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Quapaw Lead-Zinc District, Ottawa County, Oklahoma

Part II–Series on Early Lead-Zinc Mining Camps in Northeast Oklahoma

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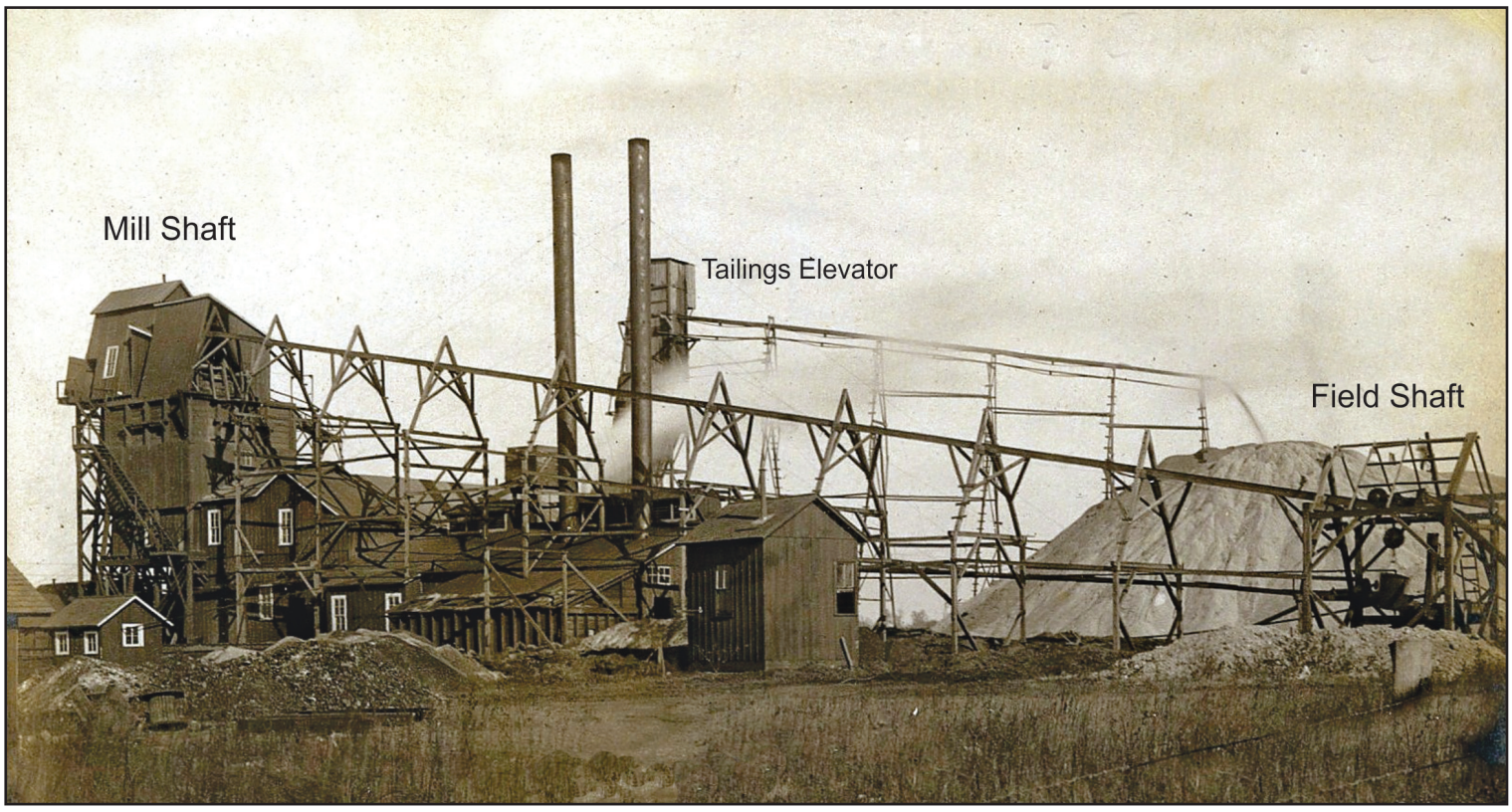
Introduction

The original Quapaw lead-zinc district, which was the second oldest in Ottawa County, Oklahoma, was located in a region that extended east of Quapaw Station to the Spring River, and from 5 to 7 mi south of Baxter Springs, Kansas (Siebenthal, 1908). The district was composed of the following three mining camps: Sunny Side, Mission City, and Lincolnville (Fig. 1). Most authors disagree about when the mines were discovered and developed. Gibson (1972) reported that the first discovery was made in 1897, when lead was discovered in a water well; however, the well was drilled in Miami near the Neosho River (*Baxter Springs News*, 1897d). McKnight and Fischer (1970) reported that the first discovery was made in 1901; and Martin (1946) gave a 1904 discovery date. Martin's 1904 date coincided with the first recorded production of lead-zinc concentrates from the district (Kirchoff, 1905). Most authors agreed that the discovery was made during the drilling of a water well.



Cover Photo. Old Abe mill in Lincolnville. The mill became operational in August, 1905 (photograph courtesy of John Schehrer).

In This Issue. . .

Quapaw Lead-Zinc District, Ottawa ...	1
In Memoriam, Kenneth V. Luza...	10
OGS Outreach 2013...	12
Krukowski Hits Pay Dirt...	15
New OGS Guidebook 38...	16
OGS Personnel "Hellos and Goodbyes"...	17
OGS Granite Wash Workshop ...	18
Kudos to OGS Student Employee...	19
OGS Calendar...	19

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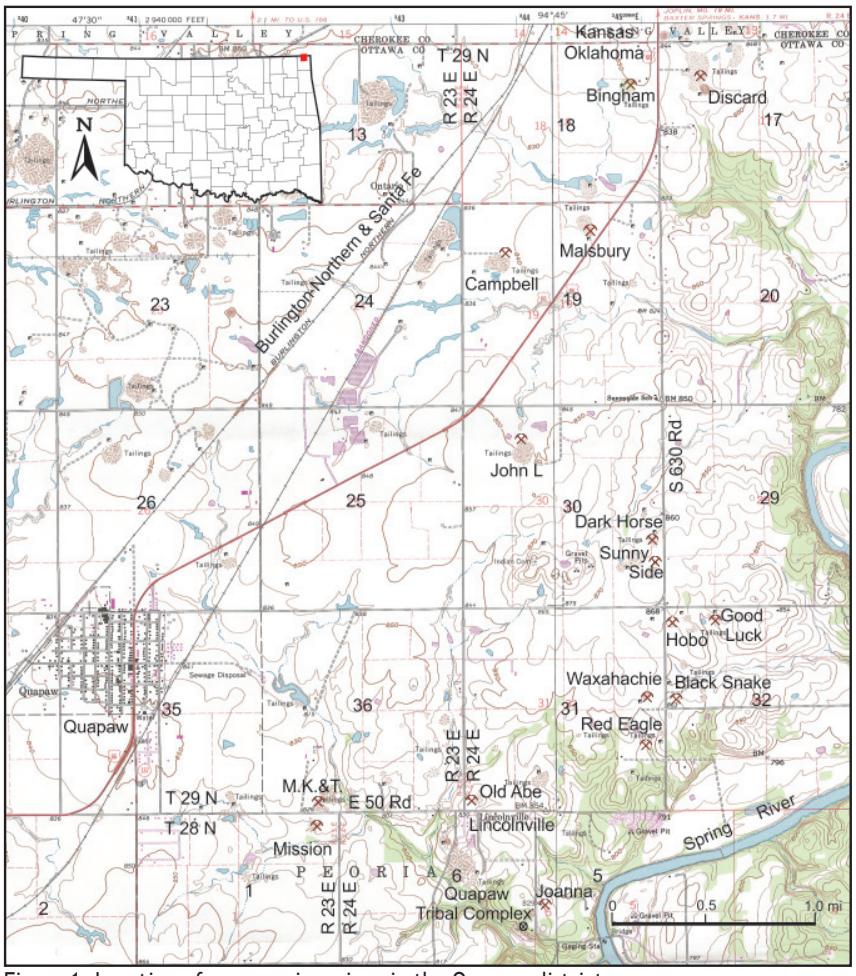

Figure 1. Location of some major mines in the Quapaw district.

Abner W. Abrams and family had six allotments, 1,200 acres, in part of sec. 25, T. 29 N., R. 23 E., part of sec. 31, T. 29 N., R. 24 E., and all of sec. 30, T. 29 N., R. 24 E. Abrams hired Ollie M. Youse, from Baxter Springs, to drill a water well on his daughter's (Maude) allotment in SE ¼ SE ¼ sec. 30, T. 29 N., R. 24 E. In January, 1902, Youse discovered an 8-ft thick bed of zinc (sphalerite, ZnS) at 80 ft (*Joplin Daily Globe*, 1902). Abrams had Youse drill two more holes which showed the presence of sphalerite in the cuttings.

Abrams hired experienced miners from Galena, Kansas, to sink a shaft near the discovery drill hole (Abrams, 1937) and called his mine Sunny Side (later spelled Sunnyside). The shaft near the first prospect hole drilled by Abrams was impeded by excessive water and hard rock (chert). A pump shaft was dug across the road (now South 630 Road) to reduce the water problems. By late December, paying ore was being removed from the Sunny Side mine shaft and stored on the surface (Baxter Springs News, 1902). In February, 1903, Abrams started a drilling program in the vicinity of the Sunny Side Mine to determine if the size of the ore body merited a mill (Baxter Springs News, 1903c). In February 1904, Abrams started construction on the Sunny Side mill, which became operational in June 1904 (*Baxter Springs News*, 1904a).

Prospecting and Development

In 1895, the Peoria Camp was at its peak. Abner W. Abrams, an influential person in the Quapaw Tribe, and several partners established the Quapaw Mining and Milling Company (*Kansas City Daily Journal*, 1895). By September, 1895, Abrams' mining company secured several thousand acres of mineral leases between the Spring River and Peoria camp from Quapaw allottees. The mineral leases were rejected by the Secretary of Interior because they were premature and because they did not stipulate a sufficient rate of royalty. Abrams and some of his politically influential friends spent the next two years get-

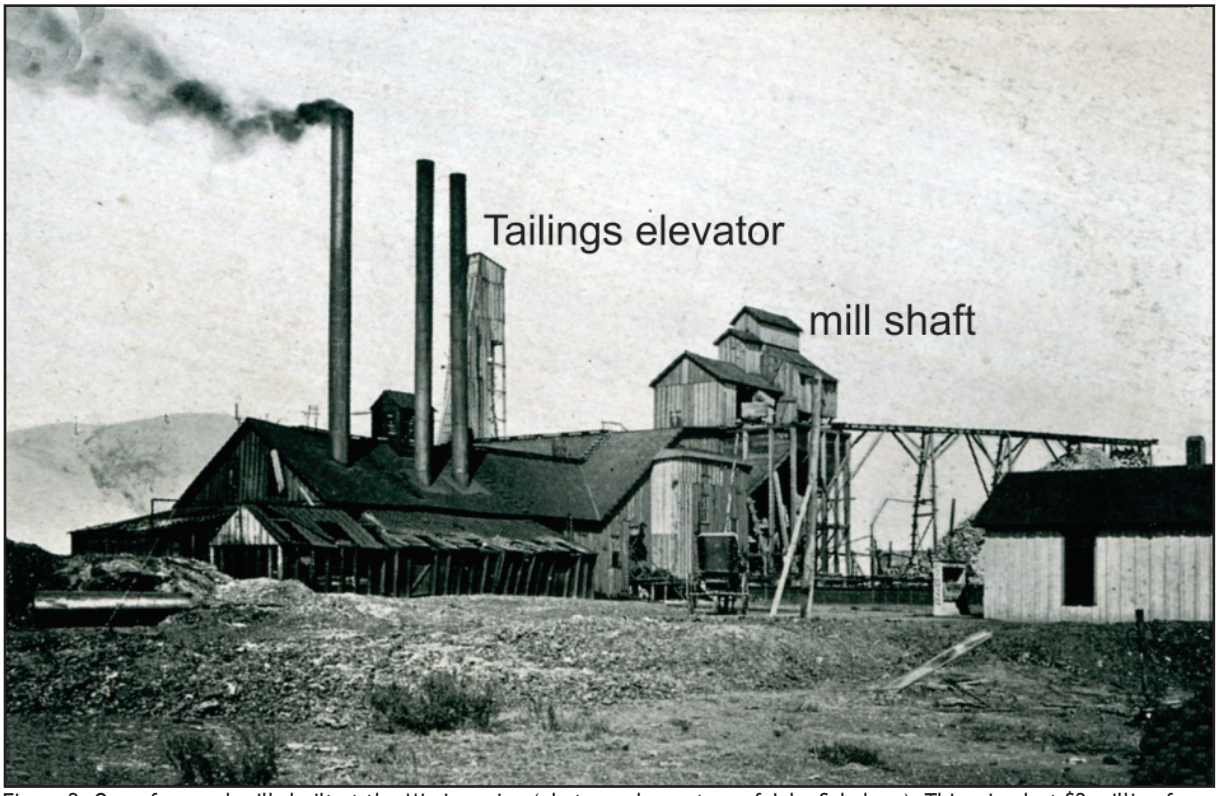

Figure 2. One of several mills built at the Mission mine (photograph courtesy of John Schehrer). This mine lost $2 million from 1906 to 1917 (Missouri-Oklahoma Zinc Mine Operators Association, 1918).

ting Congress to pass an act that empowered Indians to lease their land. The Congressional Act of June 7, 1897 (Stat. L. 62–72), gave Quapaw Agency Indians the ability to lease their allotments without government supervision. They could lease for three years land for agricultural and/or grazing use and ten years for mining and/or business ventures. Competent Indians were issued certificates that authorized them to sell and/or lease their allotted lands exclusive of a 40-acre homestead. Abrams' mining company offered Indian owners a 5% royalty on all ores mined and/or ten cents an acre if they made no profit (Baird, 1980).

By mid June, 1897, The Quapaw Mining and Milling Company (QMMCo) subleased some of their mining leases to several parties in the Devil's Hollow area (*Baxter Springs News*, 1897a). The company laid out a town site east of the Spring River at the northwest corner of Patterson Prairie, about eight miles southeast of Baxter Springs. The authors found no record of the townsite plat map in the Ottawa County courthouse. By July, the mining company claimed to have several thousand acres of land under lease and "prospectors were going after it with a rush" (*Baxter Springs News*, 1897b). The company established an office in Devil's Hollow. Abner W. Abrams, general manager and superintendent for the QMMCo, was in charge of the office (*Baxter Springs News*, 1897b). By August 20, QMMCo reported 25 shafts were in various stages of development and groundwater was not a problem (*Baxter Springs News*, 1897c).

In the spring, 2012, the authors and Larry Kropp, a life-time resident of the area, traveled to Devil's Hollow to validate the 1897 *Baxter Springs News* articles. We interviewed several land owners that lived in the area. Many of the residents hunted small game in the hills and valleys of the Devil's Hollow area for a number of years. They found little or no evidence of mining in the area. Walking down Devil's Hollow creek to the Spring River, we found one mine shaft filled with debris and several prospect pits in sec. 33, T. 29 N., R. 24 W. There was little evidence that mining ever took place in Devil's Hollow, nor was any record of production found. Apparently, the Quapaw Mining and Milling Company issued glowing accounts of mining activity in the Devil's Hollow area in order to make money selling lots and mining leases to prospectors in their newly created town. A copy of the Devil's Hollow town site hung in a Miami insurance agency for a number of years (Larry Kropp, personal communication, April 2012). The agency moved their office to Quapaw, where the map was destroyed by a flood (Mrs. Smith, personal communication, June 2012).

The Baxter Springs News (1895) reported one of the earliest accounts of zinc ore found west of the Spring River on the Quapaw Reservation. Benjamin Dardene found some jack (sphalerite) shines very close to the surface on his farm (secs. 32–33, T. 29 N., R. 24 E.). The paper stated "he put in a shot which blew out half tub of jack." Dardene's discovery went unnoticed for a number of years until ore was discovered in a nearby section that led to the development of the Sunny Side Camp.

Soon after the Sunny Side discovery, Abrams organized a new mining company, Iowa and Oklahoma [Development] Mining Company, to develop his land and to lease other land in adjacent sections (*Baxter Springs News*, 1906b; Abrams, 1937). In addition to Abrams' other mining companies, he incorporated the Quapaw Lead and Zinc Company in July 1903. Dennis Flynn, the former territorial representative to Congress, was president with Abrams as secretary and his wife, Melissa, the treasurer (*Baxter Springs News*, 1905c). By early February 1903, more investors were entering the new field with additional money, which spurred the increase of prospecting and shaft sinking (*Baxter Springs News*, 1903a).

The Baxter Mining Company, owned by an Omaha, Nebraska, consortium, entered the new mining field in May 1904. They became

Figure 3. New cabins built for workmen and miners in the Quapaw district (photograph courtesy of the Baxter Springs, Kansas Heritage Center and Museum).

the second largest lease holder behind Abner Abrams' mining companies. In 1904, the Baxter Mining Company had subleased over 1,160 acres of land to several smaller companies in the new mining field (*Baxter Springs News*, 1904j). By 1906, this company had leased over 5,500 acres of land in the Quapaw reservation (*Baxter Springs News*, 1906c).

The Peoria Camp was developed primarily by digging prospect pits and shallow shafts. The terrain in the vicinity of Sunny Side was a nearly flat, treeless prairie underlain by Mississippian limestone and chert beds. Mining companies hired water-well drillers, who used churn drills to prospect for ore deposits in the area. Primary lease agreements with the land owners usually paid a 5% royalty on lead-zinc concentrates. When a drilling campaign identified areas with potential ore deposits, the larger mining companies would subdivide the acreage into 5-, 10-, 20-, and sometimes 40-acre tracts, and then sublease the ground for a 15% royalty. Sometimes the sublease owner would sell his lease for a higher royalty such as 20% or more. It was a common practice to pyramid higher and higher royalty payments for mining leases. Many companies went broke as ore prices fluctuated while the royalties remained the same. Operators often mined only high grade ore, leaving lower grade ore behind, because the profit was much less.

Mines were developed by shafts and drifts. The usual sizes of the shafts were 4 x 5 ft and 5 x 6 ft. Little or no timbering was employed in the shafts. Drifts were usually 6 x 6 ft in section and stopes were 7–8 ft high by 25–35 ft wide. Stoping was done in floors or lifts from 7–10 ft in depth. The ore, both underground and in the shafts, was handled in 800–1,000-lb buckets. Hoisting was usually done by friction-geared hoists that were powered by 20–30-hp motors (Crane, 1907).

Until Oklahoma became a state in late 1907, Baxter Springs, Kansas, was the financial and industrial hub for the district camps. The transportation of materials for mill construction and supplies, as well as shipment of ore, was by horse-drawn wagon to and from Baxter Springs. Materials and supplies were off loaded from the railroad at Baxter, and ore concentrates were then loaded for the backhaul shipment to the smelters. Baxter Springs' business leaders quickly recognized that in order for mining in the new field south of Baxter Springs to flourish, new roads had to be built. The old Military Road through Indian Territory had been used since 1844, but it did not go directly to the new discoveries. In late 1902, the Baxter Springs Commercial Club established a "Good Roads Committee" to raise funds to build new gravel roads south of town into the new field and east towards Joplin (*Baxter Springs News*, 1903b).

The main ore deposits in the original district occurred at a depth of 80–150 ft (Siebenthal, 1908). After the district expanded west and north of Quapaw in 1922, ore depths were 200 ft or more. The ores, principally galena (PbS) and sphalerite, occurred mostly in blanket ground of chert breccias above the Short Creek oolite member of the Boone Formation. In blanket ground breccias, the ore was found in crevices cemented with secondary chert, jasperoid, and/or dolomite. This differed from the typical sheet ground in the Webb City (Missouri) district where the ore occurred in individual layers (Dunlop, 1916). In the typical blanket ground, hand jigs were ineffective because the ore had to be crushed very finely to free the zinc from the rock (Snider, 1912). The blanket ground ores were low grade, seldom averaging 3%.

The ores, principally zinc silicate (H_2ZnSiO_5, calamine) and galena, occurred in shallow ground on the east and southeast areas in the district. Local people called these deposits "grass roots ore" (Baker, 1964). This meant shallow veins of lead and oxidized ore were turned up with a shovel very near the surface.

Circular ore occurrences were usually associated with solution patches and/or paleokarst features. One of the larger solution patches, which exceeded several hundred feet, occurred on the Red Eagle lease, NE ¼ SE ¼ sec. 31, T. 29 N., R. 24 E. (Siebenthal, 1908). The early discoveries on Abrams' and adjacent properties north of Lincolnville were primarily zinc silicate and sulfide ores with some lead sulfide.

In the Mission City area, the lead-zinc ores varied in proportions of galena and sphalerite. About one-third of the output from the Mission mine was galena. The output from the M. K. & T. mine immediately north of the Mission mine was almost all sphalerite (Snider, 1911). The mines in the northeast part of the district were in "open ground" and had a higher ore grade of 8%–10%.

Sunny Side/Mission City/Lincolnville Camps—The Early Years

The original mining district started at Sunny Side and extended south about 2.0 mi to what is now the Quapaw Tribal Complex; and east of Quapaw 3.5 mi to the Spring River (Fig. 1). Numerous prospects were in some stage of development in the vicinity of the Sunny Side mine in 1903. Miners and their families from the Joplin-Galena areas moved to this location. In subsequent years, several new mines including the Dark Horse, Lead Boy, Black Jack, and Omaha were opened near the Sunny Side mine (Baker, 1964). The Sunny Side community had a racing stable, grocery store, boarding house, hotel, pool hall, and church (Baker, 1964; Abrams, 1937; U.S. Geological Survey Topographic Map, 1907). The Sunnyside school was built in the southeast corner of sec. 19, T. 29 N., R. 24 E. about three-fourths of a mile north of the Sunny Side mine.

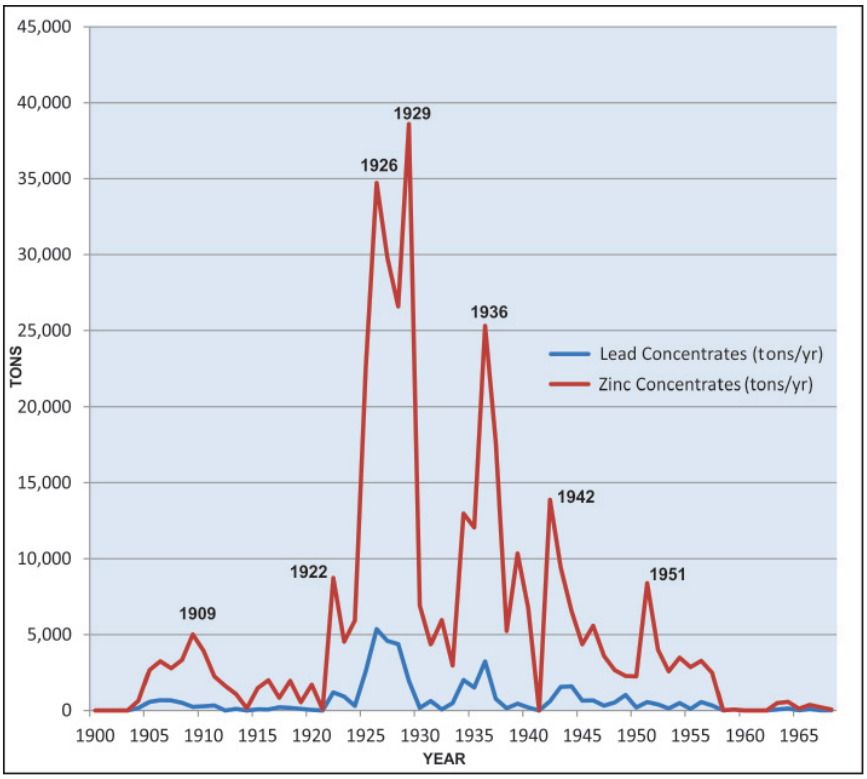

Figure 4. Graph that shows the production of lead and zinc concentrates for the Quapaw district (ASARCO and others, 1995). No distinction was made between sulfide and silicate ores.

An important discovery was made in May 1903, on Felix Dardenne's allotment about 2.0 mi southwest of Sunny Side in the NE¼ sec. 1, T. 28 N. , R. 23 E. (*Baxter Springs News*, 1903d). E. Gains, L. D. Brewster, and associates leased 40 acres from Dardenne for a 5% royalty on lead-zinc concentrates. In September, Gains and Brewster subleased this property to A. M. Wagner, J. O. Goodwin, and associates for a 15% royalty. They then assigned three-fifths interest in the lease to D. W. Troup and A. R. Ford (Ottawa County court records, 1903). Troup and Ford named the mine 'the Mission', presumably after the Quapaw Mission (Boarding) School, which was located across the road (later called East 50 Road) near the center of sec. 36 (Fig. 2). They built a 150-ton-capacity mill that became operational in June 1904 (*Baxter Springs News*, 1904a). In November 1904, Troup, Ford, and associates sold the mine to a group of Omaha investors for $75,000 (*Baxter Springs News*, 1904f).

In early December, the Baxter Mining Company let a contract for ten houses to be built for the 40 miners working at the Mission mine (*Baxter Springs News*, 1904e; j). The two-, three-, and four-room houses (Fig. 3) were rented to them at a very low rate (*Baxter Springs News*, 1904h). The foundations were laid before the end of the year (*Baxter Springs News*, 1904j). Electric lights were installed at the mine and mill by mid-December (*Baxter Springs News*, 1904g), a first in Indian Territory. The ten houses were completed by mid-March 1905 (*Baxter Springs News*, 1905b).

Local residents near the Mission mine called this area Mission City. Mission City had a grocery store, blacksmith shop, butcher shop, a two-chair barbershop, and two hotels that provided board at $4 per week. The butcher shop processed six hogs and three head of beef per week to feed the hungry miners. A new lumber yard and a hardware store were under construction in 1904 (*Baxter Springs News*, 1904i). By January 1905 Mission City had the services of a physician, Dr. C. W. Cole (*Baxter Springs News*, 1905a).

The M. K. & T. mine was located north of the Mission mine and one mile west of the Old Abe mine (SE ¼ SW ¼ sec. 36, T. 29 N., R. 23 E). In 1904, Don McRuer, C. H. Kent, and J. B. Thomas (M. K. & T.) had a ten-acre sublease from Ford and Troup, co-owners of the Mission mine (*Baxter Springs News*, 1904e). The owners sunk a shaft over a drill hole that showed a 28-ft thick deposit of lead and zinc (*Baxter Springs News*, 1904e). In December 1904, the owners put in a 100-hp boiler and 75-hp engine and then made arrangements to build a mill (*Baxter Springs News*, 1904j). They used hand jigs to produce concentrates until the mill was completed in December 1905 (*Baxter Springs News*, 1905e). The mine changed ownership several times from 1908 to 1917. Petersburg Mining Company operated the M. K. & T. and the adjacent, 10-acre Ward Mining Company lease in 1910. The Petersburg Mining Company erected a new 400-ton-capacity mill the same year after they identified additional ore reserves (Dunlop, 1911). Some of the other companies that operated on these leases included Ruby W. Mining Company in 1915 (Dunlop, 1917), Cadillac and Royal Shell in 1916, and Farmers Lead & Zinc Company in 1918 (Dunlop, 1921). The Ward and M. K. & T. mines were two of the top five producers of zinc-sulfide concentrates in the district.

By 1905, numerous mines were in some stage of development 1.5–2.0 mi south and southwest of Sunny Side. A Kansas City corporation secured a 40-acre lease on the widow Crawfish land about a mile east of Mission City (southwest corner of sec. 31, T. 29 N., R. 24 E.). They called their company the Old Abe. In January 1905, a boarding house was built by the mine for workmen and miners. A 200-ton-capacity mill was completed at the mine site for about $28,000; it began producing concentrates in August 1905 (*Baxter Springs News*,

Figure 5. Derrick used by a two- to four-man crew to gain access to an underground mine, the Blacksnake. These crews were called 'gougers' by the local people.

1905d; 1906a). By 1906, the Old Abe Mining Company had built a power plant to provide electricity for the mill and nearby grounds (*Baxter Springs News*, 1906a). A small loose-knit community, Happy Hollow, existed along Rock Creek in 1902. By July 1905, the area near the Old Abe mine had a lumber yard, livery stable, drugstore, barber shop, three restaurants, two boarding houses, confectionery store, pool and billiard halls, and J. H. Parkison operated a general store. The residents living in the community near the Old Abe mine named it Lincoln City; and then Lincolnville a short time later (*Miami-Record Herald*, 1905). A modern two-story, four-room school was built halfway between Lincolnville and Mission City on the north side of Ottawa County road, E-50, about the year 1908.

At the beginning of 1906, there were seven mills in operation or under construction, while at the close of the year there were 23 mills in operation or under construction. Contracts had also been let for the construction of three additional mills (*Baxter Springs News*, 1907a). In 1907, the Quapaw district had 25 steam concentrating mills, with a daily capacity of 3,300 tons. Seven mines operated hand-jig plants that worked ore from the more oxidized portions of the blanket ground (Siebenthal, 1908).

Production

Production records for the Quapaw district, which were compiled by American Smelting and Refining Company (ASARCO), Inc., and others (1995), Martin (1946), and Kirchhoff (1905) and Boutwell (1907a; 1907b), were used to identify mine companies, mine name and/or property, and the quantity and value of lead–zinc concentrates (Fig. 4). From 1904 to 1906, production from the Quapaw district, Indian Territory, was assigned to the Baxter Springs, Kansas, camp.

The financial depression in November 1907 led to a rapid decline in ore prices in 1908, but then rebounded slightly in 1909. Production peaked in 1909 when over 5,000 tons of zinc concentrates were sold. Low ore prices from 1910 to 1914 prevented the profitable working of the low-grade blanket ground ores. Mines that had high working faces and large-capacity mills continued to operate through these difficult times. Several mills were removed and many stood idle. At the beginning of 1911, there were 12 steam concentrating mills and a few hand-jig mills. Of these mills, only four were operating in 1911 (Snider, 1911). By 1914, concentrate production in the district was almost zero.

In July 1914, World War I started in Europe. This led to a substantial increase in prices for lead-zinc concentrates from 1915 to 1918. Many of the old mills were repaired and flooded mine workings were pumped out. In 1915, one-third of galena production and one-half of sphalerite concentrates were shipped by the Ruby W. Mining Co. from the old M. K. & T. and Mission mines (Dunlop, 1917). In 1916, considerable drilling was done from the Quapaw city limits to 2.0 mi west toward the community of Century, and some drilling was done northwest of Quapaw to the Kansas-Oklahoma state line. The drilling programs attempted to identify larger and deeper ore bodies outside the old Quapaw district (Dunlop, 1919). Many new mines opened in Quapaw and south, north, and west of town in 1917. Some of the mines included the Muskogee, Springfield, Tabor, Associated, and Prairie Dog. Most of the mines were developed on small ore bodies with limited reserves, and so contributed very little to the annual production totals. The Lincolnville camp was revived in 1917 mainly through capital from Oklahoma City investors (*The Daily Oklahoman*, 1917b). Lower water tables from pumping near the recently developed mines near Picher allowed new mining companies to buy properties that went broke because of high pumping costs (*The Daily Oklahoman*, 1917a). After the war, production had several highs and lows until 1921, when production was almost zero.

In 1922, the district expanded about a mile west of Quapaw and northeast to the Oklahoma-Kansas state line. The western district boundary ran parallel to the St. Louis & San Francisco Railroad (now Burlington Northern & Santa Fe). This was an arbitrary boundary established by the U.S. Geological Survey and later by the U.S. Bureau of Mines for the assignment of production totals to the district.

Production totals in 1922 were the highest since 1909. In the 1920s, many new mines with large ore reserves were added to the district. Some of the mines included Vantage Mining Co.'s No. 2 (Discard) and Century Zinc's Malsbury, Campbell, and Bingham. The district's production of lead-zinc concentrates peaked in 1929 at over 40,000 tons. Depressed metal prices and depleted ore reserves led to a substantial decline in production during the years 1930 through 1933. There was a modest increase in production during the years 1934 through 1937. The peak production in 1936 was caused by the inclusion of data from the Farmington mine located in the nearby Hockerville camp. Chat reprocessing mills were built in the 1930s throughout the Picher Field. Mine operators found that chat could be reprocessed much cheaper than milling crude ore. Some of the larger reprocessing mills in the Quapaw district were at the John L.,

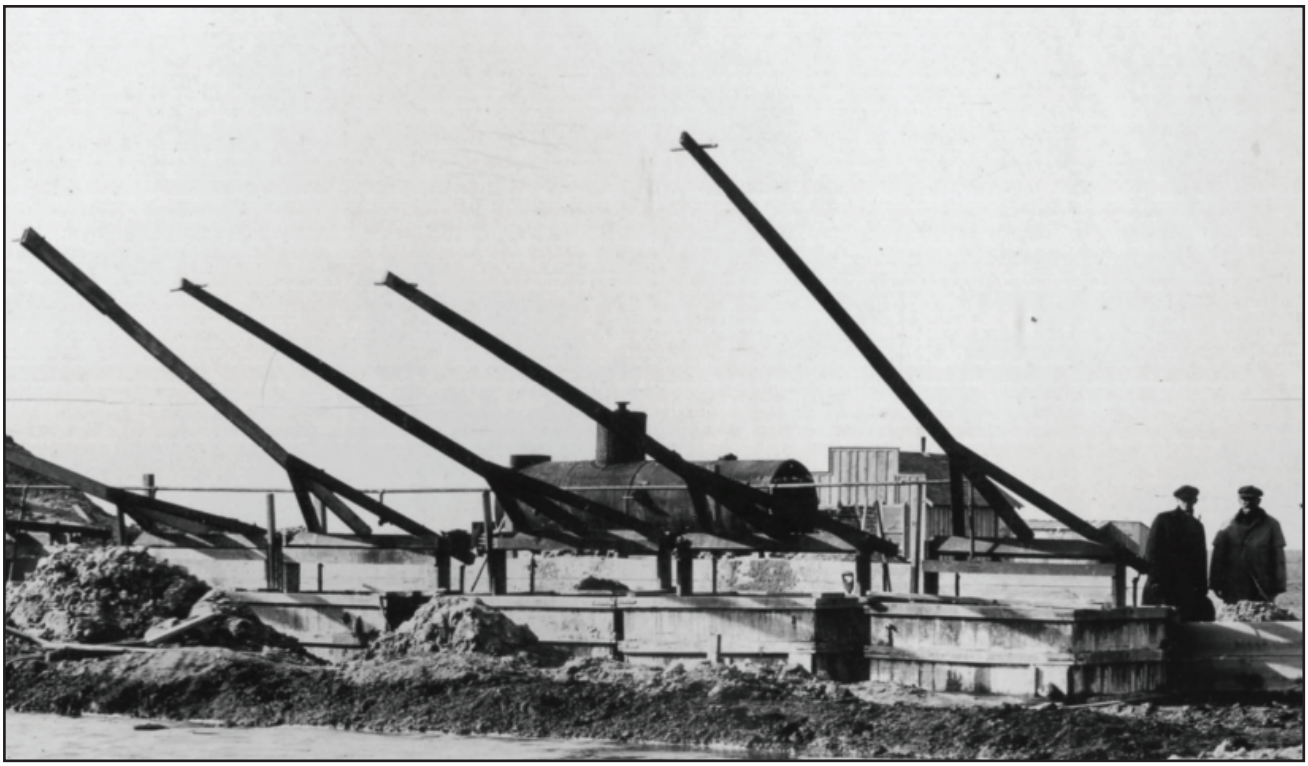

Figure 6. A bank of hand jigs used to produce lead-zinc concentrates (photograph courtesy of the Baxter Springs, Kansas Heritage Center and Museum).

White Eagle, and Discard mines.

In the 1940s, most of the major mining companies left the district. Numerous mining companies with two- to four-man crews were responsible for the majority of the crude ore production (Fig. 5). Most mining consisted of pillar removal, trimming of existing pillars, and some new mine development in abandoned mines. High metal prices during WW II caused a substantial increase in production in 1942. After 1942, the district experienced a rapid decline in production, except for 1952. The last record of production for the district occurred in 1967.

Summary

The original Quapaw district, from 1902 through 1921, started at Sunny Side and extended south about 2.0 mi to what is now the Quapaw Tribal Complex; and east of Quapaw Station, 3.5 mi to the Spring River. The district was composed of the following three camps: Sunny Side, Mission City, and Lincolnville.

Abner W. Abrams hired Ollie M. Youse, a water-well driller from Baxter Springs, Kansas, to drill a well on his daughter's (Maude) allotment in SE¼ SE¼ sec. 30, T. 29 N., R. 24 E. On January 11, the *Joplin Daily Globe* (1902) reported that an 8-ft-thick bed of sphalerite was discovered at 80 ft. Additional nearby drill holes showed the presence of sphalerite in the cuttings. Abrams sank a shaft on the discovery hole and called his mine, "Sunny Side". It took Abrams 2.5 years to develop the Sunny Side prospect into a productive mine. By June 1904, the Sunny Side mill was in operation, and the nearby Dark Horse mill, which was on an Abrams' lease, operated hand jigs (Fig. 6) to concentrate their ore (*Baxter Springs News*, 1904b). In July, the first sale of 100,000 pounds of concentrates took place at the Dark Horse mine. The following week, the Sunny Side mine sold 200,000 pounds of zinc, and the Mission mine sold 100,000 pounds of lead (*Baxter Springs News*, 1904c). The concentrate sales were the beginning of a new lead-zinc mining district in Oklahoma Indian Territory, which was later called the Quapaw district.

By 1907 the area around the Abrams' discoveries had grown into a small community (U. S. Geological Survey, 1907; Abrams, 1937). This small mining camp developed with around 200 residents and several homes, a hotel, and the usual stores; however, Sunny Side never became a well-established community (*The Daily Oklahoman*, 1917c). About 1.5 mi south of Sunny Side, the concurrent development of mines around Lincolnville overshadowed the Sunny Side community. By 1910, most Sunny Side residents had moved to the Lincolnville Camp.

The Quapaw district was an excellent example where inaccurate analysis of drill cuttings, excessive groundwater, and overbuilt mills led to numerous mine failures (Harbaugh, 1930). In some cases, natural washed drill cuttings in the hole, and/or caved ground into the hole, created greater assay values and/or indicated higher faces of ore than what actually existed. Drilling, shaft sinking, and pumping represented much additional cost at each property. Many of the mills built around 1916 cost $40,000 each (Harbaugh, 1930). In general, mill capacity in the Sunny Side and Lincolnville camps exceeded crude ore production. The underground development was insufficient to supply the mills with dirt for continuous operation. Many inexperienced mine operators built large capacity mills before fully drilling out the ore body on the mine lease (*Baxter Springs News*, 1907b). Therefore, there was considerable downtime for the mills waiting for more dirt to concentrate. The number of abandoned Lincolnville mines represented an enormous investment that never had

Figure 7. The Joanna mine/mill made a profit in the district from 1908 to 1910 (Missouri-Oklahoma Zinc Mine Operators Association, 1918). Photograph courtesy of John Schehrer.

a chance of a return.

Mining in the area continued to decline in 1913 and 1914. Less ore was produced in 1914 than in 1913. The courts were full of bankruptcy and receivership cases (Thompson, 1955). From 1906 to 1917, The Joanna (Fig. 7), Hobo, and Gook Luck were the only mines that showed a profit in the Lincolnville area (Missouri-Oklahoma Zinc Mine Operators Association, 1918). During this time period, there were over 25 mines that lost money; the biggest loser, the Mission mine, lost $2 million (Missouri-Oklahoma Zinc Mine Operators Association, 1918). Lincolnville was a wild mining town, but it was very short lived. The low-grade ore soon ran out. Investments in large mills and mining properties in this camp turned sour and large sums of money were lost. Lincolnville became a ghost town where mills, houses, and stores were dismantled and moved away (Thompson, 1955). Today, there are several people that make their home in Lincolnville. A sewage lagoon provides sanitation for the residents living in the Lincolnville area and water is provided by both the Quapaw tribe to Indian housing units and a rural water district.

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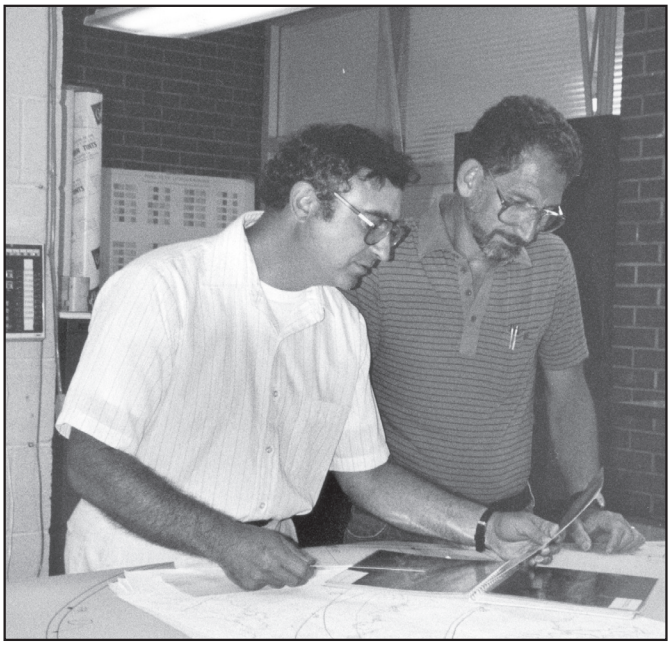
In Memoriam – Kenneth V. Luza 1945 — 2014

We are sad to announce that Dr. Kenneth V. Luza, the longest-serving member of the Survey staff, passed away Wednesday morning, July 23, 2014, in Norman after a brief illness. He is survived by his wife Margaret and son David.

He was born on Sept. 26, 1945, in Manitowoc, Wisconsin, to Vincent and Patricia (Hostetter) Luza.

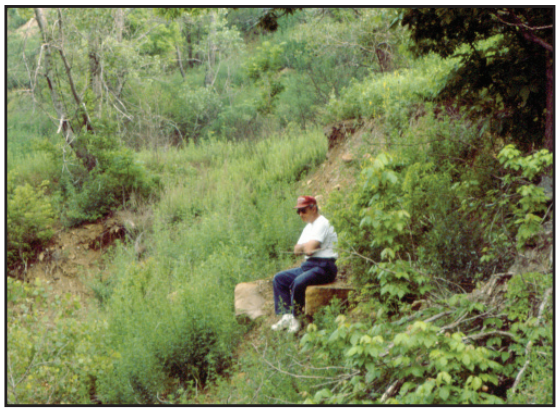
Ken was raised in Joliet, Illinois, and graduated from Joliet Township High School in 1963.



Ken received his B.S. in Geological Engineering from the University of Arizona in 1967, and then earned his M.S. in Geological Engineering (1969) and his Ph.D. in Geology (1972) from the South Dakota School of Mines and Technology. In 1969, he was commissioned as a second lieutenant in the U.S. Army Corps of Engineers.

In 1972, he joined the Nevada Bureau of Mines and Geology, where he worked on engineering and environmental problems in the Reno and Las Vegas areas. In 1975, he took a position as Engineering Geologist with the Oklahoma Geological Survey.

During his career, Ken worked in all areas of Oklahoma, and he studied and wrote on almost all aspects of Oklahoma geology. His Oklahoma-related projects included: the study of earthquakes, the Meers Fault in the Wichita Mountains, tectonics of the Nemaha Ridge, geothermal resources, industrial minerals, and waste disposal; and he spearheaded the Survey's efforts at trying to bring the nation's planned Superconductor Super Collider to Oklahoma.



However, his most important studies were on the hazardous hydrologic and ground-subsidence problems associated with abandoned underground lead/zinc mines in Ottawa County of northeast Oklahoma. This area, the Picher Field of the Tri-State Mining District, was once the world's leading producer of lead and zinc. Emission of water from the underground mines, abandoned by 1970, and the large mounds of mining waste ("chat" piles) left at the surface, led to surface-water contamination at the Tar Creek Superfund Site—one of the Nation's most toxic locations, requiring major reclamation and restoration efforts.

His work in the Picher Field involved the following: study of water contamination, preparing maps showing the distribution of underground mines, identifying and evaluating the condition and potential hazard of all mine shafts (more than 1,000 shafts), evaluating the numerous sites of ground failure and collapse, and contributing in many ways to resolving problems associated with these issues. Ken worked closely with the people living in the area, and cared deeply about their problems and helped them through the difficult transition period. He worked both with his professional knowledge base, but also with his heart.

In addition to his work for the Survey, Ken also served on the graduate faculty at The University of Oklahoma, supervising graduate students in the fields of Geology and Geophysics, Civil Engineering, and Geological Engineering. His professional service included membership in the following organizations: Geological Society of America, American Institute of Mining Engineers, Association of Engineering Geologists (AEG), American Institute of Professional Geologists (AIPG), Shallow Exploration Drillers Clinic, and Oklahoma Board of Geographic Names (OBGI); he served as Chair of the OBGI and as an officer in the Oklahoma Sections of both the AEG and the AIPG.

Ken was a prolific writer, having authored or co-authored more than 150 publications.

He also gave many lectures to technical and public-interest groups, mainly summarizing his research on earthquakes, seismicity, and tectonics, and on problems in the Picher lead/zinc mining district and the Tar Creek Superfund Site.

Ken Luza will be missed by all who knew him, not only for his important contributions to Oklahoma as a geologist, but also for his sly wit and humor. A long-time Survey staff member noted "*If Ken Luza told you something, you could take that to the bank. He didn't say things he wasn't sure about. And he was sure of, and right about, so much in this state.*"

Despite his declining health, Ken worked until his last days to complete his investigations.

The Survey staff and the University of Oklahoma Mewbourne College of Earth and Energy would like to express our deepest sympathy to the family and friends who share this loss. Ken will be missed as a geologist and as a friend, and will not be forgotten.

OGS Outreach 2013

Stan Krukowski, OGS Industrial Minerals Geologist

One way the Oklahoma Geological Survey accomplishes its mission of disseminating the results of investigating the State's land, water, mineral, and energy resources and promoting their wise uses consistent with sound environmental practices is through outreach services.

Oklahoma Rocks! State Parks is the fifth in the series in cooperation with Oklahoma City newspaper, *The Oklahoman*. The Survey began its association with *The Oklahoman*'s education program called Newspapers in Education (NIE) in 2009 with the first *Oklahoma Rocks!* issue. Since then *The Oklahoman* has published four additional issues. This latest edition, compiled by Neil Suneson and assisted by other Survey staff geologists, covers the geological wonders of Oklahoma's state parks. The idyllic settings of state parks owe much to the geology of the areas in which they are found.

Oklahoma Rocks! State Parks highlights the state parks as unique examples of Oklahoma's geology, conveying the geologic history of the state through its parks system. In addition, there are six activities that inform, teach, and challenge students as they learn about the geological background of several state parks. Students learn about plate tectonics, Oklahoma's state crystal (hourglass selenite), porosity, and much more.

What is the impact of the *Oklahoma Rocks!* series? NIE *The Oklahoman* web site (http://nie.newsok.com/) on February 12, 2014, estimated that 890 teachers in 586 schools with 30,400 students in the state saw *Oklahoma Rocks!*, as well as *The Oklahoman*'s 500,000 readers. Along with *The Oklahoman* and the Oklahoma Geological Survey, the 2013 version of *Oklahoma Rocks!* was sponsored by the Oklahoma Geological Foundation and the Oklahoma Aggregates Association. Visit http://www.ogs.ou.edu/level2-earthscied.php to see the latest *Oklahoma Rocks!*.

Staff geologists Neil Suneson and Brittany Pritchett participated in Science in Action Day at the Sam Noble Oklahoma Museum of Natural History on Feb. 24, 2013. They helped identify rocks, minerals, fossils, and various other "earth" materials brought in by the general public. A popular item every year are objects thought to be meteorites.

In cooperation with Red Earth Desk and Derrick Club and Wichita Mountains Wildlife Refuge staff, Neil Suneson, OGS Geologist IV, reviewed Burford Lake Trail geology and nature signs on a November 15, 2013, trip to the Wichita Mountains. Neil (*see photo bottom left*) continues to work with the two groups on the geology interpretive trail. Dr. M. Charles Gilbert, Professor Emeritus, ConocoPhillips School of Geology and Geophysics, University of Oklahoma assisted in the project, lending his expertise and experience over a professional career of studying the igneous petrology and geology of the Wichitas. OGS cartographer Jim Anderson's artistic talents are evident in the signs themselves. Jim was responsible for much of the art work in the interpretive displays.

Strolling through the second floor rock and mineral displays in Sarkeys Energy Center, you will come across one of the latest educational exhibits. Scientists from the Oklahoma Geological Survey and the ConocoPhillips School of Geology and Geophysics cooperated in designing the exhibit: Historic Oklahoma Quartz (*see photo below right*). OGS staff geologists Neil Suneson and Brittany Pritchett worked with Dr. David London, well-known for his work on the origins and internal evolution of granitic pegmatites, in putting the display together. The two quartz crystals from the Lugert Granite are thought to be the largest ever recovered in Oklahoma. The larger crystal weighs 75 lbs! They were extracted in 1947 from the

Government Quarry near the town of Lugert, Oklahoma. Jim Anderson, OGS Cartography Manager, provided the art work in the display.

OGS Geologist IV Ken Luza continued assembling mineral and rock identification kits for classroom use by teachers. The kits have been a part of Survey outreach for decades, serving as a teaching tool during earth science instruction. Along these lines, OGS research geologist Brittany Pritchett had an unusual request to fill in August, 2013. A school teacher from Moore, Oklahoma, had lost her OGS rock and mineral ID kit in the May 20th tornado. Pritchett coordinated with the Pick and Hammer student club at OU to create new rock and mineral ID kits (*see photo below left*). Pick and Hammer's mission statement is "*to raise awareness of the importance of geology and geophysics in society, and create a venue for students to explore the geosciences through field trips, social events, and community outreach.*"

With the sudden increase of seismic activity in the State of Oklahoma, OGS staff seismologist Austin Holland is seen pretty often on various local television news outlets as well as local and even national radio. Earthquakes are not new to Oklahoma; however, their frequency and magnitude have increased recently. Holland and OGS Director Randy Keller, also a geophysicist, are interviewed often by the media to help explain the earthquake phenomena. Holland also was in demand throughout 2013 to give presentations to various school groups, civic organizations, and professional organizations in Oklahoma.

It isn't unusual for OGS geologists to be invited to give presentations to various groups on their specific expertise. Kyle E. Murray, OGS hydrogeologist, studies and examines the interplay between water and energy resources. But Murray is at ease giving talks at professional conferences, as well as to school grades K through 12. In cooperation with the Pioneer Library System in central Oklahoma, Murray addressed local grade school students on rocks and earth science education in 2013. OGS staff geologist Stan Krukowski gave presentations at the Tulsa Rock and Mineral Society's annual gem and minerals show on the industrial minerals of Oklahoma and another on the efforts to reestablish the mining merit badge with the Boy Scouts of America (*see photo below right*).

Throughout the years, the OGS has participated in Oklahoma rock and mineral club annual meetings and rock and mineral shows. In 2013 the OGS maintained its presence at the Tulsa Rock and Mineral Society's annual gem and minerals show held in July and at the Tahlequah Rock and Mineral Show held in August. The OGS exhibit booth helps rock hounds identify the unknown contents of rock-and-mineral grab bags that enthusiasts typically purchase at the events. The exhibit booth also features geologic posters; free rock, mineral, and fossil information; and Survey publications for purchase. Manning the booth is a full-time proposition for OGS staff, as rock hounds, teachers, and professional earth scientists characteristically use it as an assembly point and meeting place. The OGS booth was manned by staff geologist Stan Krukowski and Oklahoma Petroleum Information Center (OPIC) Manager Gene Kullmann this year.

Every year the Survey participates in ScienceFest during Earth Week. ScienceFest, held at the Oklahoma City Zoo, educates children about protecting the environment, conserving natural resources, and using alternative fuels and technologies. The event gives students the opportunity to see how much fun science can be by presenting it in a situation outside the classroom. The 2013 Survey team consisted of staff geologists Stan Krukowski and Ken Luza. The normal exercise is one called Birdseed Mining. It teaches how society depends on mining and how science impacts everyday life. The presentation is hands-on, showing not only the importance of minerals and their uses, but how to reclaim and restore mine lands after mining is finished. Cold, rainy weather forced the demonstration indoors in 2013, but the Survey's poster display was eagerly attended, especially by teachers and chaperones.

On February 5, 2013, the Boy Scouts of America (BSA) approved the Mining in Society merit badge. Staff geologist Stan Krukowski had been involved in the effort beginning in 2003. Please see the next article on page 15, Krukowski Hits 'Pay Dirt' with "Mining in Society" Merit Badge, for additional information.

The requirements for the new merit badge can be reviewed at:

http://www.scouting.org/scoutsource/BoyScouts/AdvancementandAwards/MeritBadges/mb-MINE.aspx

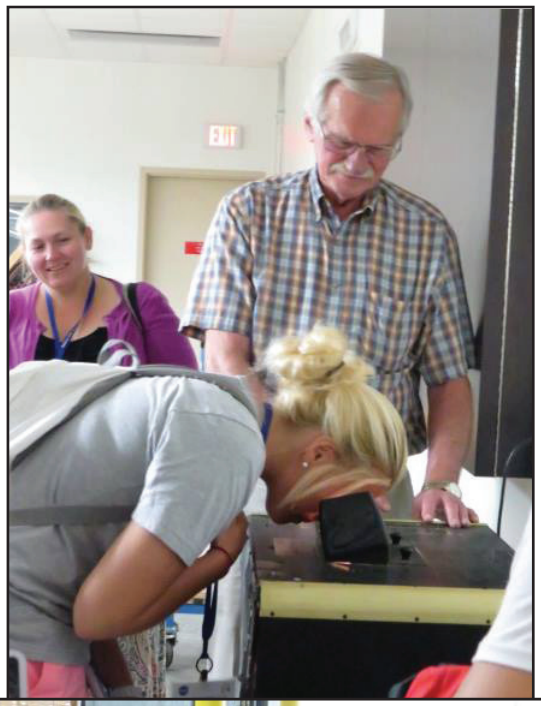
To learn more, contact the BSA or the Minerals Education Coalition at SME's web site:

http://www.mineralseducationcoalition.org/MiningInSocietyMB

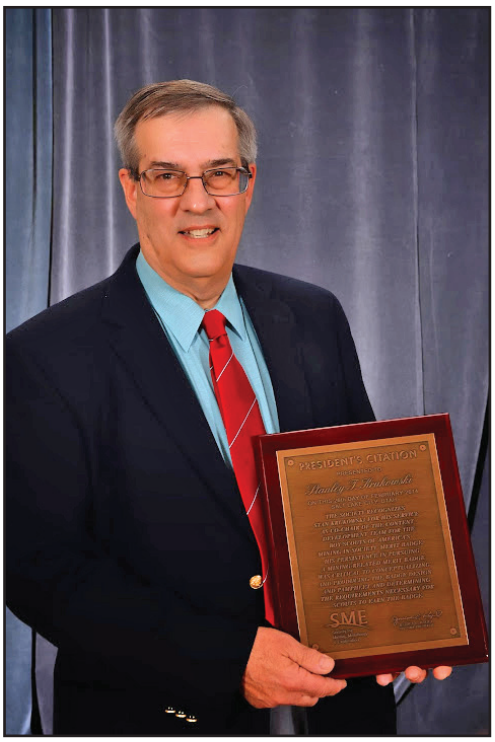
Over the last decade, the OGS has entertained the teachers from the Oklahoma NASA Space Grant Consortium/NASA EPSCoR program. Part of the project's goal is to inspire and train current and future educators to use aerospace-related materials to achieve educational objectives in the classroom. In June 2013, the educators made their annual visit to the Survey's OPIC facility; OPIC Manager Gene Kullmann gave the tour of the OPIC facility (*see photos to right and below*). OPIC's 192,916 sq. ft. houses 500,000 boxes of core and sample cuttings; an extensive library of petroleum information from well logs to completion cards; the Survey's aerial photo collection; and the OGS Publications Sales Office.

The teachers' first impression is reminiscent of the final scene in Raiders of the Lost Ark: four warehouses with row upon row upon row of core boxes shelved right up to the ceiling (*see photo below left*)! Another highlight of their visit was OPIC's X-ray imaging laboratory and core photographic station. Staff geologist Stan Krukowski made a presentation on industrial minerals and mining in the State of Oklahoma. The tour concluded with a visit to the OGS Publications Sales Office conducted by Joyce Stiehler, who supervises the publications office. Souvenirs from the teacher visit included rose rocks, various OGS publications for earth science education, and grinding media used in the comminution of rocks and minerals as part of the mining process.

The OGS Teacher Resource Room at the OPIC facility has been visited by many teachers in the past year or two. The room's collections of rocks and minerals are nearly depleted. The Survey is making a diligent effort to replenish the collections. These are rocks and minerals that are dispensed to teachers who contact the Survey in need of materials for their classrooms. The OGS looks to supporters and volunteers to help in this enterprise by donating specimens and hand samples that are suitable for that purpose. If anyone wishes to donate material, please contact Stan Krukowski at skrukowski@ou.edu or 405-325-8033.



Krukowski Hits 'Pay Dirt' with "Mining In Society" Merit Badge



Stan Krukowski, OGS Industrial Minerals Geologist

"Good things come to those who wait!" Well, that's exactly what happened on February 5, 2013, when the Boy Scouts of America (BSA) approved the Mining in Society merit badge. OGS staff geologist Stan Krukowski had been involved with the endeavor to establish the mining merit badge since it was first proposed in 2003. At that time Krukowski was serving on the GEM Committee (Government, Education, and Mining Committee) of SME (The Society of Mining, Metallurgy, and Exploration, Inc.). Committee Chair Elaine Cullen presented the idea to the GEM executive committee as proposed by fellow NIOSH (National Institute for Occupational Safety and Health) colleague, Mark Larson. After 10 years of proposing, convincing, and cajoling, including a personal meeting with Scout Executive Director Bob Mazzuca in 2010, Krukowski and SME staff hit 'pay dirt' when the badge was approved in 2013.

Krukowski's efforts from the 2003 proposition included assembling a team of SME volunteers. The group put together a framework of topics for the future pamphlet and devised a list of requirements to go with the outline. The first official submission of the proposed merit badge was made in 2005, but it was turned down by the BSA. Then SME member Bill Francart submitted a proposal to the BSA in 2007.

When Francart's effort was also turned down, he joined forces with the GEM Committee and later became part of the Content Development Team, writing about health and safety issues and making other contributions. SME's Executive Director, Dave Kanagy, became personally involved in 2009. In 2010 Kanagy and Krukowski were invited by Stillwater Mining Company CEO, Frank McAllister, to meet with Mazzuca in Stillwater, Montana. Mazzuca was presented with a package of letters and endorsements from leading mining executives throughout the United States in favor of the mining merit badge. Kanagy committed the full support of the SME staff after this meeting, joining the struggle to secure a dialog with the BSA.

Once the merit badge proposal was approved by the BSA, the SME team of member volunteers began working on the pamphlet on February 24, 2013, during a snowstorm in Denver, Colorado, while attending the SME Annual Meeting. Serving as Co-chairs of the Content Development Team, Krukowski and Bob Pruett of Imerys (a specialty industrial minerals company) were given one year to complete the task of planning and writing the Mining in Society pamphlet. With weeks to spare, the team, aided by an official Advisory Panel, completed its task.

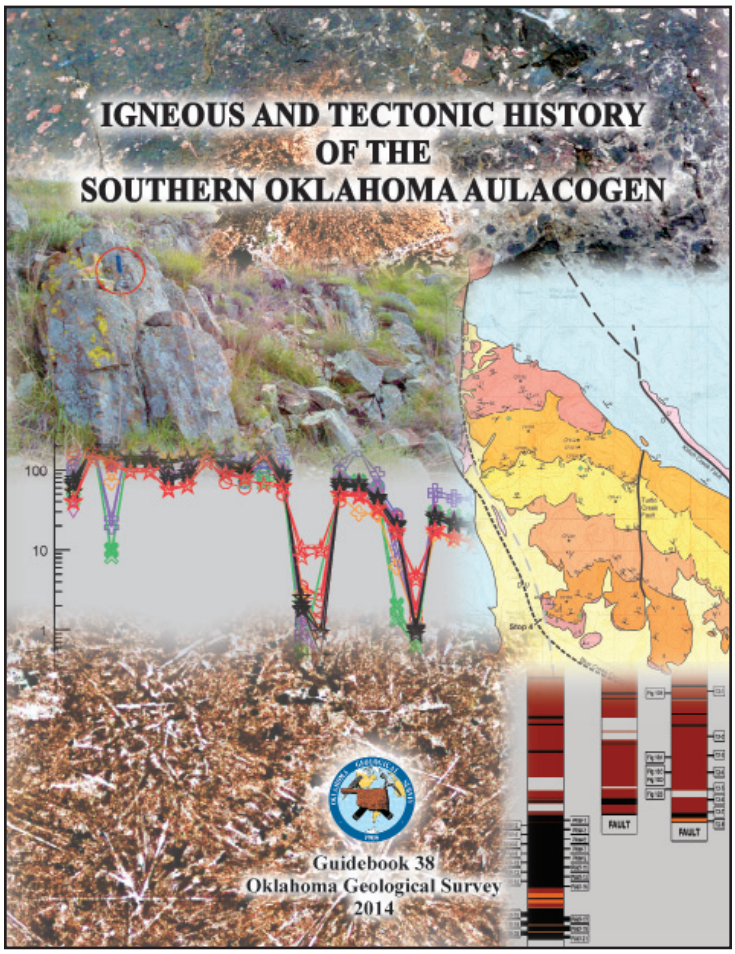
In the meantime, a team of BSA counselors in Salt Lake City, Utah, had a group of volunteer Scouts work on accomplishing requirements for the merit badge. They began in November, 2013, working off a draft of the requirements and pamphlet, and sworn to secrecy by their counselors not to reveal the contents. With the cooperation of Kennecott Utah Copper Corporation, the Scouts successfully completed the requirements.

An 11-year odyssey came to an end when the merit badge was launched on February 26, 2014, in Salt Lake City at SME's annual meeting there. That day 49 Eagle Scout candidates were presented with the first Mining in Society merit badges. Affectionately referred to as the "New Forty-Niners," the awardees were honored at the SME Annual Awards Banquet. Krukowski, the principal architect of the Mining in Society pamphlet, and serving as the Co-chair of the Content Development Team, was awarded the SME President's Citation award and the Mining in Society merit badge itself from the BSA (*see photo, upper left*). Sharing similar awards with Krukowski were Co-chair Pruett and Advisory Panel Chair, John Murphy.

Continuing work on the BSA project, Krukowski is compiling a list of mining exhibits, mining museums, and tour mines in the United States to help Scouts with accomplishing some of the requirements. The list covers all 50 states, the District of Columbia, and U.S. territories. It will be published on the OGS web site under "Outreach," and already consists of over 360 entries.

New OGS Guidebook 38: "Igneous and Tectonic History of the Southern Oklahoma Aulacogen"

Neil Suneson, OGS Geologist IV



The Survey's latest guidebook, Guidebook 38, "Igneous and Tectonic History of the Southern Oklahoma Aulacogen", is printed and available for purchase (price is $35).

Description:

This book is a tribute to Tim Denison, an University of Oklahoma graduate (1954 and 1959) (*also University of Texas, but that doesn't count*) and long-time worker on Oklahoma geology. Tim was a co-author of a seminal work on the basement rocks of Oklahoma—OGS Bulletin 95—which is still widely cited by researchers studying the southern mid-continent. Tim was gracious enough to write an often humorous account of the making of Bulletin 95, and Tim's story is included in the guidebook.

The guidebook is an outgrowth of a field conference held by the OGS in March, 2014. At that time, the organizers had a two-day field trip, and all of the stops we made on that field trip are written up in the guidebook—8 stops in all. The stops focused on the igneous rocks of the Arbuckle Mountains and Wichita Mountains and were led by (and later written up for inclusion in the guidebook by) the geologists who are the experts in those areas. Thirty-seven people attended the field trip from as far away as Ottawa, Canada; Pittsburg, Pennsylvania; and Houston, Texas. It really was a very special field trip—OGS Director Randy Keller called it "a happening." We were extremely fortunate that Tim Dension attended and shared his insights from nearly 60 years of work in the area.

The guidebook is 391 pages long and will make an excellent Christmas present for your loved ones! In addition to the 8 field-trip stop descriptions, there are 15 original research papers on various aspects of the Southern Oklahoma Aulacogen. Another special note of interest regarding this publication is that a number of students actually contributed work to the guidebook, and many of these students have graduated and gone on to professional careers as geologists.

The authors of the papers come from a long list of universities, including (and in no particular order): Kansas State University; Texas Christian University; the University of Oklahoma; the University of Pittsburgh; Franklin and Marshall College; Midwestern State University; the University of Texas, Dallas; the University of Tulsa; and the Geological Survey of Alabama.

The quality of the book's print job (by OU Printing Services) is outstanding, and partly for this reason I think the photomicrographs and the detailed work done by Dr. Richard Hanson at Texas Christian University will make this an important reference work for geologists studying old (500 million years) silicic volcanic rocks. A whole new avenue of research that is being opened up in the guidebook are the subsurface studies of the igneous rocks by Bob Puckett (independent geologist from Oklahoma City). I don't think there is another study out there, anywhere, that compares to Bob's analysis of the drill cuttings and e-logs of the igneous rocks. Another significant contribution is that by Dr. Jonathan Price on what is now being (correctly) called the Mount Scott Intrusive Suite. Jon is a University of Oklahoma graduate and former student of Dr. Charles Gilbert; he is now at Midwestern State University in Wichita Falls, Texas. This guidebook has several outstanding features, including:

- Full color throughout
- Contains new geologic maps of the igneous rocks that are being published for the first time
- Special major-, minor-, and trace-element analyses of the igneous rocks (too many analyses to count)
- Photomicrographs of the volcanic rocks.

If you would like to purchase Guidebook 38 for $35, please call OGS Publication Sales at 405/325-1299.

OGS Personnel "Hellos and Goodbyes"

Let Us Introduce You...

The Survey has recently added two new members to our Research Staff. We'd like to first introduce you to **Amberlee Darold**, who is the new Research Seismologist at the Oklahoma Geological Survey. Amberlee joins Survey Seismologist Austin Holland as a most welcome addition to the Survey.

Amberlee received both her B.S. and M.S. in Geophysics from the University of Oregon where her main research focus was using global seismicity to study upper-mantle structures of the Pacific Northwest. Additionally, during her time at the University of Oregon she aided in the deployment, maintenance and data collection of temporary passive seismic experiments in North America, Spain and Morocco.

After graduating with her M.S. in 2012 she moved to the Washington D.C. area to work with the US Naval Research Laboratory on airborne Multi-Band Synthetic Aperture Radar in unique places such as Qatar and Papua New Guinea.

Currently, Amberlee is excited to be in Oklahoma surrounded by the unique geology, extreme weather and abundant seismicity. She looks forward to exploring the state through hiking, biking and road trips.

We would also like you to meet **Stacey Evans**, who has recently joined the Survey as a Research Geologist.

Stacey began studying geology while attending school in southwestern Wyoming and completed her B.S, in Geology at the University of Oklahoma. She also earned an M.S. in Geology, with a focus on paleomagnetism and diagenesis, from the University of Oklahoma.

She has field and research experience in Nevada, Scotland, Colorado, and Wyoming. After graduation, Stacey began working for Apache Corporation in Tulsa before moving to Houston, Texas, to work for Apache Corporation and then Concho Resources. She gained experience working the Anadarko Basin, Permian Basin, and Gulf of Mexico Shelf.

Stacey's charge at the Survey is to conduct investigations of petroleum-producing areas with an Oklahoma focus and to participate in the development, presentation and publication of such findings; i.e., conduct a play-based study that will culminate in a Survey publication and workshop. She will also work on externally funded studies, performing data acquisition, database management, and supervising student assistants. She will also be involved with the Survey's charge of public service, providing information and technical assistance to operators, consultants, and the public.

Stacey loves traveling and visiting new places. She recently returned from a cycling trip throughout southern Portugal, and is now looking forward to exploring new places around Oklahoma. Stacey also enjoys reading and gardening. She's excited to be back in Oklahoma so she can enjoy the fall season outdoors with activities like running and hiking.

Congratulations and Farewell...

Along with welcoming new members to the Survey staff, we are also bidding fond farewells to two of our valued support staff.

Tammie Creel was the Accounting and Payroll Representative, as well as Conference Assistant in OGS (a.k.a. Payroll, Travel, and Registration expert). Tammie joined the Survey in 1988 and has served in various roles in the administrative office. She officially retired from the Oklahoma Geological Survey/University of Oklahoma on May 31, 2014, with 26 years of service.

Since retiring, Tammie has been spending her time enjoying the beautiful summer weather by the pool and cooking her favorite dishes for her family and friends, especially during OU football watch parties. (The Survey staff will miss sampling her wonderful cooking!)

Tammie will most be remembered for her kind demeanor and positive professional work style that she demonstrated consistently for years. Tammie was well known for always providing staff with the bright side of the issue as well as creative solutions for resolve. We'll definitely miss all the snacks and treats she'd prepare and share with OGS weekly. Tammie will also be remembered as an expert in customer service because she displayed nothing short of first rate service!

Jennifer Veal served as Administrative Assistant in the front offices of the Survey since July 2006. She retired on April 30, 2014, with over 24 years of employment at the University of Oklahoma, 9 of which were with the Survey. She's currently enjoying traveling around the world with her husband Butch, who also recently retired. Jennifer is very involved with her family and caring for her mother and grandchildren.

She takes care of her family with pride and care and demonstrated that same spirit in her position with the OGS. Jennifer will be remembered as being a great team player who always took initiative and completed whatever task assigned with a positive attitude. She successfully took care of the needs of the front office area by providing top notch assistance faithfully!

GRANITE WASH WORKSHOP

November 13th, 2014

Moore Norman Technology Center
Norman, Oklahoma 73069

Drilling Granite Wash wells has dramatically increased since 2009. Approximately 2,200 horizontal wells have been drilled targeting the Missourian, Desmoinesian and Atokan Granite Wash Zones in Oklahoma and the Texas Panhandle. Problems of nomenclature make it necessary to communicate the reservoir or zone that one is referencing when talking to other operators. This is best accomplished by referencing a type well. As of now, operators are targeting the more liquids-rich sections of the Granite Wash. Numerous deeper targets that are composed of lean gas in the lower Desmoinesian and Atokan sections await more development. As gas prices increase, these additional zones will become drilling targets. Each of the zones are correlatable and mappable units. However, this macro-mapping belies the fact that these units are complex. The different Granite Wash units vary rapidly along and across depositional strike. We need to continue to study and develop processes to identify these complexities and how to deal with them to produce the economic results that we strive to achieve.

The industry continually learns and improves on the hydraulic fracturing techniques that work for this formation. Seismic and microseismic applications are invaluable due to the presence of faulting and frac barriers between zones which affect completions and production results. What are the petrophysical complexities of this formation and how do we approach the analysis to predict drilling locations and improve completion methods? This workshop will aid in shedding light on petrophysical analysis. What is the source of oil and condensate that occurs in the Granite Wash? This workshop will attempt to answer that question. Presentations will emphasize the geologic, petrographic, geochemical and engineering factors that benefit the production of hydrocarbons from tight Granite Wash reservoirs.

Sponsored by the
Oklahoma Geological Survey
University of Oklahoma
Norman, Oklahoma

Contact: Michelle Summers
(405)325-7313 or (800)330-3996
mjsummers@ou.edu
For registration information

Kudos to OGS Student Employee

We're proud to share that one of our OGS student employees, Babatunde "Babs" Babayemi, and University of Oklahoma faculty advisors Xingru Wu and Suresh Sharma, were selected to present a paper at the Society of Professional Engineers (SPE) Artificial Lift Conference and Exhibition - North America. Babs will graduate from the OU Mewbourne School of Petroleum & Geological Enginnering this December with his master's degree in Natural Gas Energy Management. The conference will be held in Houston, Texas, October 6-8. The paper is SPE 171371-MS, "Improved Artificial Lift Design for Solvent Assisted SAGD Processes".

This paper was selected for presentation by an SPE program committee following review of information contained in an abstract submitted by the author(s). Contents of the paper have not been reviewed by the Society of Petroleum Engineers and are subject to correction by the author(s).

Abstract

Artificial lift design for heavy oil systems is a continually changing process in which evolving technological advancements coupled with constant learning experience has led to production capabilities that were not feasible in the past. There has been an increase in installation of temperature tolerant Electric Submersible pumps (ESP) with the primary aim of improving deliverability from mature heavy oil fields. Similarly, in the heavy oil industry, the desire to attain energy efficiency has birthed variations of the Steam Assisted Gravity Drainage (SAGD) process that use solvent additives in further reducing bitumen viscosity. The heavy oil emulsion formed in these systems exhibit rheological characteristics and outflow behaviors different to conventional SAGD systems. Tubing hydraulic performance, steam trap requirements and flow assurance behaviors associated with production from these systems are investigated in this work.

This paper presents dynamic multiphase simulations detailing fluid flow regimes, mass and heat transfer mechanisms and pressure/temperature changes as the reservoir fluid flows out of the reservoir, through an ESP and up the production tubing to the surface. The reservoir is a 3D fully coupled reservoir/wellbore model with properties similar to the Athabasca bitumen reservoir. The simulation was conducted considering all periods in the lifecycle of production; i.e., pre and post ramp up. This research finds that a detailed understanding of fluid phase behavior and reservoir operating parameters during the different periods can dramatically improve operating efficiency and impact on ESP design.

Furthermore, results generated from this research can be used as a yardstick for SAGD production engineers in designing artificial lift systems for solvent assisted processes.

Workshops, Meetings, Conferences, and Field Trips – *2014*

October 2

2014 Oklahoma Oil & Gas Trade Expo (SOER)
Oklahoma Expo Hall, Oklahoma State Fairgrounds; Oklahoma City, Oklahoma
contact: Trey Lewis, 405/92-2334; website: www.soerok.com

Oct. 19-22

Geological Society of America (GSA) Annual Meeting
Vancouver, BC Canada; contact: 303/447-2020 or 800/472-1988; website: www.geosociety.org

Oct. 22-23

Governor's Water Conference 2014
Oklahoma City, Oklahoma; contact: Lauren Sturgeon, 405/530-8842; website: http://www.owrb.state.ok.us

Oct. 26-31

Society of Exploration Geophysicists (SEG) Annual Meeting
Colorado Convention Center, Denver, Colorado; website: http://www.seg.org

Oct. 27-29

Society of Petroleum Engineers (SPE)
Amsterdam, The Netherlands; contact: 972/952-9393; website: http://www.spe.org

November 13

OGS Granite Wash Workshop
Moore Norman Technology Center; Norman, Oklahoma; contact: Michelle Summers, 405/325-7313 or 800/330-3996; e-mail: mjsummers@ou.edu; website: www.ogs.ou.edu

November 13

GIS Day at University of Oklahoma 2014
Center for Spatial Analysis; Norman, Oklahoma; contact: Melissa Scott, 405/325-4871; e-mail: mscott@ou.edu; website: http://eomf.ou.edu/gisday/overview

Dec. 15-19

American Geophysical Union (AGU) Fall Meeting
San Francisco, California; contact: 202/462-6900; website: http://www.agu.org

Oklahoma Geological Survey
THE UNIVERSITY OF OKLAHOMA
MEWBOURNE COLLEGE OF EARTH & ENERGY
100 E. Boyd, Room N-131
Norman, Oklahoma 73019-1001

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