Shale Shaker

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Sedimentology of the Upper Pennsylvanian Bigheart Sandstone Member, Tallant Formation, Pawnee and Osage Counties, Oklahoma,

Origin and Significance of Conglomerates in the Southwest Corner of the Arkoma Basin, Oklahoma,

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About the Cover

Michael Root creates the covers of the Shale Shaker. His cover for this Issue utilizes an image taken by Jacky Erisman, of SandRidge Energy, Inc., during the Society's spring 2012 Field Trip to the Cretaceous of southern Oklahoma.

The image depicts the contact between the Goodland Limestone and Kiamichi Formation along the north side of US Highway 70 immediately west of its intersection with OK Highway 209, and just east of Fort Towson, Oklahoma. The contact is a regional unconformity and sequence boundary dated at 106.5 million years by Dr. Robert Scott from the University of Tulsa. The contact is irregular and marked by several inches of iron-oxide staining at the very top of the Goodland.

For more details on the Field Trip, see Neil Suneson's paper within this Issue.

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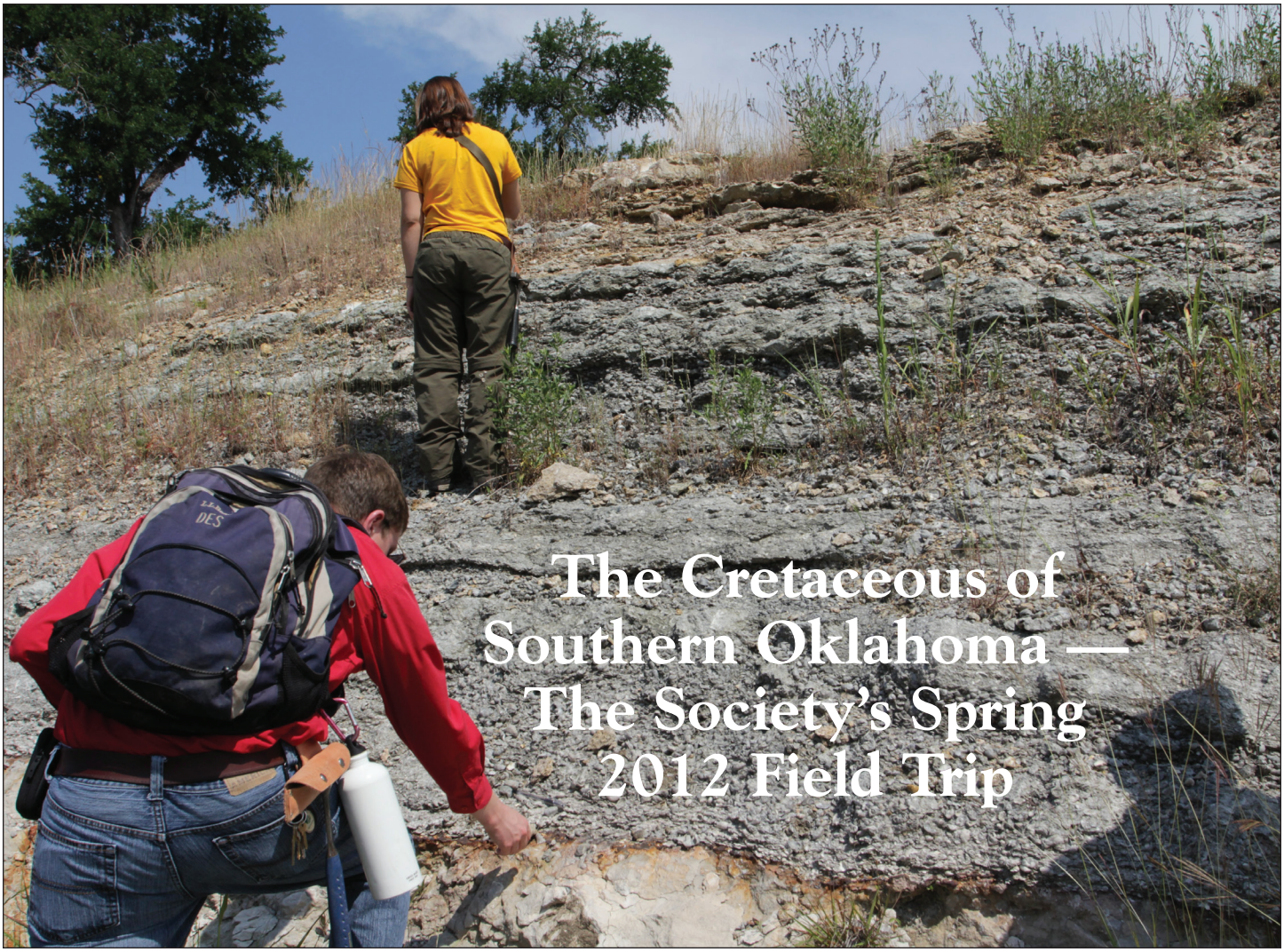

The Cretaceous of Southern Oklahoma — The Society's Spring 2012 Field Trip

The Oklahoma City Geological Society, Dr. Robert Scott from the University of Tulsa, and Brock Edwards from JMA Energy in Oklahoma City broke new ground in May, 2012 by running the first geology field trip in over 40 years that's looked at the Cretaceous rocks of southern Oklahoma. (The only earlier one was run by the Shreveport Geological Society in May, 1970.) It's possible that groups have snuck in from northern Texas to look at our rocks, and it's probable that students taking carbonate petrology have driven around Choctaw or Bryan County a bit, but there are no published guidebooks on the geology of the Cretaceous in this part of the world. Until now.

Thanks to some good publicity efforts from our front office staff, the trip was a sell out. Thirty-five intrepid early-risers met the bus in the parking lot of the Oklahoma History Center and left for the "short" ride to Hugo, where we met our leaders for the day. Dr. Robert Scott is a research associate at the University of Tulsa and has spent much of his professional career studying carbonate platforms. He is a co-editor of a recent AAPG Memoir titled "Cretaceous Carbonate Platforms" and the author of several papers in that volume. Brock Edwards received his MS in geology from the University of Tulsa in 2010 and, as part of his degree, completed a report titled "The Lower Cretaceous Goodland Formation, Southeastern Oklahoma." After a brief ride through parts of Hugo that most, if not all of us had never seen before (no, we weren't "lost" in the strictest definition of the word), we met Bob and Brock outside of town and headed for our first stop in the Cretaceous of southeastern Oklahoma (Figure 1).

The contact between the Goodland Limestone and Kiamichi Formation is beautifully exposed on the north side of US Hwy 70 immediately west of its intersection with OK Hwy 209 just east of Fort Towson (Figure 2). The contact is a regional unconformity and sequence boundary dated at 104.5 million years by Scott. The

contact is irregular and marked by several inches of iron-oxide staining at the very top of the Goodland. The base of the Kiamichi here probably could supply everyone in the world with their very own specimen of *Texigryphaea navia*, a small Cretaceous oyster popularly known as "devil's toenail."

A short walk back along US 70 and north along an old haul road took the group to an abandoned quarry and an excellent outcrop of the Goodland Limestone. Most of the outcrop consists of moderate gray, medium-bedded limestone (Figure 3). Two key features, however, are the interbedded nodular limestone and thin laminated claystone beds. Bob suggested several possible origins for the repetitive nature of the beds including wet–dry climate change, sea level change, and diagenesis.

Our third stop of the day was multi-purpose – to eat lunch and reexamine the Goodland – Kiamichi contact (Figure 4). Bob had kindly arranged to have box lunches made for us and had brought good examples of some of the fossils that characterize the Lower Cretaceous section with him that he laid out on one of the picnic tables. Several features of the contact are notable at this locale: 1) a microkarst topography developed on Goodland Limestone and 2) *Thallasinoide*s burrows in the very top of the Goodland filled with Kiamichi silt and sand.

Stop 4 (near Soper, Oklahoma, and the type section of the Soper Limestone Member of the Bokchito Formation) illustrated for the group why mapping and stratigraphic studies of the Cretaceous in southeast Oklahoma is not straightforward. The Soper Limestone is a persistent unit in Choctaw County but is thin (here, about 1½ feet) and typically poorly exposed. Unlike the other units the group had visited thus far, the Soper is a high-energy, cross-bedded, bioclastic grainstone that Bob suggested was deposited in a nearshore environment, possibly as a prograding shoreface. In addition, Bob

Figure 1. Stratigraphic column of Cretaceous strata, Choctaw County, Oklahoma. (Modified from Huffman et al., 1975, figure 2)

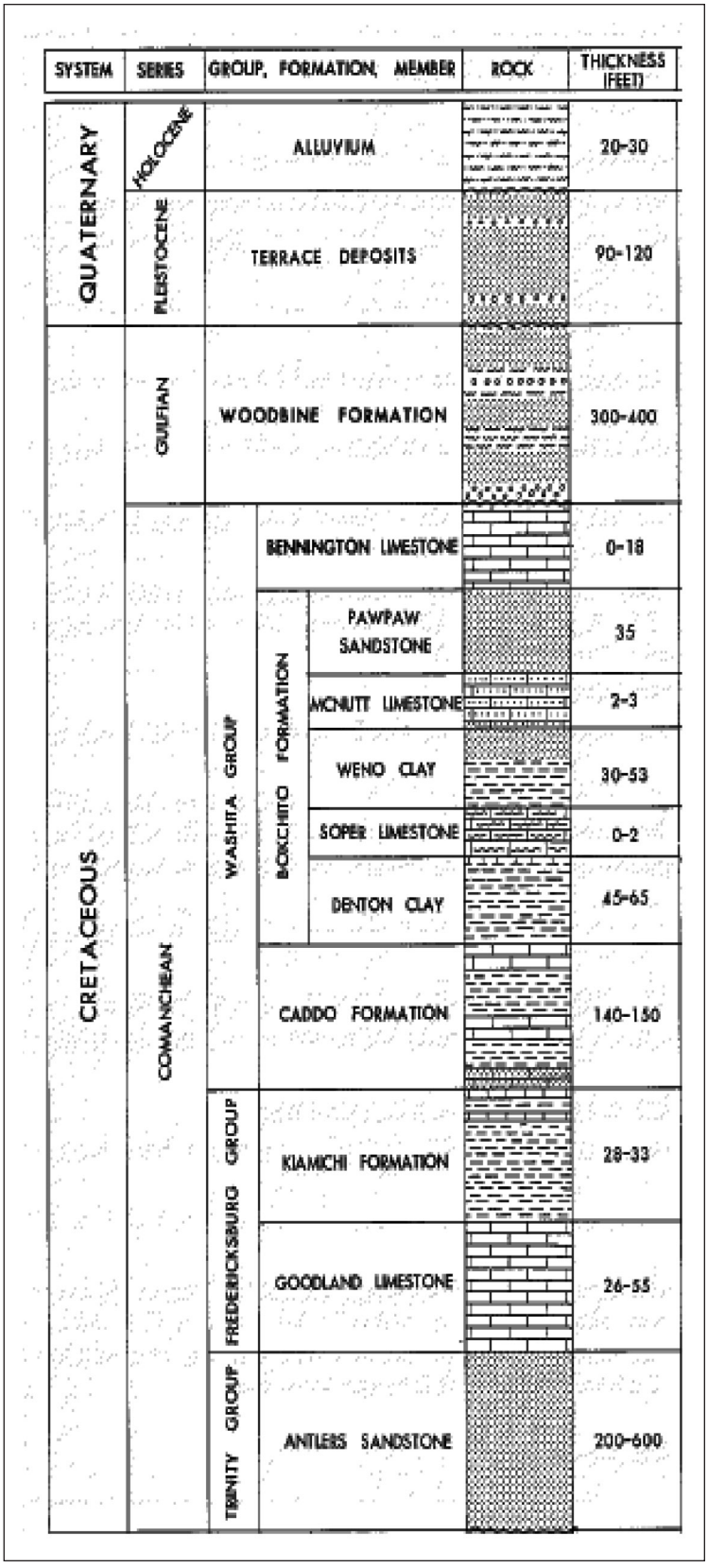

Figure 2. Field-trip leaders Bob Scott (sunglasses) and Brock Edwards (holding display) in front of Goodland – Kiamichi contact. Jim Franks' (on left) left hand is just above the iron-oxide-stained zone that marks the contact.

Figure 3. Neil Suneson, John Kieschnick, Sumit Verma, Todd Lannert, and Bob Scott examining pieces of Goodland Limestone at the abandoned quarry at stop 2.

Figure 4. Some of our group preferred to delay lunch and preferred to look at the Goodland – Kiamichi contact along the shore of Hugo Lake. The Goodland is the light-colored outcrop at and just above the water level; the Kiamichi, more poorly exposed, is just above the Goodland.

Figure 5. Dave May and Jim Bedford diligently looking for fossils and at sedimentary structures in a block of Bennington Limestone near Blue, Oklahoma.

has identified the top of the Soper as a 99.9 million-year-old sequence boundary. The underlying Denton Clay Member is also exposed here, but most of the group preferred not to dig through the poison ivy to examine it up-close and personal.

Given the political nature of the state, it is little wonder that few people have ever heard of Blue, Oklahoma. Our next stop was one mile west of Blue and just east of the Blue River. On the north side of US Hwy 70 the contact between the Bennington Limestone and the underlying Pawpaw Sandstone Member of the Bokchito is exposed. The Bennington here is a medium- to thick-bedded bioclastic and arenaceous packstone with a variety of fossils, including bivalves, oysters, brachiopods, and echinoids. In Bryan County the Bennington is overlain by the Grayson Marlstone, but in Choctaw County it is unconformably overlain by the Upper Cretaceous Woodbine Formation. The group examined several of the Bennington blocks that had slid down the slope (Figure 5) and many collected a variety of well-preserved fossils.

Our last geologic stop of the day was eagerly anticipated but unfortunately a disappointment due to high water. (How often does high water impact geological field trips in Oklahoma?) The upper part of the Kiamichi Formation and lower part of the Duck Creek Member of the Caddo Formation is exposed on the south bank of the Red River immediately below Denison Dam in Baja Oklahoma (aka Texas). Large marine invertebrates (ammonites, bivalves such as *Inoceramus*) occur in boulders along the river bank, but collecting is poor when water is being released from the dam and the water is up, as was the case on the day we visited (Figure 6). However, a few of the group found some good fossils. We checked out another Duck Creek locality a little farther south on Hwy 75A but to no avail. But oh well! You win some, you lose some.

Bob once again proved he was not only thinking of our geologic interests but our gastronomic interests and had arranged for us to have dinner at Roma Italian Restaurant in Durant. Over liquid refreshments unlike those our bus driver was having and a variety of pasta dishes, we agreed that we had long overlooked this fascinating chapter in Oklahoma's geology and thanked Bob and Brock for having made our field trip possible.

Acknowledgements

I'd like to thank Jacky Erisman, Sandridge Energy, for all the photographs used in this report. Joel Alberts, field trip committee chair for the OCGS, read an early version of this report to be sure I didn't say anything that would make me sound like an idiot.

Figure 6. James Jackson (blue shirt) and others vainly looking for giant ammonites along the Red River just below Denison Dam. It was worth the try.

Figure 7. Large ***Inoceramus*** *fossil from the Duck Creek Member of the Caddo Formation, collected just below Denison Dam on the Texas side of the Red River.* ***Inoceramus*** *is an extinct genus of fossil pelecypod that often grew to an unusually large size. OCGS members who attended the November 2011 field trip to northwest Oklahoma were able to collect these from the Cretaceous Greenhorn Limestone (see figure 17, p. 96, Shale Shaker v. 62 no. 2).*

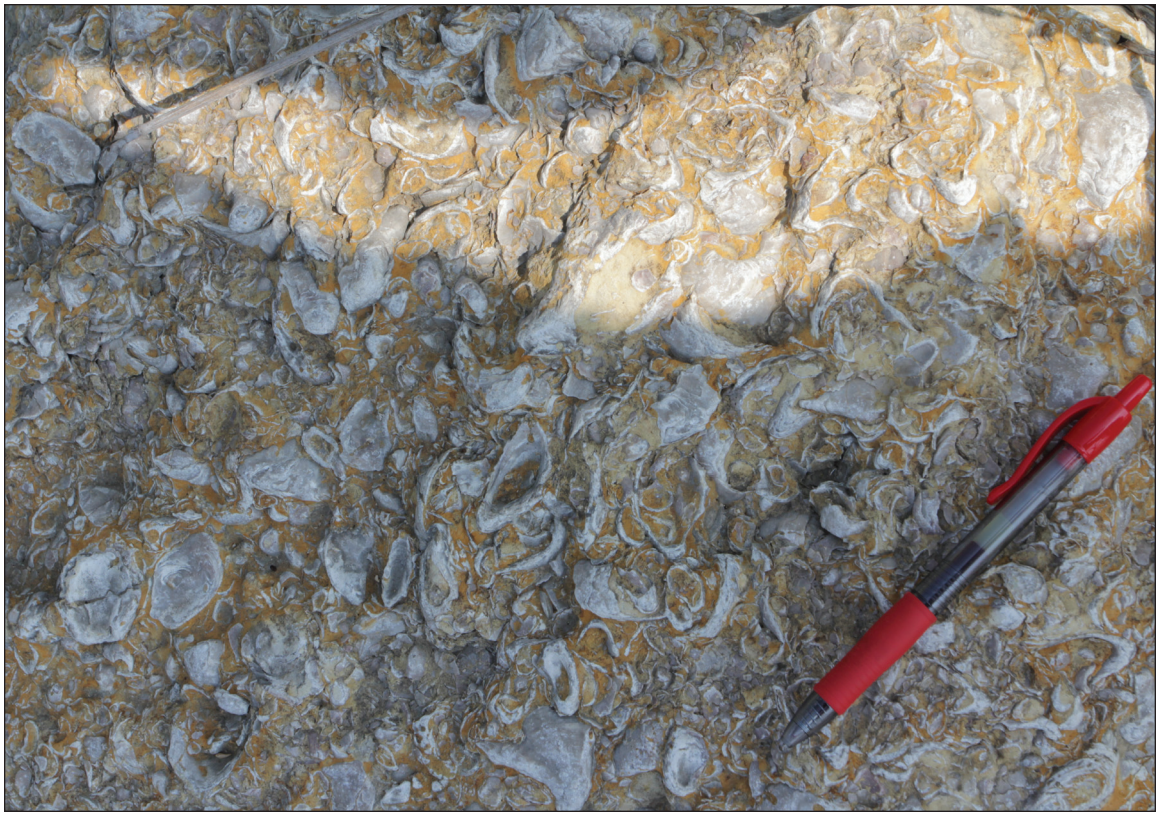

Figure 8. A "cornucopia" of ***Texigryphaea*** navia *or "Devil's Toenail" in the lowermost part of the Kiamichi Formation. This picture is of the outcrop, but many of these fossils had eroded out the rock and were lying loose on the ground. The amazing abundance of these suggests this part of the Kiamichi must have been an oyster bank. See figure 10, following.*

Figure 9. Cast of a large ammonite from the Duck Creek Member of the Caddo Formation from below Denison Dam. Ammonites this size and larger are not uncommon in the Duck Creek, and a popular collecting area for these is along the west shore of Little Glasses arm of Lake Texoma about four miles northeast of Kingston, Oklahoma.

*Figure 12. **Manuaniceras powelli**, a large ammonite used as a Cretaceous index fossil. Bob Scott brought a number of key fossils with him on the field trip and laid them out for viewing at lunch.*

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Figure 10. ***Texigryphaea****-rich basal part of Kiamichi Formation in roadcut along US Hwy 70 near Fort Towson, Oklahoma. The contact between the Kiamichi Formation and underlying Goodland Limestone is the rust-strained zone in the lower left part of the photograph.*

Figure 11. The OCGS Spring Field Trip group examining an outcrop of the Goodland Limestone in an abandoned quarry just west of Fort Towson. Field-trip leader Bob Scott measured and described about 50 feet of Goodland here.

Biographical Sketch

Neil Suneson has worked for the Oklahoma Geological Survey since 1986, when he and some colleagues started mapping the frontal belt of the Ouachita Mountains and the southern part of the Arkoma Basin as part of the USGS-sponsored COGEOMAP and later STATEMAP programs. After working in the Ouachitas, he did some reconnaissance mapping in northwestern Oklahoma and more detailed mapping in the Oklahoma City metro area.

Neil Suneson
Oklahoma Geological Survey

When the Survey became part of the Mewbourne College of Earth and Energy at OU, more of Neil's time was devoted to teaching (including the School of Geology's summer field camp outside of Cañon City, Colorado) and advising students on their theses. His interests range from the Late Tertiary geology of the Oklahoma Panhandle to the Early Paleozoic geology of the Broken Bow uplift in southeastern Oklahoma and everything in between. He even likes (some) igneous rocks.

Prior to working for the Survey, Neil was a petroleum development geologist with Chevron USA where he worked on the Lost Hills Oilfield. He also worked with Chevron Resources Company in geothermal exploration throughout the western U.S. All his college degrees are in geology. He received at B.A. from Amherst College in 1972, an M.S. from Arizona State University in 1976, and a Ph.D. from the University of California – Santa Barbara in 1980. His dissertation, largely funded by the U.S. Geological Survey, was based on mapping in the highly extended terrane of west-central Arizona.

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