KANSAS GEOLOGICAL SOCIETY

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ON THE COVER

Low altitude aerial photograph of eastern Chetumal Bay, northern Belize. The view is from the north looking south and encompasses Ambergris Caye in the upper portion of the photo and Cayo Reid in the right center. The linear white feature is a shallow water, carbonate sand shoal composed predominately of soritid foraminifera with inherently high inter- and intraparticle porosity, and is juxtaposed by tight muddy sands and sandy muds. The elongate narrow shoals are reservoir analogs to some Lansing and Kansas City Group producing fields in Kansas.

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All KGS technical meetings are held at 12:30 p.m. in the Bank of America Auditorium unless otherwise noted. Note: For those geologists who need 30 points to renew their licenses, there will be a sign-in sheet at each presentation and also a certificate of attendance.

CALL FOR PAPERS

The Kansas Geological Society Bulletin, which is published bimonthly both in hard-copy and electronic format, seeks short papers dealing with any aspect of Kansas geology, including petroleum geology, studies of producing oil or gas fields, and outcrop or conceptual studies. Maximum printed length of papers is 5 pages as they appear in the Bulletin, including text, references, figures and/or tables, and figure/table captions. Inquiries regarding manuscripts should be sent to Technical Editor Dr. Sal Mazzullo at salvatore.mazzullo@wichita.edu, whose mailing address is Department of Geology, Wichita State University, Wichita, Kansas 67260. Specific guidelines for manuscript submission appear in each issue of the Bulletin, which can also be accessed on-line at the Kansas Geological Society web site at http://www.kgslibrary.com

PRESIDENT'S LETTER

A year ago, you gave me this job, and it has been one of the highlights of my career, for which I give you my heartfelt thanks. You also provided an excellent board, director, and staff, which made everyone's duties a lot easier, and the result is a society and business which continues to earn the respect of its members and indeed the whole geo-science community. This has been very apparent in the esteem in which KGS is held among our peers, and especially in AAPG and Mid Continent Section meetings. Rebecca, Jon Callen , Larry Richardson and I attended a two-day meeting in Tulsa in mid October at the "First Annual Mid-American Energy Libraries Conference and Workshop" at which thirteen participants, which included board members and staff from libraries in Wichita, Tulsa, Oklahoma City and Ft. Worth attended. They were very interested in the Walters Digital Library and wanted to know how we accomplished the feat so that they may follow suit. Enthusiasm ran high and we have definitely begun something of importance to our profession and industry. Jim McGhay of Tulsa, organized this and I believe it will rapidly develop into a necessary self-help association of libraries nationally.

The Walters Digital Library project is the result of a lot of very dedicated people who have the foresight to see where the information age is headed and the courage to be the pioneers in this effort with all the hazards that lack of precedent and prior experience entail much like drilling wildcats. Space, and my memory will not allow all these names here, but prominent among them are Tyler Sanders, Dick Jordan, Roger Martin, Jon Callen, Larry Richardson, and Derry Larson. Tyler has the necessary computer science and geo-science foresight. Dick Jordan and Jon Callen did a heroic job of fund raising. Jon and Larry were point men for the KGF, Roger's KGS Board worked with the KGF and Derry with the Walters family, and gave valuable business planning advice. A year and half ago, and $300,000 short of our necessary funding to complete the WDL, Dick Jordan worked with Senator Sam Brownback to obtain that final funding without which the project would be incomplete. When you elected me, I did not know whether I would preside over a funeral or a celebration. Oh, how I do thank you all!

And since this last letter is mainly one of thanks, I owe much to Rebecca and her fine staff, and to all Committee Chairs, whose names appear elsewhere in this publication, not the least, its editors, Kimberly Dimmick-Wells and Sal Mazzullo; to Tom Hansen, past president, whose leadership instructed me, to your new president Chuck Brewer, who has been a strong voice for sound business management, and to all the board. Finally, I must acknowledge the man who is simply, in my experience, the best Program Chair KGS has ever had, Bob Cowdery. Going to AAPG with Bob is a real trip. He knows everyone, and they all have great respect for him. If I single out this particular effort, it is because this is the main reason I am so thankful to not have to retire, to remain in this business as long as I wish, and that is because it is so damn fascinating and I'll bet there are a lot of my contemporaries that will agree. *Continued on page 6……..*

Continued from page 5…..

Technology is one of the fascinations because it is growing so rapidly and giving us tools we never dreamt of for finding and producing what nature has provided. Continuing education is vital and a very good exercise for the mind. Without it, one flirts with obsolescence, a life-long dread of mine. But overall, almost as a writing in stone, I remember Bob Walters saying, "You find oil by intelligent exposure." (Think about that one a while.) Lastly, in the words of another of my heroes, Duke Ellington used to close by telling people, "Love you madly!"

—–Alfred James, III

ATTENTION!!!!

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KGS Talk December 1, 2005

Finding Simpson Sand Production in Southern Oklahoma
With 3-Dimensional Seismic Data

Bob Springman
Dominion E & P, Inc., OKC

The Simpson Group Sands have been prolific reservoirs in Southern Oklahoma. The Basal Oil Creek sand is capable of producing in excess of 1,000,000 barrels of oil per well with recovery factors as high as 800 barrels of oil per acre\foot at depths less than 7,000 feet. The Bromide sands are capable of producing in excess of 600,000 barrels of oil per well with recovery factors as high as 400 barrels of oil per acre/foot at depths less than 6,000 feet. The McLish sands are prolific in southeastern Oklahoma.

With 3D seismic the probability of finding Basal Oil Creek sand production has been increased from 5% to 30% over conventional 2D seismic. The 3D seismic also has been effective in development of Bromide sand production.

Choosing areas of good seismic record quality with easily mappable reflectors should reduce the risk of poor 3D seismic results. This paper will present new opportunities to successfully explore for oil and gas fields in southern Oklahoma.

FROM THE MANAGER'S DESK

Dear Members,

This is one of the more important issues of the Bulletin that we put out each year. This is the issue with our new slate of candidates running for KGS office. Please take some time and look over this very fine group of people that have accepted the responsibility to serve the KGS. In this time of high oil prices and busy drilling schedules, it is very difficult for anyone in the business to commit to the time to serve on a board therefore we need to be very grateful to those who have agreed to serve.

As we come to the close of another year, we are anticipating another busy and prosperous year in 2006. I would like to take this time to thank my wonderful staff, Janice, Linda, Rhonda & Sherri for all of their hard work and for making it fun to come to work each day. I also want to acknowledge Alan Heckle who works on Thursday nights and Katie Pierce who is working a few hours each week on our Core Hole library data. I don't want to forget David Bayer, our "technical guy", who has made all of our lives much easier! All of these people are making your library a better place. Please thank them when you get a chance.

Besides the staff, I want to give my special thanks to the volunteers. There are many of you who give us a helping hand in whatever way you are able and I want you to know how much that is appreciated. I do, however, need to give my special thanks to Sal & Chellie Mazzullo, Larry Friend, Ted Jochems and Marj Crane for the countless hours they spend in the library, integrating the basement material into our files and helping with whatever else needs to be done. We have recently hired Alan Heckle to help with the integration project in addition to his Thursday night duties. The KGS and the KGF jointly, will be concentrating on dealing with the vast amounts of data in the basement. This will be the main focus over the next couple of years as we hope to weed through the duplications and bring to the surface, the data that is new to our library.

Wishing you all a very wonderful holiday season!

-Rebecca Radford

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Modern Carbonate Depositional Settngs In Northern Belize, Central America: Analogs for Modeling And Exploring for Stratigraphic Traps In Lansing-Kansas City Reservoirs

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INTRODUCTION

The study of modern carbonate sediments reveals a complex mosaic of facies deposited in an array of depositional regimes. As such, understanding the origin of these sediments and controls on their deposition is paramount in interpreting, modeling and reconstructing ancient carbonate depositional systems (Scholle et al., 1983; Mazzullo & Reid, 1986; Wilhite, 2000). Inasmuch as carbonate rocks account for 50% of the world's hydrocarbon production and reserves (Mazzullo, 2004), much of which is stored in subtle stratigraphic traps, explorationists should understand the mechanisms responsible for reservoir facies distributions. Keeping up with current literature and scientific concepts is the first step towards developing better exploration techniques. However, nothing is more beneficial than actually visiting and examining modern depositional environments. Through this practice, the geologist (and his exploration team) can get a "hands-on" perspective of the myriad of environmental settings in which carbonate sediments are deposited. Furthermore, this practice yields a real-life sense for the heterogeneous nature of the deposits, a scope for their distribution and facies relations, and most importantly, an idea of true scale. Armed with this knowledge an explorationist is better equipped to envision the complexity of ancient depositional systems in the subsurface, while at the same time objectively mapping regional facies trends, particularly in relation to reservoir objectives.

Rocks of Upper Pennsylvanian age, particularly the Missourian Lansing and Kansas City Groups, are known petroleum reservoirs in Kansas, from the northwest to south-central part of the state. Dominated by limestones deposited in shallow marine environments, hydrocarbon accumulations are present largely in structural and structural-stratigraphic combination traps where the majority of production is controlled by structural closure (Rascoe & Adler, 1983). However, a number a fields from the Lansing-Kansas City (e.g., various LKC units in the Cahoj-Wilhelm complex in Rawlins County) produce from true stratigraphic traps (Watney, 1980;) and as such, whereas the majority of structural areas of hydrocarbon production in Kansas have already been defined, are a number of areas with as-yet discovered subtle stratigraphic traps to be explored/exploited. To these ends, the explorationist must first regionally understand the types of deposits represented in the objective strata and controls on facies distributions. From this point they can define potentially productive trends and then examine the reservoirs on a field size basis.

The purpose of this paper is to introduce the reader to some of the modern carbonate depositional environments of northern Belize, Central America, as analogs to inferred ancient environments in the Lansing and Kansas City Groups. We will discuss Holocene sediments of the northern Belize shelf by examining the types of reservoir analog deposits and their relation to Holocene sealevel rise, factors controlling facies distributions and their geometries, and overall spatial extents of facies. Once defined, Holocene shallow marine deposits will then be compared to the Lansing and Kansas City Groups, with some examples from productive stratigraphic reservoirs including discussion and considerations for continued exploration.

GENERAL GEOLOGY OF THE NORTHERN BELIZE SHELF

Belize, Central America is located on the southeast side of the Yucatan Peninsula where it is bordered to its north by Mexico and west and south by Guatemala (Fig. 1). The country lies in the humid tropical climate belt and overlooks the Carribean Sea to the east. The northern Belize platform extends from the latitude of Belize City north to Mexico, where it is characterized by numerous mangrove and bedrock-cored cayes surrounded by shallow water (Fig. 1). The platform lies atop a major north-northeast trending horst block that is faulted down to east into the Carribean Basin. The second largest barrier reef system in the world occupies a fault-block edge and separates the platform from the open ocean.

The Holocene section here is predominately carbonate and overlies a karsted surface of Pleistocene limestone marked by sinkholes, linear ridges and dissolution valleys. The liner ridges follow the structural grain of the region, trending north-northeast, and probably represent areas between dissolution-enlarged fracture systems. The largest of the karsted highs is a ridge of bedrock that is the core of Ambergris Caye. This caye separates the platform into two distinct depositional provinces, the inner shelf to the lee of Ambergris Caye and the outer shelf between the caye and the barrier reef. Water depths on the northern platform are typically no deeper than 15 feet and, with the exception of northern Chetumal Bay, tend to shallow to the north. Here the platform is in a microtidal regime where the semidiurnal tidal range is maximum 1.5 feet (Wilhite, 2000). Water circulation patterns, in general, are dominated by northeasterly trade winds and sea swells over and through cuts in the reef. Periodic storms, particularly 'northers' and hurricanes, generate currents paralleling prevailing trade winds as well (Fig. 1).

Deposition of the Holocene section began during the post-Wisconsin (Flandrian) inter-glacial sealevel rise approximately 6,300 years before present (BP) (Fig. 1; Mazzullo et al., 2003), and initial transgression of the platform was from the south. Inasmuch as the previous sealevel lowstand was below the edge of the Pleistocene platform, the Holocene sediments have since been deposited on a Type I sequence-bounding unconformity (Wilhite, 2000), and as such, are a separate depositional sequence from the underlying Pleistocene. In general, these sediments have been deposited in an onlapping fashion and are deposits representative of the transgressive system tract (TST) deposited during rapid sealevel rise from 6,300 BP to 4,600 BP and an early highstand systems tract (HST) deposited during decelerating sealevel rise from 4,600 BP to present (Fig. 1).

HOLOCENE FACIES TRACT DISTRIBUTIONS AND GEOMETRIES

Inner Shelf Reservoir Analogs

The inner shelf lagoon is protected from the outer shelf and open-ocean influence by Ambergris Caye (Fig. 2), and it typically is a quiet water, low energy regime. In this restricted lagoon surface waters fluctuate in temperature and salinity due to freshwater runoff from the mainland and inadequate mixing with normal-salinity seawater. Due to these environmental 'extremes', only a limited set of fauna and flora thrive in this schizohaline setting. The low diversity of fauna is represent ative of both the surficial and subsurface sediments which indicates the bay has been a sheltered schizohaline lagoon since initial flooding. Composed primarily of soritid and miliolid foraminifera, a low diversity mollusc assemblage (pelecypods and gastropods), and ostracods, the sediments of the bay can be divided texturally into two regimes. The region to the west-northwest of a line from Cayo

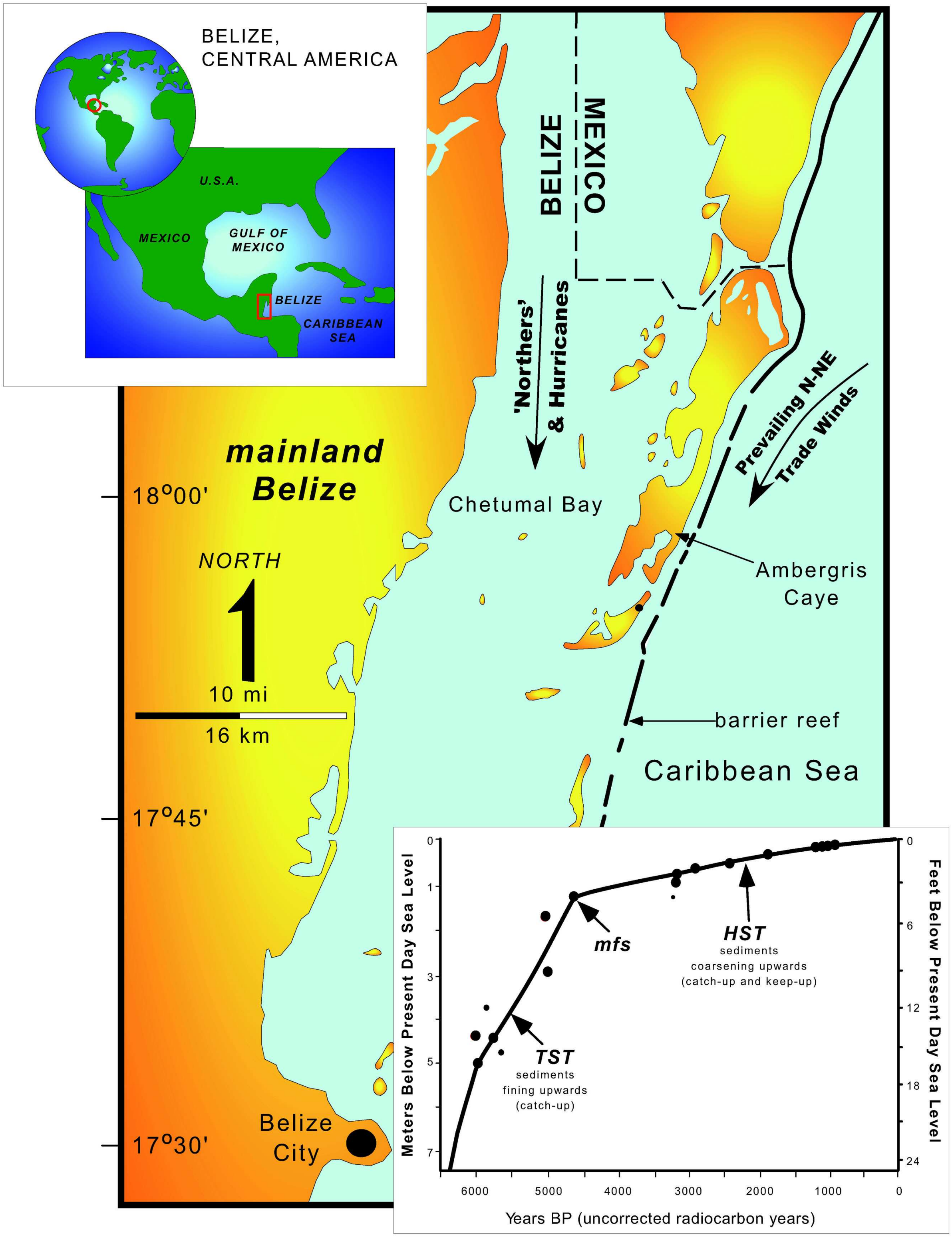

Figure 1. The northern Belize shelf and dominant wind patterns. The inset to the lower right is the sealevel curve for the northern shelf based on radiocarbon age dates of mangrove peat and dolomite crusts.

Chelem to Mosquito Caye (Fig. 2) the sediments are dominated by peloid and miliolid muds. The sediments here are mudstone-wackestone equivalents and, if preserved, would represent non-reservoir facies. To the east of the aforementioned line, however, are soritid sand shoals and molluscan sands and gravels (e.g. grainstone) and represent reservoir-analog facies.

The area between Ambergris Caye and Blackadore Caye is a bowl-shaped depression on Pleistocene bedrock limestone dissected by two prominent north-northeast trending ridges with sink-holes and remnant karst knobs. Deposition and sediment accumulation here typically reflects the underlying bedrock, where sediments thicken in lows and thin over highs (Wilhite, 2000). Cored sections of the sediment in this area yield an internal stratigraphy, where complete, composed of (Fig. 3a): 1-a basal terrigenous clay with Pleistocene rock fragments, representing a buried soil developed during sealevel lowstand; 2-mangrove peat, indicative of deposition in coastal swamp environments; 3-a basal transgressive carbonate skeletal-intraclast lag, deposited in the near-shore environment; and 4-carbonate sediments representing marine deposition (Wilhite, 2000).

Composed dominantly of foraminiferal sands and muds, the carbonate section was deposited in a catch-up and keep-up mode of deposition during decelerating post-Pleistocene sealevel rise (Wilhite & Mazzullo, 2000). Cored sediments initially show a deepening-upward trend which rapidly changes to a shallowing and coarsening- upwards fashion representing deposits of the TST and early HST (Figs. 1 & 3a). Inherently high-porosity foraminiferal sands are the end members of the HST and were deposited in shallow water (<3 feet) over bedrock and/or antecedent depositional highs. These sands are linear deposits with excellent inter- and intraparticle porosity that overlie subjacent muds and pinch out laterally into muddy sands and sandy muds in the inter-shoal areas.

The distribution and geometry of these sand shoals are in direct relation to underlying topography and current patterns. In an otherwise low-energy regime protected from open ocean influence and dominant trade winds by Ambergris Caye, the main mode of sediment transport and redistribution in the inner shelf is from strong northerly winds associated with cold air masses, moving south from the northern hemisphere, known as 'northers'. In addition to 'northers', hurricanes and intermittent periods of sustained prevailing trade winds across the island barrier (Fig. 1) combine to cause overall net sediment movement to the south-southwest. The linear sand shoals have been developed on underlying highs where muds have been winnowed from the coarser sand size sediments and have developed long axes mutually parallel and at a constant angle to the prevailing wind patterns (Fig. 2) (Wilhite & Mazzullo, 2000). The shoals are prograding to the south and in some instances developing a cuspate shape to the west (*see cover photo)* due to spit accretion (Wilhite, 2000). If preserved in the subsurface, the high length-to-width ratio of the sand shoals would classify them as "shoestring" sands. Figure 2 illustrates the size and areal extent of the shoals (outlined in dashed lines) where, at maximum, the shoals are 3.75 miles long and 0.5 miles in width. Furthermore, these carbonate sands have sharp contacts (see cover photo KGS Bulletin May/June, 2005) where they pinch out laterally into, and overlie, tight muds and sandy muds, and as such, with their high inter- and intraparticle porosity, they are good analogs to narrow elongate stratigraphic traps in similar inner-shelf and platform margin parallel carbonate sand reservoirs (Wilhite & Mazzullo, 2000).

Outer Shelf Reservoir Analogs

The outer shelf lagoon between Ambergris Caye and the shelf edge is quite narrow in comparison to the wide inner shelf (Fig. 2). This current-swept environment is of normal temperature and salinity and is fed nutrient-rich waters by sea swells over and through cuts in the barrier reef from the Carribean Sea. The normal-marine environmental conditions are reflected in a wide array of biota (i.e., algae, echinoderms, molluscs, foraminifera, coral, sponges, etc.) that live within, and are deposited post-mortem, on the outer shelf. Numerous facies are represented by these sediments such as, shallow water sponge reefs, mud mounds and patch reefs, however, two principle facies tracts dominate throughout: 1-the barrier reef (encompassing the barrier reef-flat, reef-crest, upper fore-reef slope) biolithite and associated sands and gravels; and 2-coralgal sands and gravels, dominated by sediments composed of corals, coralline algae and *Halimeda* (green algae) (Fig. 2). Although each of the aforementioned facies may be reservoir analogs, it is the coralgal sands that will be the focus of discussion below. The pre-Holocene surface of the outer shelf is defined by a linear dissolution valley that lies between the barrier reef and Ambergris Caye. Here sediments thicken in bedrock lows and thin over highs and share the same general

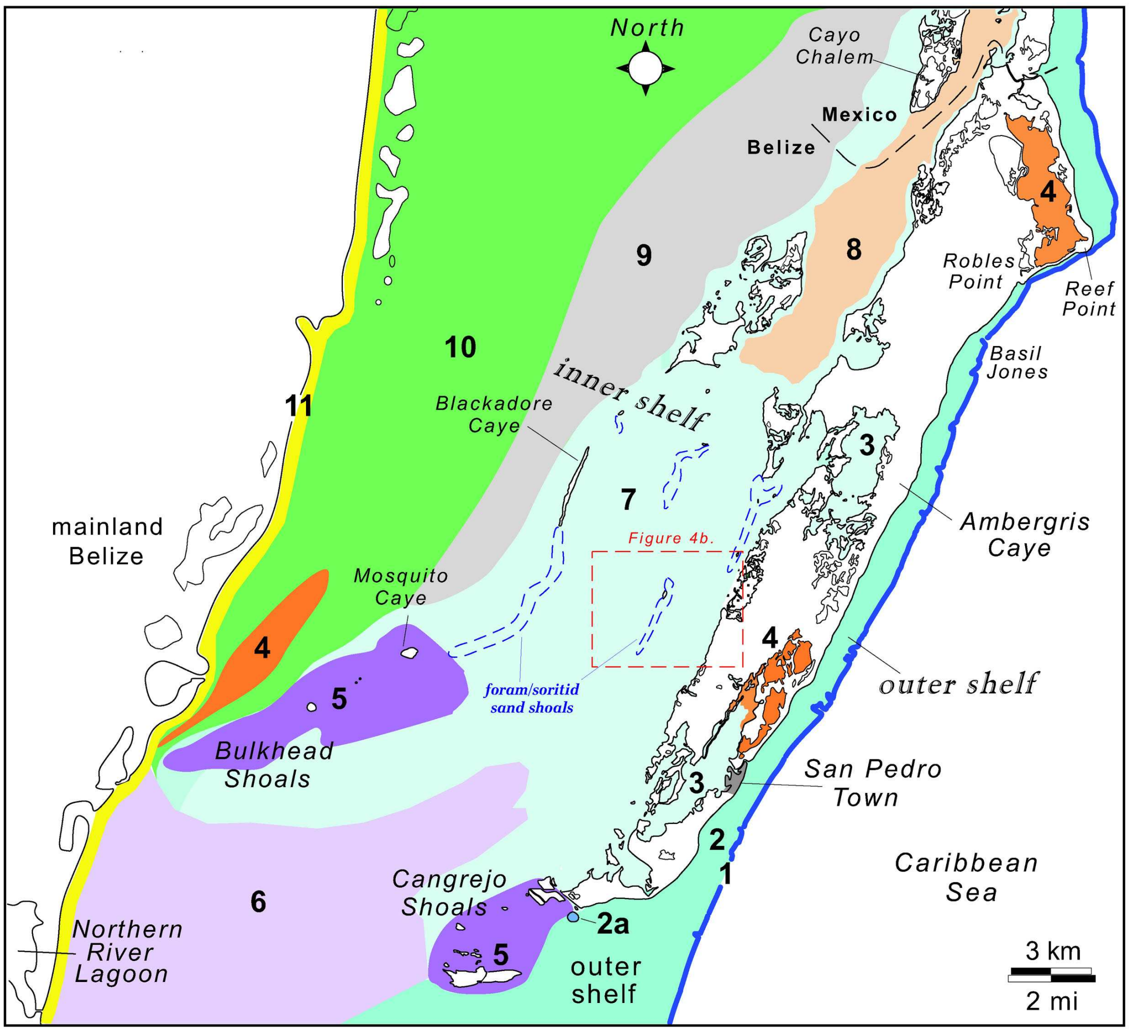

Figure 2. Surficial Holocene inner and outer shelf facies around Ambergris Caye. Beaches, tidal flats, and mangrove swamps can not be shown at this scale: 1 - barrier reef-flat, reef-crest, and upper fore-reef biolithite and associated sand and bioclastic gravel; 2 - outer shelf coralgal sand and bioclastic gravel, scattered patch reefs, and beach sand along the eastern coast of Ambergris Caye; 2a - sponge “reef”; 3 - miliolid-soritid-*Chione* mud; 4 - muddy molluscan gravel; 5 - mud-mounds; 6 - miliolid mud; 7 - locally gravelly, soritid-miliolid-*Chione* sand and mud; 8 - *Brachidontes*-foram-molluscan muddy sand and bioclastic gravel; 9 - soritid-miliolid-molluscan muddy sand to sandy mud; 10 - peloid-miliolid-pelecypod-ostracod sandy mud; and 11 - miliolid molluscan sand. From Mazzullo (in press). Inner shelf foram (soritid) sand shoals highlighted in the dashed lines. Box outlined in red shows the location for inset photo in Figure 4b.

stratigraphy as the inner shelf, represented by a basal terrigenous soil, overlain by coastal mangrove swamp deposits (TST) and normal marine carbonate sediments (late TST and early HST). As opposed to the inner shelf, energy levels on the outer shelf are moderate to high. Ocean swells transport sediments to the west whereas, north-northeast trade winds blow unobstructed against the eastern shore of Ambergris Caye that sets up a longshore drift, and funnels sediments to the south-southwest.

The coralgal sand facies of the outer shelf has been deposited as a southward extending sand sheet to the lee of the barrier reef (Fig. 2). Composed predominately of sand and gravel size fragments this facies stretches across the width of the outer shelf and are reservoir analogs to current washed bioclastic grainstones. In a westward direction towards Ambergris Caye, this facies gets slightly more muddy in places. This is in response to a general increase in depth to underlying bedrock, deposition in a relatively lower energy regime and the dominance of *Thalassia* sea grass that tends to baffle sediment movement and traps smaller mud size particles. If preserved in the subsurface the subtle change in texture from a grainstone to a packstone equivalent toward Ambergris Caye may be the difference between a lucrative producer and a marginal producer. Conversely, the change of the sediment texture to a packstone within this depositional unit may act as a lateral stratigraphic seal/trap to the grainstone facies. Deposited as a tabular sand sheet across the outer shelf, the coralgal sand facies, regionally, has a linear geometry. This facies averages no more than one mile wide from Rocky Point south to San Pedro Town (Fig. 2) where it gradually eventually widens to four miles wide, east of Cangrejo Shoals. Based on the geometry and voluminous extent, these sands with their inherent high inter- and intraparticle porosity, are good analogs to outer shelf and shelf margin reservoir sands that grade laterally, updip, into shallow water subtidal packstones and wackestones.

CONSIDERATIONS IN EXPLORING FOR LANSING-KANSAS CITY RESERVOIRS

From the previously described examples of facies tracts on the Belize shelf the reader should start to recognize some repeated reference to common characteristics in both, inner and outer shelf depositional environments. The first of these factors has to do with structure and antecedent bedrock topography underlying Holocene sediments, and the second has to do with water current and circulation patterns. It is these two components that are integral in controlling facies distributions and geometries. The third factor is in the type of biota present in the sediments, which is indicative of not only environmental setting of deposition, but also, in part, potential for reservoir quality facies.

The explorationist will recognize that in order to successfully explore for Lansing and Kansas City hydrocarbon reservoirs, particularly those stored in subtle stratigraphic traps (and structural-stratigraphic combination traps), more is needed than just a gross isopach and structure map. Accordingly, in applying the modern Belize analog to the Lansing and Kansas City Groups, the first step is to define paleogeography and major paleotectonic/structural provinces and features. During the Missourian, Kansas was just north of the equatorial belt between 5 and 10 degrees latitude (Heckel, 1980) and trade winds were from the present-day northeast. The sediment-starved Anadarko Basin was to the south of south-central Kansas (present day) and a carbonate dominated shelf lay to its north (Heckel, 1980). The primary, positive structural elements, prior to Pennsylvanian transgression and deposition, were the Central Kansas Uplift, the Pratt Anticline and the Nemaha Ridge (Merriam, 1963). The Cherokee and Marmaton Groups onlapped the structures whereas, the Kansas City Group was concordant and completely transgressed the majority of the aforementioned structural provinces.

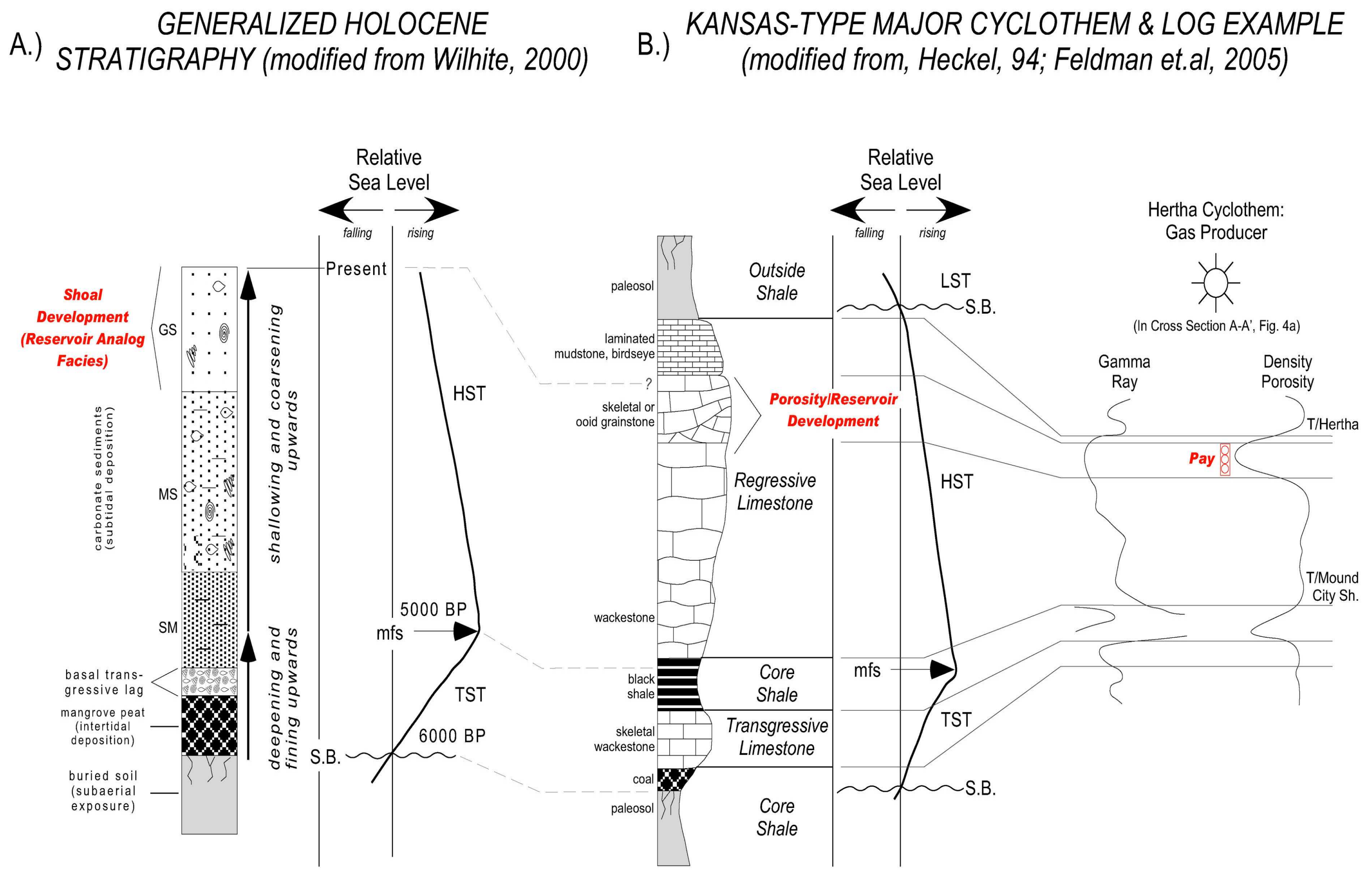

Figure 3. Comparison of Holocene and Pennsylvanian stratigraphic sequences. A - Generalized stratigraphy from the northern shelf and its relation to sealevel rise. B - Kansas-type major cyclothem stratigraphy and log response. Both sequences are quite similar showing a deepening and then shallowing-upward sequence where reservoir facies develop in the HST, as can be seen by the Hertha producer to the right. (S.B. - sequence boundary; mfs - maximum flooding surface; TST - transgressive systems tract; HST - highstand systems tract; LST - lowstand systems tract

Consider now, with an understanding of the paleogeography, the scenario during Missourian time in the vicinity of Pratt Anticline, Barber County, Kansas. Here was a structural/topographic high that, in conjunction with wind driven currents, probably directed sediment transport and was a nucleation site for shoal development. The example in Figure 4(a) shows a small field that is productive from the Kansas City Hertha Limestone in Barber County near the crest of the Pratt Anticline. Mapping of the porosity shows upwards of 6 feet of reservoir development on a localized structural monocline (Fig. 4a). Some geologists may refer to this monocline simply as a structural bump with slight roll-over as the mechanism for hydrocarbon trapping. Closer examination of logs and plotted geological reports however, indicates that this reservoir produces from a grainstone shoal, developed during Hertha time, that pinches out laterally into a tight packstone-wackestone. Structural adjustment subsequent to Hertha deposition tilted the reservoir to the east where hydrocarbons migrated into and filled void space until trapped updip against the tight packstone-wackestone facies, resulting in a stratigraphic-structural combination trap (Fig. 4a).

Comparison of the Hetha producing field to the Holocene inner shelf foram shoal example (Fig. 4b) illustrates a strong similarity in size, geometry and sediment distribution. Furthermore, both shoals (Holocene and Hertha) nucleated on topographic highs in response to prevailing wind patterns. As such, in reference to the modern analog, the interpretation for the Hertha should be that production is from a grainstone deposited in a low energy, inner shelf regime. Caution must be taken however in this analysis, as it was previously discussed that similar controls affected deposition of sediments on the high energy, outer shelf, that resulted in deposition of linear sand bodies as well. Therefore, to fully understand the nature of the reservoir in terms of environmental setting of deposition, the biota within the rocks must be taken into account. Based on the modern analogs, if cuttings from the productive unit were composed of a low diversity of biota dominated by only a few fossil types it would be interpreted that the grainstone reservoir was deposited in an inner shelf environment. Conversely, if associated grain types were represented by a wide array of fossils it would be determined that the reservoir was deposited in an outer shelf environment. Whereas paleotopography, and current patterns dictate reservoir geometries and distributions, the importance in the recognition of biota and constituent grains enables the explorationist to envision reservoir types, size and spatial trends based on environmental settings of deposition (i.e., exploring for thin, inner shelf "shoestring" sands vs. thick, widespread, outer shelf tabular sands).

Pennsylvanian cyclothems have been deposited in transgressive-regressive sequences in response to periodic glacio-eustatic pulses of sealevel (Heckel, 1994) and are the building blocks of the Lansing and Kansas City Groups. The Kansas-type major cyclothem, as shown in Figure 3(b) (Heckel, 1994; Feldman et al., 2005) is composed of a stratigraphy consisting of a basal paleosol, overlain by coal (early TST), succeeded by a transgressive limestone and core shale (TST) followed by a regressive limestone (HST). Deposited in response to a glacio-eustatic cycle of sealevel rise and fall, the stratigraphy here is a near match to the Holocene depositional sequence described earlier for both the inner and outer shelf of northern Belize shelf (Fig. 3b). Furthermore, Holocene sealevel rise and associated deposition has also been a direct result of the transition from an ice-house to a greenhouse climate, as was the case during the Pennsylvanian. In both the Kansas-type Pennsylvanian cyclothem and the Holocene sequence, carbonate sedimentation typically has responded by deepening and fining-upwards in the TST, during rapid sealevel rise, and shallowing and coarsening-upward in the HST, during sealevel deceleration and eventual fall (Figs. 4a & 4b). In evaluation of the vertical facies within these systems tracts, it is most often that the reservoir facies are present in the HST (Fig. 4b). Inasmuch as the Lansing and Kansas City Groups are vertically-stacked sequences

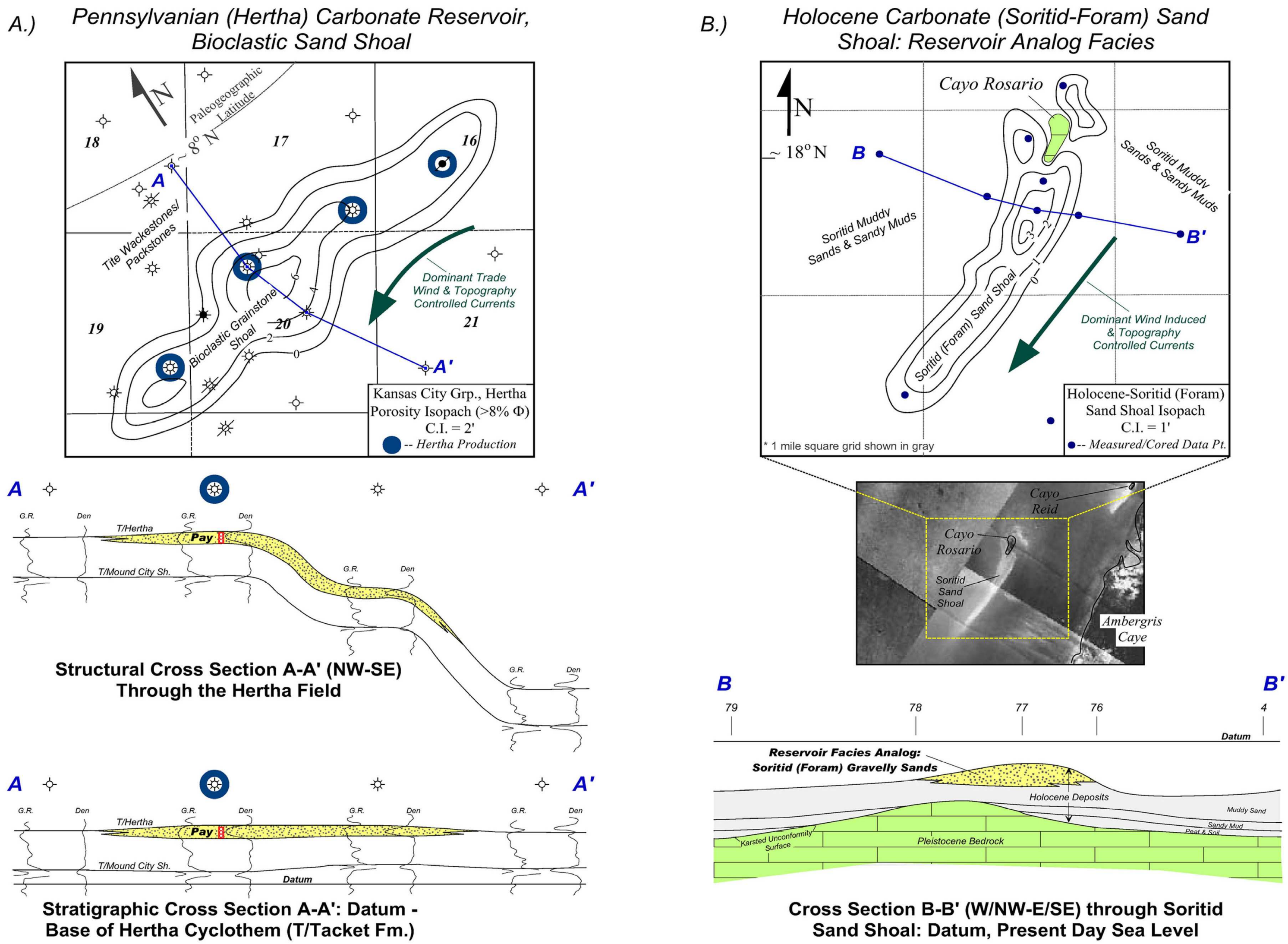

Figure 4. A - Map showing an isopach of a producing field, from the Hertha, in relation to paleogeographic north. The field produces from bioclastic grainstones that pinch out into tight wackestone/packstones. B - Holocene example of a bioclastic sand build up on the inner shelf of northern Belize in the vicinity of Cayo Rosario (see cover photo). Dominant wind patterns, antecedent structure and geometry are quite similar in both instances. By evaluating the stratigraphic cross section from A, in comparison to B, both shoals may be of the same type origin where they were deposited in low energy, inner shelf regimes.

(cyclothems) they have the potential for multiple stacked pay. Therefore, based on the data that has been presented, the explorationist should not only be able to map potential reservoir facies laterally on a stratigraphic/horizon level (e.g., Hetha, Swope, Stanton, etc.), but also, through understanding reservoir occurrence in a sequence stratigraphic framework, should be able to predict potential targets up-section, vertically throughout space and time.

CONCLUSION

In exploring for carbonate reservoirs, and the subtle stratigraphic trap, it should be evident the value and importance in studying and understanding the complexities of modern carbonate depositional environments. There are many variables that can affect reservoir facies geometries and distributions, however, by utilizing information gained from the modern examples, the explorationist will be able recognize the common factors that can be applied to predict reservoir occurrences. Although keeping current with the literature and new scientific concepts is beneficial in generating reservoir models, nothing is more insightful than actually visiting the modern depositional environment. Through this practice, the geologist/geophysicist enters into a real life "immersion room" where they can make the connection that, the "present is truly the key to the past."

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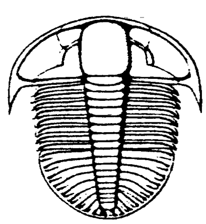

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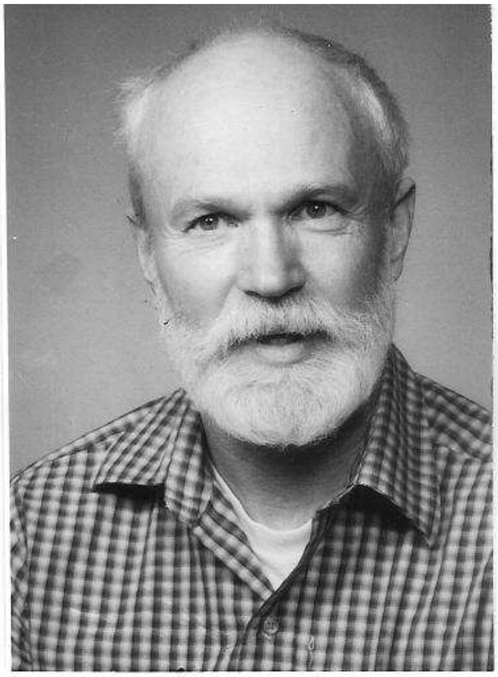
MEMBER PROFILE: Walter "Innes" Phillips



It is always a pleasure to write a story about an individual that has enjoyed both his professional and personal life. Innes Phillips is one of those individuals.

His story commences in Wichita in 1933 and he has been a resident of Wichita with the exception of some brief interludes at college and in the service, all of his life. His father, Lee Phillips, operated the Lee Phillips Oil Co., and his grandfather L. E. Phillips was one of the founders of Phillips Petroleum Co., so it is not surprising that Innes gravitated to the "oil business". His mother had also grown up in Wichita. Innes has one sibling, Lee Phillips, who continues to operate their father's company.

Innes' days as a student prior to college were all in Wichita, first at Hyde, then Middle School at Robinson, followed by East High School where he graduated in 1951. Following graduation, he enrolled at the University of Kansas. He majored in geology as he found the subject interesting, and with his family background, it would seem to be a "natural".

At KU, Innes, in particular, found Dr. Cecil Lalicker and Dr. Bill Hambelton to be good instructors who presented interesting material. Also helpful to Innes at KU was a graduate assistant, Dr. Dan Merriam. Classmates of Innes at KU, who later became successful oil operators in Kansas, were Scott Ritchie and Dick Smith. Innes graduated from KU in 1955. While at KU Innes joined the geologic fraternity, Sigma Gamma Epsilon.

Also in 1955, he married Patsy Wiley who died in 2000. Innes has two known children: Walter "Flip" who works with Innes and Julie who works in Kansas City. In 2002 Innes married Karen Weaver.

In 1956 after ROTC, Innes entered the Air Force where his time was spent in St. Louis, and near London where he not only worked as a supply clerk, but also worked with aeronautical charts as a cartographic officer.

After his discharge in 1959, Innes commenced with a job search since the oil business was in a decline and the only job was with his father, Lee Phillips Oil Co. Innes had learned during interviews with major oil companies that grades count and his mostly "C" grades in geology courses counted against his employability. Innes believes, as many do, that if you have a masters Degree you have a much better opportunity for employment. This lack of an advanced degree and his course record cited previously made finding employment difficult and thus he joined his father's company.

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After working for his father, Innes begin wanting some changes in the company. His father, after Innes demanded changes or "I'll quit", said "you'll do fine son", shook his hand and it was one of the best things his father did. Thus Innes became an independent operator although shortly after his independence, he did spend a few months working for Dick Smith at Range Oil.

It is obvious that Innes has enjoyed exploring in Kansas, particularly in Pratt and Stafford Counties. Even though he has been able to stay in Kansas for the most part, and has not wanted to go elsewhere, he would caution a young geologist entering the field that they may not be able to find employment in this area and may have to work in the Rocky Mountains or elsewhere. Possibly, their only employment opportunities may be International. Professionally he is a member of the American Association of Petroleum Geologists, Kansas Geological Society, and the Society of Independent Professional Earth Scientists.

As an independent, Jim Tasheff, of Kansas Petroleum bought Innes' first deal and helped him exploit many other deals until his death in 2005. During his time as a wellsite geologist, several older geologists provided support and help in developing his wellsite capabilities. These included: Jack Brown, Ralph Ruwwe, and Steve Powell. In the time that he spent with Dick Smith, he learned from him that it was necessary to collect the very best data obtainable on a prospect. As a result of his partnership with Bo Darrah and drawing on Bo's willingness to challenge accepted ways of drilling and completing wells, he has learned many things about various aspects of the oil industry.

While in the field, Innes had several interesting experiences. One of his first tests was also one of his most challenging. Bob Gensch was the wellsite geologist and Innes was the farmout geologist on a Phillips Petroleum seismic farmout, which showed a strong Arbuckle structural closure. The Mississippian on the test ran more than 100' lower than any Arbuckle in the area and they couldn't figure out why they couldn't even find the Mississippian rocks. On another occasion, in the middle of the night, he was receiving samples to examine that were not properly washed from the crew on the Red Tiger Drilling Co. rig. He went to the "doghouse" to complain and found four guys with long hair, spitting tobacco juice, and sharpening four long knives. After considering the situation, he went back to the trailer and went to sleep.

Innes, in looking back on his career, says he would certainly be a petroleum geologist if he had it to do over, but he realizes that in today's changing conditions, he couldn't work his entire career in Kansas. It has not been "all work and no play" with Innes. He has found time to engage in other activities. These include gardening, farming, duck hunting, fishing and playing racquetball, although at times he encounters somewhat contentious players. It has been a very interesting career. After being fired by his father and later by boyhood friend, Dick Smith, he found his home as a consultant watching wells and turning deals . He finally joined Dick Hess, Jim Hess and Bo Darrah to start Pintail Petroleum Ltd.. of which he is President today

Innes plans to continue enjoying life, doing the things he enjoyed in the past, drilling tests, fishing and duck hunting etc.

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Professional Affiliations: KGS, Past President of SIPES Wichita chapter.

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Professional Experience: Woolsey Petroleum, Owner, 1970-Present; Zenith Drilling, 1968-1970; Mull Drilling, 1968-1969; Texaco, 1958-1968.

Professional Affiliations: AAPG, Society of Independent Earth Scientists (Wichita Chapter Chairman), KGS, KGF, West Texas Geological Society, Rocky Mountain Association of Geologists, Quails Unlimited, Ducks Unlimited, Served on the Wichita Crime Commission, Member of the Chamber of Commerce and Kansas Independent Oil and Gas Association.

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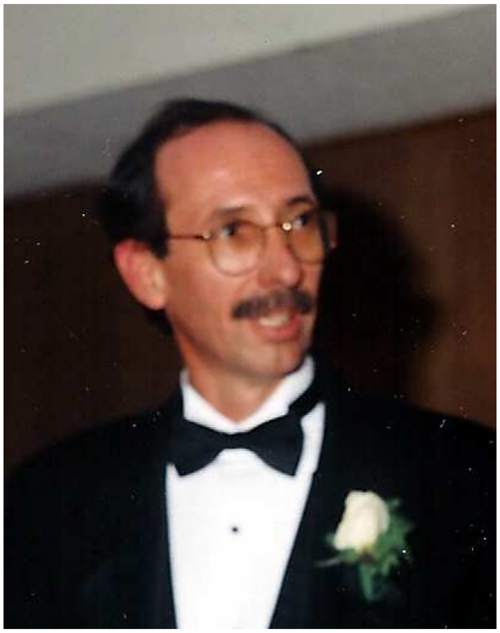

Doug Davis

Education: B.A.Geology, Wichita State University, 1973; Post Graduate Studies, 35 hours 1973-1976, Wichita State University; Teaching Certificate Secondary Education, 1987, Wichita State University.

Professional Experience: Consulting Geologist American Energies Corp., 1997-Present; Right-Of-Way Consultant, Koch Industries, Inc., 1998-2000; Consulting Geologist, 1994-1997; Consulting Geologist at Charter Production Co., 1990-1994; Consulting Geologist, 1986-1990; President Clark-Davis, Inc., 1978-1986; Vice-President High Plains Consulting, Inc., 1976-1978; Geologist for Robert J. Gutru, 1974-1976.

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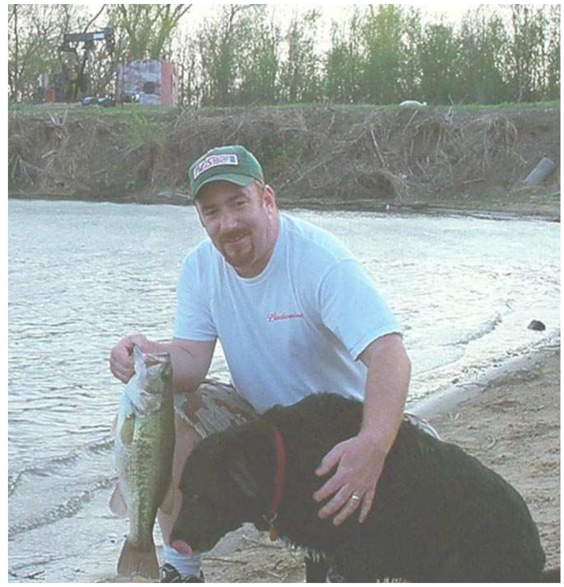

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Professional Affiliations: KGS 1996-present;, AAPG, 1995-present; SEPM, 1998-present, International Association of Sedimentologists, 2000-2001; West Texas Geological Society, 1998-2001.

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Professional Affiliations: KGS, NPS.

Doug Lewis

Education: B.S. Geology, Wichita State University, 1981; MBA Wichita State University, 1991.

Professional Experience: Martin Oil Co., 1979-81; Chief Drilling Co., 1981-84; W.L. Kirkman Inc., 1984-86; Kansas Corporation Commission, 1986-present.

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BOOK REVIEW
by Bob Cowdery

"Winners never Cheat"

Jon M. Huntsman

This book published by Wharton School Publishing is very interesting particularly in light of the numerous corporate scandals, frauds etc. recently revealed. Jon Huntsman founded Huntsman Chemical in 1970 and it has became the largest family owned chemical company in America. (he took the company public in 2005)

As proclaimed on the cover, "A self-made Billionaire speaks out on Honesty and Generosity". A particular paragraph seems worthy of quoting, "I have known enough business executives, though, who, greed, arrogance, an unhealthy devotion to Wall Street, or a perverted interpretation of capitalism, have chosen the dark side. Their numbers seem to be growing".

The book contains many examples of what is wrong with today's business and political leadership and suggests what all of us need to do to provide leadership in forthright, ethical and honest manner.

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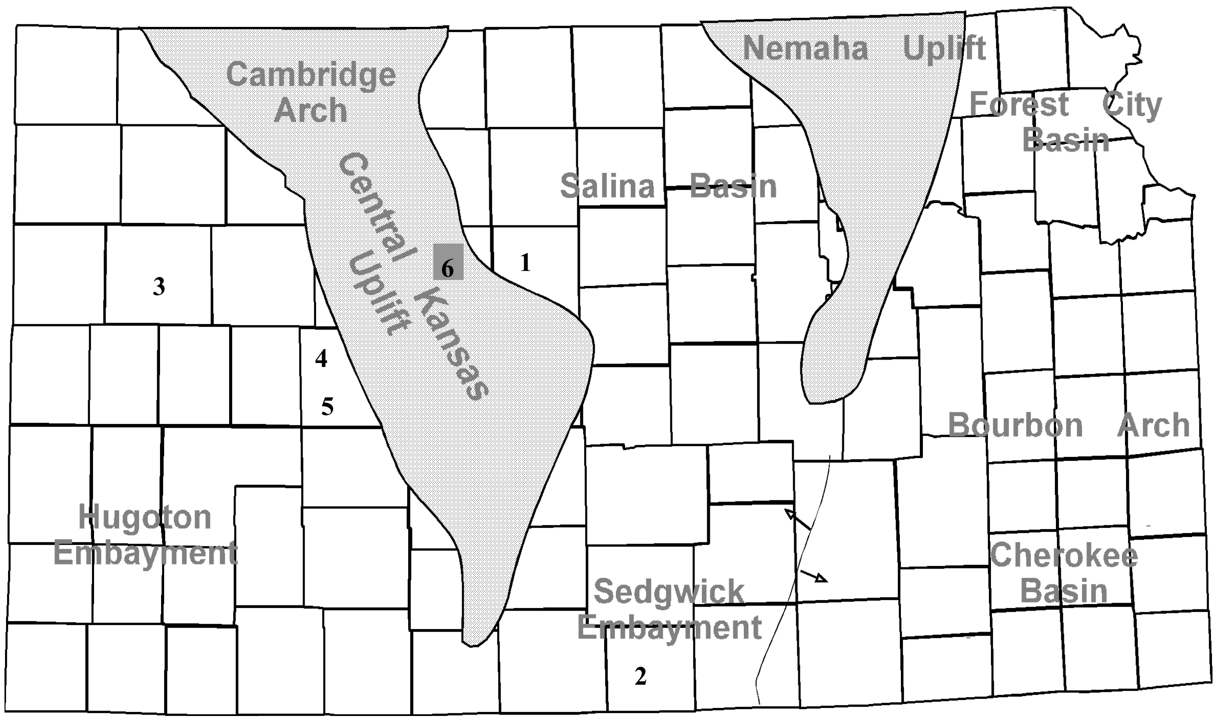
Harold Trapp	11/02	2002
Donald M. Brown	11/02	2003
Elwyn Nagel	03/03	2003
Robert Noll	09/03	2003
Benny Singleton	09/03	2003
Jay Dirks		2003
J. Mark Richardson	02/04	2004
John "Jack" Barwick	02/01	2004
Richard Roby	03/04	2004
Ruth Bell Steinberg		2004
Gordon Keen	03/04	2004
Lloyd Tarrant	05/04	2004
Robert J. "Rob" Dietterich	08/96	2004
Mervyn Mace	12/04	2004
Donald Hoy Smith	03/05	2005
Richard M. Foley	06/05	2005

EXPLORATION HIGHLIGHTS

By John H. Morrison, III
Independent Oil and Gas Service



(1) John O. Farmer, Inc. Finals New Discovery: (Wichita, KS - IOGsi News Service 9/5/2005) - Independent oil producer John O. Farmer, Inc., of Russell (KS), has discovered new Lansing-Kansas City oil deposits at a remote wildcat location in Russell County, about 6-1/4 miles south of the city of Waldo. Discovery of the new Waldo Township oil field was made at the Weigel #1, spotted in approximately W/2 NW NW in section 7-T12s-R13W. The 3545 ft deep well found oil deposits in the Lansing 'C' Limestone formation. Commercial production began on August 11, 2005 at an undisclosed rate. Operator focused on area located nearly three miles southeast of the Steinle oil field which has also produced LKC oil since 1982. The field has produced over one-half million barrels of oil from eight or nine wells. Farmer's latest discovery has not been named.

(2) MTM Petroleum Opens New Oil/Gas Field: (Wichita, KS - IOGsi News Service 8/29/2005) - Marvin A. Miller, dba/ MTM Petroleum, Inc., Spivey (KS), has discovered new Mississippian gas reserves at a remote wildcat site located in southwestern Harper County. The Stuart #1 is producing oil and gas from the Mississippian formation at an undisclosed rate in approximately NE NE in section 5- T33s- R8W, about 2 miles south and 3/4 mile east of the town of Attica. The well was drilled to a total depth of 4585 ft. Closest existing production is located 1-1/4 miles to the west of the Stuart lease in the Sullivan South Field, which has produced nearly 10,000 barrels of oil and 850 million cubic feet of gas from the Mississippian at a depth around 4500 ft. The new field has been named Sullivan Southeast.

(3) Norstar Petroleum Has Cherokee Oil Discovery: (Wichita, KS - IOGsi News Service 8/29/2005) - Norstar Petroleum, Inc., of Centennial (CO), is producing an unknown amount of crude from the Cherokee (Johnson

Zone) at the Soucie #1-17 wildcat well in Logan County, northwest Kansas. Spotted in approximately SW NE NE in section 17- T11s- R34W, the new pool discovery was put on pump on August 4, 2005 at site located about 1-3/4 miles northeast of the town of Page City. Murfin Drilling tools were contracted to drill the well to a rotary total depth of 4800 ft. Discovery lies nearly 3/4 mile west of the recently established National Field, discovered by Falcon Exploration, Inc. in October last year. Falcon's Peterson #1, in section 16, has given up over 2800 barrels of oil from the Cherokee during its first six months of being on production. Norstar's new pool has been named National West . Future Petroleum has Discovery in Cowley County: (Wichita, KS - IOGsi News Service 9/19/2005) - Future Petroleum Co., LLC, of Houston (TX), has discovered Arbuckle oil deposits at the Pauly #1, located in approximately C S/2 S/2 NW NE in section 10- T30s- R3E, or 4-1/4 miles northwest of the town of Rock in northwest Cowley County. Operator drilled the wildcat well in June this year to a rotary total depth of 2825 ft. First oil sales were made at an undisclosed volume on July 29, 2005. The new Polecat Creek oil field lies over one mile from the one-well, now abandoned Maple Field that produced oil from the Cherokee Bartlesville Sand from July 1958 to June 1962. Closest known Arbuckle production is located 3-1/4 miles to the south in the also abandoned Udall field, where oil was produced from a depth around 2872 ft (-1623 KB) from late 1959 until the field was plugged-out in July 1981.

(4) McCoy Petroleum Opens New Oil Field: (Wichita, KS - IOGsi News Service 9/26/2005) **-** McCoy Petroleum Corp., of Wichita (KS), has opened a new unnamed oil field in Ness County with the completion of their McDonald 'A' #1-11, located in approximately NE SW NE in section 11- T19s- R24W. The 4,400 ft. deep wildcat well is currently being put on pump for further testing at site located 2-1/4 miles southwest of Ness City, Kansas. No production information is available. The new discovery is situated about one mile west of Mississippian oil wells in the Obee Field.

(5) Palomino Petroleum Opens New Oil Field: (Wichita, KS - IOGsi News Service 10/10/2005) - Palomino Petroleum, Inc., Newton (KS), has discovered Cherokee Sand oil deposits at the Jarvis #1 in Ness County. The wildcat well establishes a new unnamed oil field four miles southwest of the town of Ransom, Kansas. Southwind Drilling tools were used to drill the well to a rotary total depth of 4,540 ft. Drill site was located in the SW/4 SE/4 of section 5- T17s- R24W. Top of the Cherokee Sand was logged at 4445 ft. (-1981 KB), and perforations were shot at three holes per foot from 4446 to 4451 ft. Hole filled with 2650 ft. of oil overnight, naturally. Pumping unit was installed on September 29, 2005. The well was completed for 85 barrels of oil per day, no water. Field area lies over one and one-quarter miles from other known Cherokee production in the area.

(6) Downing-Nelson Oil Completes New Discovery: (Wichita, KS - IOGsi News Service 10/10/2005) - Downing-Nelson Oil Company, of Hays (KS), has established a new Arbuckle oil field in Ellis County. The Goetz #1-10, located in approximately SW NW SW in section 10- T14s- R16W, is producing 52 barrels of oil per day, no water, as of October 1, 2005. Production comes from perforated interval at a depth between 3414 to 3421 ft. Zone was treated with only 100 gallons of cleanup acid. Top of the Arbuckle was logged at 3412 (-1483 KB). Total depth is 3515 ft. The well verified a 3-D seismicanomaly five-eighths mile north of Lansing-Kansas City oil wells in the Dreiling North Field in NW/4 of section 15. Closest known Arbuckle wells lie nearly one mile away in the Hertel Field in the NE/4 of section 16. Downing-Nelson's new oil field has not been named. Site is located two and one-half miles east of Victoria, Kansas.

Walters Digital Library News

The Kansas Geological Foundation and the Kansas Geological Society met in the month of September and made the decision for the Kansas Geological Society to buy the Walters Digital Library from the Foundation. This change of ownership will take place in January 2006. The sale will give the Foundation a source of income to further its scholarship & grant programs and will also allow for an employee or two to be hired to integrate the masses of data that are in the basement of our library facility. The Society will continue to maintain and manage the Walters Digital Library and will add to the on-line data by scanning logs and other documents in-house with library staff. We are excited about this change and think it will benefit both organizations and further the amounts of data that can be accessed by the geological community.

In addition to this change, we are also developing new software for the Walters Digital Library. This new software will be implemented sometime before the first of the year and we think will be a seamless transition and will have some added features that will be well accepted by the digital users. Once the new software is in place, you should see a rapid increase in the amount of data offered on-line as the KGS staff will be scanning and adding data on a regular basis.

October 19th & 20th, Society president Fred James, Foundation president Larry Richardson, Jon Callen, & myself attended a workshop in Tulsa with other libraries of the Mid-Continent area. We were asked to share our successes and problems as other libraries begin to tackle the work of moving to a digital age. It was a very productive meeting and we felt very good about all that has been accomplished by the Foundation, Society and Library. We do stand miles ahead of other libraries and we are excited about cooperating with them on the road to the future, to ensure that we all benefit from our experiences.

----Rebecca

Please, Share Your Photos!!!

We would like to publish any photos that you may have taken that would be of geological interest to our membership. The idea is to share any geology you may have had the opportunity to see that the rest of us could enjoy. Here is an example: 60 miles west of Moab, Utah you can see the hogbacks of Navajo Sandstone of the San Rafael Swell.

Your photo could be on our front cover!!!!

THE ON-LINE BULLETIN IS NOW IN PDF FORMAT

Check out the complete KGS Bulletin on our web site www.kgslibrary.com

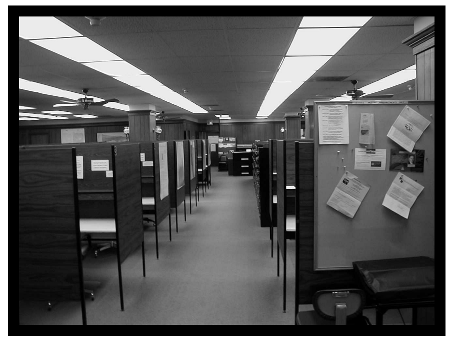
A simple way to help your Society save money would be to let us know if you like viewing the Bulletin on line. This would allow us to reduce our mailing & printing costs of sending the Bulletin to every member.

We are glad to keep mailing it to you but if you are satisfied with reading on-line, please just let us know.

KGS Library Open Late on Thursday Nights until 9:00 pm

This is an added benefit for :

- **Geologists who have left the business to work elsewhere during downturns in the oil business**
- **Out of town members will now be able to maximize a trip to our library to do research, perhaps cutting a full day off of their visits**



Looking For Donations

To The KGS Core Hole Library

If you have core hole drilling data or seismic data that you would like to donate to this project, please contact Gus Messinger or Rebecca Radford at the Kansas Geological Society Library.

316-265-8676

This collection of data could prove to be of great value to those who are looking at prospects in Kansas.

GUIDELINES FOR MANUSCRIPT SUBMISSION TO KGS BULLETIN

Each issue of the Bulletin is published both as a hard copy and in electronic format on the KGS web site (http://www.kgslibrary.com). Most questions on formatting manuscripts for submission to the Bulletin can be answered by referring to recently published articles. The following topics also provide specific guide-lines to authors regarding manuscript preparation:

Cover Letter: include a cover letter with your submission that states: (i) that the manuscript has not been published elsewhere nor has it been submitted for publication elsewhere; and (ii) the name of the corresponding author in the case of multiple authors, and his/her contact information (e-mail address, fax and phone numbers).

Paper Length: maximum length of published papers is 5 Bulletin pages. As a general guide, double-spaced manuscript length (including text, references, all figures and/or tables & figure captions) should not exceed 7 pages of text and 2 full pages of figures and/or tables.

Color versus Black & White: All illustrations for the hard-copy of the Bulletin will be published only in black & white. Authors are encouraged to submit color versions of these same illustrations, however, for the on-line version of the Bulletin.

Organization:

- hard-copies of manuscripts ***and*** electronic versions of only the text (formatted in Word) must accompany each submission. Submitted manuscripts must be written in English;
- title should be in capital letters and centered. All first-order headings (e.g., INTRODUCTION, PURPOSE OF STUDY) should be centered and fully capitalized; second-order headings also should be centered, but only the first letter of each word should be capitalized (e.g., Previous Studies);
- manuscripts need not include an ABSTRACT, but must include INTRODUCTION and CONCLUSIONS sections;
- in referring to figures outside of parentheses in the text, use the full word – e.g*., Figure 1*. In referring to figures within parentheses in the text, abbreviate the word – *(Fig. 1; Figs. 1 & 2)*;. Figure captions must be included with manuscripts and be on a page separate from actual figures. They should be written as, for example*: FIG. 1. Location of study area in…*
- text reference to published papers should be abbreviated as: (i) two authors -- *Smith & Jones (1969*) *or (Smith & Jones 1969)*; and (ii) more than two authors – *Smith et al. (1969)* or *(Smith et al. 1969*). In the text and REFERENCES section, cite references in terms of date from oldest to youngest. In a REFERENCES section, follow citation style as in published articles in the Bulletin. Full references must be cited, including authors' names with initials only, date of publication, title of paper, where the paper was published (e.g., *AAPG Bull*.), volume number, and pages;
- prepare figures or tables so that all lettering is legible if the figure or table is reduced; avoid "crowded" figures/tables. Put each figure/table on a separate page and include the figure/table number in the upper-right corner of that page.
- interesting black & white images from your paper or study area that can be used for the hard-copy cover of the Bulletin, and the same image but in color for the digital version, are encouraged.

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Send manuscripts to: Dr. Sal Mazzullo, Bulletin Technical Editor, Department of Geology, Wichita State University, Wichita, KS 67260

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KGS BULLETIN
November-December 2005

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November 2005

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13	14	15	16	17 Tech Talk Morris Korphage	18	19
20	21	22	23	24 Library Closed	25 Library Closed	26
27	28	29	30			

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4	5	6	7 Annual KGS / KGF Meeting	8 Tech Talk Dr. Robert Goldstein	9	10
11	12 Tech Talk Dr. Pete Rose	13	14	15	16	17
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