The Exposure

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November 2013 Meeting Announcement

Our next meeting will also be held at Park University on Sunday, November 17th, at 2 pm. Our program will be presented by Dr. Patricia Ryberg, University of Kansas. Her Topic will be Pennsylvanian Flora of Kansas City area.

Minutes of the October meeting

Minutes of the October 27, 2013 Meeting

The October Kansas and Missouri Paleontological Society meeting was held at the Park University, at the Science Building, room 5, Sunday the 27th of October at 2:00pm. Our guest speaker was David Burnham, PhD of Kansas University who gave a fantastic program about "The Food of Dinosaurs," remains of the past and of fossilized stomach contents in dinosaurs and others. We want to thank Dr. Burnham for his educational presentation.

Prior to calling the meeting to order several members visited and shared fossils and great books about plants, fossils of all kinds, and other valuable research books. We were pleased to have a great turn out of members for our special speaker.

Order of Business

1: Gilbert Parker, President, called our meeting to order.

2: New Business: Gilbert Parker gave instructions on obtaining membership cards via an email that will be sent to members. Information was given on where and dates for the Rock and Gem Show at the KCI Expo Center in November.

3: Announcements: Dr. Burnham presented information on changes in the University of Kansas concerning the Paleontology Department. KU is searching for outstanding future staff and stated that KU's Paleontology Department remains number 7 in ranking as per US News and World Report.

Dr. Burnham answered a question about tax cuts and what affects the cuts had on the University's volunteer program at the fossil museum. Changes are: No longer able to run the volunteer program for KU because no funds to pay for supervisor on site, a graduate student or himself. KU is exploring different avenues to continue this valuable program.
Several questions were asked and answered by Dr. Burnham on various topics.

4: Gilbert Parker called for an end to the questions and invited Dr. Burnham to present his program on "Food of the Dinosaurs."

5: Dr. Burnham presented his program to the joy and education on all members present. After the presentation, the floor was open to questions and discussions on topics in the presentation.

6: Gilbert Parker made a motion to adjourn: passed.

Respectfully submitted by: Linda (Katie) Moore

Innocents Cruising for Cruziana
Ron Pridgen

Gil Moore excitedly showed others and me a three by three foot slab of prominent trace fossils in sandy shale. The slab was fairly spectacular for its size and the copious abundance of traces. Soon, Gil was available to bring me to the site for the purpose of collecting it. What initially caught my attention about the three by three foot slab I was first shown, were the very large one inch wide trilobite feeding traces, known by the ichno-genus name of *Cruziana*, Fig. 1. Upon my introduction to the site, we immediately found more of these large *Cruziana* traces on slabs large and small. There were many other types of traces found, that were made by all manner of tidal animals of the time. Many traces are little changed to the present day.

Later investigation suggests that we probably collected the Liberty Memorial Shale (Pennsylvanian Period). The ancient setting was a brackish or semi-brackish, "mixed" tidal flat. Mixed, in that there were uneven depth, sandwiched layers of sandy and muddy sediments. At times these muddy flats may have been exposed to air. There are many layers with ripple marks.

The tidal flats interpretation raises a few concerns about the *Cruziana* traces. Trilobites are not known to venture onto tidal flats. They are not known to inhabit brackish or semi-brackish waters either. Furthermore, I found no walking traces (*Diplichnites*) or the resting places (*Rusophycus*) appropriate for trilobites. I should have found walking traces transitioning to feeding traces and into resting places in any other order possible.

Another problem was that the *Cruziana* were somewhat atypical. There was less of a deep divide between the twin lobes of the trace than what one would expect. I had felt that we had simply found a different variation of *Cruziana*. After all, over the years many people have shown me a variety of traces that they believed to be forms of *Cruziana*, the shallow burrowing feeding trace of a trilobite. Some of these varieties have been offered for sale and labeled as trilobite traces. There seems to be a perception that any bilobed, shallow burrowing trace has to be *Cruziana*, and its maker was a trilobite. I now realized that this idea warranted investigation.

In the outdoor magazine publishing industry, there is a type of article called a "Me and Joe went fishing article". I had originally intended to write a light hearted "Gil and I went fossicking" article. However, the more I researched the subject of trace fossils, the more I realized that I was thoroughly ignorant of the subject. Upon full realization of just how complex Ichnology (the study of trace fossils) is the more determined I became to educate myself.

I showed these traces to a respected Ichnologist, one who studies trace fossils. He must have had a brain fart or just wasn't wearing his thinking cap. He told me that the traces were called *Taphrahelminthopsis*, and were made by shallow burrowing echinoids, ie. heart urchins. That sounded wonderful! However, this set me on a confusing path until I learned that echinoids of this type do not appear until the Jurassic Period.
I will now attempt to relate a little of what I learned in my search. I will in my own words describe in easy terms some of the more common traces of the Pennsylvanian Period (Late Carboniferous Period), that have a bi-lobed appearance that possibly could be confused for *Cruziana*. I will start by describing *Cruziana* and will end with *Psammichnites plummeri* (Fig. 2) my candidate ichnospecies for the traces that Gil had shown to me.

Cruziana: There are many variations of this type. "Trace Fossil Analysis", a book among my sources, has two entire chapters devoted to trilobite traces. When a trilobite produces this type of shallow burrowing, feeding trace, the animal is plowing through the uppermost layer of sediment with its topside showing. With a particular action of its legs it is moving forward and passing organic matter and very small animals forward up its center line to its mouth. Naturally, not all trilobites foraged this way, I am just talking about those who did. The genal spines when present would sometimes leave a narrow furrow on either side of the trace. The main body of the trace formed a bi-lobed raised dual ribbon, to me resembling two hair braids laid side by side. As if to accentuate the braided hair appearance, there are well defined scratches made by the legs that form chevrons over both lobes of the trace. The groove between the lobes is deeply incised. These traces meander widely over former sea bottoms and will often cross over itself. Along the way of feeding travel, the animal may stop to rest awhile, or it may walk for a while, transitioning frequently.

I will include just a short note about the trilobite resting places or *Rusophycus*, because trilobites do change frequently between resting and feeding. Trilobites will excavate straight down very shallowly, or sometimes just deep enough to be mostly covered by sediment. A classic *Rusophycus* of a trilobite is best seen on the underside of a slab, and is formed into a sort of heart shape. The trace usually shows scratches made by the animal as it dug its burrow, and scratches made as it exited. The most common resting trace attributed to trilobites in the Pennsylvanian Period (or Upper Carboniferous Period) is *Rusophycus carbonarius*. It varies from resembling side by side "coffee beans" to a "bath tub" of roughly heart shape. Take note, there are today as in the past, many arthropods who make a wide variety of heart shaped resting traces. The only instance I have read about with trilobite body fossils actually being found in *Rusophycus* forms, are those from the Upper Ordovician Period, Corryville Formation, Cincinnati, Ohio. Otherwise, all we can only say for certain is that, a resting place we found may have been formed by a trilobite.

Among the most probable makes of *Cruziana* besides trilobites, from ancient to even modern times includes stomatopods (relatives of mantis shrimp), some isopods (like the terrestrial wood lice or sow bugs), and branchiopods (relatives of modern fairy shrimp and tadpole shrimp). It has been suggested that *Cruziana* produced after the Cambrian Period were made by what are often called "trilobitamorphs". However, none of these are known from after the Ordovician Period.

Isopodichnus: This is a very common trace in Pennsylvanian shallow water deposits. It is indistinguishable from *Cruziana*, except for its size. It is less than five millimeters across. This is thought to be too small for an adult stage series of trilobite. It may be decided by now to include these

traces as *Cruziana*, even if they were not made by trilobites. These traces are found in fully marine settings as well as in brackish conditions, and even from fresh water conditions. The makers of *Isopodichnus* (Fig. 3) were likely the same as for non-trilobite *Cruziana*, isopods, stomatopods, and branchiopods.

Didymaulichnus: This trace has a deep central groove and has smooth lobes. This trace may simply be "a preservational state for *Cruziana*", where the surface scratches of the legs were not preserved.

Gyrochorte: At first glance, this trace is somewhat similar to *Cruziana* in appearance. At a break in the slab you can see that this trace measures much deeper in cross-section than in width. It is usually less than a centimeter across (4/10"). It has a very shallow middle groove if present, and has fine rib marks on its lobes. The producers of this trace may be snails or annelid worms.

Curvolithus: This trace sometimes will or will not have a shallow central groove. There is the presence of much smaller lobes on each flank of the central lobes. It is about a centimeter wide and seems to surface and dive back into the sediment. These traces are believed to have been made by clams, but more often by flatworms.

Diplodichnus: this trace is very similar to *Cruziana*. The ridges or lobes will have leg scratches or be smooth. There is a wide gap between the lobes. It could be a different burrowing style used by some makers of *Cruziana* traces. One article showed an example of *Cruziana* transitioning to *Diplodichnus* and back as it passed over different substrate conditions (Schatz 2011).

Taphrahelminthopsis: This is a trace that first appears in the Eocene Period. The maker of this trace was probably a heart shaped echinoid. The trace is about an inch wide and has fine rib marks and a shallow central groove. It may still be produced today. This trace greatly resembles mine, except that the cross-section of mine lacks a dual fecal pellet trail, and has a continuous rather than discontinuous central siphon track.

Psammichnites plummeri: At long last I have found the name of the traces in question! There is a superficial resemblance to *Cruziana*. *Psammichnites* does have side by side lobes, but only a very shallow groove between them. Some of the traces have very fine ribs like the leg scratch marks made by trilobites and other arthropods. These fine ribs are some sort of artifact of the animal's motion through the sediment. This trace was made by a mollusk or other unknown slug-like animal that was about three times as long as it is wide. The length of the animal had been determined previously by others who noted how sediment was deposited in the backfill, as the animal moved through sediments of different particle sizes. It apparently bulldozed through the sediment in much the same way echinoids do. The very shallow groove between the lobes of the trace was made by an extended siphon for respiration.

In summary, we should not immediately assume that a bi-lobed trace was produced by a trilobite. Even true *Cruziana* type traces were, and possibly still are being made by other arthropods. I have a fascination for any kind of trace, modern or fossil. If I have a trace that I initially thought was made by a trilobite, and turns out to have been made by a slug-like mollusk, that's just fine with me!

Hakes, William G. 1985. Trace Fossils from Brackish-Marine Shales, Upper Pennsylvanian of Kansas, U.S.A. Biogenic Structures; Their use in Interpreting Depositional Environments. Ed. Curran, H.A., Society for Sedimentary Geology, Special Publication #35, p. 21-35.

Schatz, Elizabeth R., Maria Gabriela Mangano, Luis A. Buatois, and Carlos Oscar Limarino. 2011. Life in the Late Paleozoic Ice Age: Trace Fossils from Glacially Influenced Deposits in a Late Carboniferous Fjord of Western Argentina. Journal of Paleontology, vol. 85, #3, p. 502-518.

Seilacher, Prof. Dr. Adolf. 2007. Trace Fossil Anaysis. Springer, Berlin, Heidelberg, New York. Various entries.

Fig.1

Fig. 2

Fig. 3

Fig. 4 Another bipedal track.

KMPS Membership Form

The Kansas and Missouri Paleontological Society would like to have you and your family as members. Memberships are $12.00 for one year (January through December.) These fees will cover printing and postage for bulletins which will include meeting announcements and news in the field of paleontology and other minor expenses. We hope that you can join us in our exciting and informative new adventure. For more information contact: Gilbert Parker cell: 816-678-1943. gilparker@comcast.net

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c/o Gilbert Parker, 15505 E. 44th Terrace, Independence, MO 64055.
website at www.ksmopaleo.org

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Kansas and Missouri Paleontological Society
KMPS
15505 E. 44th Terrace
Independence, Missouri 64055-5255

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