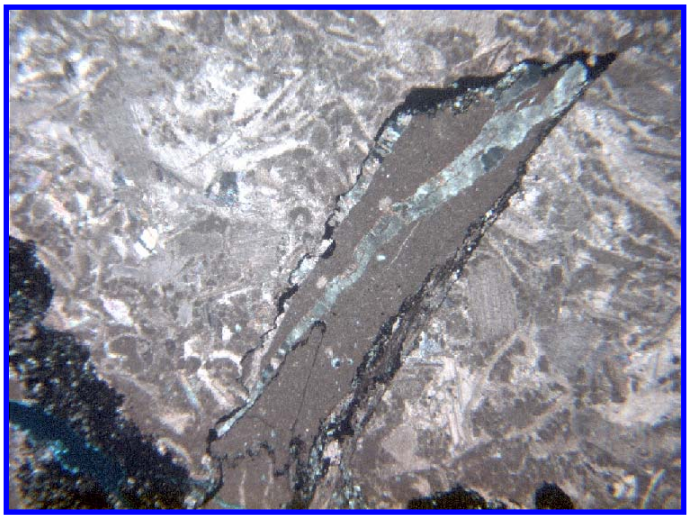
In addition matrix pyrite and void filling pyrite, skeletal grains may also be pyritized. In this thin section mollusks, crinoids, and bryozoans are partially pyritized.



Pyrite, Example #4
West Virginia, Wood County
Trenton Formation, 9560 ft

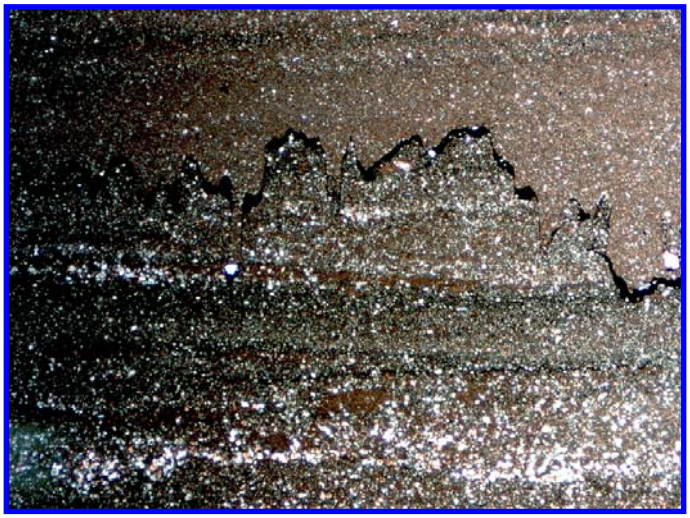
In this thin section pyritization is not grain selective, pyrite grains are disseminated throughout the rock matrix. This matrix pyritization is common in the Trenton and Black River rocks.

Compaction



Compaction, Example #1, Stylolite
Pennsylvania, Union Furnace Outcrop
Black River Formation

The stylolite in this photograph cuts into a skeletal packstone, but is filled with micrite-sized sediment. There is a large filled fracture in the muddy section underneath the stylolite. Insoluble residue is concentrated along the stylolite.

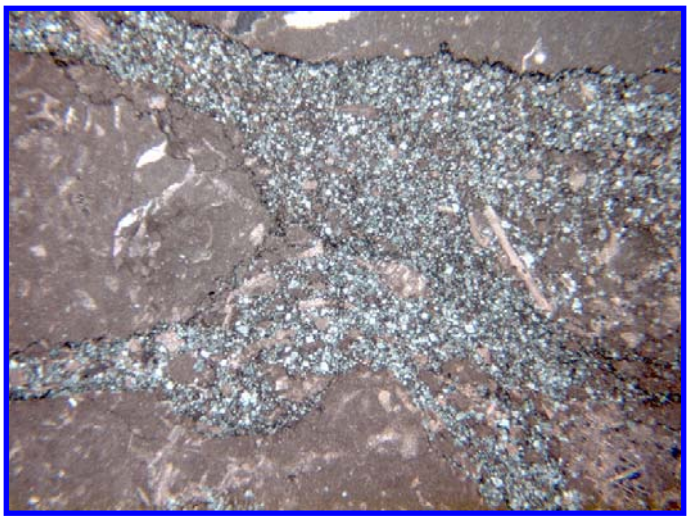


Compaction, Example #2, Stylolite
West Virginia, Wood County
Black River Formation, 10509 ft

Stylolites are common in this laminated mudstone of the Black River Formation. The stylolite is dark in color because of the insoluble residue concentrated along it.

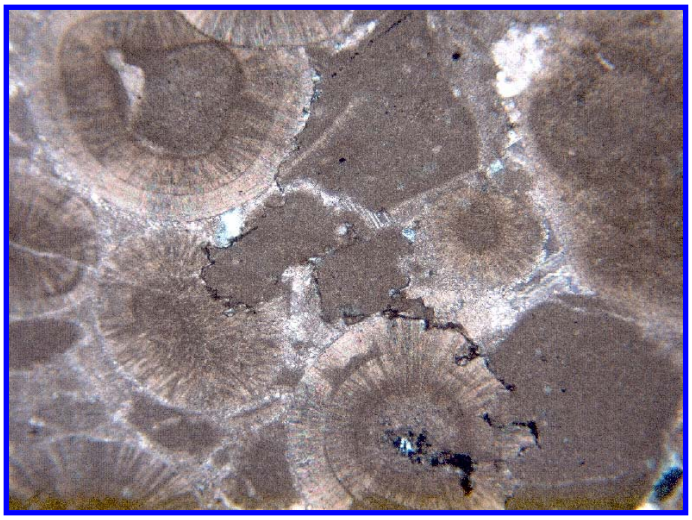
Compaction, Example #3, Stylolite
West Virginia, Wood County
Black River Formation, 9978 ft

The stylolite in this mudstone of the Black River Formation contains finely crystalline calcite spar.



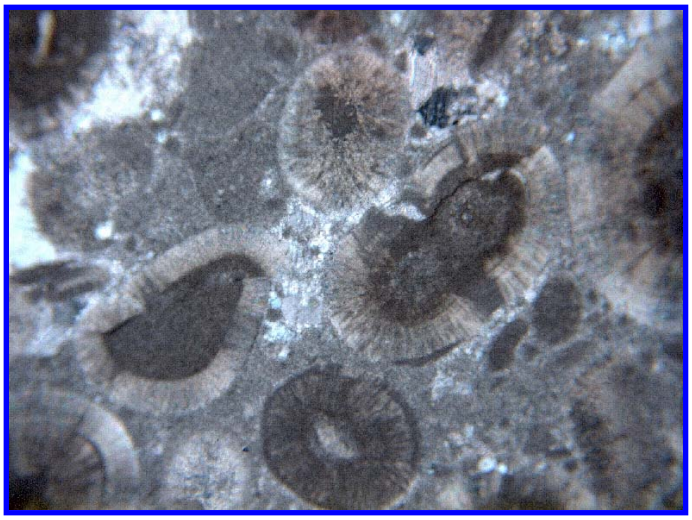
Compaction, Example #4
Pennsylvania, Union Furnace Outcrop
Black River Formation

Throughout the Trenton and Black River Formation compaction has distorted argillaceous laminations. One of these laminations is shown in this photograph. The laminations are easily recognizable because they are often preferentially dolomitized because of the argillaceous composition of the lamination.



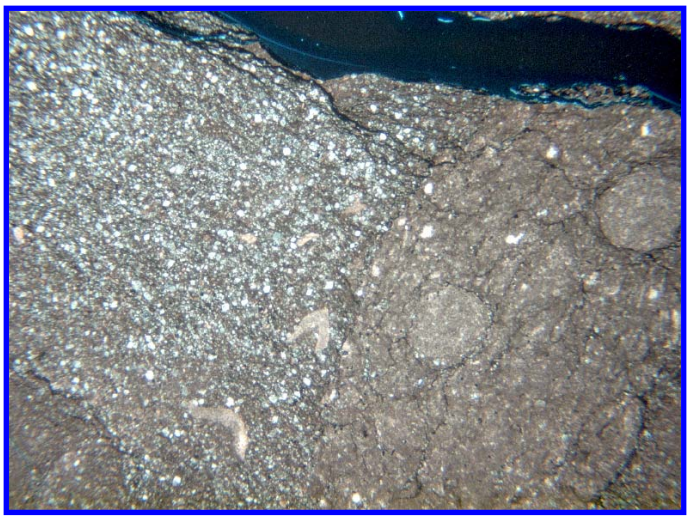
Compaction, Example #5
Pennsylvania, Union Furnace Outcrop
Black River Formation

Pressure solution has partially obliterated the ooids in this photograph. Dissolution is evident by the jagged grain boundaries. Insoluble residue is concentrated along these dissolution seams.



Compaction, Example #6
Pennsylvania, Union Furnace Outcrop
Black River Formation

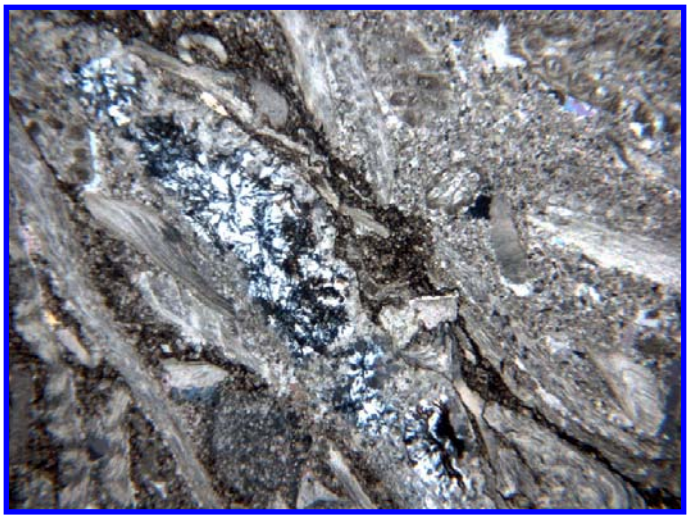
Compaction has offset the ooid laminae in this photograph. There is also partial dissolution of some of the ooid grains.



Compaction, Example #7
Pennsylvania, Union Furnace Outcrop
Black River Formation

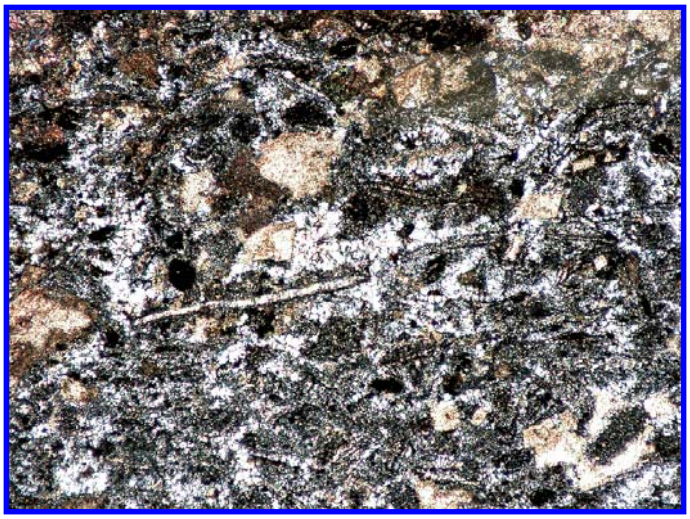
Compaction has resulted in wavy, discontinuous argillaceous lamination. The rock has also been partially dolomitized. Notice the nodular texture on the right side of the slide. This texture results from compaction of the muddy rock.

Silicification



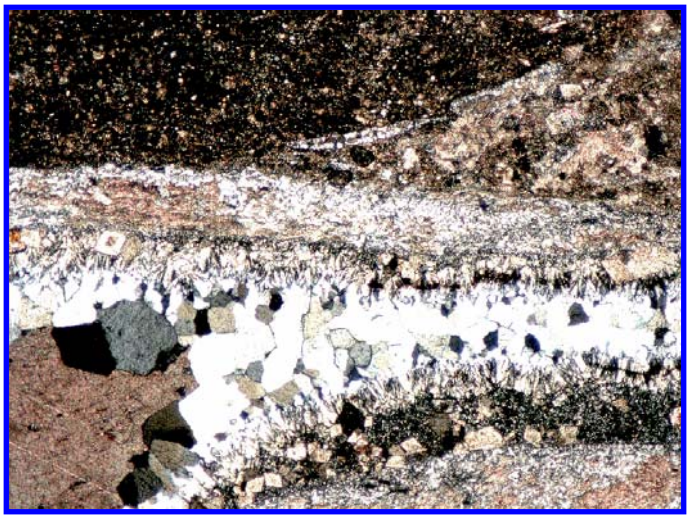
Silicification, Example #1
Pennsylvania, Union Furnace Outcrop
Black River Formation

Silicification is common throughout the Trenton and Black River. In this skeletal floatstone chert is partially replacing the brachiopod grain. In these floatstones replacement by chert occurs only in the skeletal grains.



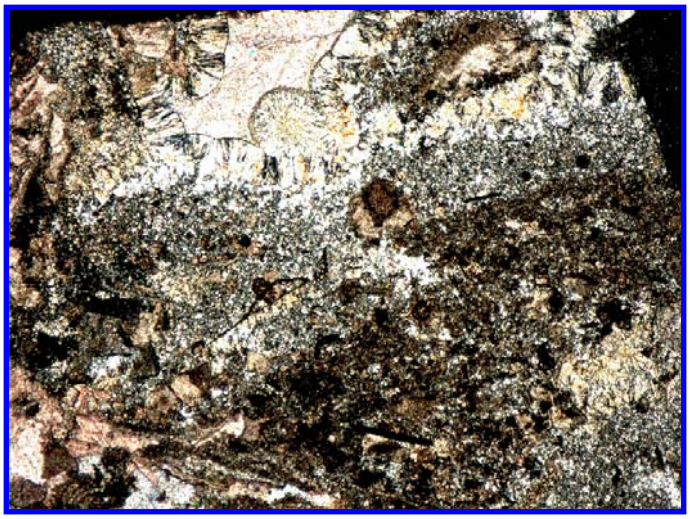
Silicification, Example #2
West Virginia, Wood County
Trenton Formation, 9656 ft

Silicification of this packstone/grainstone is not grain selective. The matrix and the grains in this rock have been silicified. This kind of pervasive silicification is not common in the Trenton and Black River.



Silicification, Example #3
West Virginia, Wood County
Trenton Formation, 9618 ft

The outer portion and most of the central portion of this grain has been silicified. There is a small amount of calcite remaining in the lower left portion of the thin section.



Silicification, Example #4
West Virginia, Wood County
Trenton Formation, 9618 ft

This photograph was taken at the same depth as the above thin section. Notice the pervasive silicification of the rock. The amount of silicification that has taken place makes it difficult to identify the rock type. Notice the botryoidal growth pattern of the chert in the upper portion of this slide.