Appendix 2. Thin section images and descriptions from Weatherford Laboratories

Paup Spur Field

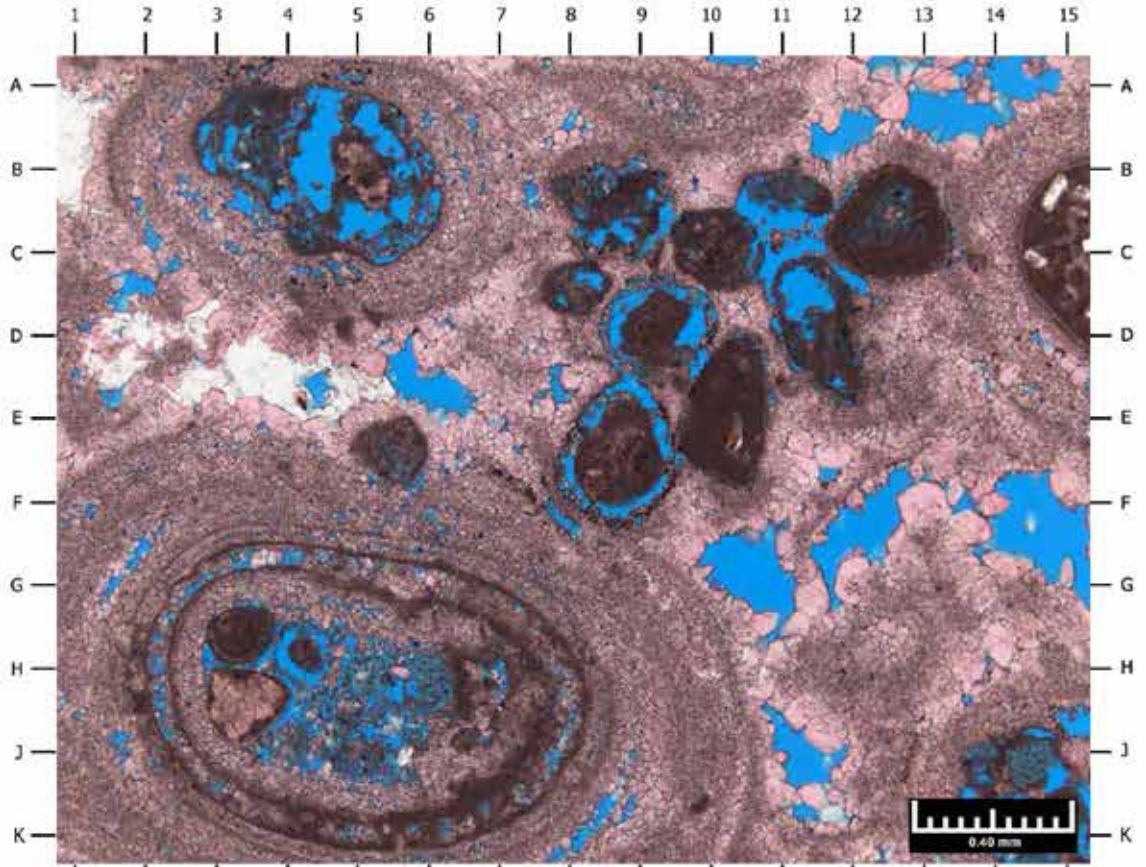
Permit #24445

Sampled interval: 6222’- 6265’

Arkansas Geological Survey
Upper Smackover
Onshore

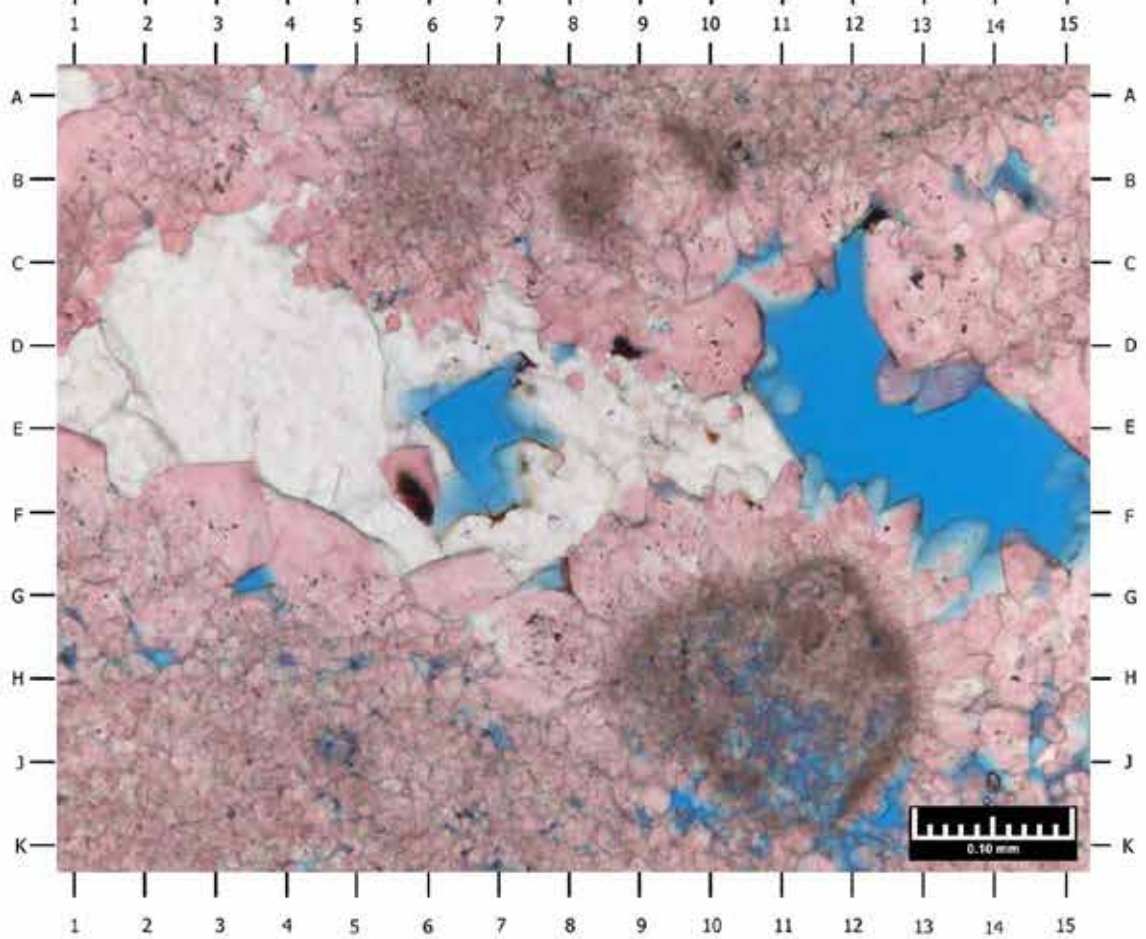
6222.00'
Plate 1

Weatherford LABORATORIES



A

50X



B

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Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 6222.00 FEET
SAMPLE NUMBER: 6 CS

PLATE 1

Lithology: Oolitic limestone

Texture: Moderately-compacted ooid grainstone

Detrital Grains/Allochems: Abundant amounts of recrystallized ooids; minor peloids/pellets and compound clasts; rare undifferentiated calcareous shell fragments; rare amounts of silt-sized to very fine sand-sized detrital quartz

Matrix: Interparticle pore space it occluded by sparry calcite, coarse dolomite, and rare anhydrite; rare to minor amounts of residual bitumen fills secondary intraparticle/intracortical pores and lines primary interparticle pores; rare to minor amounts of clay and trace quartz grains are observed within pore spaces, particularly within the nuclei of ooids

Cement and Replacement Minerals: Abundant very fine to fine crystalline calcite occurs as neomorphic recrystallization of ooids and lesser peloids/pellets and undifferentiated shell fragments, as common amounts of fine to medium crystalline equant isopachus cement rims, and as minor amounts of fine to medium crystalline interparticle calcite cement; slightly common amounts of medium to coarse crystalline dolomite occurs as interparticle and intraparticle void-filling poikilotopic cement/replacement; rare to minor amounts of anhydrite cement/replacement is observed; trace amounts of microcrystalline pyrite replacement

Pore Types: Abundant pore types include primary interparticle pores, secondary intraparticle pores, moldic pores, and intracortical moldic pores. Common amounts of secondary intercrystalline micropores are dominantly associated with recrystallization of allochems and minor vugs partially cut ooids. Geopetal structures are observed in orientation that suggests post depositional reworking.

Magnification: A: 50X B: 200X

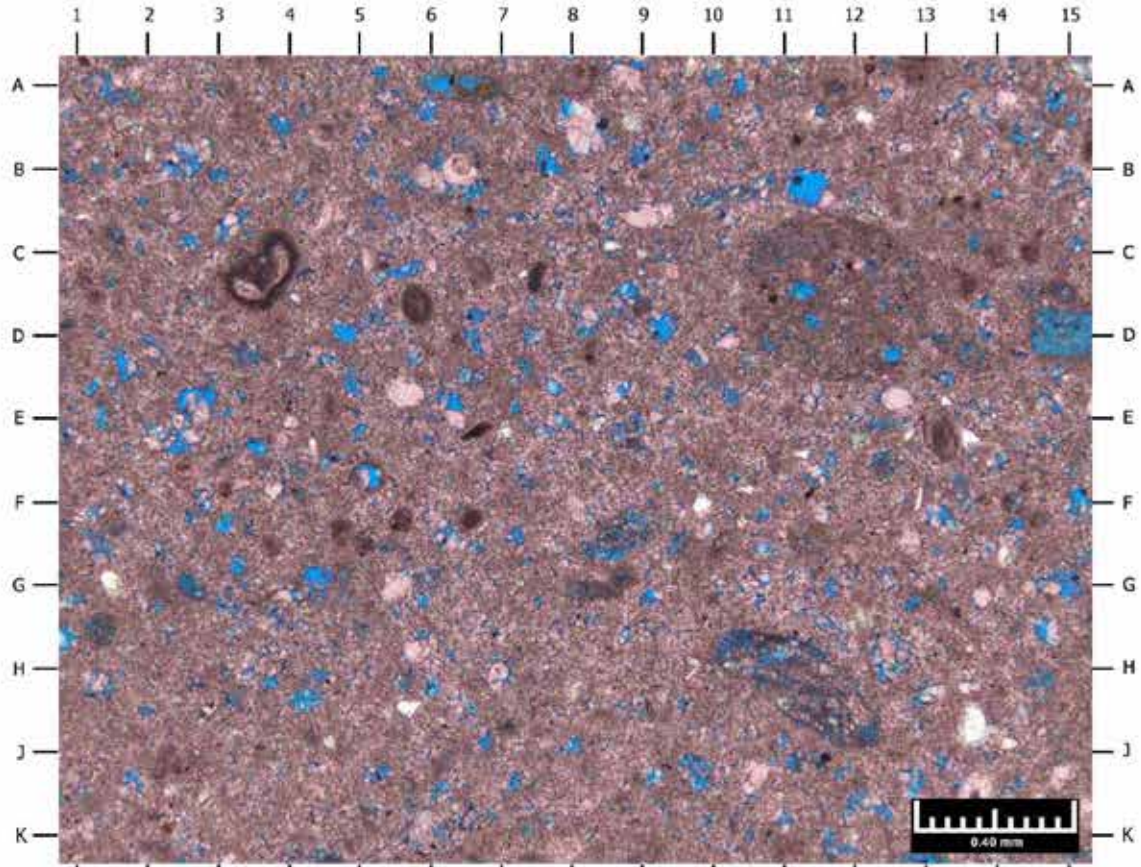
A) Photo A provides an overview of this moderately-compacted ooid grainstone dominantly composed of ooids (A2-CD6.5, F1-K10) and lesser amounts of allochems characterized as peloids and/or pellets (C10, B-D15, E10). Very fine to finely crystalline calcite (stained red) commonly occurs as recrystallization of ooids, resulting in moderate to poor preservation of probable tangential cortices, and other undifferentiated relics where remnant structures have been completely obliterated (A8-AB11, H12-13). Secondary intraparticle pores (AB3-BC6, CD11.2, G2, HJ4-6, JK8.5), intracortical moldic pores (selective dissolution of probable cortices; F8-9), and primary interparticle pores (AB12, AB13-14, DE6, FG10.5, FG14-15, J11.3) represent the dominant pore types depicted. Pore throats are partially occluded by isopachus calcite cement, particularly where isopachus rims have merged to bind adjacent allochems, and coarsely crystalline dolomite (AB1, D1.5-DE5).

B) Photo B provides a highlighted view of the area near E5 in Photo A. Secondary intracrystalline micropores, associated with recrystallization of allochems, are prominent at this magnification (B14.3, G3.5, GH2.2, JK9-12.5). Pores are reduced by fine to medium crystalline calcite occurring as equant isopachus crusts rimming allochems (A15-C10, FG9-12, G-J13), interparticle cement and/or crusts that merge to bind allochems (B13-D15), followed by coarse poikilotopic dolomite cement (non-ferroan; DE1-EF11). Traces of residual bitumen rim pores (BC12.2, DE7.3, F7).

Arkansas Geological Survey
Upper Smackover
Onshore

6238.00'
Plate 2

Weatherford LABORATORIES



A

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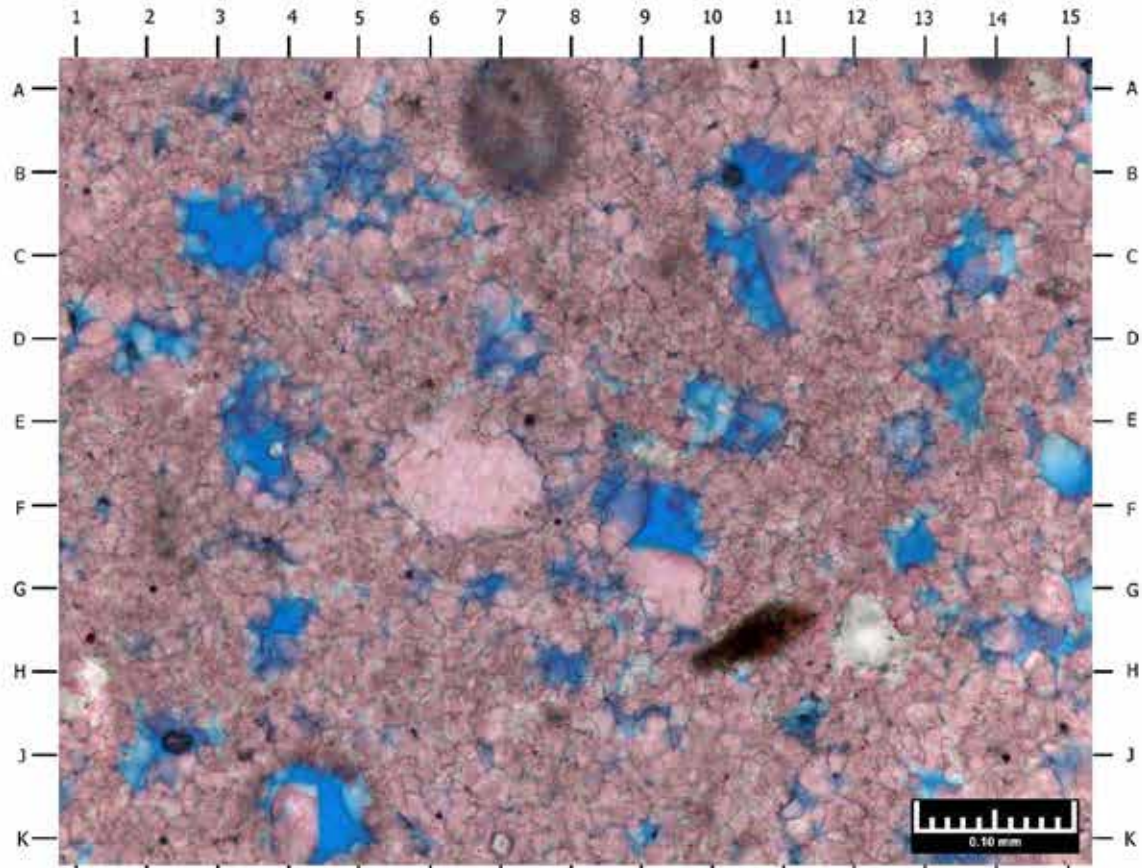


B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 6238.00 FEET
SAMPLE NUMBER: 7 CS

PLATE 2

Lithology: Silty/sandy limestone

Texture: Wackestone to packstone

Detrital Grains/Allochems: Common amounts of silt-sized to upper fine-grained detrital quartz (<0.1mm–0.26mm; average 0.08mm); rare to minor feldspar grains; minor amounts of mudstone/shale rock fragments and/or argillaceous pellets; minor to common amounts of recrystallized relic peloids/pellets, possible ooids, and undifferentiated calcareous shell fragments; rare probable foraminifera; rare muscovite mica; trace heavy minerals (tourmaline); trace partially pyritized organic fragments

Matrix: Abundant calcite spar and trace intercrystalline clay

Cement and Replacement Minerals: Abundant very fine to fine crystalline calcite (stained red) occurs as neomorphic recrystallization of precursor fine-grained matrix, allochems (peloids/pellets, probable ooids, and undifferentiated shell fragments), and as minor amounts of fine to rarely medium crystalline void-filling cement; rare to minor amounts of authigenic overgrowths are present on host quartz grains; rare dolomite cement/replacement and trace amounts of microcrystalline pyrite replacement are observed; rare authigenic kaolinite occurs within pores

Pore Types: Abundant intercrystalline pores/micropores are observed and secondary intraparticle and moldic pores are also common; however, interconnectivity appears low in this planar view.

Magnification: A: 50X B: 200X

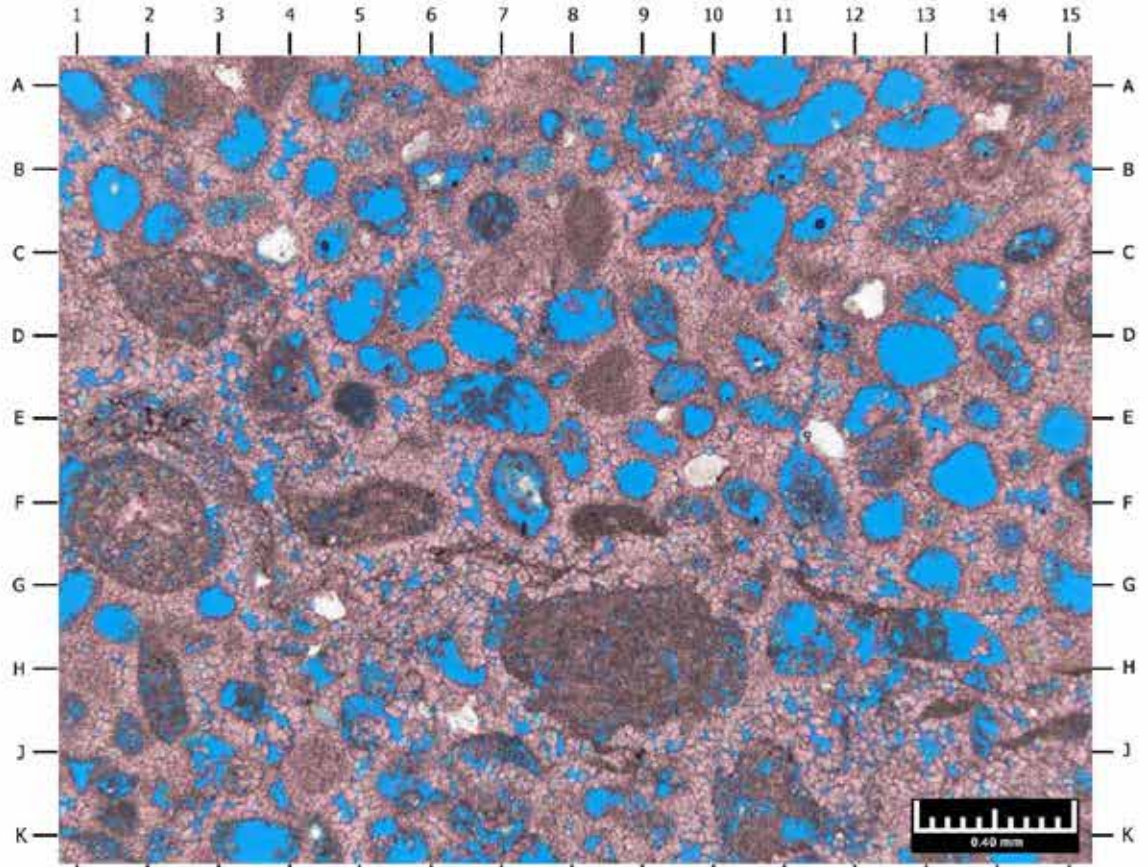
A) Photo A provides an overview of this silty/sandy wackestone to packstone. Abundant amounts of very fine to finely crystalline calcite spar occur as neomorphic cement/replacement of precursor matrix and allochems. Common amounts of quartz (white grains) are disseminated throughout the sparry matrix. Minor amounts of finely crystalline calcite fills voids (AB8, BC9, DE5.7). Relic allochems are delineated by remnant dusty micrite/very fine spar (C11-DE12.5) and/or moldic pores (FG8.7, GH1.3, H11). Rare amounts of probable foraminifera (CD3.5, FG5.5) are depicted.

B) Photo B provides a highlighted view of the area near E6 in Photo A. Abundant intercrystalline pores are depicted (blue epoxy; B10.7, C3.2, C10.3, C13.7, EF3.5, DE13.3, FG9.3, GH4, FG13, JK4.7). Quartz (GH12.2), rare probable dolomite (EF9.2), and trace pyrite (black specks) are observed. The brown fragment at GH10-11 is likely composed of clay and trace organic material (detrital clay birefringence and lacks reflectivity).

Arkansas Geological Survey
Upper Smackover
Onshore

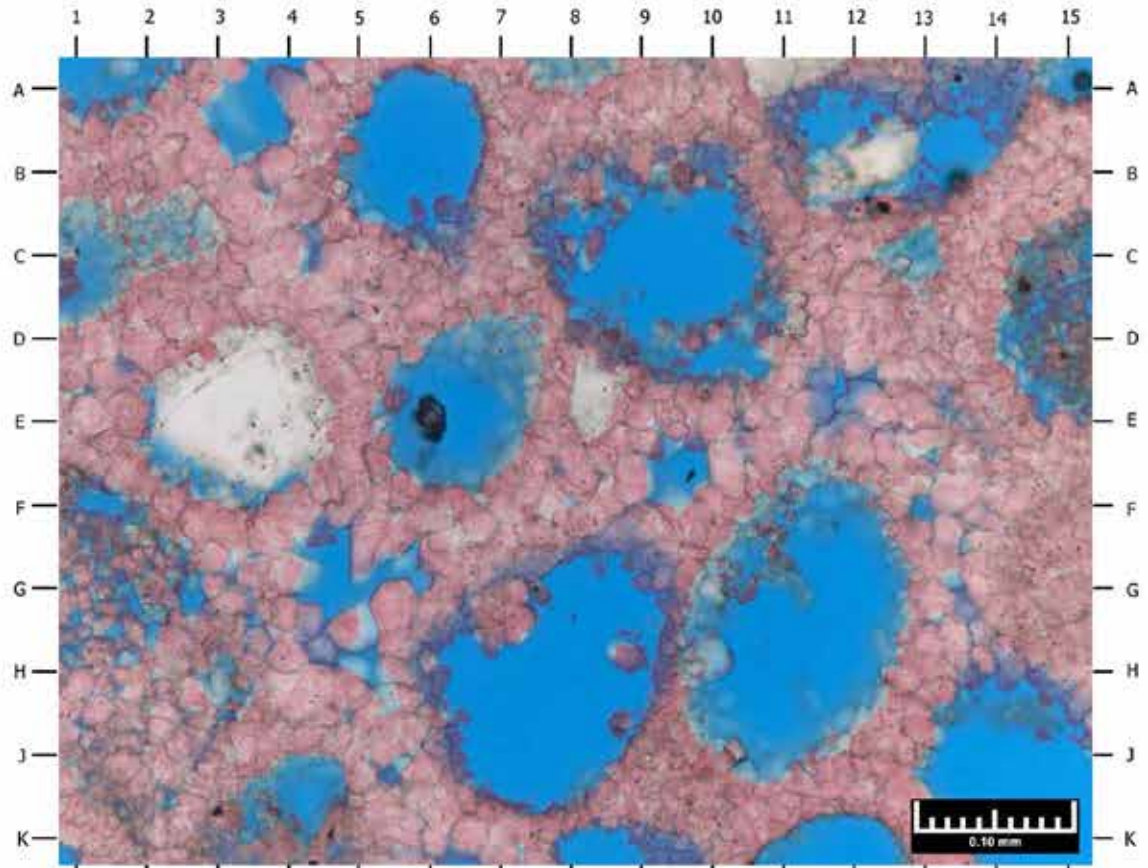
6245.00'
Plate 3

Weatherford LABORATORIES



A

50X



B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 6245.00 FEET
SAMPLE NUMBER: 8 CS

PLATE 3

Lithology: Peloidal limestone

Texture: Peloidal/pelletal grainstone to relic packstone

Detrital Grains/Allochems: Common peloids/pellets and traces of possible relic ooids (selective dissolution of cortices); rare partially recrystallized calcareous shell fragments (foraminifera and echinoderm fragments); minor amounts of silt-sized to upper fine sand-sized monocrystalline quartz (0.02mm-0.28mm; average 0.11mm); rare feldspar grains; trace polycrystalline quartz; rare mudstone/shale lithic fragments; trace siltstone fragments; trace organic material; trace heavy minerals (possible epidote and amphibole); trace undifferentiated micaceous/argillaceous fragments

Matrix: Common calcite spar replacement of precursor matrix; rare to minor amounts of clay within pore spaces and compacted detrital clay stringers

Cement and Replacement Minerals: Abundant very fine to fine crystalline equant calcite (stained red) occurs as neomorphic recrystallization of precursor matrix, allochems (peloids/pellets, probable ooids, and undifferentiated shell fragments), and as equant isopachus rims; trace dolomite replacement; trace amounts of microcrystalline pyrite replacement; rare quartz overgrowths; trace possible authigenic quartz and gypsum; and trace authigenic kaolinite is present within pores; trace halite?

Pore Types: Moldic pores represent the dominant pore type with common amounts of secondary intraparticle pores and intercrystalline pores associated with replacement of the matrix. Trace vugs and secondary intragranular pores associated with partial dissolution of feldspar grains are also observed.

Magnification: A: 50X B: 200X

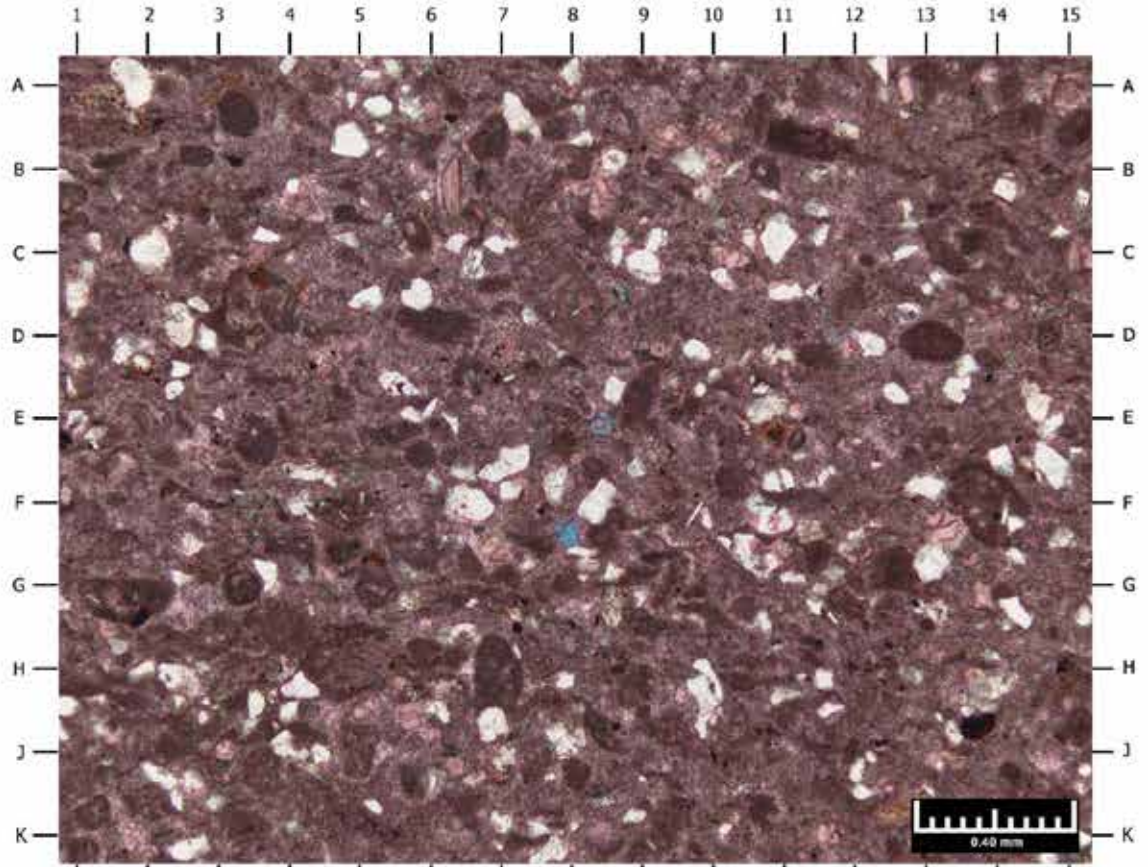
A) Photo A provides a general overview of this peloidal/pelletal grainstone to relic packstone. Abundant moldic pores, resulting from selective dissolution of precursor allochems, represents the most ubiquitous feature of this thin section photomicrograph. Secondary intraparticle pores occur within partially dissolved peloids/pellets (A14, CD2-3, F1.5-G2.5, H7-10, JK10-11), Minor amounts of quartz grains (most white grains) are depicted. Post depositional compaction is evidenced by thin stringers of compacted clay (F-G3.8, FG6-8, GH12). Trace argillaceous fragments (HJ13.2) and heavy minerals (H14.5) are also observed.

B) Photo B highlights an area dominated by moldic pores near C5 in Photo A. Abundant very fine to finely crystalline blocky calcite (stained red) occurs as neomorphic recrystallization of precursor matrix. An example of remnant isopachus calcite rims is observed lining moldic pores from A5-E1 and is also observed rimming partially preserved peloids throughout the thin section. Rare quartz overgrowths are present on host grains (DE3). Trace microcrystalline pyrite (black specks; CD14.3) is depicted.

Arkansas Geological Survey
Upper Smackover
Onshore

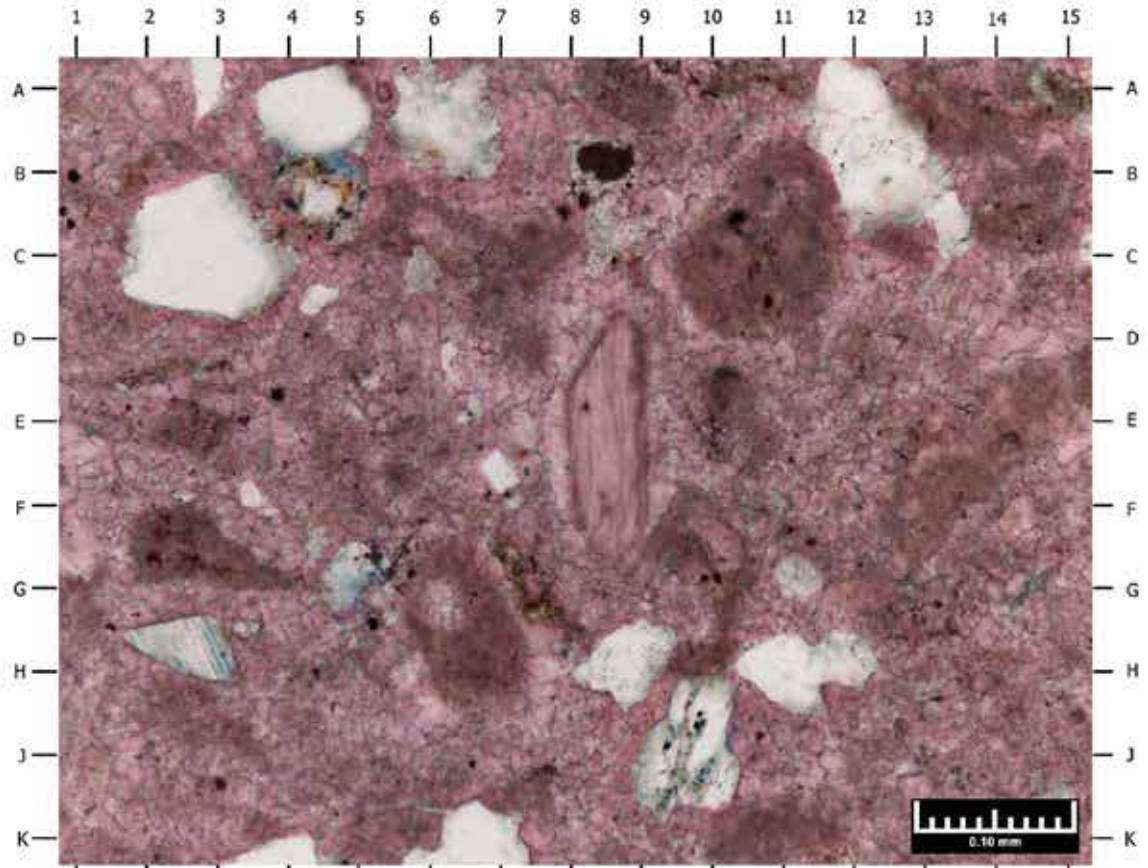
6265.00'
Plate 4

Weatherford LABORATORIES



A

50X



B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 6265.00 FEET
SAMPLE NUMBER: 9 CS

PLATE 4

Lithology: Silty/sandy peloidal/pelletal limestone

Texture: Well-compacted, peloidal/pelletal packstone to grainstone with evidence of bioturbation

Detrital Grains/Allochems: Common peloids/pellets; common amounts of silt-sized to upper fine-grained monocrystalline quartz (0.02mm-0.22mm; average 0.08mm); minor amounts of argillaceous/micaceous fragments are characterized as mudstone/shale fragments, trace possible argillaceous fragments/pellets, and other undifferentiated/altered grains; minor partially recrystallized calcareous shell fragments and foraminifera; minor feldspar grains (dominantly plagioclase); rare polycrystalline quartz; trace micaceous, possible metamorphic fragments; trace siltstone fragments; trace chert fragments; trace organic material; trace heavy minerals (zircon); trace glauconite

Matrix: Sparry calcite; trace intercrystalline clay

Cement and Replacement Minerals: Abundant very fine to fine crystalline equant calcite spar (stained red) occurs dominantly as recrystallization of precursor matrix, with lesser amounts occurring as partial replacement of allochems (peloids/pellets and undifferentiated shell fragments) and as fine crystalline void-filling cement; trace amounts of very fine to fine crystalline dolomite replacement and void-filling cement; rare microcrystalline pyrite and siderite replacement; trace quartz overgrowths; trace authigenic kaolinite and sericite replacement of less stable framework grains

Pore Types: Secondary intragranular/intraparticle pores and micropores associated with preferential dissolution of allochems, feldspar grains, and argillaceous/micaceous fragments represent the most ubiquitous pore type observed with minor amounts of intercrystalline matrix micropores present.

Magnification: A: 50X B: 200X

A) Photo A provides a general overview of this well-compacted, silty/sandy, peloidal/pelletal packstone to grainstone. Micritic peloids/pellets (AB3.3, AB6.8, B11, D6, D13, EF3.7, E9, F14, H7) and monocrystalline quartz (most white grains) represent the dominant constituents. Rare muscovite mica (F9.8), detrital argillaceous fragments (EF10.8), and undifferentiated shell fragments (BC6.3) are also observed. Intercrystalline matrix pores (FG8) and secondary interparticle pores (CD8.7, EF8.6) are present in minor amounts.

B) Photo B highlights an area dominated by moldic pores near BC6.2 in Photo A. Very fine to fine crystalline calcite spar commonly occurs as replacement of precursor matrix. Rare pyrite replacement (black specks) and dolomite (F10.8) are also observed within the matrix. Secondary intragranular pores/micropores (B4.8, G5.2, H3, J9.5), occurring in relation to partially leached grains, represent the dominant pore type.

Atlanta Field

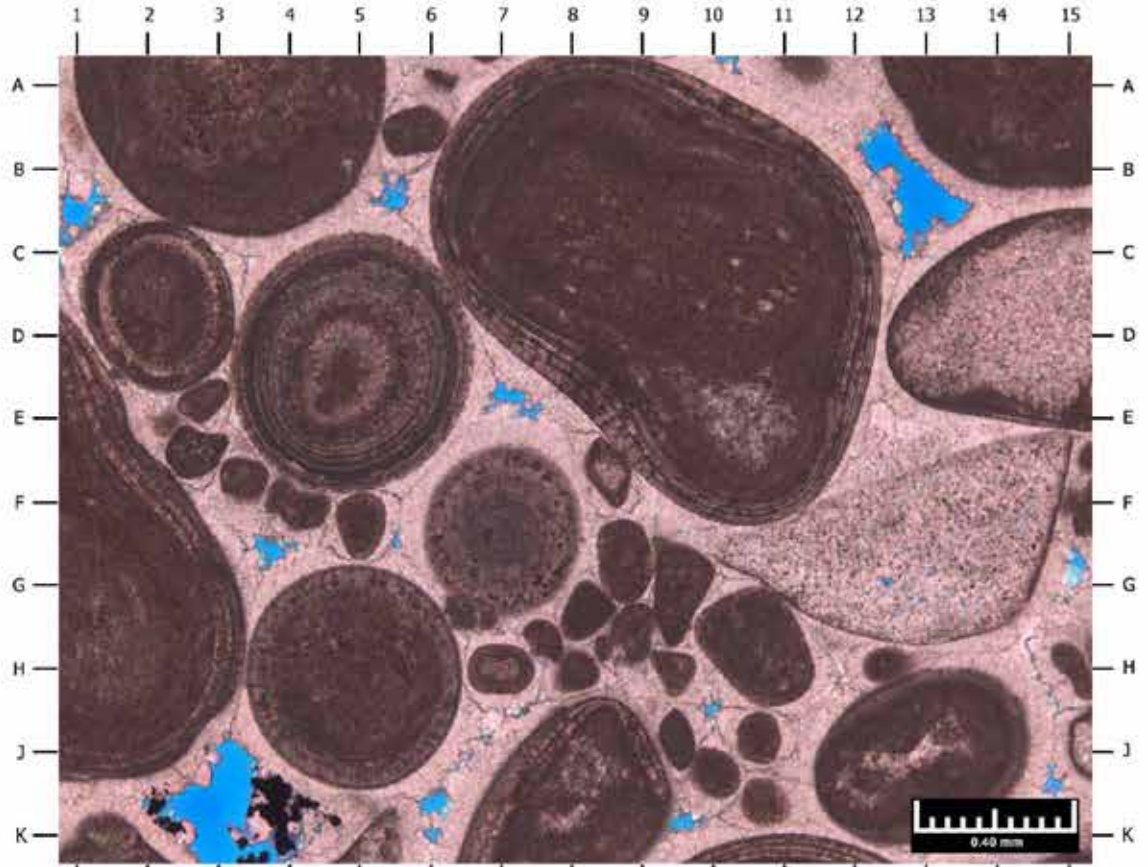
Permit #26629

Sampled interval: 8294’- 8351’

Arkansas Geological Survey
Upper Smackover
Onshore

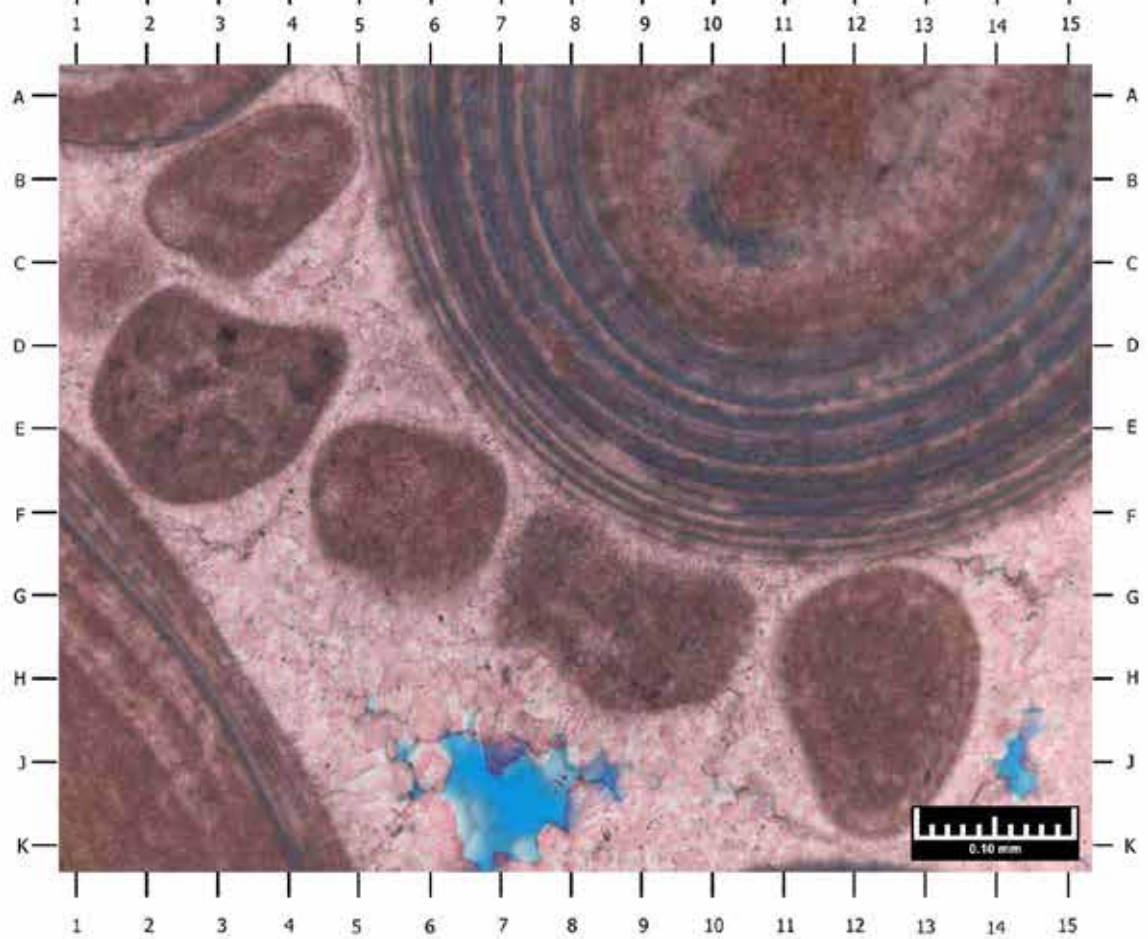
8294.00'
Plate 5

Weatherford LABORATORIES



A

50X



B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8294.00 FEET
SAMPLE NUMBER: 10 CS

PLATE 5

Lithology: Oolitic limestone

Texture: Low to moderately-compacted, poorly-sorted ooid grainstone

Detrital Grains/Allochems: Common amounts of partially recrystallized, micritized ooids; minor undifferentiated peloids/pellets and composite clasts/ooids; minor amounts of partially recrystallized calcareous shell fragments, probable echinoderm fragments, and abraded sponge fragments; trace monocrystalline quartz

Matrix: Interparticle pore space it occluded by common calcite spar

Cement and Replacement Minerals: Abundant calcite (stained red) occurs as bladed isopachus cement rims on allochems, as very fine to fine crystalline and rarely medium crystalline partial replacement of allochems, and as fine to medium crystalline void-filling cement. Trace to rare pyrite cement and replacement is also observed.

Pore Types: Interparticle matrix pores represent the most conspicuous pore type. Minor vugs partially cross-cut allochems. Secondary intraparticle micropores and intracortical micropores also present in minor amounts. Rare moldic pore are observed.

Magnification: A: 50X B: 200X

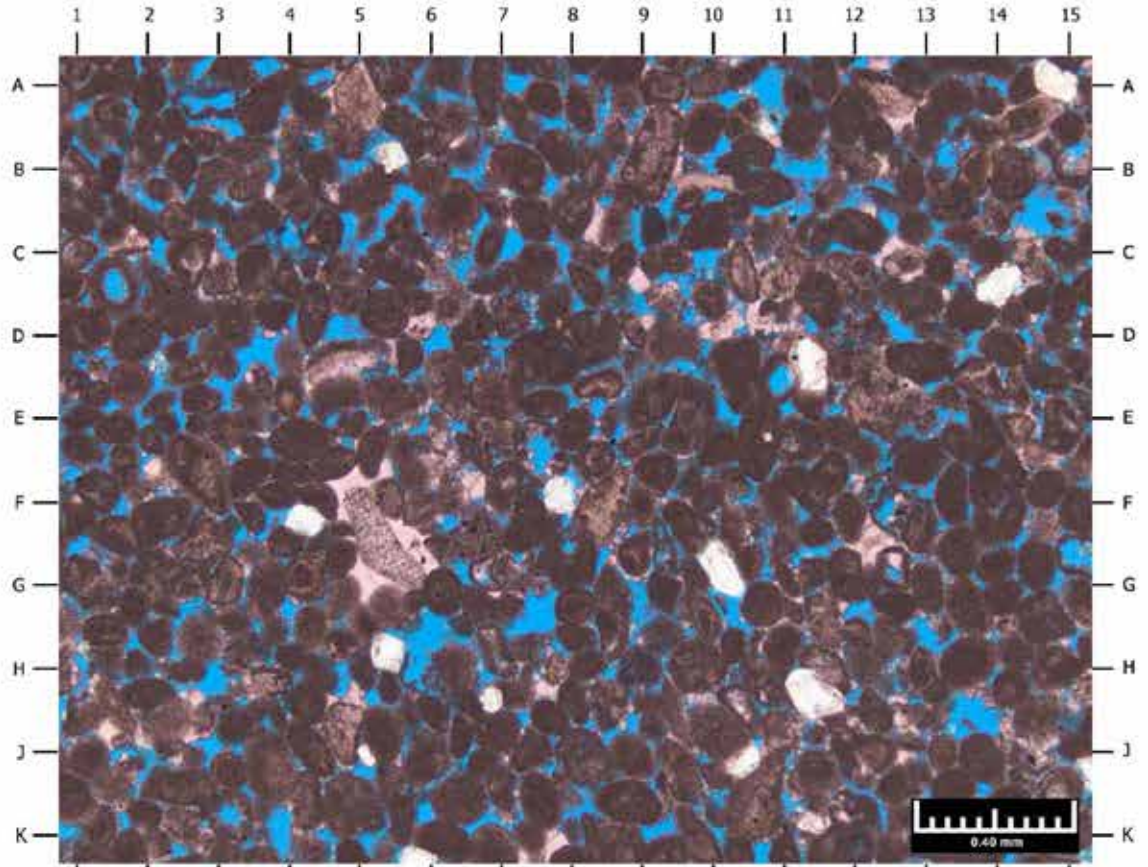
A) Photo A provides a general overview of this low to moderately-compacted, poorly-sorted ooid grainstone. Micritized ooids (A8-F11, C2-D3, C4-E6, FG5, H7) represent the dominant framework component, with minor peloids/pellets (AB5.8, EF3, GH8) and echinoderm fragments (D13-15, FG10.5-F14.5) observed. Discontinuous micritic envelopes (G10-GH14) and microbial borings (E13-15) are associated with some fossil fragments. Interparticle matrix pores (BC1, BC5.5, B12.7, E7.3, FG3.8, J-K3, JK6, JK9.5, JK14.8) characterized the main pore type present. Intraparticle micropores are associated with echinoderm fragments in this view (G12.5). A rare amount of pyrite occurs as cement/replacement at JK2.3 and JK4.

B) Photo B provides a detailed view of the area near EF4 in Photo A. Post depositional bladed, isopachus calcite crusts (C2.5-CD4, FG3-K6, G-J13.8) often coalesce to occur as pore-occluding cement. Blue-dyed epoxy assists in defining intracortical micropores associated with the tangential cortices of ooids (A6-E15, F1-K4). Interparticle matrix pores are present at J6.5-JK8 and J14.3.

Arkansas Geological Survey
Upper Smackover
Onshore

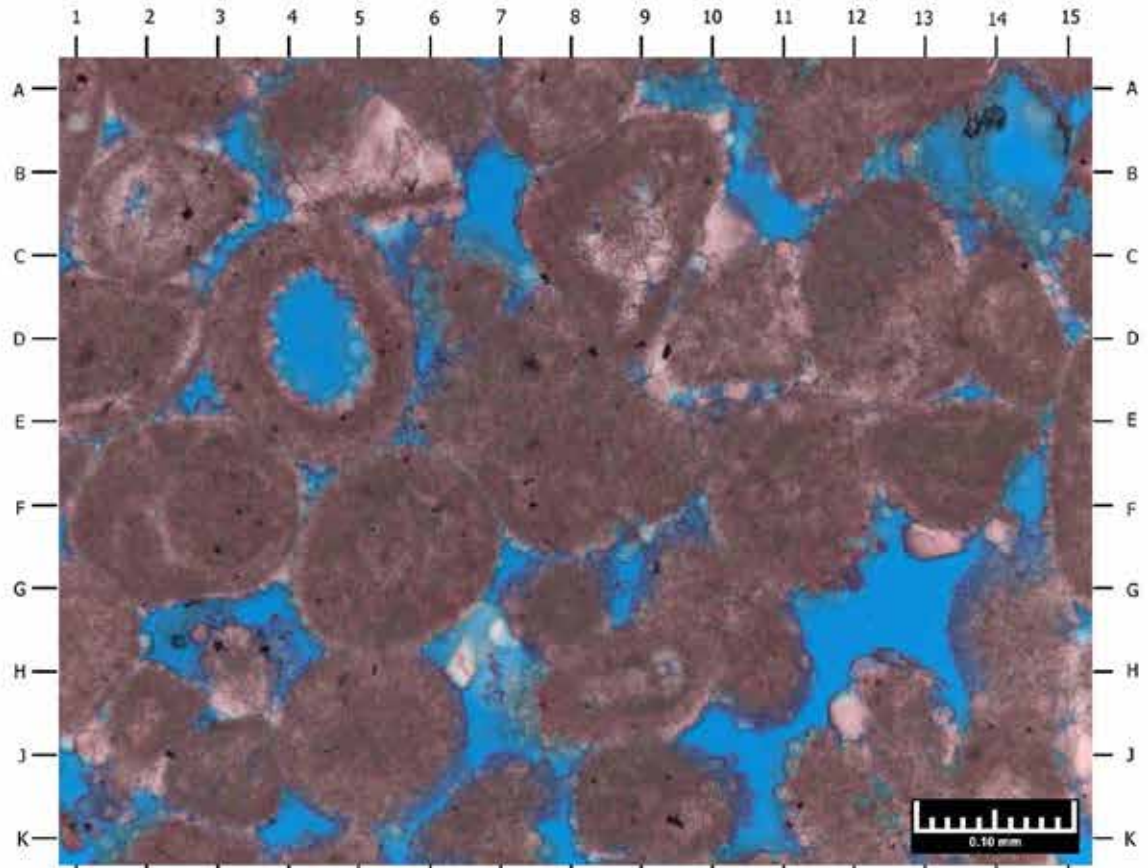
8303.00'
Plate 6

Weatherford LABORATORIES



A

50X



B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8303.00 FEET
SAMPLE NUMBER: 11 CS

PLATE 6

Lithology: Oolitic limestone

Texture: Moderately-compacted, poorly- to moderately-sorted and possibly graded ooid grainstone

Detrital Grains/Allochems: Common amounts of micritized ooids (radial and tangential cortices are observed on ooids exhibiting preserved internal structure; however, preservation is relatively rare); minor undifferentiated peloids/pellets and composite clasts/ooids; minor amounts of partially recrystallized calcareous shell fragments (possible brachiopod) and echinoderm fragments; minor monocrystalline quartz

Matrix: Interparticle pore space it occluded by rare to minor, very fine to rarely medium crystalline calcite spar

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as poorly-developed, discontinuous blocky crusts on allochems, as very fine to fine crystalline partial replacement of allochems, and as minor amounts of fine to rarely medium crystalline void-filling cement and overgrowths associated with calcareous shell fragments and other allochems. Trace pyrite replacement is observed. Rare quartz overgrowths and trace dolomite cement are also present.

Pore Types: Interparticle matrix pores characterize the dominant pore type. Minor vugs partially cross-cut allochems. Secondary intraparticle micropores, intracortical micropores, and moldic pores are present in minor amounts.

Magnification: A: 50X B: 200X

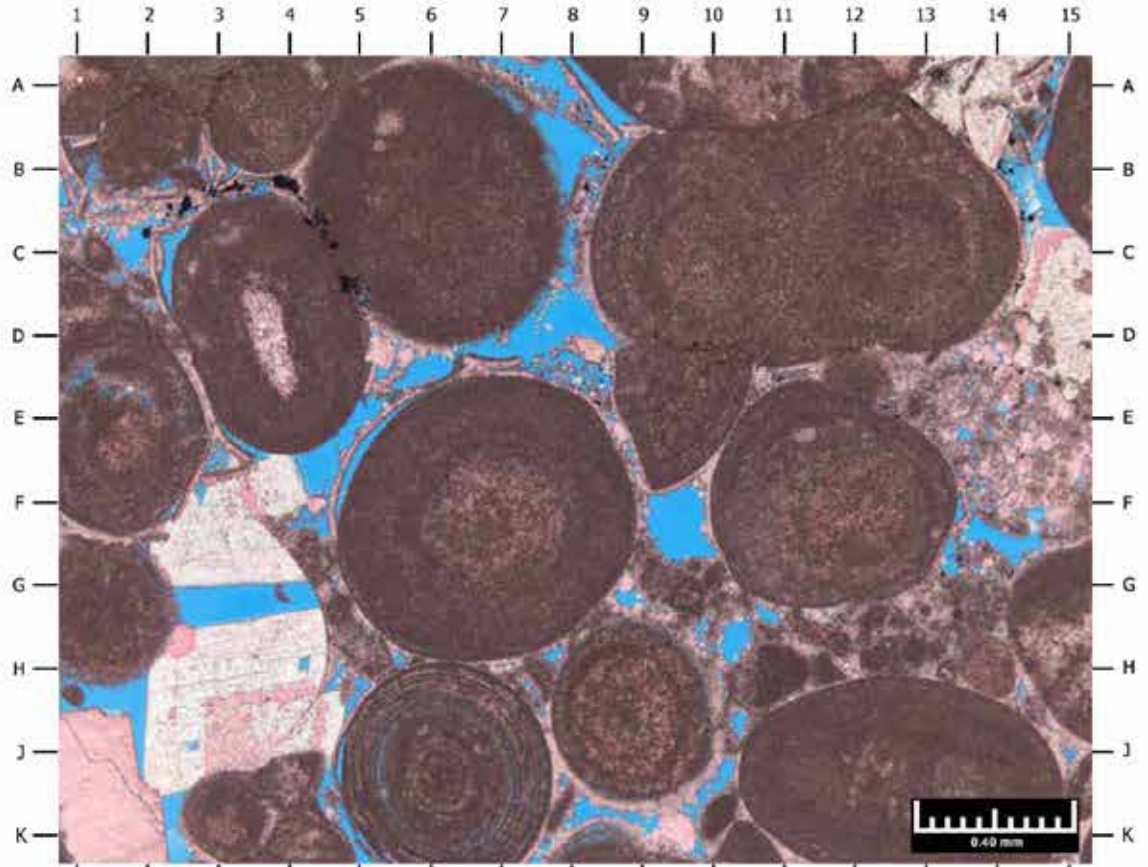
A) Photo A provides a general overview of this moderately-compacted ooid grainstone. Very fine sand-sized ooids represent the dominant constituent, with minor amounts of peloids/pellets, calcareous fossil fragments (AB5, FG5.3), and monocrystalline quartz (white grains) observed. Minor amounts of fine to rarely medium crystalline interparticle cement is dominantly related to overgrowths often associated with echinoderm fragments (syntaxial overgrowths in optical continuity is observed; F-G5.3) and occasionally associated with ooid/pellet replacement (HJ4.8). Overgrowths are also observed on host quartz grains (G10.2, H11.3).

B) Photo B provides a detailed view of the area near CD2.5 in Photo A. Abundant interparticle matrix pores/micropores are observed (blue-dyed epoxy; BC7, BC10.8, DE10-11, DE13.7, GH4, GH12-13, J6.7, K4), with low to locally minor (G13-K10.5) connectivity in this plane view. Minor amounts of moldic pores (B13-15, D4.3) and intraparticle micropores (BC2, H9.5, JK12.5) are observed. Interparticle pores are reduced by compaction (G1.5), blocky isopachus crusts on allochems (C3-BC3.5, E3, G4, G14.8), and minor amounts of fine crystalline calcite cement/overgrowths (B5-6, C10, FG13). Very fine to fine crystalline calcite also occurs as partial replacement of allochems (C9, E1-D3). Trace dolomite (H6.5) and microcrystalline pyrite (black specks) are observed.

Arkansas Geological Survey
Upper Smackover
Onshore

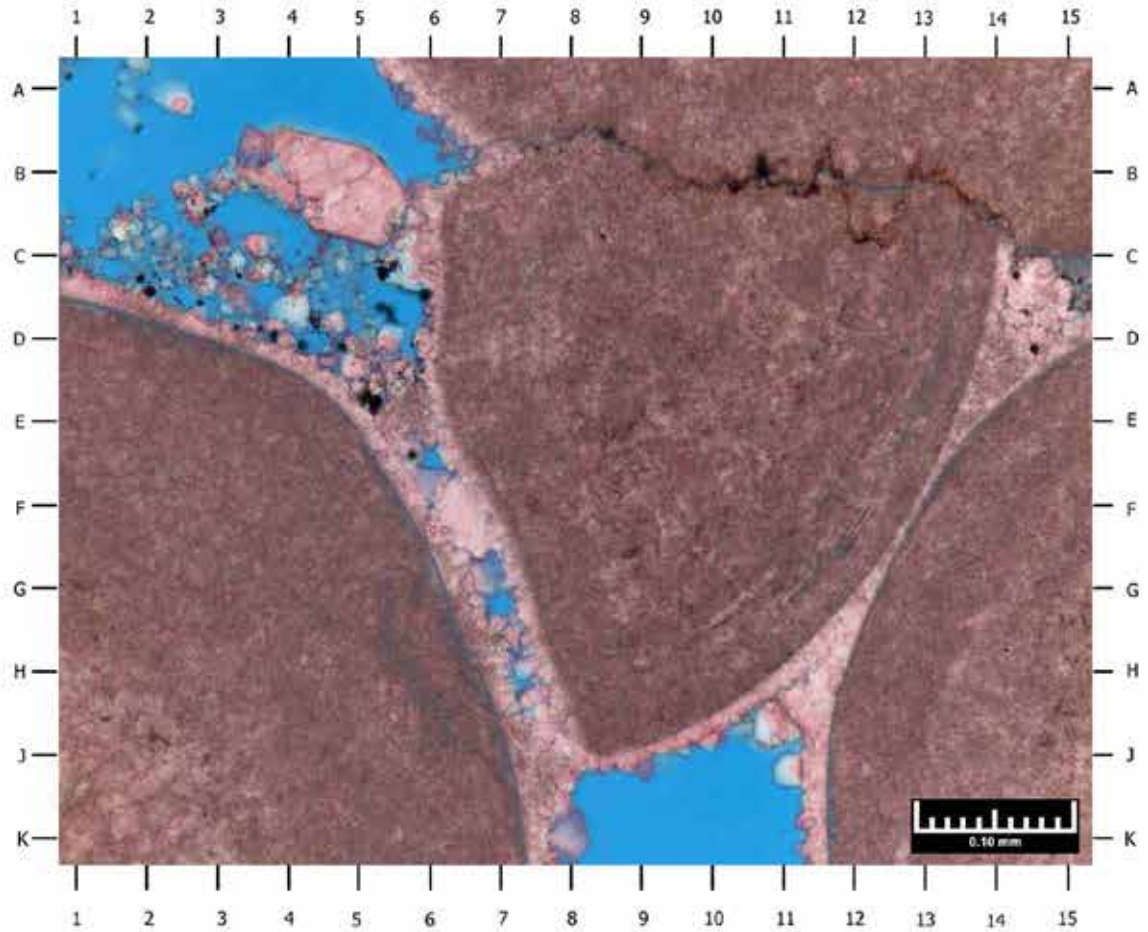
8307.00'
Plate 7

Weatherford LABORATORIES



A

50X



B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8307.00 FEET
SAMPLE NUMBER: 12 CS

PLATE 7

Lithology: Oolitic limestone

Texture: Well-compacted, very poorly-sorted ooid grainstone. Stylolites often occur between compacted particles and exhibit dissolution at sutured contacts.

Detrital Grains/Allochems: Common amounts of micritized ooids (radial and tangential cortices are observed on ooids exhibiting moderately preserved internal structure); relatively common composite ooids/clasts; minor undifferentiated peloids/pellets; minor amounts of partially recrystallized calcareous shell fragments (possible brachiopod) and echinoderm fragments; minor monocrystalline quartz

Matrix: Interparticle pore space it occluded by minor amounts of coarse crystalline dolomite and calcite spar

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as poorly-developed blocky crusts on allochems, as very fine to fine crystalline partial replacement of allochems, and as minor amounts of medium to coarse crystalline cement. Minor amounts of coarse crystalline dolomite cement are present. Rare pyrite cement/replacement is observed.

Pore Types: Interparticle matrix pores represent the dominant pore type. Minor amounts of secondary intraparticle pores/micropores, intracortical micropores, and rare moldic pores are related to preferential dissolution of allochems. Trace particle fracture pores are observed.

Magnification: A: 50X B: 200X

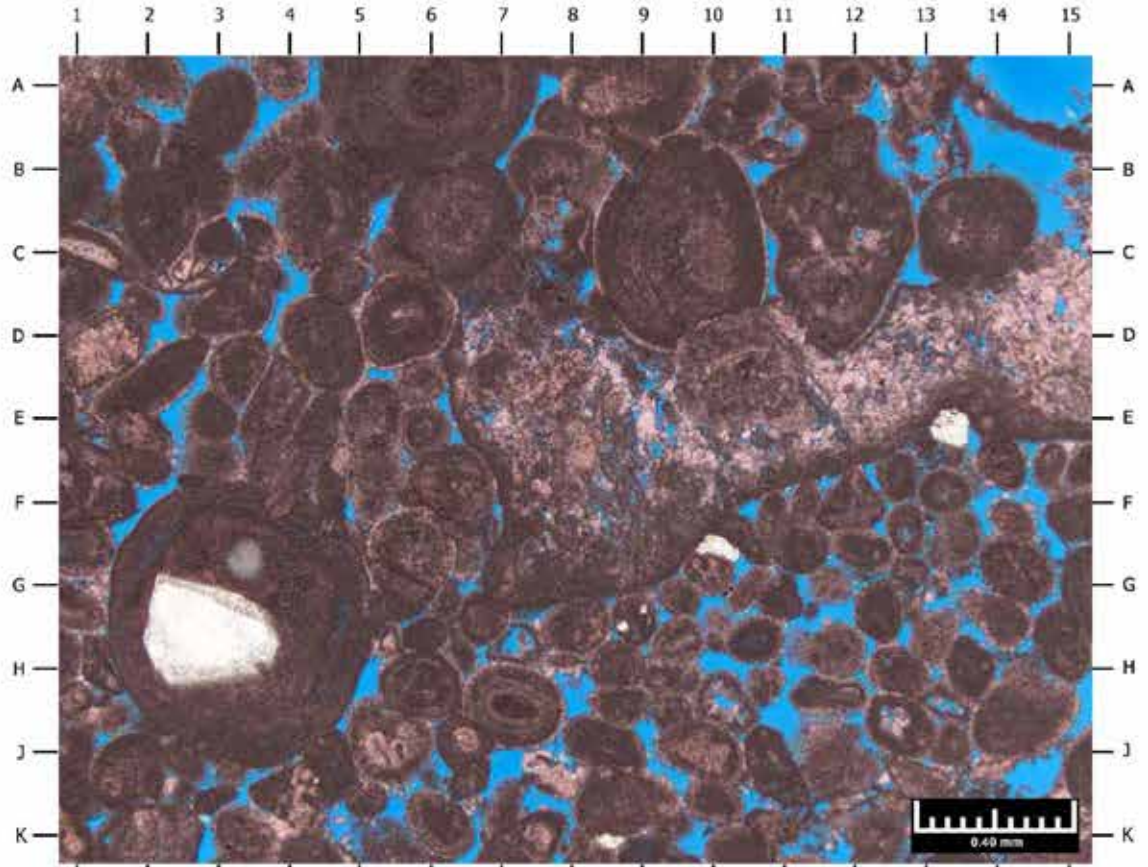
A) Photo A provides a general overview of this ooid grainstone. Well-compacted, generally medium- to coarse sand-sized ooids characterize the dominant framework constituent. Internal structures are moderately preserved with tangential cortices observed within the ooid present at J5-7. Poorly-developed blocky calcite crusts are often pulled from allochems and fractured. Fractured calcite crusts are partially enveloped (A14.5, FG2.3) and probable earlier calcite cement replaced (J3-4) by later coarse crystalline dolomite cement. Interparticle pores (EF4.5-D7-8, FG9.5, GH3-4, FG14, HJ1.8, K2.3) are partially occluded by compaction and coarse crystalline dolomite (C-D15, FG3-4, HJ2-4.5) and calcite (J1-K2). Rare microcrystalline pyrite cement/replacement is observed (black; BC2-4).

B) Photo B provides a detailed view of the area near E9 in Photo A. A stylolite, occurring between compacted particles, is highlighted at B9-BC14. Blocky isopachus calcite crusts on allochems occasionally coalesce and obstruct pore throats (E5.8-J8). Minor interparticle/intercrystalline micropores are preserved (EF6, G7, H7.3). Secondary intraparticle (H6) and intracortical micropores (D13.5-G11.5) are associated with partial leaching of allochems. Rare pyrite framboids (black specks; CD2, CD5.3, DE5.3) are also observed.

Arkansas Geological Survey
Upper Smackover
Onshore

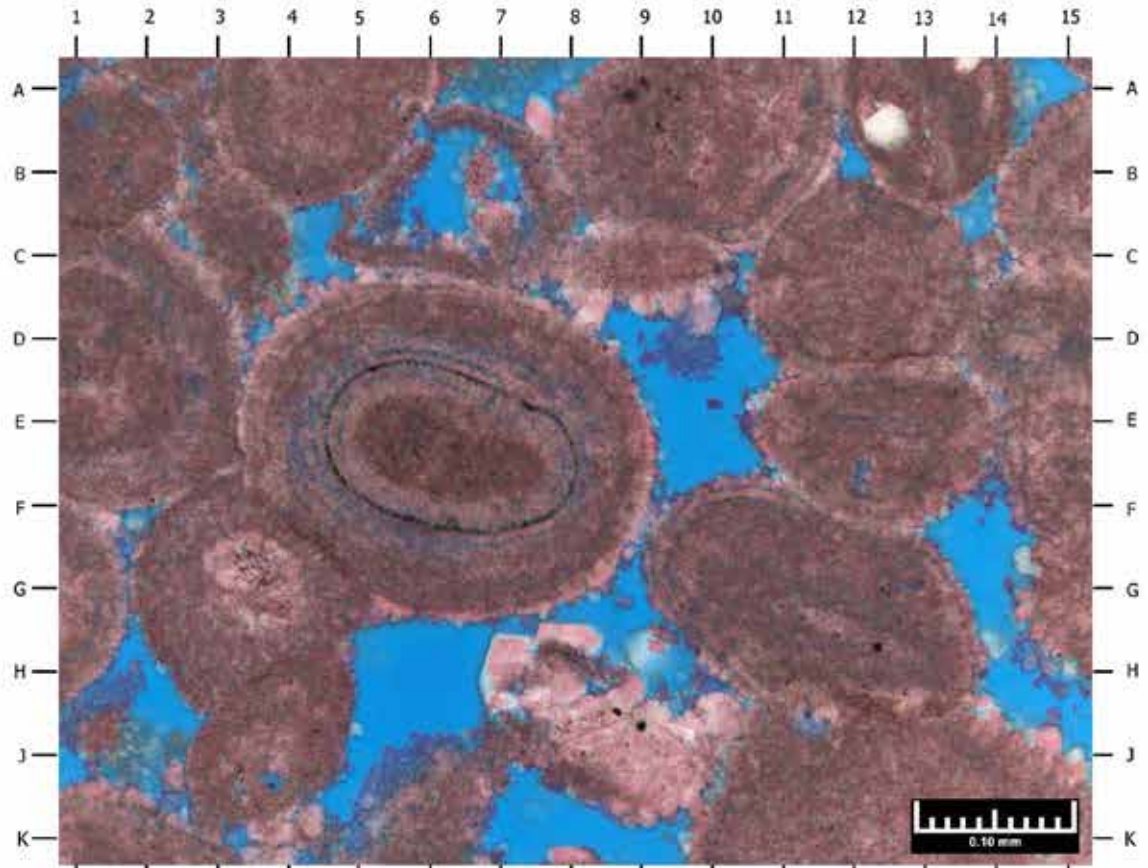
8326.00'
Plate 8

Weatherford LABORATORIES



A

50X



B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8326.00 FEET
SAMPLE NUMBER: 13 CS

PLATE 8

Lithology: Oolitic limestone

Texture: Well-compacted, very poorly-sorted ooid grainstone. Incipient stylolites/solution seams occasionally occur between compacted particles and exhibit dissolution at sutured contacts.

Detrital Grains/Allochems: Common amounts of micritized ooids exhibiting moderate to poorly-preserved internal structures; minor composite ooids/clasts and undifferentiated peloids/pellets; minor amounts of partially recrystallized calcareous bivalve fragments, echinoderm fragments, sponge-algal-bryozoan fragments, and trace other undifferentiated shell fragments; minor monocrystalline quartz

Matrix: Interparticle pore space it occluded by rare amounts of calcite spar

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as thin, poorly-developed, blocky crusts on allochems, as very fine to fine crystalline replacement of allochems, and as rare to minor amounts of fine to coarse crystalline cement dominantly related to overgrowths associated with allochems. Rare pyrite cement/replacement and trace quartz overgrowths are observed.

Pore Types: Abundant interparticle matrix pores characterize the dominant pore type. Secondary intraparticle pores/micropores, intracortical micropores, and moldic pores are associated with preferential dissolution of allochems. Rare vugs cross-cut allochems.

Magnification: A: 50X B: 200X

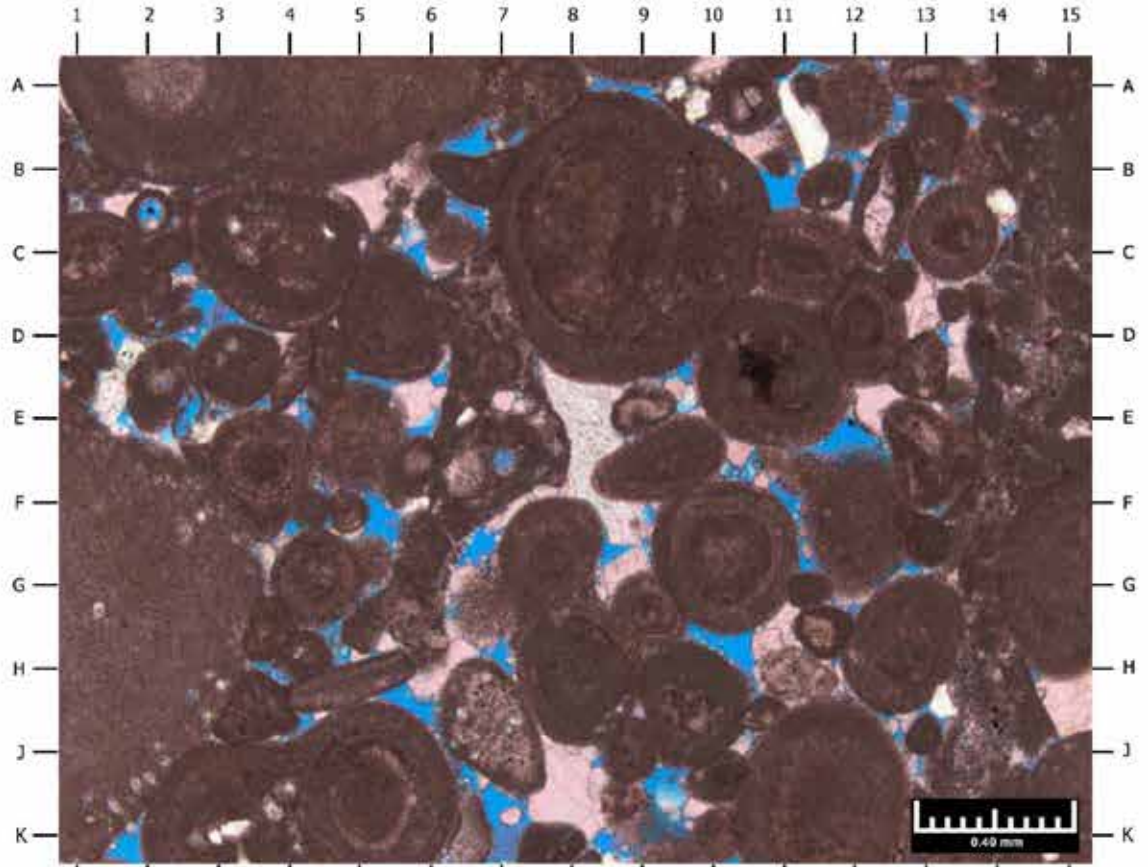
A) Photo A provides a general overview of this well-compacted, very poorly-sorted ooid grainstone. Fine to coarse sand-sized ooids occur as the dominant framework constituent. Minor quartz grains are observed (white grains) and are often associated with the nuclei of ooids. An undifferentiated, calcite-recrystallized allochem occurring from E7 to D15 exhibits common amounts of secondary intraparticle pores. Primary interparticle matrix pores (blue epoxy) represent the dominant pore type and exhibit low to moderate pore throat connectivity (CD4, E2.5-FG2, F14.5-G14.8) in this planar view. Minor moldic pores (A14-15, GH7.2, JK14.5) are also observed.

B) Photo B highlights the area near HJ8 in Photo A. Thin blocky isopachus crusts are present on allochems and occasionally bind adjacent particles (CD8.5). Interparticle pores are dominantly reduced by compaction, with rare to minor amounts of fine crystalline calcite cement occluding pores (H7, K4). Secondary intraparticle (AB1.2, EF12) and intracortical micropores (D5-E8, EF4-FG7) contribute minor amounts of porosity to the overall pore volume.

Arkansas Geological Survey
Upper Smackover
Onshore

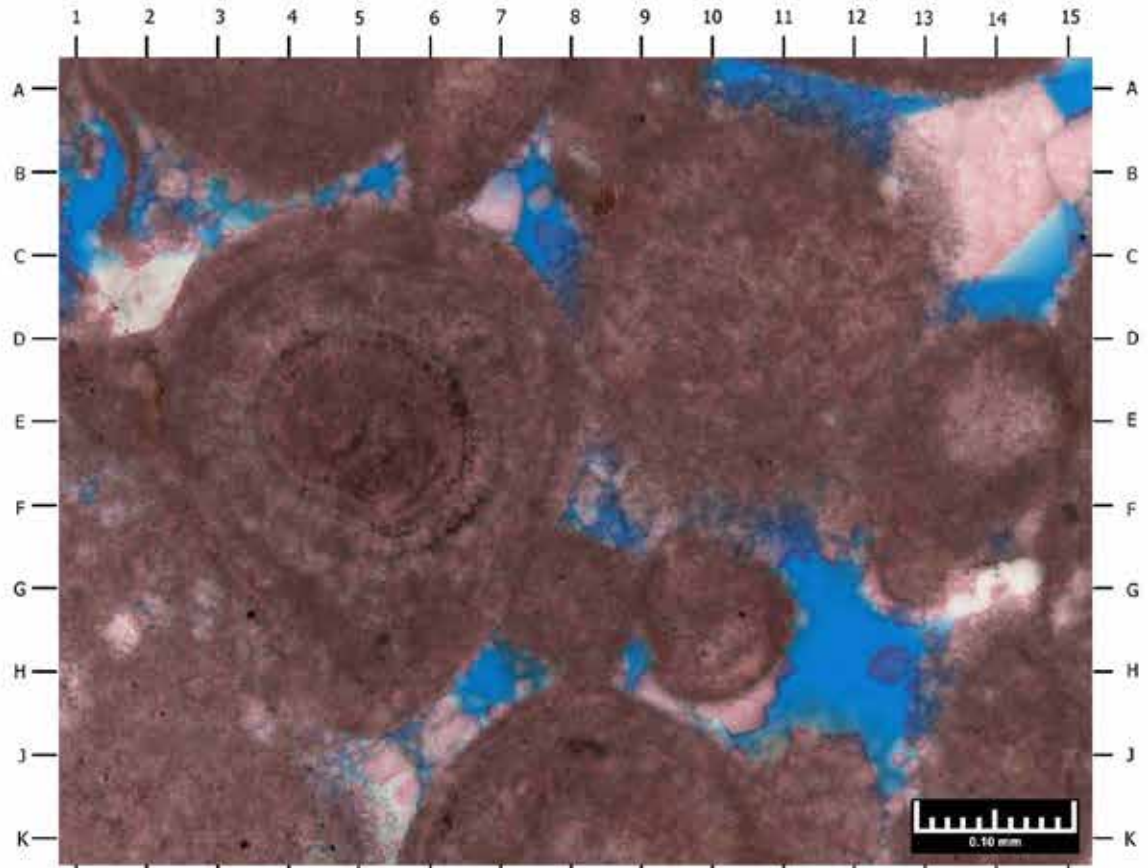
8334.00'
Plate 9

Weatherford LABORATORIES



A

50X



B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8334.00 FEET
SAMPLE NUMBER: 14 CS

PLATE 9

Lithology: Oolitic limestone

Texture: Well-compacted, poorly-sorted ooid grainstone. Solution seams often occur between particles and exhibit dissolution at sutured contacts.

Detrital Grains/Allochems: Common amounts of micritized ooids exhibiting moderate to poorly-preserved internal structures (vague evidence of radial cortical structures); minor composite ooids/clasts and undifferentiated peloids/pellets; minor amounts of partially recrystallized calcareous shell fragments and echinoderm fragments; minor monocrystalline quartz; trace chert

Matrix: Interparticle pore space it occluded by minor amounts of fine to coarse crystalline calcite spar

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as minor amounts of thin, discontinuous, poorly-developed, blocky crusts on allochems, as very fine to finely crystalline replacement of allochems, and as minor amounts of fine to coarse crystalline cement. Rare dolomite (non-ferroan dolomite does not stain) and pyrite cement/replacement and trace quartz overgrowths are observed.

Pore Types: Abundant interparticle matrix pores represent the dominant pore type. Minor amounts of secondary intraparticle pores/micropores, moldic pores, and trace intracortical micropores are associated with preferential dissolution of allochems.

Magnification: A: 50X B: 200X

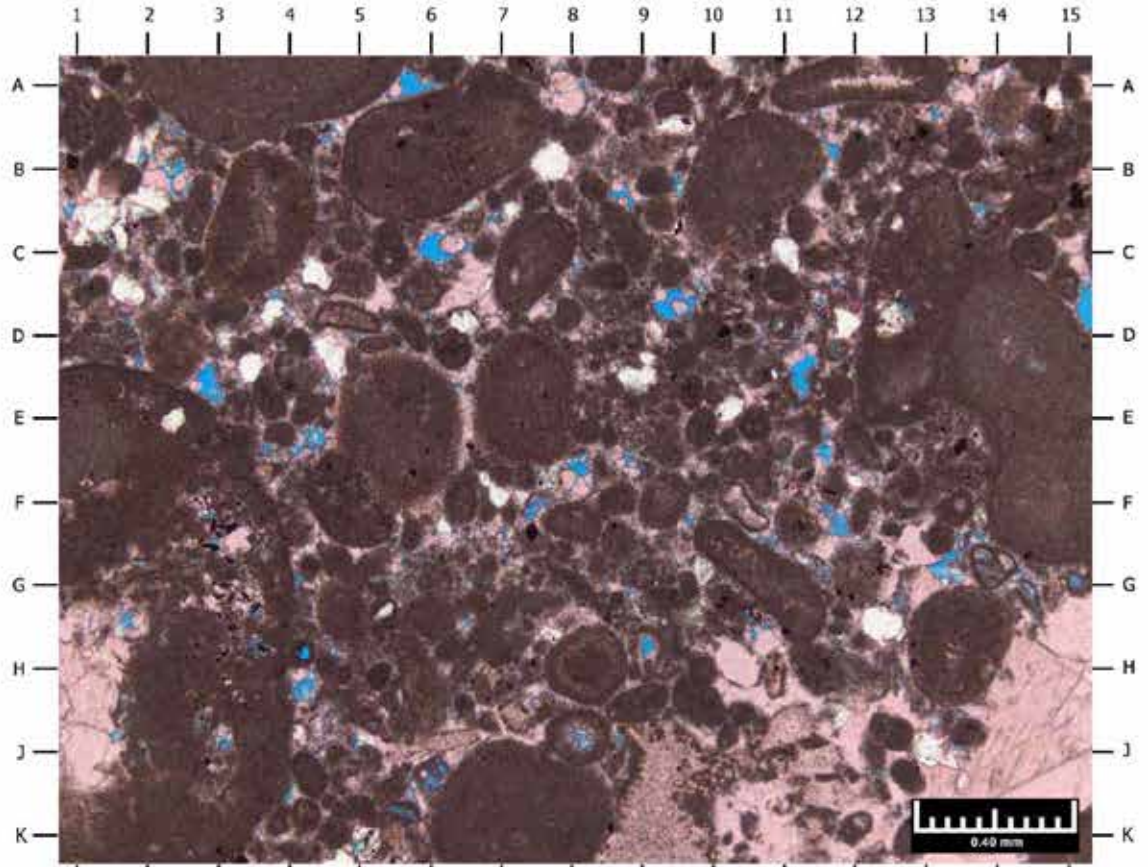
A) Photo A provides a general overview of this well-compacted ooid grainstone. Micritic ooids characterize the dominant framework constituent, with minor amounts of undifferentiated peloids/pellets (C2.2, D-E13.8, FG13), composite ooids (A1-6.5), and undifferentiated, partially recrystallized/micritized shell fragments (H5) observed. Moderately developed solution seams often occur between allochems (D4.9, C10.7, D10.2). Minor amounts of fine to coarse crystalline calcite occurs as interparticle cement (BC1.7, BC5, CD13, E5.8, G8.7, H6.2, HJ15, J-K8), with rare dolomite (E-F8) also present. Minor quartz grains (BC14, E6.7, K3) occasionally exhibit overgrowths (AB11.2).

B) Photo B provides a detailed view of the area near EF4.5 in Photo A. Ooids exhibit moderate to poor preservation of internal structures (C3-FG7). Undifferentiated micritic grains are characterized as peloids/pellets (B9-DE12). Primary interparticle pores (A15, A10-AB12.3, C7.3, CD14, G11.5-J12.5, H7) contribute the majority of porosity. Minor moldic pores (AB1.2) and secondary intraparticle micropores (F1.3, FG14) are observed. Pore throats are reduced by compaction and partially occluded by minor amounts of thin, discontinuous, poorly-developed, blocky isopachus crusts on allochems (BC3-5, F10), minor interparticle calcite cement (AB13-B15), and rare dolomite cement (CD2). Trace microcrystalline pyrite (black specks) are observed.

Arkansas Geological Survey
Upper Smackover
Onshore

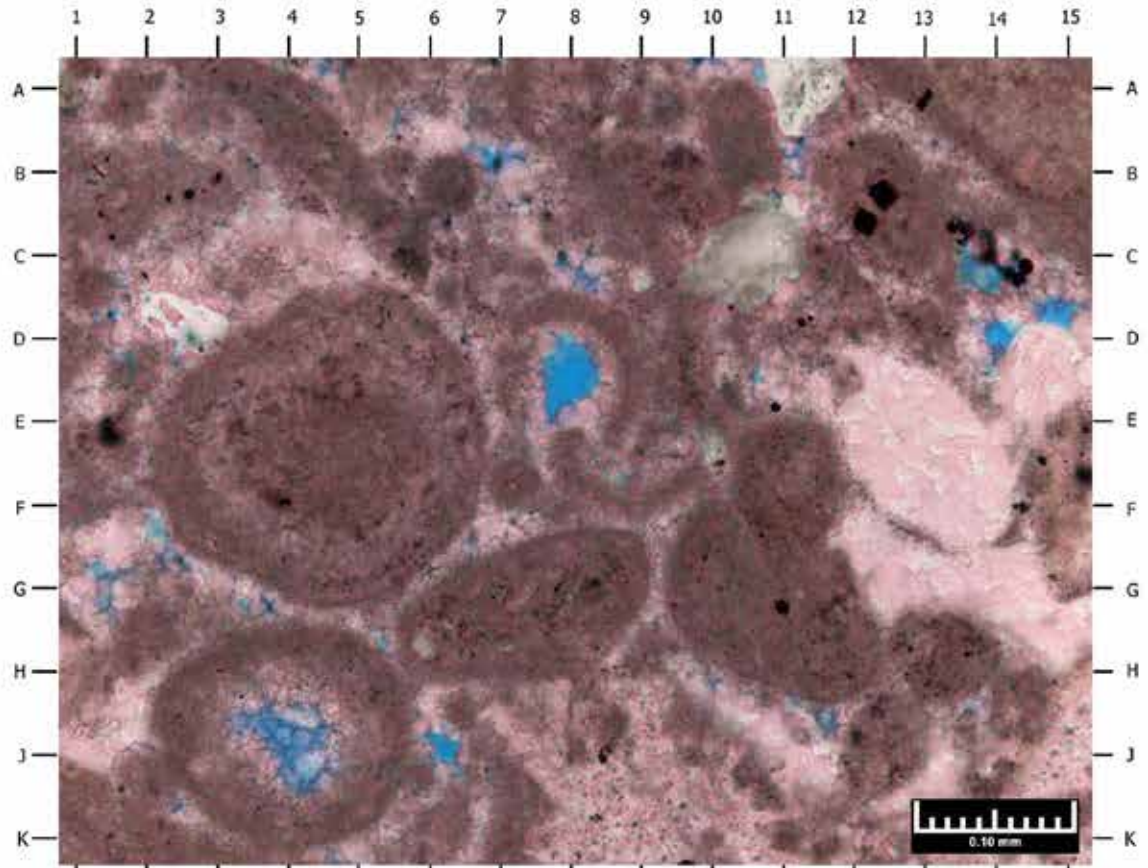
8351.00'
Plate 10

Weatherford LABORATORIES



A

50X



B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8351.00 FEET
SAMPLE NUMBER: 15 CS

PLATE 10

Lithology: Oolitic, peloidal/pelletal, intraclastic limestone

Texture: Moderately to well-compacted, poorly-sorted grainstone; local particle size zonation; solution seams occur between particles and exhibit dissolution at sutured contacts in areas containing coarse interparticle cement between allochems suggestive of post-compaction exposure/reworking and/or preferential dissolution and cement/replacement.

Detrital Grains/Allochems: Common amounts of peloids/pellets, micritized ooids exhibiting poorly-preserved internal structures, coarse sand-size to pebble-size compound ooids and clasts; minor amounts of partially recrystallized calcareous shell fragments, echinoderm fragments, foraminifera, and algal-sponge-bryozoan fragments; minor to locally common monocrystalline quartz; residual bitumen/organic material

Matrix: Interparticle pore space it occluded by common amounts of fine to coarse crystalline calcite spar, rare dolomite, and trace anhydrite cements

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as minor amounts of thin, discontinuous, poorly-developed, isopachus crusts on allochems, as very fine to finely crystalline replacement of allochems, and as common amounts of fine to coarse crystalline interparticle and void-filling cement. Rare to minor dolomite (non-ferroan dolomite does not stain) cement/replacement; trace possible anhydrite cement; trace quartz overgrowths; trace to rare microcrystalline pyrite as cement and partial replacement of allochems and organic material

Pore Types: Common to abundant amounts of porosity includes interparticle matrix pores secondary intraparticle pores/micropores and moldic pores associated with preferential dissolution of allochems.

Magnification: A: 50X B: 200X

A) Photo A provides a general overview of this oolitic, peloidal/pelletal, intraclastic grainstone. The image is captured near an area representative of a contact (G15-K10) between a localized zone of very poorly-sorted, dominantly very fine to fine sand-size peloids/pellets/ooids with rare coarse compound/intraclasts and minor calcite cementation (most of image; A1-G11) and an area of more commonly coarse to pebble size peloids/pellets/ooids/clasts that are cemented by abundant coarse crystalline calcite cement (bottom right corner). Micritized ooids (H8.3, H13.5), undifferentiated peloids/pellets (A15, BC9.2, C2.7, D9.7), compound ooids/clasts (CD14-FG15, DE1-K3), partially recrystallized fossil fragments (G14.8, J-K9.2), and very fine-grained quartz (white grains; B7.8, D11.8, DE3.6) characterize the main framework components. Possible residual bitumen/organic material (trace pyrite reflectivity) occurs within secondary pore spaces (FG3-GH3.5). Probable anhydrite cement is observed near B2.

B) Photo B provides a highlighted view of the area near H9 in Photo A. Interparticle micropores (AB5.6, B7, CD8.2, CD15, J6.2) and secondary intraparticle/moldic pores (DE8, J4) characterize the pore types depicted. Probable dolomite (C10.5, EF10.2, GJ6) and pyrite cement/replacement (BC12.2, C14) are observed. Microbial borings are present within the echinoderm fragment at HJ9.5-K11.

Kress City SE Field

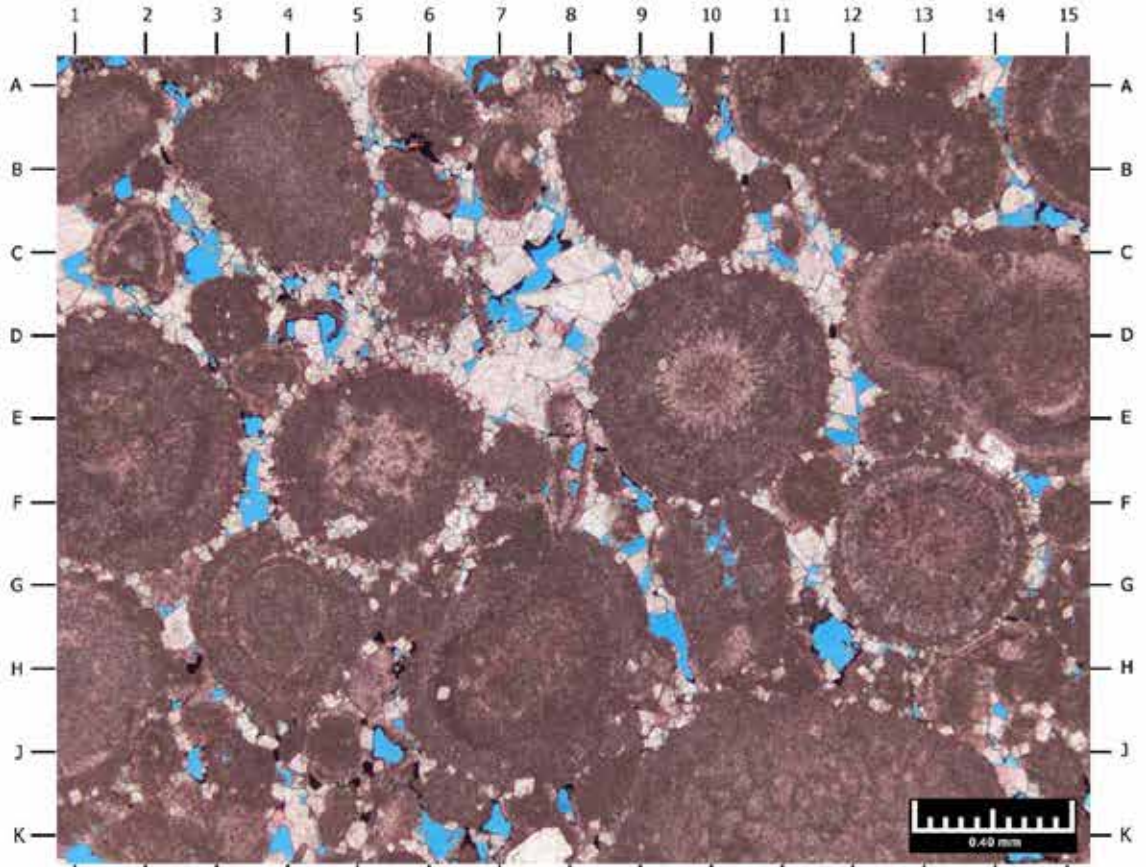
Permit #34944

Sampled interval: 8417’- 8451’

Arkansas Geological Survey
Upper Smackover
Onshore

8417.00'
Plate 11

Weatherford LABORATORIES



A

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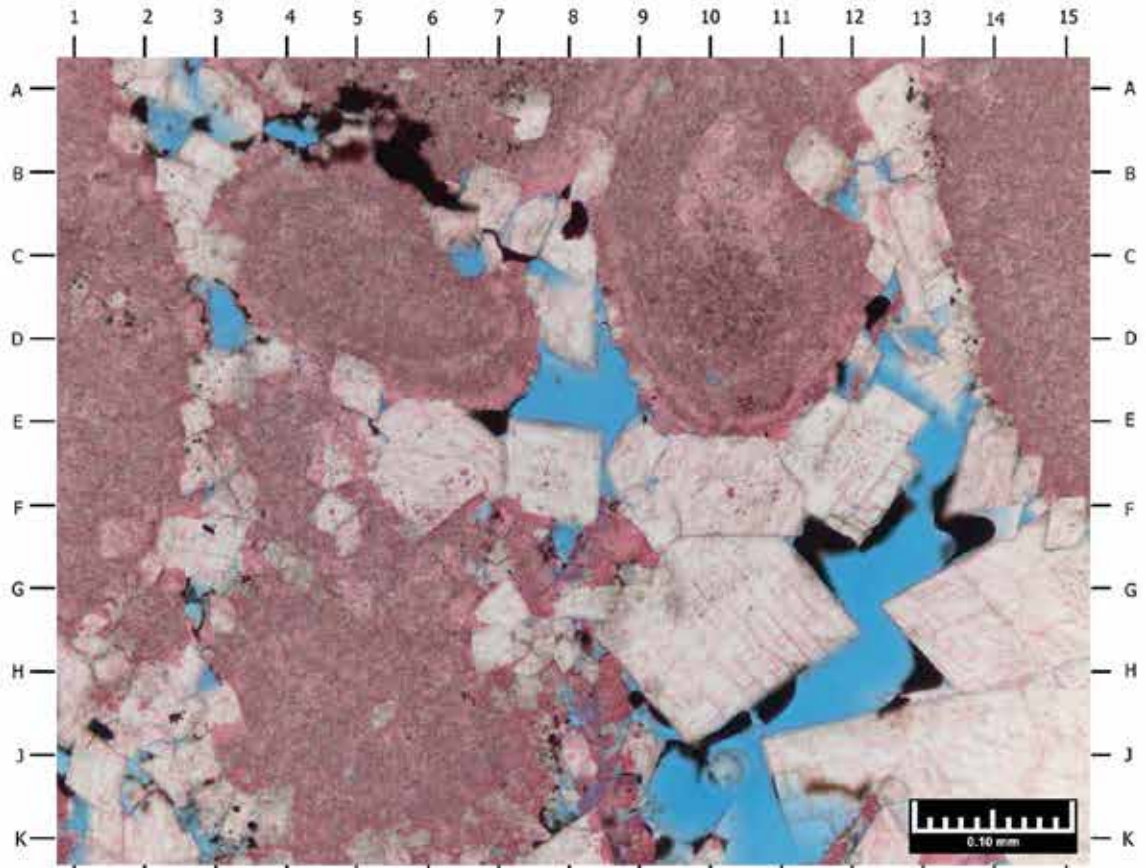


B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8417.00
FEET SAMPLE NUMBER: 1 CS

PLATE 11

Lithology: Dolomitic, oolitic limestone

Texture: Moderately-compacted, poorly-sorted ooid grainstone

Detrital Grains/Allochems: Abundant amounts of micritized ooids exhibiting moderate to poorly-preserved internal structures (evidence of minor microbial boring within ooids and fossil fragments); minor amounts of undifferentiated micritic peloids/pellets; minor amounts of partially recrystallized/micritized calcareous fossil fragments (bryozoan, echinoderm, bivalve); rare compound ooids/clasts; rare monocrystalline quartz; residual bitumen/organic material

Matrix: Interparticle pore space it occluded by common amounts of fine to medium crystalline calcite and dolomite cements

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as very fine to finely crystalline replacement of allochems, as fine to medium crystalline interparticle and void-filling cement, and as minor amounts of thin, discontinuous, poorly-developed, blocky, isopachus crusts on allochems. Common amounts of fine to medium crystalline, euhedral to subhedral dolomite (non-ferroan dolomite does not stain) occurs as interparticle cement and replacement of precursor isopachus crusts on allochem; trace quartz overgrowths; trace to rare microcrystalline pyrite as cement and partial replacement of allochems and organic material

Pore Types: Common amounts of interparticle pores characterize the dominant pore type. Minor amounts of secondary intraparticle pores/micropores and moldic pores are associated with preferential dissolution of allochems. Trace vugs cross-cut allochems.

Magnification: A: 50X B: 200X

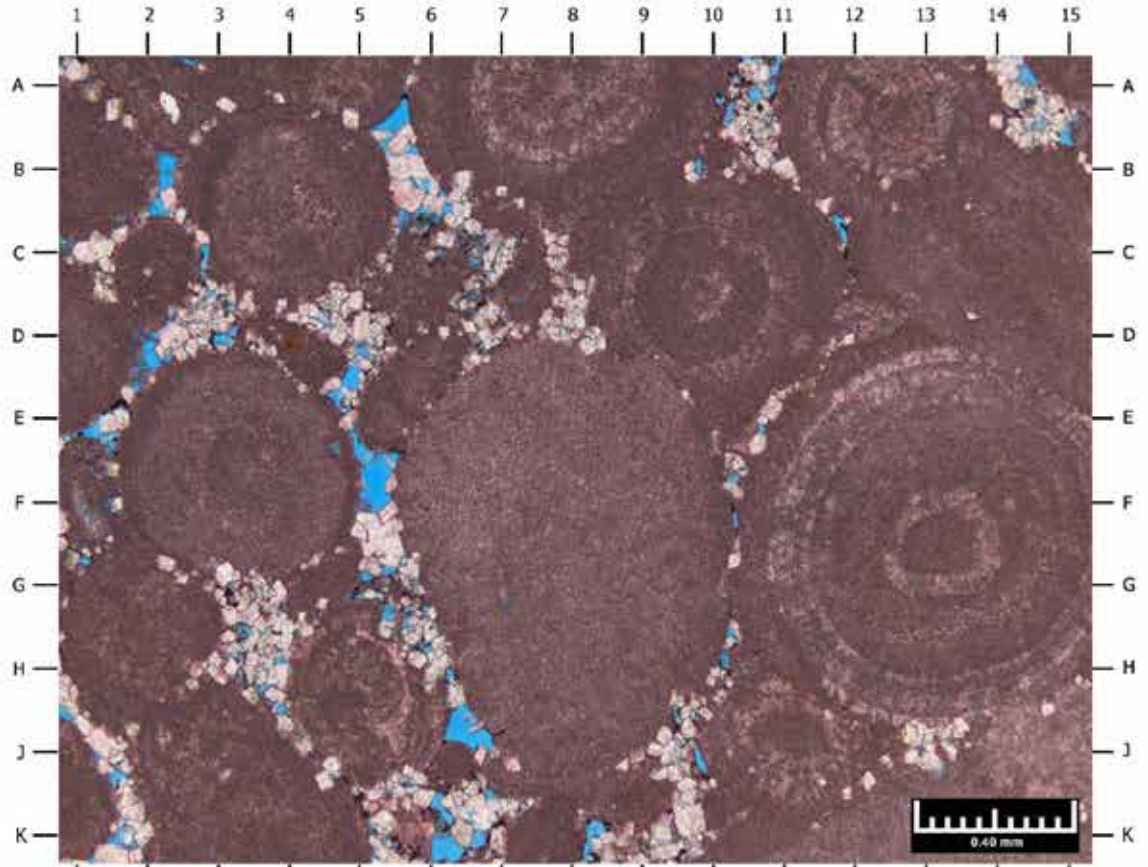
A) Photo A provides a general overview of this dolomitic, ooid grainstone. Abundant amounts of micritic ooids characterize the dominant constituent, with minor amounts of undifferentiated peloids/pellets (D3.2, J4.7) and partially recrystallized/micritized fossil fragments (EF8, HJ10-K14) also depicted. The internal structures of ooids are moderately to poorly-preserved, but may reflect radial cortical structures (F12.5-GH13.5). Minor calcite cement (C6.5) and allochem-rimming crusts are observed (A6, C11). Dolomite commonly occurs as replacement of precursor, calcareous isopachus crusts around allochems (AB2.5-C5.2, DE4.3-FG6.2) and as fine to medium crystalline, interparticle cement (C1, CD8, DE7.5). Common interparticle pores (blue epoxy) are present and minor intraparticle pores (EF8.2, FG10.2) result from partial leaching of allochems.

B) Photo B provides a detailed view of the area near BC6.5 in Photo A. Common interparticle pores (D3, DE8, EF13.2-K10.5) represent the main pore type. Interparticle pores are often partially occluded by dolomite cement (B-C2.7, B12.5-EF14, EF7-12.5, H2.5-K1.5). Minor dolomite also occurs as partial replacement of allochems (A9.3, CD1.2, FG4, K5.2). Probable residual bitumen lines pores (black material; AB4-BD6.5, E7, F12.5-HJ10, FG13.5, H13).

Arkansas Geological Survey
Upper Smackover
Onshore

8424.00'
Plate 12

Weatherford LABORATORIES



A

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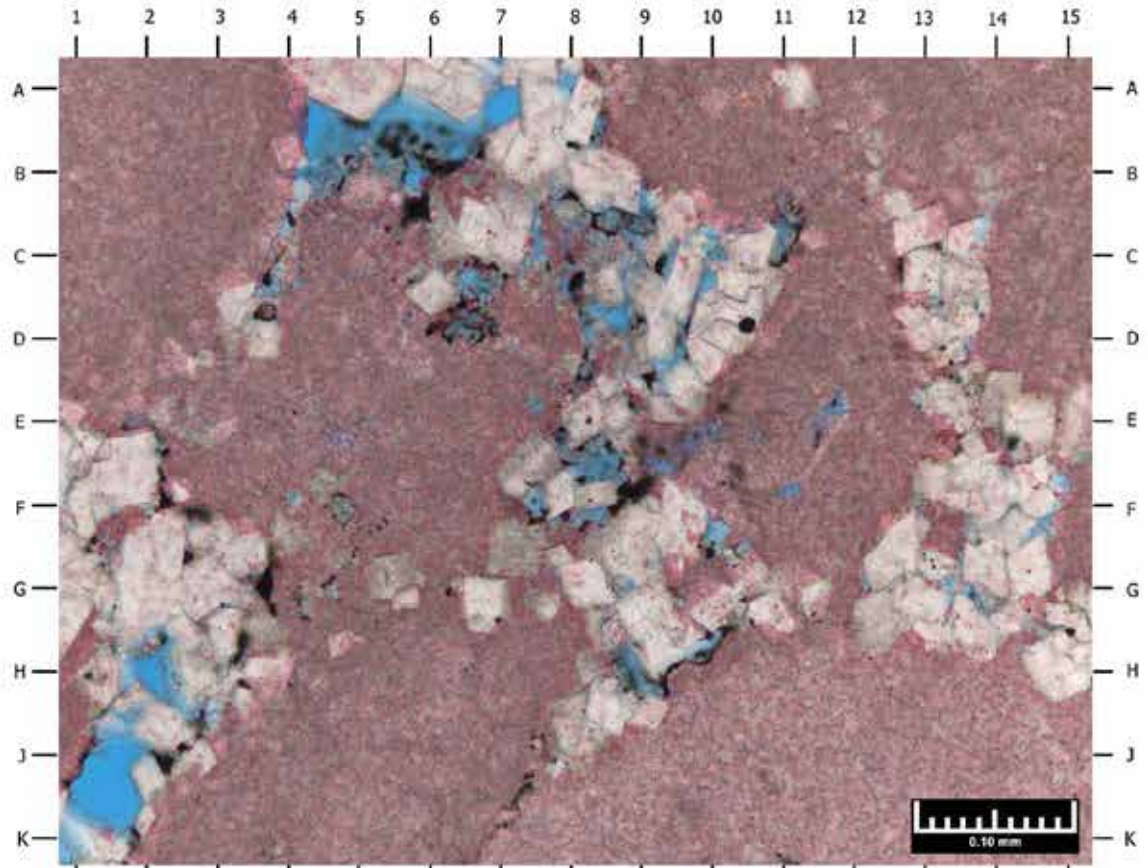


B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8424.00 FEET
SAMPLE NUMBER: 2 CS

PLATE 12

Lithology: Dolomitic, oolitic limestone

Texture: Moderately to well-compacted, coarse, poorly-sorted ooid grainstone; minor solution seams occur between particles and exhibit dissolution at sutured contacts

Detrital Grains/Allochems: Abundant amounts of micritic ooids, ranging from fine sand-size to very fine granule-size particles, exhibit moderate to poorly-preserved internal structures (minor microbial borings are observed); minor amounts of undifferentiated micritic peloids/pellets; minor amounts of partially recrystallized/micritized calcareous fossil fragments (bryozoan-algal, echinoderm, bivalve); minor compound ooids/clasts; trace monocrystalline quartz; residual bitumen/organic material

Matrix: Interparticle pore space it occluded by common amounts of fine to medium crystalline calcite and dolomite cement

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as very fine to finely crystalline neomorphic recrystallization of allochems and as fine to rarely medium crystalline interparticle and void-filling cement; common amounts of fine to rarely medium crystalline, euhedral to subhedral dolomite (non-ferroan dolomite does not stain) occurs as interparticle cement and rare replacement of allochems; trace to rare microcrystalline pyrite as cement and partial replacement of allochems and organic material; rare anhydrite cement

Pore Types: Common amounts of interparticle pores represent the dominant pore type. Minor amounts of secondary intraparticle pores/micropores, rare intracortical micropores, and moldic pores are associated with fossil fragments and preferential dissolution of allochems.

Magnification: A: 50X B: 200X

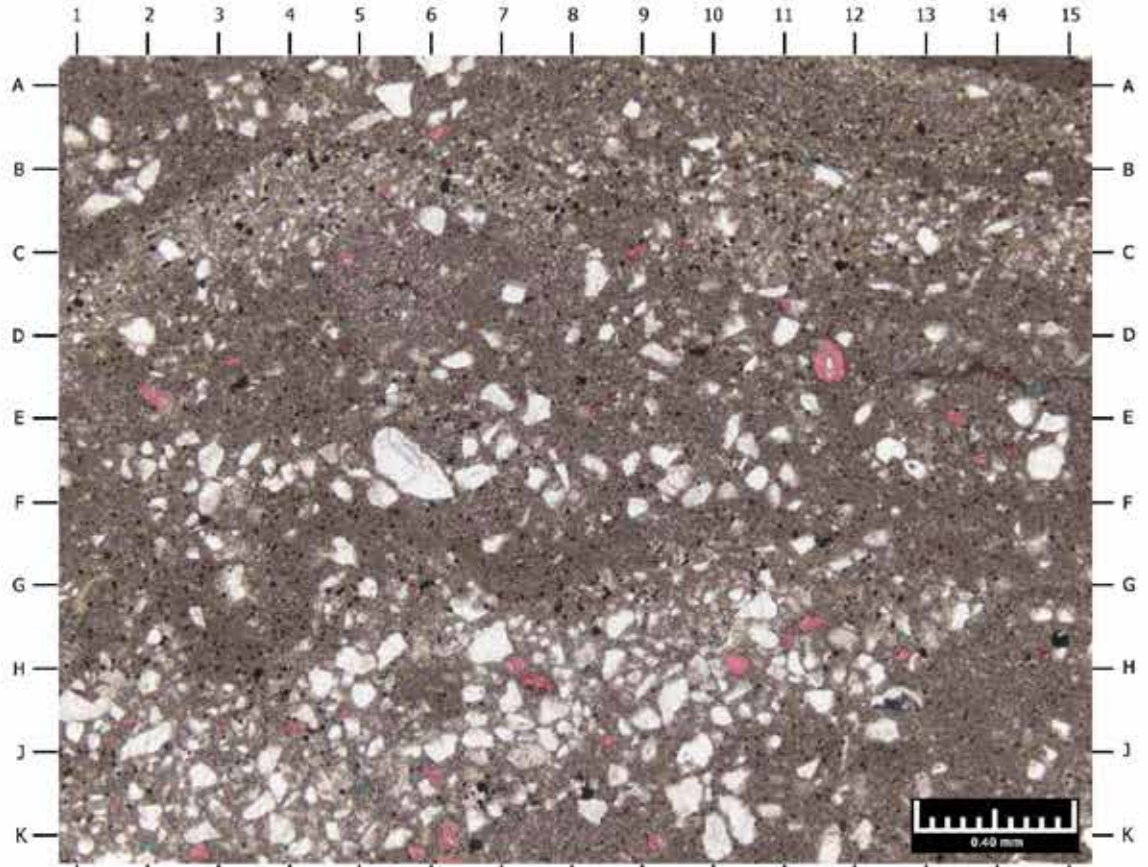
A) Photo A provides a general overview of this dolomitic, ooid grainstone. Abundant amounts of micritic ooids constitute the dominant component, with minor amounts of undifferentiated micritic peloids/pellets (DE5.7, K7.7), partially recrystallized/micritized fossil fragments, and compound ooids/clasts observed (not shown). The internal structures of ooids are moderately to poorly-preserved, but may reflect radial cortical structures (A7-B9, A12-B13). Common interparticle pores (blue epoxy) are partially occluded by fine crystalline dolomite (AB14.5, D3, D8, FG5.5, G-H3.7) and rare to minor calcite cement (H3, K5.7).

B) Photo B provides a detailed view of the area near CD6.5 in Photo A. Common interparticle/intercrystalline pores and/or micropores (AB4.3-7, C10, CD8.7, EF8.5, J-K1.5) represent the prevalent pore type. Interparticle pores are often partially obstructed by euhedral to subhedral dolomite cement. Minor dolomite also occurs as partial replacement of allochems (B12.2, B13.8, G5.5, FG7.2). Probable residual bitumen lines pores (black material; BC6, G3.7, H10). Trace microcrystalline pyrite replacement (black specks; D10.7) are observed and trace amounts may be associated with bitumen/organic material.

Arkansas Geological Survey
Upper Smackover
Onshore

8442.00'
Plate 13

Weatherford LABORATORIES



A

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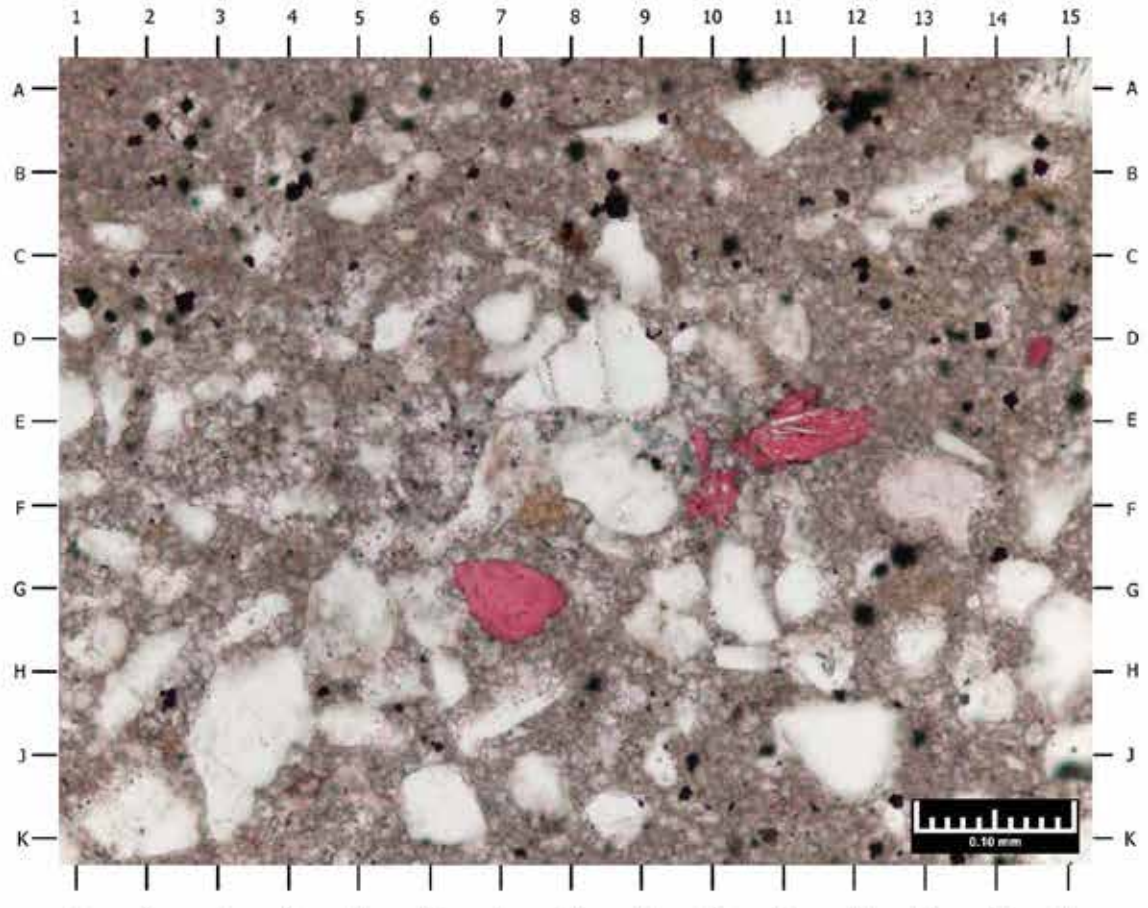


B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8442.00 FEET
SAMPLE NUMBER: 3 CS

PLATE 13

Lithology: Silty/sandy dolostone

Texture: Commonly burrowed/bioturbated

Detrital Grains/Allochems: Abundant amounts of monocrystalline quartz (ranging from <0.15mm to 0.26mm, with an average visual grain size of 0.09mm); minor amounts of calcareous lithoclasts; minor muscovite mica; rare to minor amounts of undifferentiated argillaceous grains; trace to rare amounts of polycrystalline quartz, feldspar, chert, metamorphic (micaceous) rock fragments, siltstone rock fragments, and heavy minerals (zircon, rutile, epidote); rare organic material and/or residual bitumen

Matrix: Abundant very fine crystalline dolomite occurs as replacement of a probable precursor clay matrix. Minor intercrystalline detrital clay is observed. Trace to rare amounts of illite and chlorite are observed partially coating some grains.

Cement and Replacement Minerals: Abundant amounts of very fine crystalline dolomite occurs as replacement of a very fine grained precursor, likely clay; microcrystalline pyrite commonly occurs disseminated throughout the matrix and is preferentially concentrated in burrowed areas; trace siderite replacement is observed

Pore Types: Minor intercrystalline pores are scattered throughout the matrix and trace secondary intragranular pores occur within partially leached grains

Magnification: A: 50X B: 200X

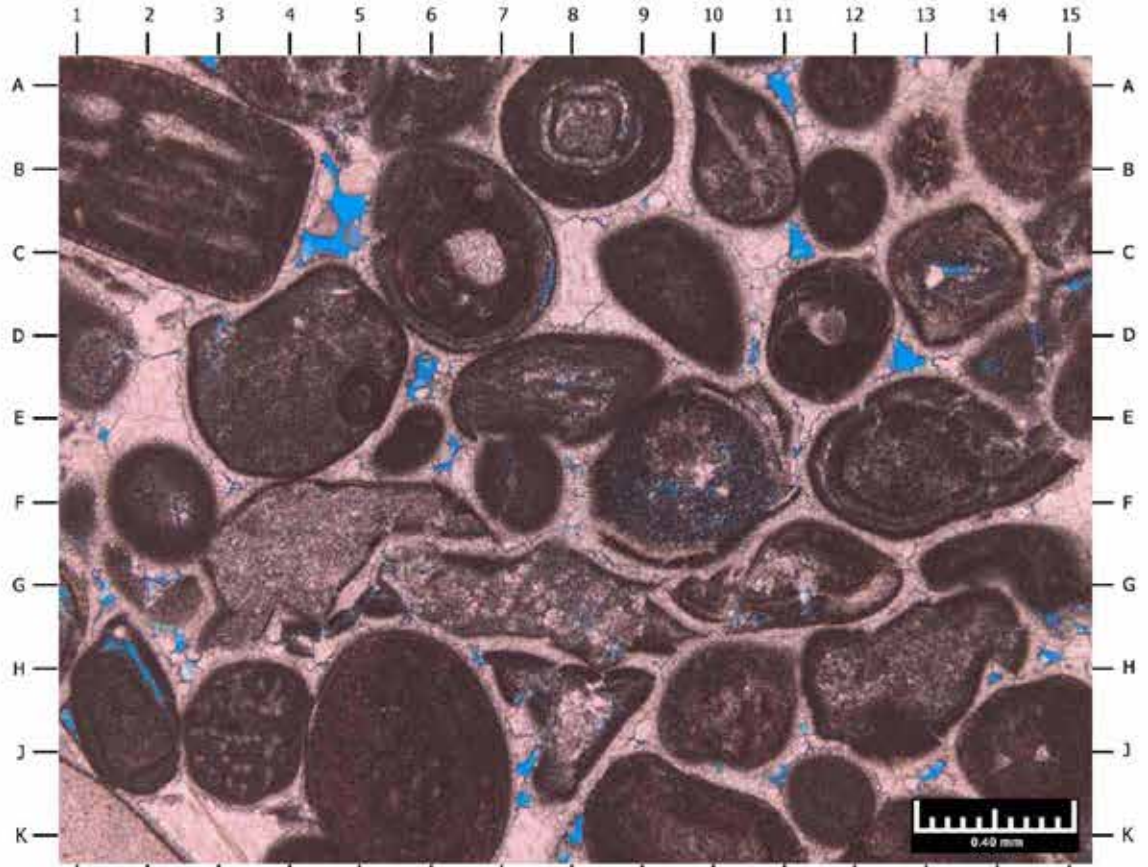
A) Photo A provides a general overview of this silty/sandy dolostone. Burrows are defined by concentrations of sand and silt (D1-BC6, A8-AB15, BC10-C15, K1-GH13.5). Abundant angular to subangular, generally very fine-grained quartz (most white grains depicted) represents the dominant framework grain, with minor amounts of calcareous (stained red; DE2, DE11.7, H7.5, GH11.2, K6) lithoclasts observed.

B) Photo B provides a detailed view of the area near GH10.5 in Photo A. The matrix is composed of abundant very fine crystalline, generally euhedral to subhedral authigenic dolomite (non-ferroan dolomite does not stain), with minor areas of intercrystalline clay observed. Cubic (D13.8) and framboidal (CD12.5) microcrystalline pyrite occurs throughout the dolomitic matrix. Quartz overgrowths are moderately abraded (FG1.2, J12.5) and calcite particles are detrital in nature. Trace intercrystalline pores are depicted in the area of E10 (blue epoxy).

Arkansas Geological Survey
Upper Smackover
Onshore

8445.00'
Plate 14

Weatherford LABORATORIES



A

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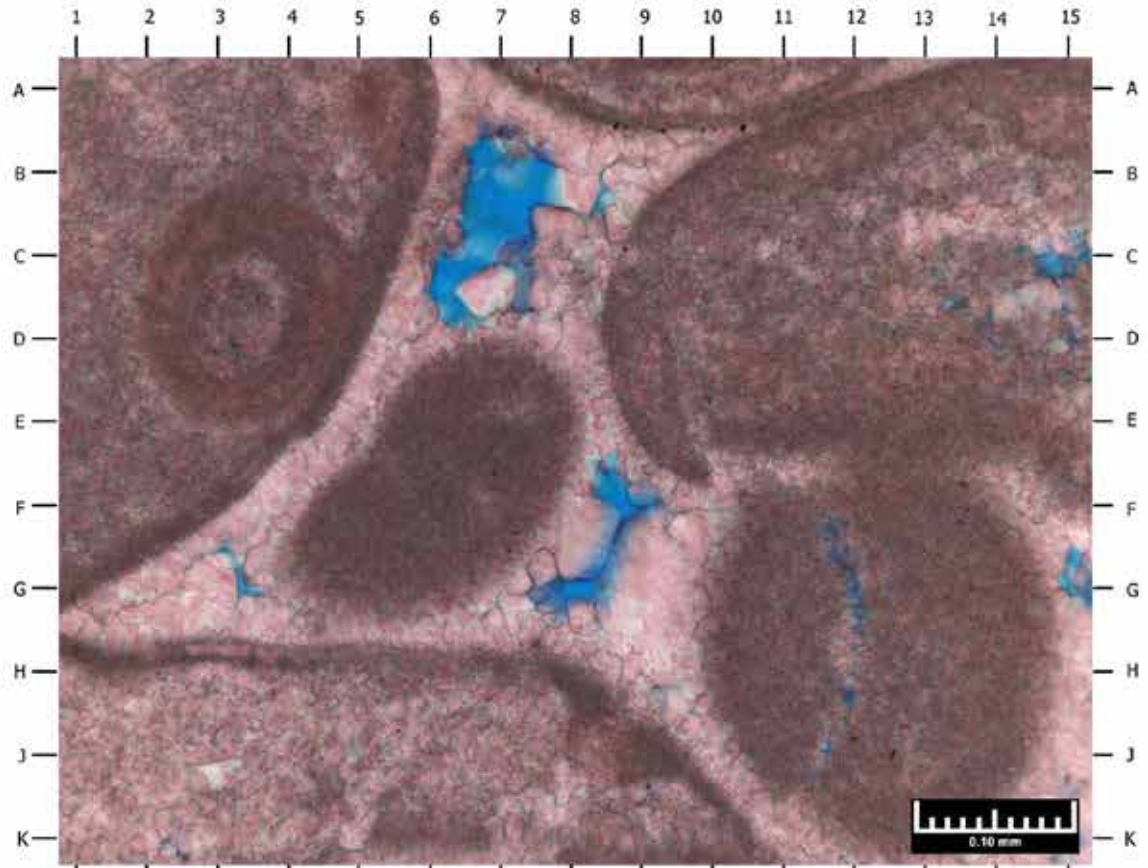


B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8445.00 FEET
SAMPLE NUMBER: 4 CS

PLATE 14

Lithology: Oolitic limestone

Texture: Moderately-compacted ooid grainstone

Detrital Grains/Allochems: Common amounts of micritized ooids exhibiting moderate to poorly-preserved internal structures; minor amounts of undifferentiated peloids/pellets; minor amounts of partially recrystallized/micritized calcareous fossil fragments (echinoderm, bivalve, probable algal-sponge-bryozoan fragments, and other undifferentiated fragments); minor monocrystalline quartz; rare compound ooids/clasts; trace argillaceous grains/pellets; trace heavy minerals (zircon)

Matrix: Interparticle pore space it occluded by abundant amounts of fine to coarse crystalline calcite and rare dolomite and anhydrite

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as very fine to fine and rarely medium crystalline replacement of allochems, as common amounts of blocky isopachus cement on allochems, and as fine to coarse crystalline interparticle and void-filling cement. Minor amounts of dolomite (not stained) as fine to coarse cement and replacement of allochems; rare probable authigenic quartz with euhedral terminations and minor authigenic quartz overgrowths on host detrital grains; trace microcrystalline pyrite as partial replacement of allochems; rare amounts of coarse anhydrite cement

Pore Types: Minor amounts of interparticle pores represent the prevalent pore type. Minor amounts of secondary intraparticle pores/micropores and moldic pores are associated with preferential dissolution of allochems.

Magnification: A: 50X B: 200X

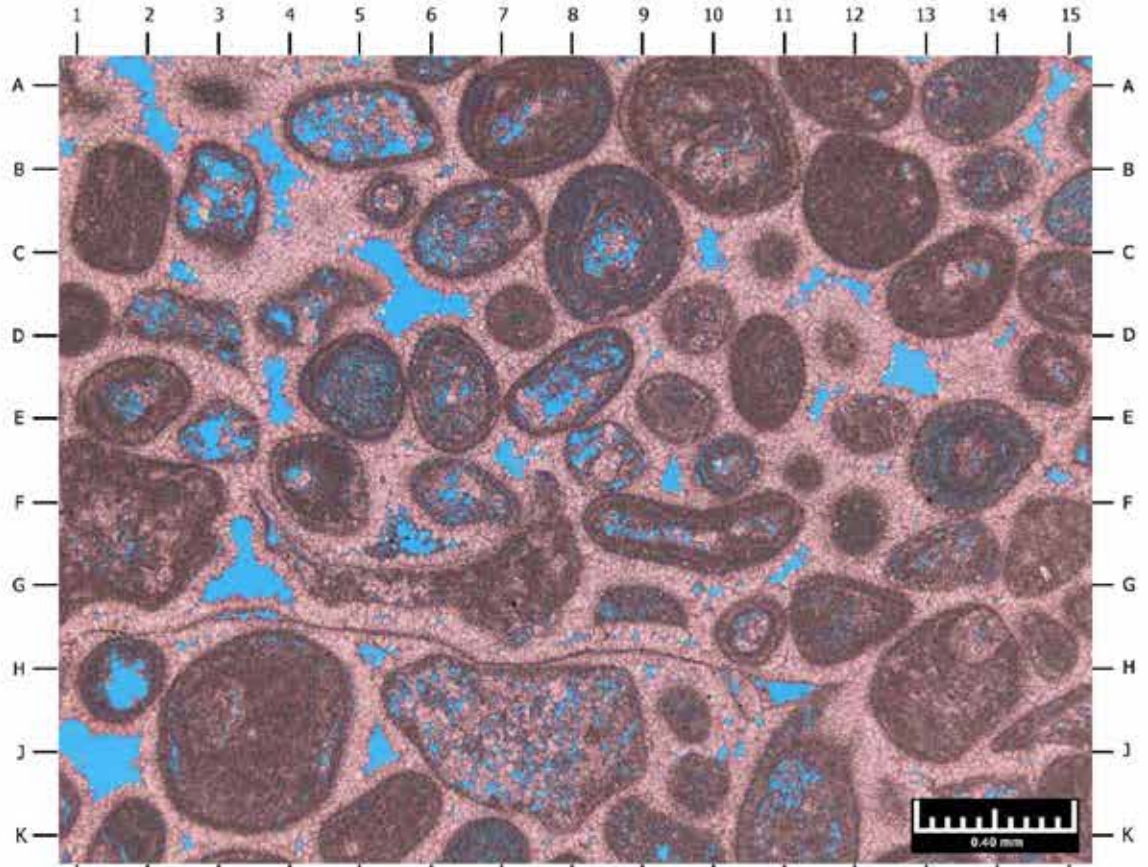
A) Photo A provides a general overview of this ooid grainstone. Micritized ooids (A8-B9, B6-D6.5, C-D13.5, H-K5.5), undifferentiated micritic peloids/pellets (A12, EF6), rare compound clasts (DE3-5), rare echinoderm fragments (J1-K2), fragments of possible algal origin (A1-CD3.5, H-J3.5), and other recrystallized undifferentiated fragments (FG3-6, G6-9; have retained their fractured micritic envelopes and may be comparable to the partially recrystallized/fractured probable ooid at G10-12) characterize the main components depicted. Abundant calcite cement (fine to coarse crystalline) fills interparticle pores. Minor amounts of interparticle pores (A11, BC4.8, C11.2, DE5.8, DE12.8, EF6.3, H2.5, JK7.3) are preserved.

B) Photo B provides a highlighted view of the area near E6 in Photo A. Blocky isopachus cement, forming early around allochems (A6.5-B9.5, A6.5-GH1, GH1-8), occludes interparticle pores and binds adjacent allochems. Minor amounts of interparticle pores/micropores (B-C7, F8.7, G3.3, G8) remain. Minor secondary intraparticle pore/micropores (C15, G-J11.7) result from partial leaching. Rare dolomite replacement of allochems is present (CD14.5, JK3).

Arkansas Geological Survey
Upper Smackover
Onshore

8451.00'
Plate 15

Weatherford LABORATORIES



A

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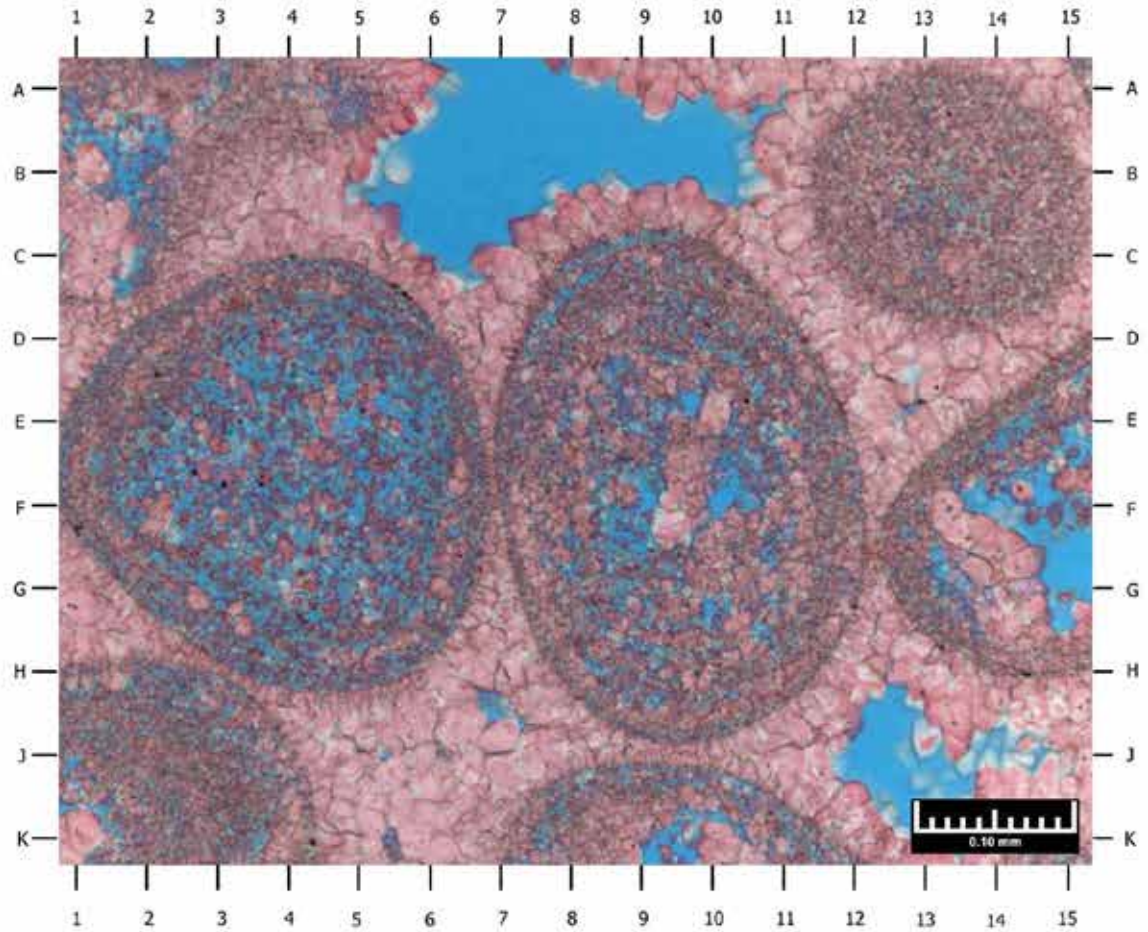


B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 8451.00 FEET
SAMPLE NUMBER: 5 CS

PLATE 15

Lithology: Oolitic limestone

Texture: Moderately-compacted ooid grainstone

Detrital Grains/Allochems: Abundant amounts of micritized ooids exhibiting partially leached and poorly-preserved internal structures; minor amounts of undifferentiated peloids/pellets; minor amounts of partially recrystallized/micritized calcareous fossil fragments (undifferentiated shell and probable algal fragments); rare compound ooids/clasts; trace monocrystalline quartz; trace residual bitumen/organic material

Matrix: Interparticle pore space it occluded by abundant amounts of fine crystalline calcite and rare dolomite

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as very fine to finely crystalline replacement of allochems, as common amounts of blocky isopachus cement rimming allochems, and as minor amounts of fine crystalline, equant, interparticle cement. Minor amounts of fine crystalline, euhedral to subhedral dolomite (non-ferroan dolomite does not stain) occurs as interparticle cement and partial replacement of allochems; trace microcrystalline pyrite as cement and partial replacement of allochems and organic material

Pore Types: Abundant amounts of porosity include common interparticle matrix pores, common secondary intraparticle/intracortical pores and micropores, and minor moldic pores

Magnification: A: 50X B: 200X

A) Photo A provides a general overview of this ooid grainstone. Partially recrystallized and/or dissolved micritized ooids (A7-B8, A9-BC11, B-D8.5, E2, DE4-7, EF13-14, FG8-11) represent the main type of allochem recognized in this highly leached sample. Minor amounts of undifferentiated micritic grains are characterized as peloids/pellets (A3, C10.7, HJ9.7) and minor possible algal fragments (B-C1.5) are observed. Common amounts of interparticle matrix pores (A2, A15, B4, C-D5.5, C10, DE12.8, DE3.8, FG3.5, J1.5), common amounts of secondary interparticle pores/micropores (AB4-6, B-C3, C8.5, D2-3, DE8, H1.8, J-K11), minor intracortical micropores (AB6.5-8.5, EF13-14), and minor moldic pores (EF3, HJ6-9) characterize the pore types depicted. The line that extends from GH1-H11 likely represents a post-dissolution collapsed allochem. There are several of these structures in this thin section. The isopachus cement associated with these structures are similar in size and morphology as the cement throughout the sample, with minor amounts of possible solution effects resulting in minor post-collapse cement overprinting. In other areas of the thin section, trace residual bitumen may also be observed in association.

B) Photo B provides a detailed view of the area near E6 in Photo A. Blocky isopachus cement riming allochems represents the dominant cement type often coalescing with interparticle mosaic cement (JK5-HJ6.5) and binding adjacent allochems. Common interparticle matrix pores are observed (B5.5-10.5, J12.5). A moderate amount of incipient porosity inversion has resulted in common interparticle pores/micropores (D2-H5, C8-H11, E-G15, H1-K3.5, K9-10). Rare dolomite replacement (E10, FG9.5) is observed.

Mt. Vernon Field

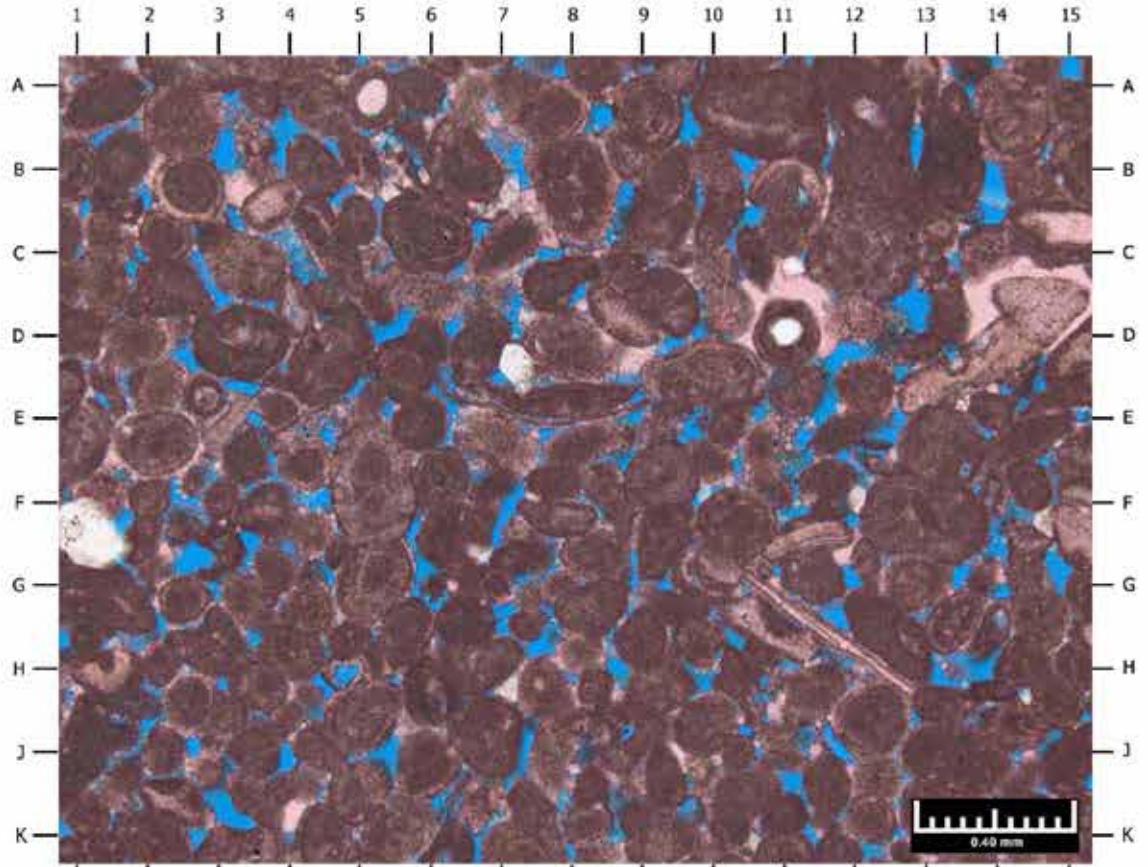
Permit #24227

Sampled interval: 7940’- 7957’

Arkansas Geological Survey
Upper Smackover
Onshore

7940.00'
Plate 16

Weatherford LABORATORIES



A

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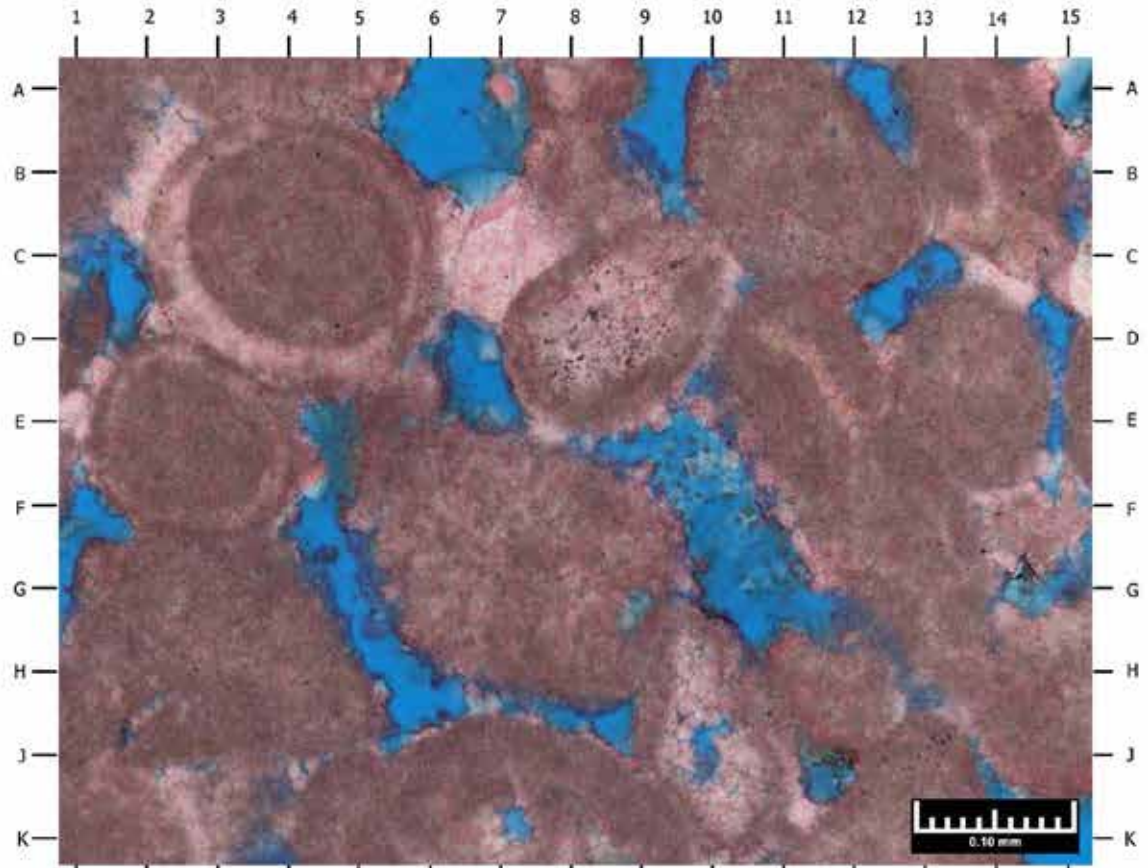

B

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Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 7940.00 FEET
SAMPLE NUMBER: 16 CS

PLATE 16

Lithology: Oolitic limestone

Texture: Low to locally, moderately-compacted, poorly-sorted ooid grainstone; trace instances of partial particle dissolution at contacts between allochems

Detrital Grains/Allochems: Abundant amounts of partially recrystallized/micritized ooids; minor undifferentiated peloids/pellets and composite clasts/ooids; minor amounts of partially recrystallized calcareous shell fragments (probable echinoderm fragments, bryozoan fragments, brachiopods, possible ostracods, and other undifferentiated shell fragments); trace monocrystalline quartz is present; and trace amounts of residual bitumen lines interparticle pores

Matrix: Interparticle pore space is occluded by minor amounts of authigenic calcite spar and lesser dolomite

Cement and Replacement Minerals: Abundant calcite (stained red) occurs as incomplete, bladed cement rims on allochems, as very fine to fine crystalline and rarely medium crystalline partial replacement of allochems, as optically continuous overgrowths associated with shell fragments, and as fine to coarse crystalline matrix void-filling and intraskeletal cement. Minor amounts of fine to medium crystalline, euhedral dolomite rhombs occur as interparticle cement and partial replacement of allochems. Trace to rare pyrite cement and replacement is also observed. A rare amount of anhydrite cement and rare authigenic quartz/quartz overgrowths are present.

Pore Types: Interparticle matrix pores represent the dominant pore type. Secondary intraparticle micropores are present in minor amounts. Rare moldic pore are observed. Trace vugs partially cross-cut allochems.

Magnification: A: 50X B: 200X

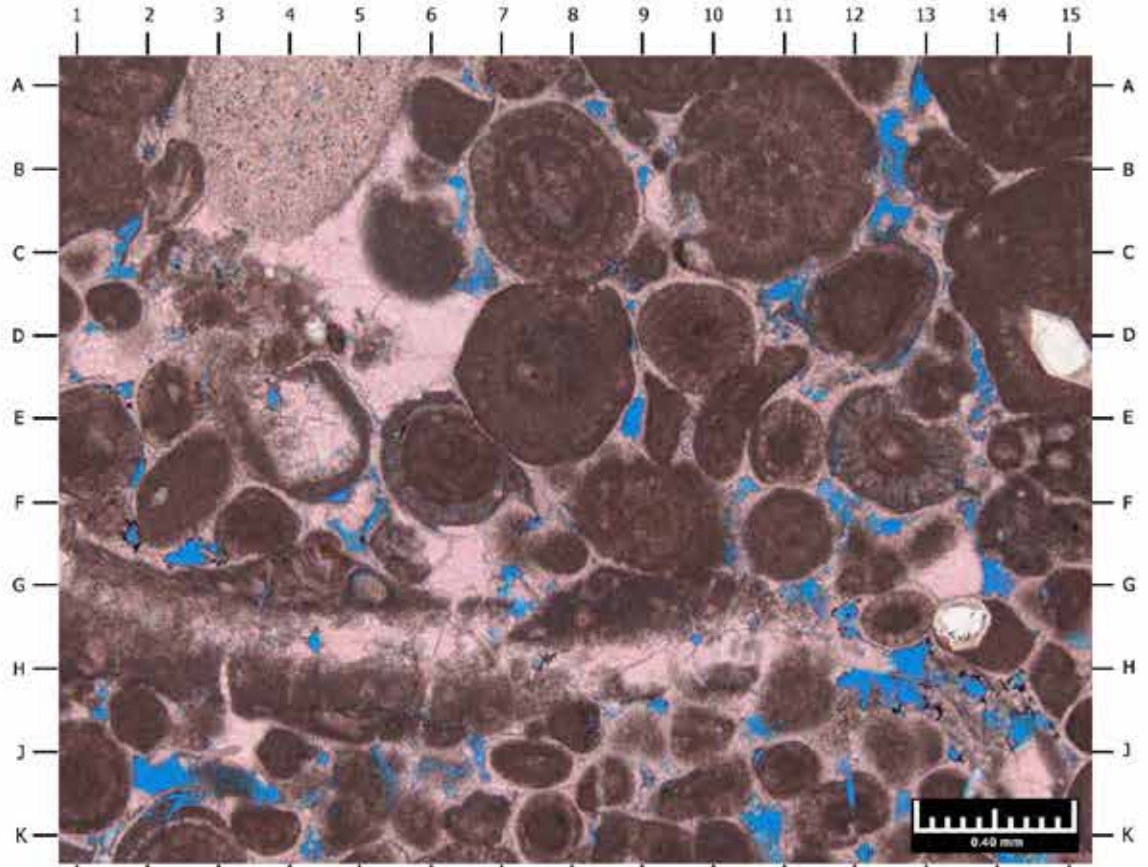
A) Photo A provides a general overview of this low to moderately-compacted, poorly-sorted ooid grainstone. Micritized ooids (most allochems; B1, AB14.3, DE5.8, EF2, F5, FG10.5, G5, GH13.3) represent the dominant framework component. Minor peloids/pellets (micritic grains lacking internal structure; E4, F7.7, J3.5), echinoderm fragments (CD14-15, FG15), possible ostracod (E7-9), and other undifferentiated shell fragments (E3.3, FG11-12, G10.5-H12.5) are observed. Interparticle matrix pores (AB1.5, B3.2, B14, C7.7, CD3, F4.7, GH11.7, J7.3) characterize the main pore type present. Intraparticle pores result from partial dissolution (D3.5, EF13.7, GH14). Rare quartz grains exhibit overgrowths (DE7, FG1).

B) Photo B provides a detailed view of the area near C3.5 in Photo A. Post depositional, bladed calcite crusts (B2, E1.2, E9.3, FG9.7) occasionally result in pore-occluding/particle-binding cement. Authigenic calcite also occurs as partial replacement of allochems (C2.5-D3.3, D8-9, H-K10). Interparticle matrix pores (AB6.2, AB9.3, A12.2, CD1.8, CD13, DE7, FG1, F4.7-HJ6, EF9.5-GH11) and rare intraparticle pores/micropores (GH9, HJ2, J10, JK11.5, K7.2) are highlighted.

Arkansas Geological Survey
Upper Smackover
Onshore

7946.50'
Plate 17

Weatherford LABORATORIES



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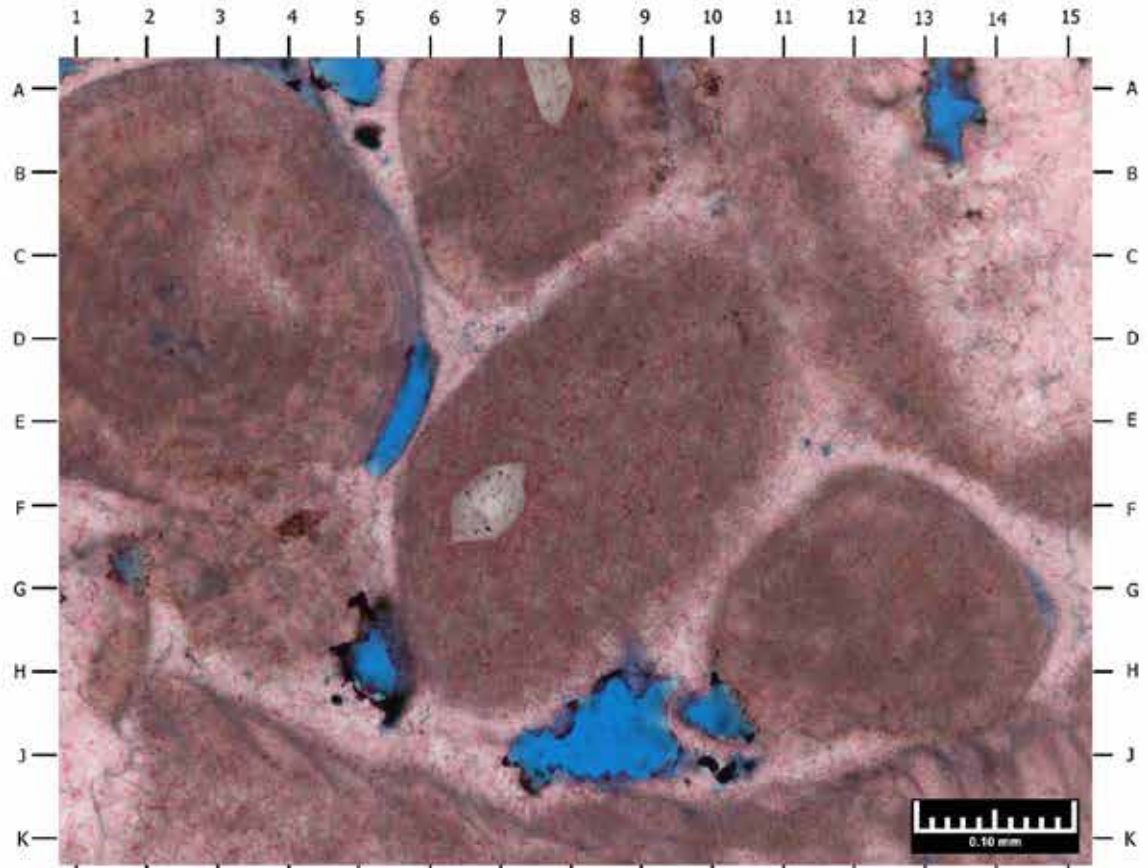

B

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Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 7946.50 FEET
SAMPLE NUMBER: 17 CS

PLATE 17

Lithology: Oolitic limestone

Texture: Low to moderately-compacted, very poorly-sorted ooid grainstone; trace instances of partial particle dissolution at contacts between allochems

Detrital Grains/Allochems: Common amounts of micritized ooids (radial cortices are observed on ooids exhibiting preserved internal structure; however, preservation is relatively rare); minor composite clasts/ooids; minor undifferentiated peloids/pellets; minor amounts of partially recrystallized calcareous shell fragments (possible brachiopod, bryozoan, echinoderm fragments, bivalve fragments, and other undifferentiated shell fragments); rare monocrystalline quartz; and trace amounts of residual bitumen line interparticle pores

Matrix: Interparticle pore space is occluded by minor amounts of very fine to coarse crystalline calcite spar

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as equant crusts on allochems, as very fine to fine crystalline partial replacement of allochems, as fine to coarse crystalline void-filling cement, and syntaxial overgrowths associated with calcareous shell fragments (echinoderm). Rare to minor dolomite is present as inter/intraparticle cement and partial replacement of allochems. Trace pyrite replacement is observed. Rare quartz/quartz overgrowths are also present.

Pore Types: Interparticle matrix pores characterize the dominant pore type. Minor vugs partially cross-cut allochems. Secondary intraparticle micropores, intracortical micropores, and moldic pores are present in rare to minor amounts.

Magnification: A: 50X B: 200X

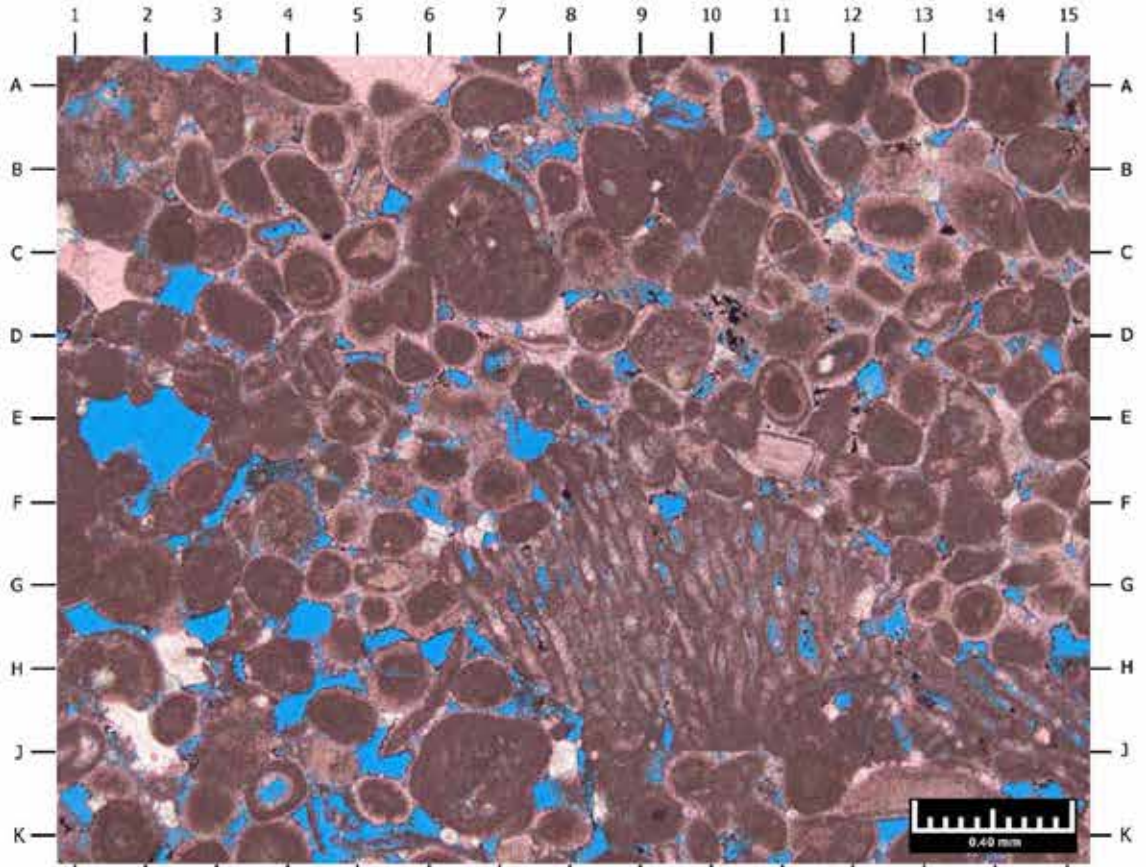
A) Photo A provides a general overview of this moderately-compacted, very poorly-sorted ooid grainstone. Micritized ooids (AB7-CD8.5, A-C11, D9.8, EF6, EF12-13) represent the dominant constituent, with minor amounts of peloids/pellets (FG7.8, J4), calcareous fossil fragments (echinoderm A3-B5 and recrystallized shell fragments with probable encrusting bryozoan G1-H11), and monocrystalline quartz (white grains) observed. Authigenic calcite occurs as syntaxial overgrowths associated with echinoderm fragments (C4.7), as equant crusts rimming allochems (CD9-10, DE11-12, JK7-8), and as void-filling cement (EF4.5, FG6.5). Common interparticle matrix pores are observed (A6.5, AB8.3, B12.5, CD11, DE1.7, F10.5, G14, H12.8, JK2). Secondary intraparticle pores result from partial dissolution (E3.8, GH4.3, HJ12-13, HJ14), intracortical micropores occur in relation to ooids (EF12, G5), and intraskeletal micropores are present within the echinoderm fragment (AB4.5).

B) Photo B provides a detailed view of the area near F2.5 in Photo A. Interparticle matrix pores (blue-dyed epoxy; A5, AB13.3, E5.7, H5.2, J8-9) are partially lined by probable residual bitumen. Equant crusts on allochems often coalesce to bind adjacent allochems (AB5-D6, EF11.5-G15). Rare interparticle micropores are preserved (EF11.5). Intraparticle micropores are present within allochems (D2.5, G14.5). Possible authigenic quartz is observed within recrystallized/micritized allochems (A7.7, F6.8). Trace microcrystalline pyrite cement/replacement is observed (AB5, HJ4.8).

Arkansas Geological Survey
Upper Smackover
Onshore

7952.00'
Plate 18

Weatherford LABORATORIES



A

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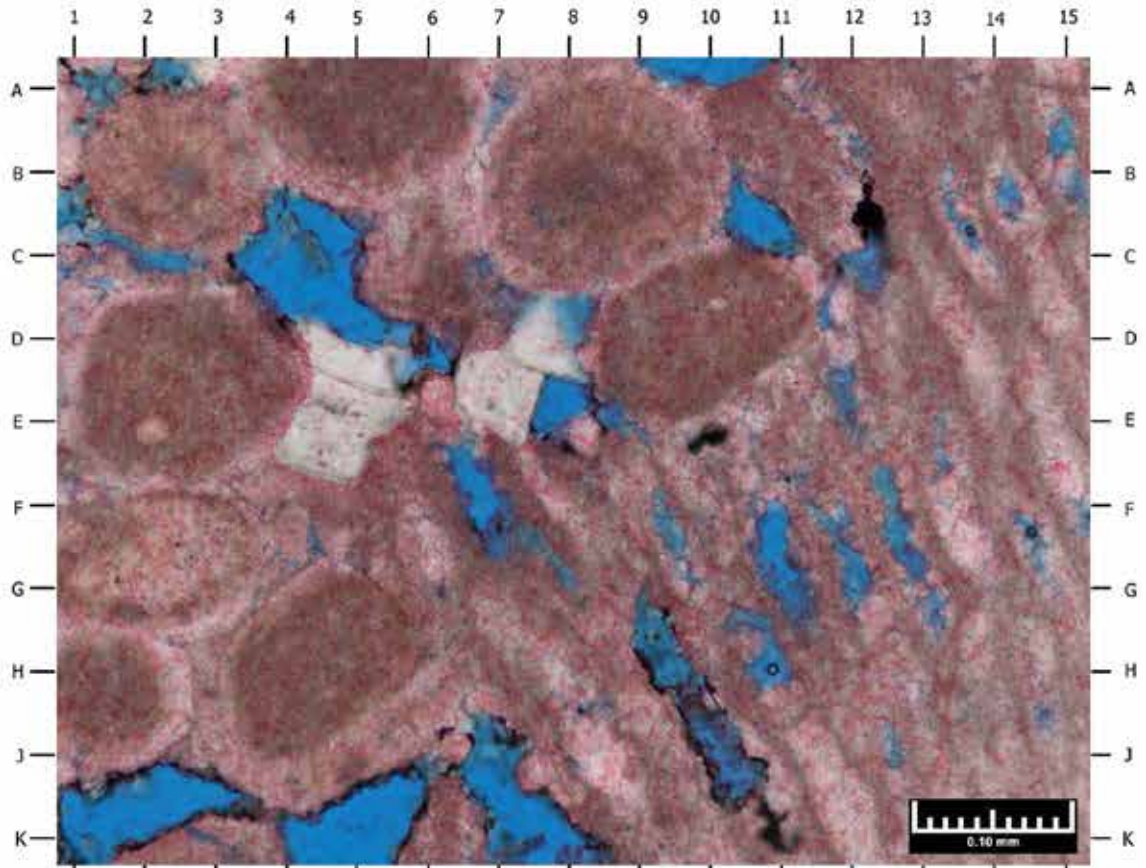


B

200X

Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 7952.00 FEET
SAMPLE NUMBER: 18 CS

PLATE 18

Lithology: Oolitic limestone

Texture: Moderately well to locally very-poorly sorted, ooid grainstone

Detrital Grains/Allochems: Abundant amounts of micritized ooids exhibiting moderate to poorly-preserved internal structures (radial); minor amounts of undifferentiated peloids/pellets; minor amounts of partially recrystallized/micritized calcareous fossil fragments (echinoderm, bivalve, brachiopod, bryozoan, algal fragments, and other undifferentiated fragments); rare monocrystalline quartz; trace compound ooids/clasts; trace residual bitumen

Matrix: Interparticle pore space is partially occluded by fine to coarse crystalline calcite, minor amounts of dolomite, and trace anhydrite

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as very fine to fine crystalline neomorphic recrystallization of allochems, as fibrous and equant/blocky isopachus cement rimming allochems, and as fine to coarse crystalline void-filling/intraskeletal cement. Minor amounts of dolomite (not stained) as fine to medium crystalline cement and replacement of allochems; trace probable authigenic quartz with euhedral terminations and overgrowths; trace microcrystalline pyrite as partial replacement of allochems; and trace amounts of coarse anhydrite cement

Pore Types: Common interparticle pores represent the prevalent pore type. Minor amounts of secondary intraparticle pores/micropores and moldic pores are associated with dissolution of allochems. Trace vugs cross-cut allochems and trace grain-fracture pores are observed.

Magnification: A: 50X B: 200X

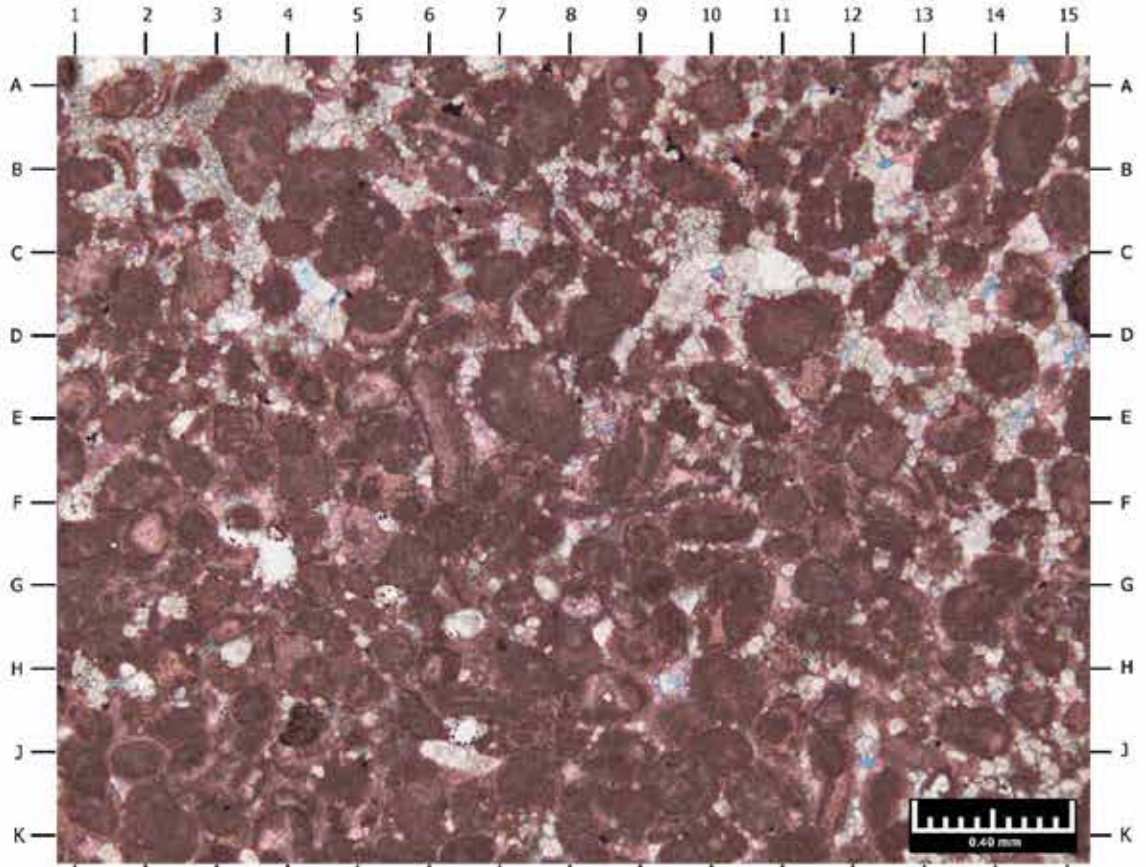
A) Photo A provides a general overview of this ooid grainstone. Abundant micritized ooids (A13.3, B6, BC12.5, CD4.3, D8.5, DE11, H5.5, GH13.7), minor undifferentiated peloids/pellets (micritic grains lacking internal structure; BC4.3, CD5.7, DE5.7, F13.5), probable trace compound clasts (C6.5), and partially recrystallized probable bivalve fragments (EF11, JK12-14) and algal fragments (FG7-G12) characterize the main components depicted. Common amounts of interparticle pores (AB13.2, B7, BC5.5, BC11, C12.7, CD2.5, DE12.3, DE14.8, GH1.2, GH6.2, J5.2) are preserved. Secondary intraparticle/intraskeletal pores (AB9.5, DE7, FG7-J15, JK3.8) are present in relatively minor amounts. Trace moldic pores (GH4.2) and vug-like pores (E2) are rare.

B) Photo B provides a highlighted view of the area near FG7 in Photo A. Calcite often occurs as recrystallization of allochems and isopachus rims. Calcite rims often coalesce to occlude interparticle pores and bind adjacent allochems (AB3.5, AB10, F2-3, H-J3). Minor amounts of medium crystalline dolomite cement (not stained) are observed at DE5 and DE7. Traces of probable residual bitumen line pores (black material lining some pores). Trace pyrite cement/replacement is observed (BC12.2).

Arkansas Geological Survey
Upper Smackover
Onshore

7957.00'
Plate 19

Weatherford LABORATORIES



A

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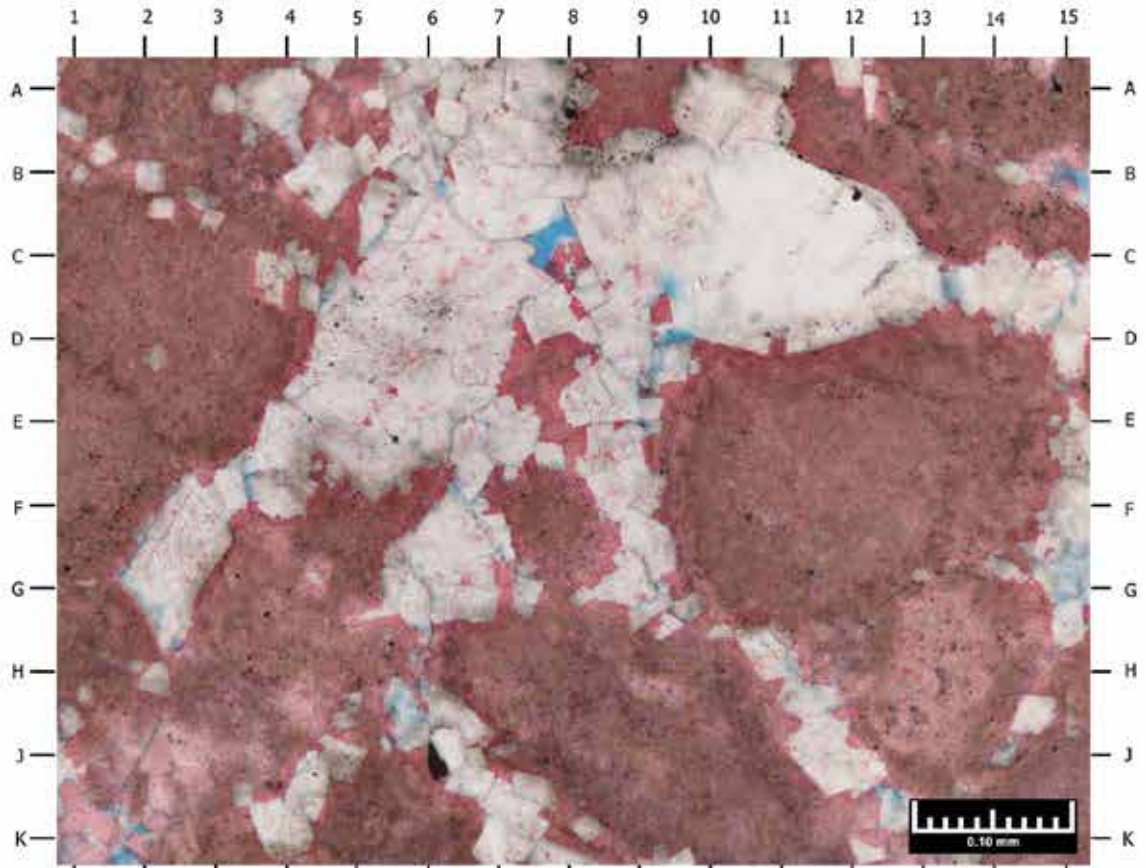

B

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Weatherford LABORATORIES

Arkansas Geological Survey **Conventional Core Chips**

GENERAL THIN SECTION DESCRIPTION

SAMPLE DEPTH: 7957.00 FEET
SAMPLE NUMBER: 19 CS

PLATE 19

Lithology: Dolomitic, oolitic limestone

Texture: Moderately-compacted, moderately-sorted ooid grainstone; relic possible laminae and/or burrows evidenced by preferential interparticle dolomite cement/replacement of precursor matrix; minor instances of partial particle dissolution and dissolution seams between moderately-compacted allochems

Detrital Grains/Allochems: Abundant amounts of micritized ooids, ranging from very fine to medium sand-size particles, exhibit poorly-preserved recrystallized internal structures (minor microbial borings are observed); minor amounts of undifferentiated peloids/pellets; minor amounts of partially recrystallized/micritized calcareous fossil fragments (algal fragments, echinoderm, bivalve, brachiopod, foraminifera, probable ostracod); trace compound ooids/clasts and superficial ooids; minor silt-sized to fine sand-sized monocrystalline quartz and trace polycrystalline quartz and metaquartzite; trace possible organic fragments

Matrix: Interparticle pore space is occluded by common amounts of very to medium crystalline dolomite and calcite spar

Cement and Replacement Minerals: Calcite (stained red) commonly occurs as very fine to finely crystalline neomorphic recrystallization of allochems, precursor calcite rims on allochems, and as fine to medium crystalline void-filling cement; common amounts of fine to medium crystalline, euhedral to subhedral dolomite (non-ferroan dolomite does not stain) occurs as interparticle cement and lesser replacement of allochems; rare microcrystalline pyrite as cement and partial replacement of allochems; trace possible anhydrite

Pore Types: Minor amounts of interparticle/intercrystalline pores and micropores represent the dominant pore type. Secondary intraparticle/intraskeletal micropores are rare.

Magnification: A: 50X B: 200X

A) Photo A provides a general overview of this moderately-compacted, moderately-sorted, dolomitic ooid grainstone. Abundant micritized ooids constitute the dominant component, with minor amounts of undifferentiated peloids and/or pellets (micritic grains lacking internal structure), and partially recrystallized/micritized fossil fragments (B1.8, E3.3, E6, JK11.7). Rare microcrystalline pyrite (black specks) occurs as cement/replacement (BC6.5, CD5, HJ4).

B) Photo B provides a detailed view of the area near D610 in Photo A. Calcite (stained red) occurs as very fine to finely crystalline neomorphic recrystallization of allochems, recrystallization of probable precursor calcite rims lining allochems (E-G9.5, HJ11, HJ12), and as fine to medium crystalline interparticle cement (AB6, C8, DE7.5, J2). Fine to medium crystalline, euhedral to subhedral dolomite (non-ferroan dolomite does not stain) commonly occurs as interparticle cement/replacement of precursor matrix (G2-A7.5, CD14-15, B-G9, H11-J12) and lesser replacement of allochems (AB1-CD4, H2). Minor interparticle/intercrystalline pores and micropores are preserved (C7.8, B15, D9.5, K1.8). Fine-grained quartz is depicted at C10-12.