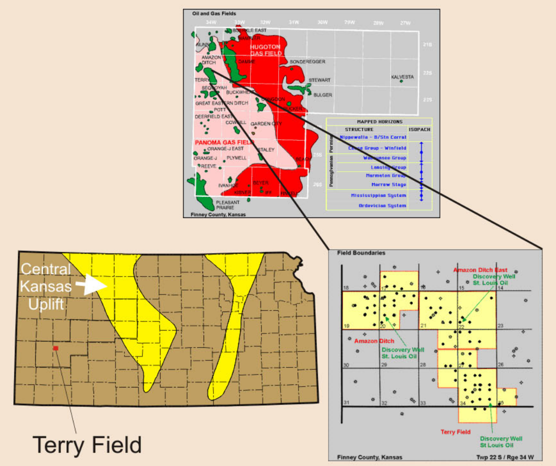
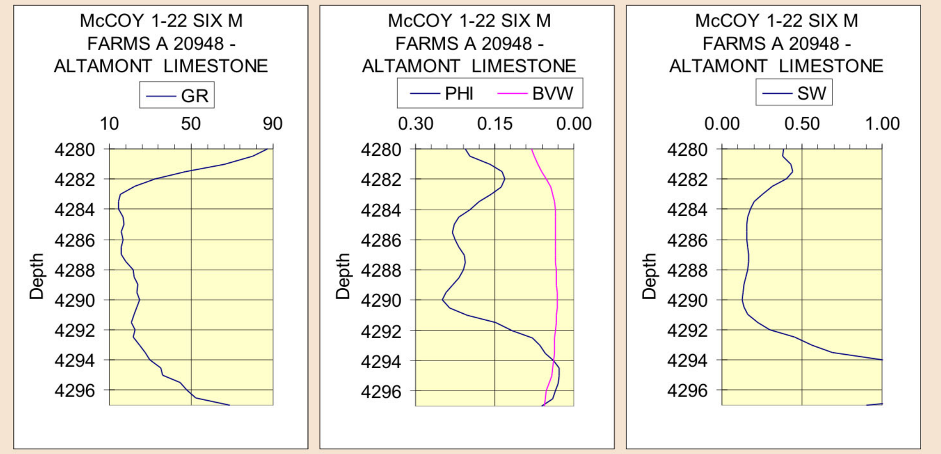
Oolite Reservoirs - Terry Field

The Altamont Limestone contains a prolific oolitic grainstone reservoir with a petrophysical profile closely resembling other Pennsylvanian ooid grainstones.

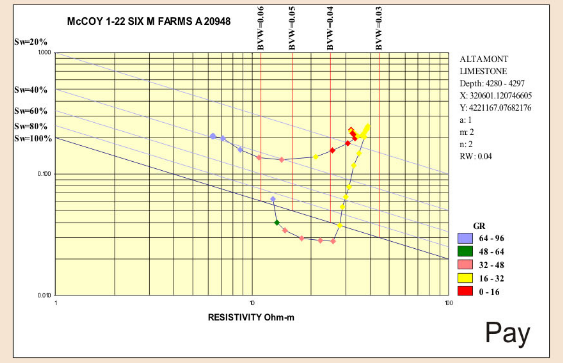


Terry Field

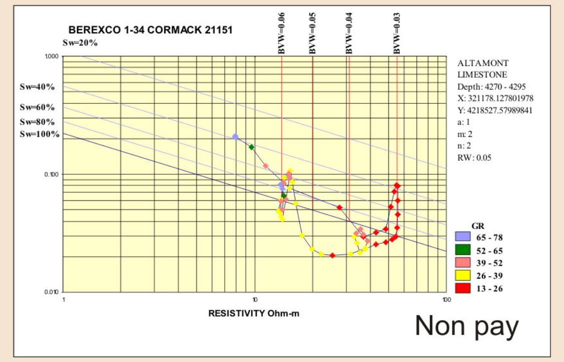


Super Pickett Wireline Log Analysis

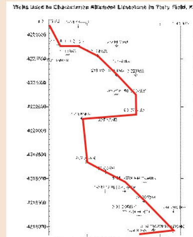
Super Pickett cross plots for a producing and nonproducing reservoir delineate pay cutoffs of 17% porosity and BVW under 0.05. Minimum BVW of pay is approximately .032. Corresponding parameters of water saturation and porosity were mapped below through selected maps in the field.

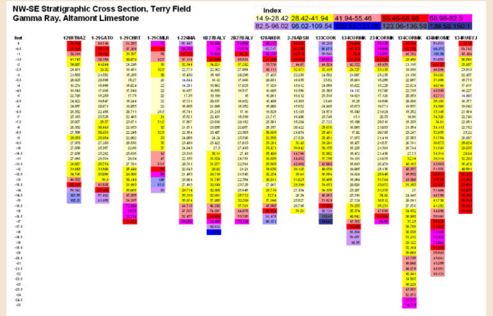


Pay

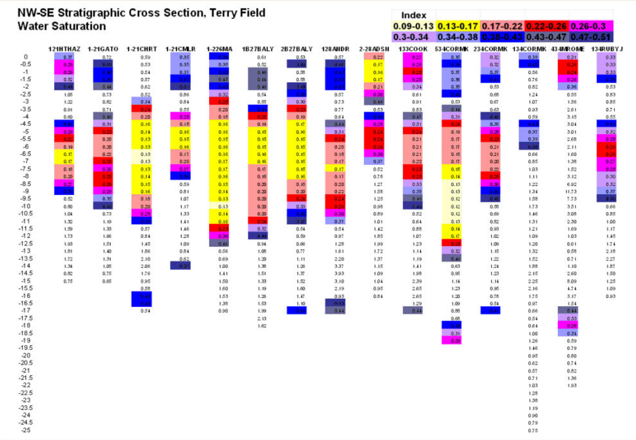


Non pay

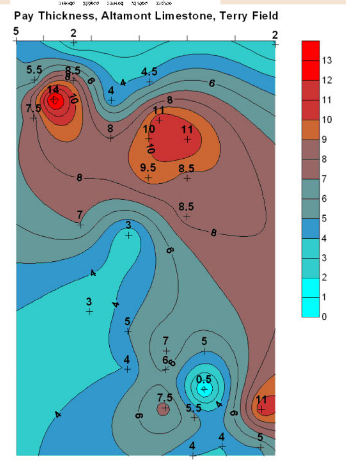

Cross section index map across Terry Field

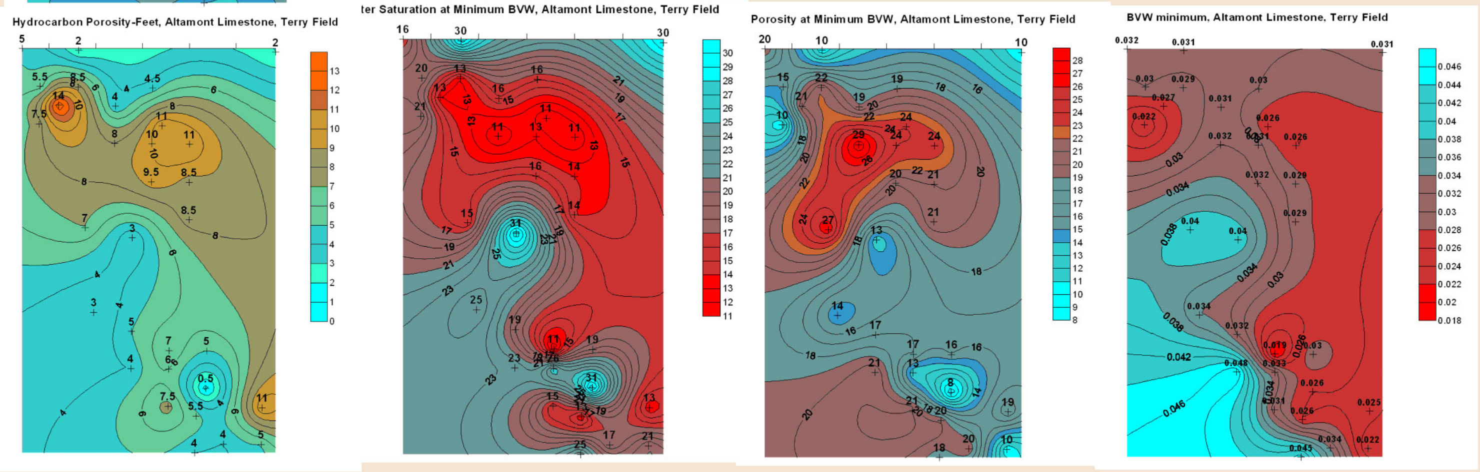


Color image cross section depicting gamma ray for Altamont Limestone across Terry Field.



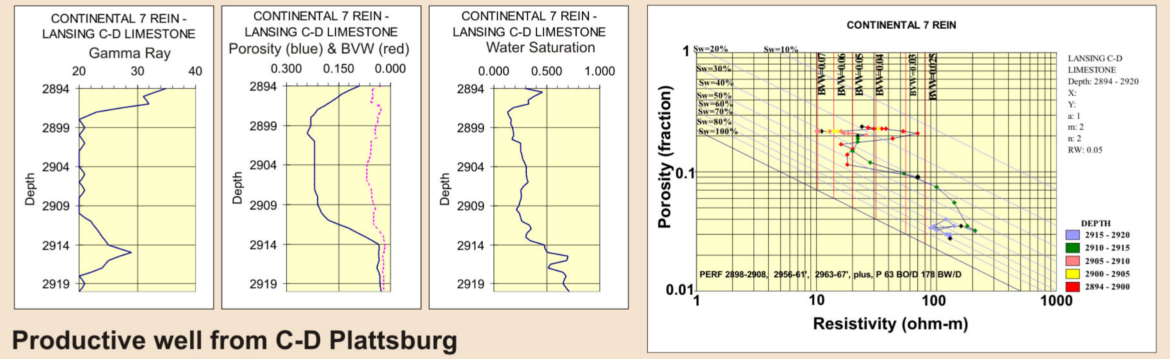
Color image cross section across Terry Field depicting water saturation in Altamont Limestone. "Sweet spot" indicated by lower water saturation (warmer colors).





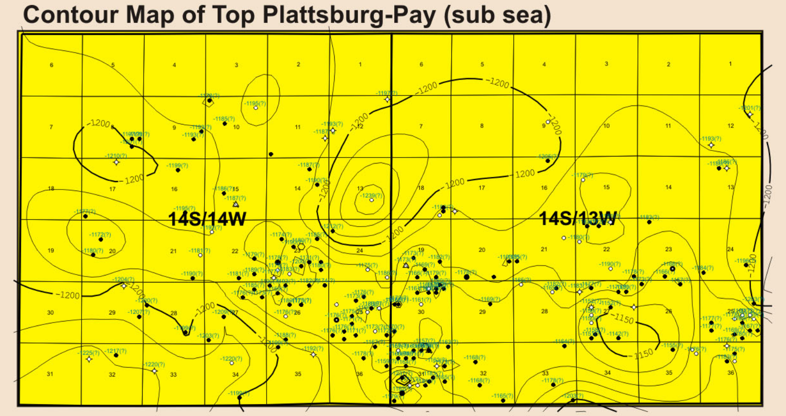
Series of maps illustrating petrophysical parameters and pay for Altamont Limestone derived from Super-Pickett cross plots.

Oolite Reservoirs - Hall-Gurney Field



Productive well from C-D Plattsburg Limestone in Hall-Gurney Field

HALL-GURNEY CO_2 DEMONSTRATION AREA Contour Map of Top Plattsburg-Pay (sub sea)

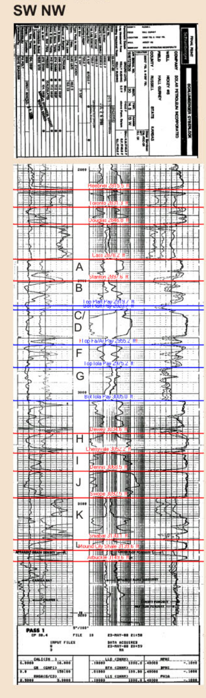


Scale = 1:76125 Contour Interval = 10 ft.

Structure contour map depicts the current structural variation in a two township (12 mi x 6 mi, 19 km x 10 km) area around Hall-Gurney Field located in Russell County, Kansas. Primary reservoirs are a stacked oolitic grainstone in the Lansing Group. Field has produced over 154 million barrels of oil since it was discovered in 1931. Today it is the site for a pilot carbon dioxide flood project sponsored by Department of Energy in cooperation with the MV Oil Company.

Sect. 30-14-13
SW NW

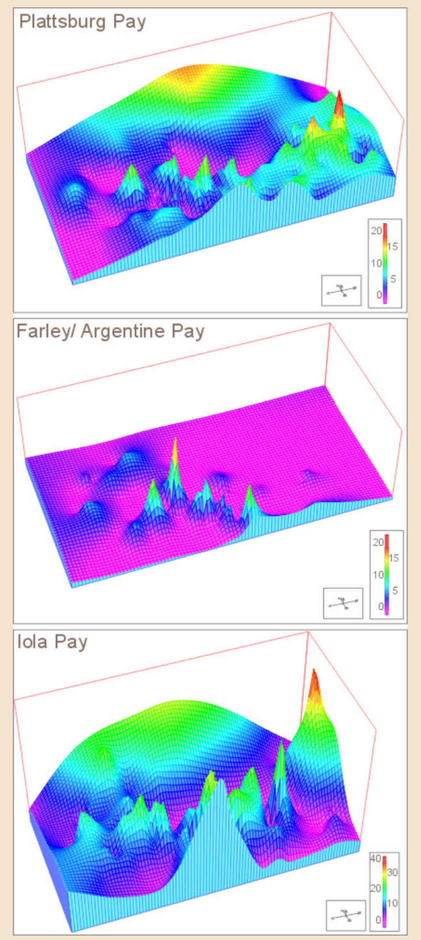
Type Log from Hall-Gurney Field



Stratigraphic Formation and Letter Nomenclature

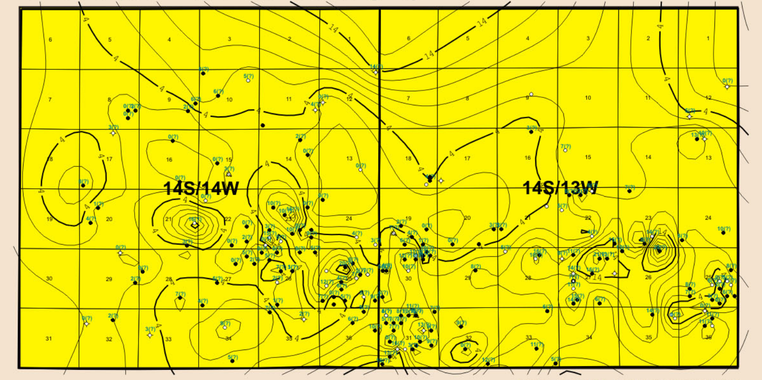
Heebner Shale
Toronto Limestone
Cass Limestone (A)
Stanton Limestone (B)
Plattsburg Limestone (C/D)
Farley/Argentine Limestones (F)
Iola Limestone (G)
Dewey Limestone (H)
Cherryvale Formation (I)
Dennis Limestone (J)
Swope Limestone (K)
Sniabar Limestone (L)

GROSS ISOPACH BLOCK DIAGRAMS OF PAY-ZONES IN THE HALL-GURNEY CO_2 DEMONSTRATION AREA



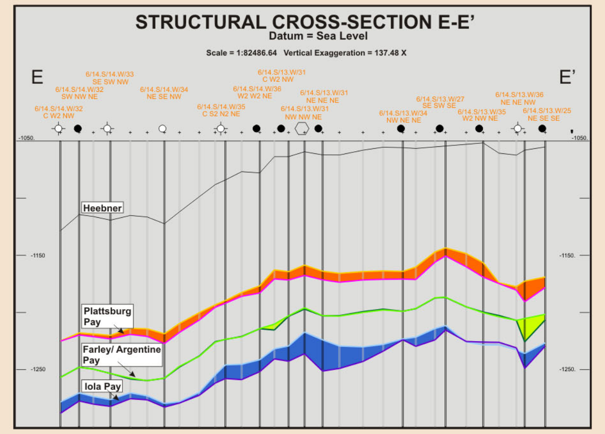
(Note different color scale at Iola Pay)
Vertical Exaggeration : 750 X

Gross Isopach Map of the Plattsburg Pay

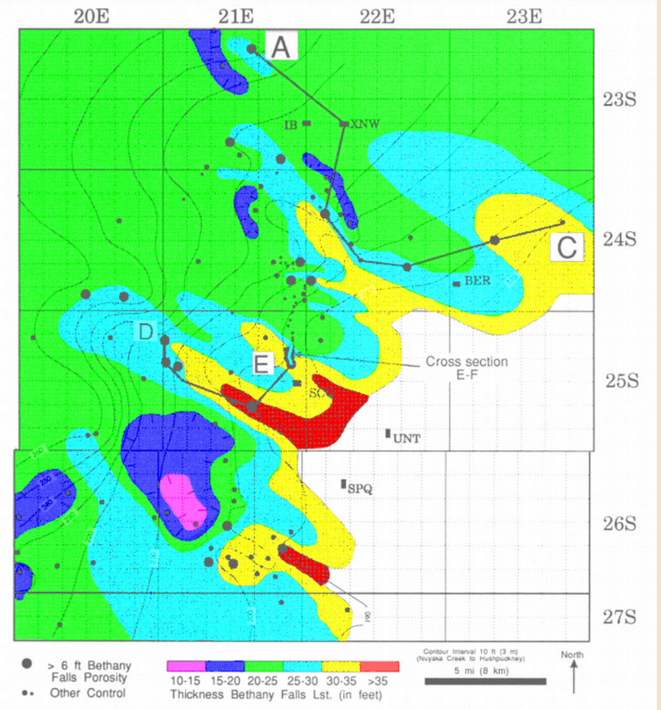


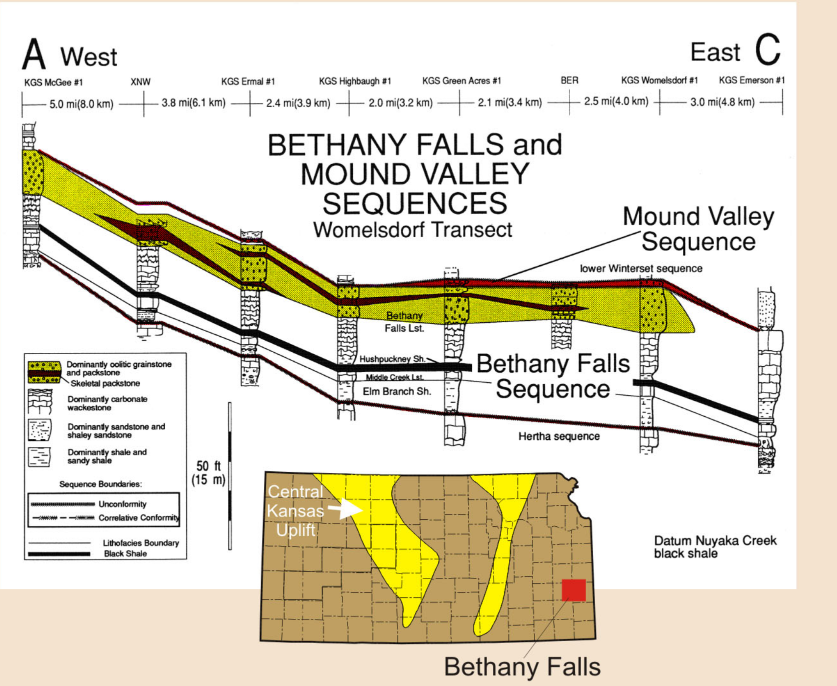
Scale = 1:76125 Contour Interval = 2 ft

The gross isopach map for the Plattsburg Limestone reflects thickness of porous carbonate (primarily oolitic grainstone) that exceeds 17% porosity. The trends on this map parallel current structure. the C/D Plattsburg Limestone is considered to be the best pay due to the greater thickness and spatial extent of higher porosity.



Outcrop Analogs and Bedding Architecture



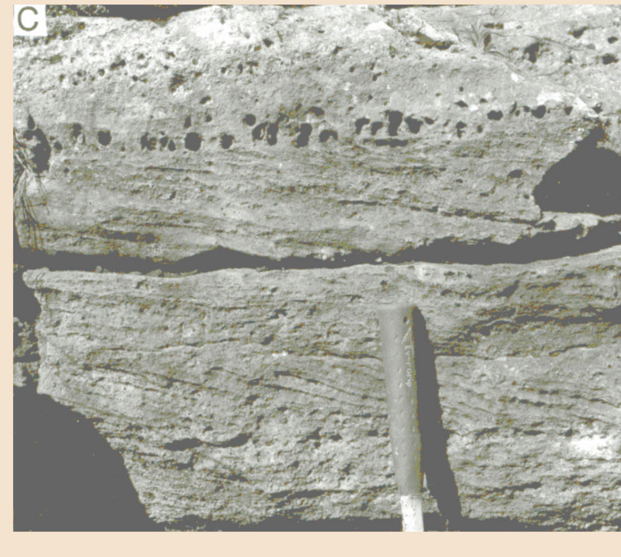


Bethany Falls

Bedding Architecture in Outcrop and Near Surface

Surface exposures and shallow cores and wireline logs in eastern Kansas provide detailed view of the architectural elements comprising L-KC ooid grainstones. Ooid shoals accumulated as lobate deposits on ramped shelves (contours on map) usually delimited by buildup of the regressive limestones containing the ooid deposits (color patterns on map). A dip-oriented cross section (A-C) along the depositional slope (inferred from an isopach map of underlying deposits) shows en echelon lobes of oolite comprising the ooid body within the upper portion of the Bethany Falls Limestone. Lobes are delineated by tight skeletal packstones, potential baffles to fluid flow. A sample of the Bethany Falls Limestone from the outcrop illustrates oomoldic pores typifying pores developed in these rocks throughout the Kansas shelf (French and Watney, 1993).

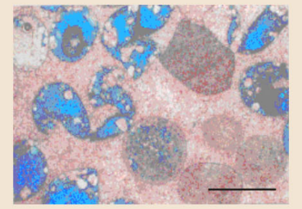

Crossbedded oolitic grainstone facies of the Drum Limestone in Hartland Quarry at Independence, Kansas. Drum Limestone is over 75 ft thick (Feldman and Franseen, 1995).

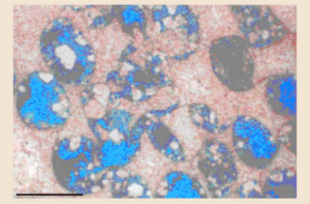


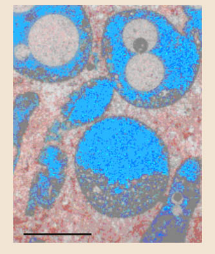
Wells Used in Study

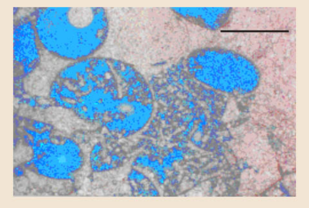
Operator	Well No.	Lease Name	Sec	Twn.	Rng.	County
AMOCO	4	A.E. Cox				
CITIES SERVICE	506	DORR UNIT W	16	9S	16W	ROOKS
CITIES SERVICES	A-17W	EICHMAN	12	15S	14W	RUSSELL
CRA	1	D.Witt				
EDWARDS	1	MANKE B	16	18S	10W	RICE
EDWARDS	2	OBERLE	16	18S	10W	RICE
EDWARDS	1	POPPELREITER	17	18S	10W	RICE
EMPIRE	1	SELLENS	30	15S	13W	RUSSEL
N.C.R.A.	2	TREMBLY B	34	24S	8W	RENO
PHILLIPS	12	HOFFMAN	31	15S	13W	RUSSEL
RUPE	3	VOPAT A	21	14S	10W	ELLSWO
SHELL	1	A.C.GORDON	21	21S	10W	RICE
SHELL	1	E.E. TOBIAS	6	19S	9W	RICE
SHELL	1	H. RADER	11	19S	11W	BARTON
SHELL	1	H. SOEKEN A	10	19S	9W	RICE
SHELL	1	HAFERMANN	6	19S	9W	RICE
SHELL	1	J.J. MICHEALIS	31	15S	13W	RUSSELL
SHELL	5	MCFARLAND	7	20S	9W	RICE
SHELL	1	MICHAELIS	31	15S	13W	RUSSEL
SHELL	1	PETZ	14	19S	11W	BARTON
SHELL	2	RADER	11	19S	11W	BARTON
SINCLAIR	2	M. SELLENS	36	15S	13W	RUSSEL
SINCLAIR PRAIRIE	1	SELLENS	15	15S	13W	RUSSEL
SKELLY	2	EHRLICH	25	14S	15W	RUSSEL
SPRINGER	1	OESER SOUTH	30	16S	11W	BARTON
TEXACO	1	FRANK PRINC	20	14S	10W	ELLSWO
THEODORE GORE	8	BOXBERGER	26	14S	14W	RUSSEL
THEODORE GORE	7	LUERMAN	28	15S	12W	RUSSEL
VIRGINIA	1	TIEPERMANN	29	21S	12W	STAFFO

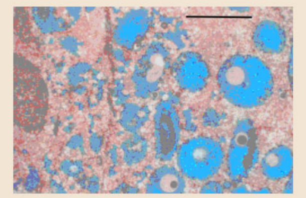
Paragenesis and Microscopic Textures

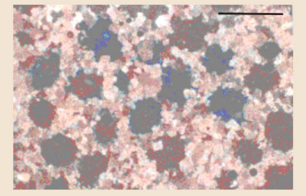

Crinoidal ooltic grainstone cemented with drusy calcite. Micritized crinoidal debris and ooids with ghosts of oolite cortices preserved. Oomoldic pores with blue-dye epoxy filling with occasional coarse calcite spar. Crushed oomolds containing scattered cement shards. Occasional mold filled by coarse dolomite cement. Thin section photomicrograph stained by alizarin-red. Gore Leurman #7 3040 ft. Scale bar 0.5 mm. Plane polarized light.

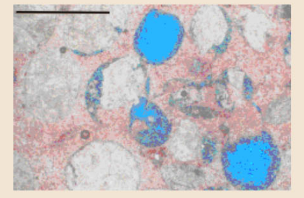

Crinoidal oolitic grainstone with blue-dye epoxy filled oomolds cemented by drusy calcite. Millimeter- to centimeter-sized areas of collapsed ooids and cement. Oomolds contain shards of drusy cement presumably collected in pore as crushing occurred. Some larger calcite spar in molds appears to be in place. Thin section photomicrograph stained by alizerin-red. Gore Leurman #7 3040 ft. Scale bar 0.5 mm. Plane polarized light.

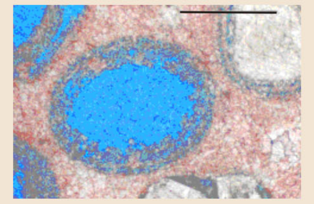

Oolitic grainstone containing abundant oomolds with blue-dye epoxy filled pores. Broken oomolds with small connections between oomolds seen in this plane of view. Also, fine cement shards appear to form geopedal fabric. Other cement shards have collected along other positions on walls of oomolds. Thin section photomicrograph stained with alizerin-red. Shell Hafferman A, 2955.5 ft. Scale bar 0.5 mm. Plane polarized light.

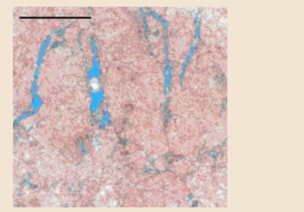

Oolitic grainstone with oomolds. Some oomolds are crushed along with drusy cement. View of fringing spar calcite cement shards that have accumulated in vug along with large fragments of calcite cement. Area filled with blue epoxy. Other ooids appear to consist of neomorphozed calcite spar. with intervenning pore space filled with in place druzy calcite. Thin section photomicrograph stained on right side by alizerin-red. Shell Hafferman A, 2955.5 ft. Scale bar equals 0.5 mm. Plane polarized light.

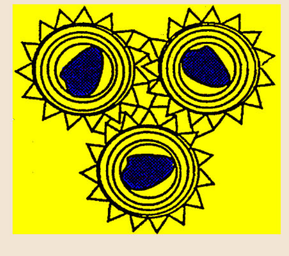

Oomoldic grainstone containing heavily neomorphosed cement with crystals terminations into oomolds and reduction of original oomold shape. Areas appear to be crushed on left side, preceeding neomorphism. Thin section photomicrograph stained with alizerin-red. Eichman A-17-W #7. Scale bar equals 0.5 mm. Plane polarized light.

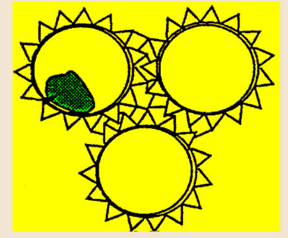

Oomoldic grainstone containing heavily neomorphosed calcite cement. Cement has grown into original oomold pores reducing pore volume. Note that most of these pores are not filled with blue epoxy suggesting that these pores are not connected. Thin section photomicrograph stained with alizerin-red. Drews A-1. 3147 ft. Scale bar equals 0.5 mm. Plane polarized light.

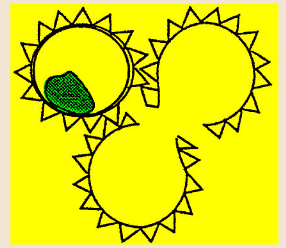

Oomoldic grainstone with considerable number of oomolds filled by coarse dolospar. Localized crushing of oomolds alongside preserved oomolds filled by blue epoxy. Some cement shards partly filling several oomolds.Thin section photomicrograph stained with alilzerin-red. Rebecca Bounds 4402 ft. Scale bar equals 0.5 mm. Plane polarized light.

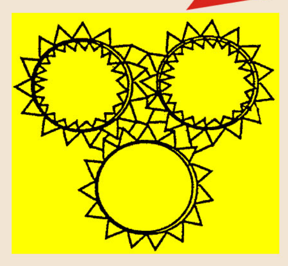

Oomoldic grainstone with oomolds that contain solution-altered micritized ooid cortices as seen in the center of this photo. Other ooids are filled with coarse dolospar. Druzy calcite spar fills pore space. Oomoldic pores are filled with blue epoxy. Thin section photomicrograph stained with alizerin-red. Rebecca Bounds 4402 ft. Scale bar equals 0.25 mm. Plane polarized light.

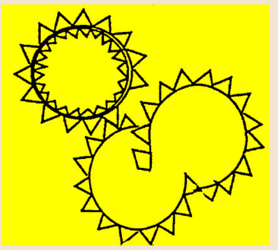

Neomorphosed crinoidal ooid grainstone containing localized small fractures, crushed areas, and small solution vug, all containing blue epoxy. Thin section photomicrograph stained with alizerin-red. Shell Hafferman #1 A 2955.5. Scale bar equals 0.5 mm. Plane polarized light.

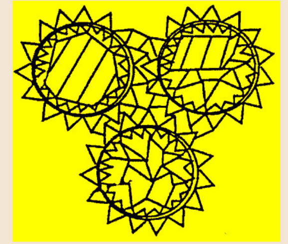

Growth of equant calcite spar in isopachous rims on ooid grains - occlusion of porosity


Dissolution of ooids- creation of isolated oomoldic porosity


Continued dissolution of grains and early calcite cement - creation of connected porosity


Growth of equant calcite spar on inner walls of oomolds - decreases connectivity


Slight crushing of some ooids to form connections between pores


Continued growth of carbonate cement, ferroan calcite, and baroque dolomite during burial. Possible complete occlusion of porosity

Porosity Evolution of Grainstone Bethany Falls Limestone, Victory Field