Join us for

MGS Happy Hour

When? **Thursday, February 29th** **5:00PM – 8:00PM**

(Happy Hour 5–6 pm, dinner at 6 pm, talk starts at 6:30 pm)

Where? **Bighorn Resort** at the west end of Billings (1801 Majestic Lane)

What? Presentation, Buffet Style Dinner, Drinks

Dinner tickets: $30 for members, $40 for non-members (guests), $10 for students (*Drinks not included with ticket*)

RSVP to montanageologicalsociety@gmail.com by latest **Monday Feb. 26th**

SPEAKER: Dr. Daigo Yamamura

Science Instructor – Miles Community College

I am a Science faculty at Miles Community College (MCC) and previously taught at University of Arkansas - Fort Smith as a visiting assistant professor. This is my third year teaching at MCC, and classes taught include introductory chemistry, biology, geology and dinosaur paleontology. GEO 111 (Dinosaurs) was first taught at MCC last year, and it has been most popular science class for non-science major students.

I received B.S. in Earth Science and Ecology and M.S. in Earth Science from Montana State University (2008 and 2013 respectively). I moved to Fayetteville, AR to study stable isotope geochemistry and received Ph.D. in 2017; my dissertation work provided opportunities to collaborate with Natural History Museum of Utah, Denver Museum of Nature and Science, Bureau of Land Management and Utah Geological Survey. Aside from academic work, I worked as a mitigation paleontologist in UT, CO, WY and MT. My research focus is paleoclimate and paleoecology of the Cretaceous North America, and the majority of the fieldwork took place in eastern Montana and south-central Utah. Use of chemical signatures for paleoclimate investigation requires distinguishing biological signatures from geological (diagenesis) signature. As such, understanding of chemistry is essential to the techniques employed in my research; including petrography, X-ray diffraction, scanning electron microscopy and stable isotope geochemistry.

From Bones to Fossils: diagenesis of dinosaur bones and enclosing sandstone in the Hell Creek Formation

Although a great deal of paleontological information is derived from analyzing fossilized skeletal remains, the fossilization process of vertebrate skeletal remains is poorly understood. As paleobiology and paleoclimatology rely on chemical signatures preserved in the bone, understanding potential alteration of bone chemistry or mechanisms that prevent such alteration are crucial. As such, petrographic microscopy, optical cathodoluminescence, scanning electron microscope (SEM), X-ray diffraction (XRD), and stable isotope geochemistry were used to investigate the diagenetic history of dinosaur bone and enclosing sandstone from the Late Cretaceous Hell Creek Formation. A fossil assemblage was discovered in Makoshika State Park near Glendive, MT. The depositional environment including the fossil assemblage is interpreted as a crevasse splay based on the facies association of repeating sequences of mudrock and fine sandstone overlying channel and levee deposits. Wide ranges in stable isotope composition ($\delta^{13}C$ = -22.4 to 2.1‰, $\delta^{18}O$ = -14.1 to -4.8‰) suggest carbonate cements were precipitated multiple times mostly in alkaline pore-fluid. However, oversized pores and highly altered grains indicate that pore-fluids were acidic during late diagenesis; acidic pore-fluid conditions are due to the organic acid produced by degradation of organic molecule at higher diagenetic temperatures. XRD result shows that fossil bones are composed of a variation of apatite. Fossil bones show well-preserved microstructure with minor radial fracture suggesting repeated hydrations and desiccations. Permineralization in large pores are likely formed in such process. This study demonstrates a combination of various techniques to help decipher the diagenetic history of fossilized bones.