We got something new for you this fall
Join us for

MGS Happy Hour

When? **Tuesday, October 18th 5:00PM – 8:00PM** (talk starts at 6:30PM)

Where? **Tiny's Tavern** in downtown Billings (323 N. 24th Street)

What? Drinks, Presentation, Dinner (food orders need to be placed by 6pm)

RSVP to montanageologicalsociety@gmail.com by latest Monday October 17th

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Speaker: Mitchell Lukens

Energy Laboratories, Billings, Montana

Mitchell Lukens is a recent graduate of Fort Hays State University in Hays, Kansas where he earned his Master's of Science in Geosciences with an emphasis Stable Isotope Geochemistry. He received his Bachelors of Science in Geology with an emphasis in Paleontology from the University of Wyoming in 2014. He has primarily worked as a paleontological field technician for SWCA Environmental Consultants, Quality Services, PaleoSolutions, and recently KLJ Engineering. He is currently working as a Chemical Analyst at Energy Laboratories in Billings, Montana.

Warm-Blooded Mosasaurs? How a Kansas Fossil May Reveal Ancient Physiologies

The question of mosasaur physiology is important because of the ancient marine reptiles' dominance of the late Cretaceous oceans. An elevated body temperature would have enabled these animals to be active in many different aquatic environments. Stable isotope analysis of oxygen isotope ratios (expressed as $\delta^{18}O$ values) preserved within fossil tissues can reveal temperature and physiological variances within skeletons but not differentiate between body temperature and water temperature. A rare specimen of a mosasaur with stomach contents presented an opportunity to resolve this problem.

Excavated from the Niobrara Chalk of Logan County, Kansas, "Belle," a *Platecarpus tympaniticis*, contains the remains of its last meal: belemnites, *Actinocamax sternbergi*. Belemnites, squid-like animals, had body temperatures equivalent to the ocean water they lived in, preserving the water temperature in their calcite-based rostrums. The entombing chalk, composed of coccolith tests, also recorded the surface water temperature. Preliminary results of calculated temperatures provide evidence that Belle's body temperature is elevated relative to both the belemnites and the coccoliths, suggesting an endothermic physiology. Examining intra-bone and inter-bone variation of oxygen isotope ratios across the skeleton indicates that the body temperature fluctuated throughout the body, implying this mosasaur was heterothermic. The belemnites' temperature entails they lived in colder waters, deeper in the water column or further north in the sea, perhaps indicating where Belle ate them before its death. The coccoliths confirm previous water temperature research for the Western Interior Seaway in Kansas during the late Cretaceous.