On our recent dinosaur dig in July, one of our participants, Jean Primozich of Washington state, uncovered this nice fossil. This is the lower jaw, or dentary, of a pachycephalosaur. Pachies (as they are commonly known, pronounced like “packies”) are a group of dinosaurs characterized by a thick dome-shaped head. Russell Hawley’s drawing (below right) shows a pachy head as well as a complete animal. It is said that pachies used their thick heads to head-butt each other, much as modern bighorn sheep do. The Denver Museum of Nature and Science has a life-sized reconstruction of a pair of these guys doing just that, but that is a different tale.

This fossil came from the Promise Hill site in the Lance Formation of eastern Wyoming. This quarry has produced numerous bones of many different types of animals; duck-billed dinosaurs, Triceratops, T. rex, many turtle pieces (including two fairly complete turtles), crocodile parts, mammal teeth, and now one pachycephalosaur jaw. Pachycephalosaurs are not a common critter in the Lance Formation. In the Tate Geological Museum’s seven years of collecting in this deposit we have found one other piece; a pachy dome. Even in microsites where small fossils abound, we have only collected maybe a half dozen teeth of pachycephalosaurs, if that many. So to find a jaw was absolutely exciting. This jaw has two teeth sticking out of it, and four others about to erupt. As the scale bar suggests, it is about 6 centimeters long. The second photo, (taken through the microscope), shows a close-up of the two teeth, plus two others waiting to come in. Pachy teeth are fairly distinctive, shaped like a serrated ace of spades, helping to identify this jaw. Each hole just below the teeth is a nutrient foramen. In life the growing teeth would have been fed the necessary nutrients via this hole.

There are three species of pachy that lived in our area near the end of the Cretaceous that can now be found as fossils in the Lance Formation. The smallest is Dracorex hogwartsia. The medium-sized species is Stygimoloch spinifer. The largest is Pachycephalosaurus wyomingensis. Along with differences in size, the shapes of these critters’ heads and defensive armor are also different. Some folks think that the three species are in fact three different growth stages of one species. This is an ongoing debate in paleontology. I am not sure which type we have here, but if I had to guess without doing the research, as I am doing right here and now, I would say this is a medium-sized Stygimoloch.

P.S., if you look closely at Russell’s drawing you can see the lower teeth exposed just behind the fangs.
Date Night at the Museums
The Casper Museum Consortium once again had a full house for its date night on July 27. The group visited the Audubon Center at Garden Creek, the Historic Bishop House, Fort Caspar Museum and ended with dessert and coffee on the patio at the Werner Wildlife Museum. It was a beautiful night and for many of the attendees it was their first visit to some of those museums.

Coffee, Tea and Dee
Casper College’s fall semester began Monday, Aug. 20, and to help celebrate the beginning of a new school year we held our first Coffee, Tea and Dee on Wednesday, Aug. 22 from 7:30 to 11:30 a.m. The museum was open at 7:30 and we added a special sale in our gift shop. Visitors could buy any t-shirt with a Tate logo for $10 for those four hours. We will continue these special Coffee, Tea and Dee sales throughout the school year. On Wednesday, September 12 all stuffed animals will be 10 percent off. For members of the Tate this will be in addition to the normal 10 percent member’s discount. On Wednesday, October 17 our Tate vests will be on sale for $10 off the regular sticker price. Note that when we have a set price like this, we cannot give the member’s discount because our price is already so low.

Kid’s Expedition
The Tate Geological Museum is hosting a Kids’ Expedition to Casper Mountain on Saturday, September 8 from 9 a.m. to noon. In order to participate you need to have a family membership. If you have an individual membership, you may upgrade to a family membership for an additional $18. Each family must have at least one adult member accompanying the children on the expedition. We will meet at the museum at 8:45 a.m. and will leave at 9 a.m. to caravan to the site on Casper Mountain. The museum is not providing transportation. Russell Hawley and J.P. Cavigelli will be leading the expedition and will be available to identify rocks or fossils. You will be allowed to keep any rocks or fossils that you find, however, if they are of such exceptional quality that the museum would like them in their collection, the museum will accept donations. If you would like to participate, please call the museum desk at 268-2447 and RSVP by Friday, September 7.

Downtown Farmer’s Market
Four museum staff members manned a table at the Downtown Farmer’s Market, which took place on July 31. Patti Finkle, Melissa Stahley-Cummings, Russell Hawley, and J.P. Cavigelli spent the evening talking to people about the museum and helping children make pipe cleaner dinosaurs. The kids were also able to play in our popular dig box.

National Fossil Day – Save the Date: Wednesday, October 17, 2012
The third annual National Fossil Day is Wednesday, October 17. The Tate Geological Museum is holding an open house from 3 to 6 p.m. to celebrate the occasion. Bring the family and enjoy special tours of the museum and the Lee Rex barn. You’ll be able to see the progress that is being made on our *T. rex* specimen.
As part of our fossil day celebration we are featuring the opening of an art show of original drawings by the museum's well-known paleo-artist, Russell J. Hawley. He will give a talk about his art beginning at 5:45 p.m. in the Tate classroom, Rm. 123. His art will remain on display through Sunday, Jan. 6, 2013.

The younger members of your family will enjoy making a fossil cast and/or a fossil day button. There will be cookies and punch, drawings for door prizes, and giveaways. Make sure that your kids get their junior paleontologist badge and workbook. We might even throw in a surprise or two. Hope to see you there.

Annual Holiday Open House
Save the Date: Saturday, December 8, 2012
Watch the Nov.-Dec. newsletter for details on the holiday open house. Santasauros will again make an appearance and we're sure to have a huge natural Christmas tree. We are already stocking up the gift shop so if you are an early shopper don't forget to stop by. Our newest item is “Copperssplash.” These are great items to display as either wall hangings or on a stand – pictures are included elsewhere in this newsletter. Each one is unique and you are sure to find the right one for you or someone special.

Reports from the Tate Geological Museum Summer Field Digs

T. rex dig: Kent Sundell, J.P. Cavigelli, and our visitor from Guatemala, Zabdi Lopez, spent two weeks moving earth with a skid steer looking for more T. rex bones. They moved a lot of rock and found one small piece of T. rex and a few other bones most likely from other animals. J.P. thinks that’s all there is. Kent is the eternal optimist and thinks there may be more in the hill. Plans for next summer are still indefinite.

Ichthyosaur dig:
Tate crews spent two days exposing and collecting bones of a large ichthyosaur at Alcova Lake. There is a string of articulated vertebrae about five inches in diameter and many other bones. There are still more out there for a future collecting trip.

Summer paid dinosaur dig to Lance Creek area:
Eight people joined us for a week spent mostly at Promise Hill, a very productive bone bed, (see fossil of the month). Many bones, teeth, turtle shells, and other fossils were collected and are now being prepared by Steve Pfaff in the Tate Prep Lab.

Salt Creek Ranch near Edgerton, Wyo.
This is a ranch that we just received access to. We took our regular volunteers out twice to explore the Lance Formation. The first day was pure exploration. Some bones were found, but nothing terribly promising and it was very smoky from the forest fires. The second trip focused on a lakebed deposit that Kent found. We hoped to find some interesting fossils as lakebeds in the Lance Formation are relatively unknown. Our discoveries for the day were primarily trace fossils.

Members-Only Fieldtrip
Approximately 30 people joined us for our Members-Only Fieldtrip to Kent's collecting site southeast of Douglas. They all were successful in finding jaws, teeth, and bones of various Oligocene epoch mammals (approximately 33 million years old) such as rabbits,
horses, camels, deer, and dogs. They also found turtle eggs, snails, and insect cocoons. There were even a couple of skulls found. It was a fairly nice morning, but after lunch (complete with watermelon) the heat drove about half of the fossil hunters back to town. The hardy crew that remained stayed another three or four hours before calling it a day. It sounded like everyone enjoyed the day.

Exchange Student from Guatemala

We were pleased to have Zabdi Lopez, an exchange student from our sister college, Universidad del Valle de Guatemala, spend several weeks with our staff. Zabdi wants to become the first paleontologist from the country of Guatemala and started his last semester of college this fall, majoring in biology. Zabdi worked with Kent and J.P. as they pursued more bones at the T. rex site in the Lance Creek area. He also learned how to do fossil preparation and joined both the ichthyosaur dig and the first summer paid dinosaur dig. He was able to visit Yellowstone when he assisted Kent in preparing his road log for the Wyoming Geological Association’s field trip to Yellowstone August 16.
Volunteer Spotlight

Judith Johnston is a retired geologist who also loves birds, so it makes sense that she volunteers at both the Tate Geological Museum and the Werner Wildlife Museum.

Judith grew up on a cattle ranch in California and as a kid was intrigued by the invertebrate fossils she found on the ranch. She received a degree in geology from the University of California-Davis. Her favorite branch of geology was paleontology. After working for Mobil Oil for seven years as a roustabout and production technician, she went to work for the Department of Energy’s Naval Petroleum Reserves in California as a petroleum engineering technician, geologist and project analyst. In her spare time she worked on her family’s ranch and enjoyed her hobbies of skiing and fishing.

When the Department of Energy closed down the branch where she worked, she decided to come to the Wyoming office where she worked in their Tea Pot Dome Field until she retired in 2007. When she first moved to Casper in 1998, she wanted to learn about the geology of Wyoming so she took classes at the college. The classes were held in the museum building and included field trips so Judith became familiar with both Wyoming and the Tate. Since that time she has volunteered to help on various digs including Dee the mammoth, and our newest discovery, Lee Rex. Lately, she has been assisting J.P. Cavigelli, our collections manager, with identifying bivalves and gastropods that are in the Tate collection.

Judith started volunteering at the Werner Wildlife Museum in January 2012 when she read an article in the newspaper about our exhibits specialist, Patti Finkle, cleaning bird exhibits at the museum. When she decided that looked like fun, and since that time she has spent many days learning how to inspect, clean, and write condition reports for the Werner bird collection. This is a tedious job and Judith’s help has been invaluable to help us get this project completed. Patti commented that Judith is a fast learner, great company, and anxious to tackle even the most difficult tasks. Most recently she helped clean and catalog the Utzinger big horn sheep collection.

We appreciate Judith’s willingness to help with so many varied assignments and look forward to working with her for many more years.

This Coppersplash is a byproduct of the copper smelting process. As the molten copper is being poured into molds, it spills, drips and splashes on the mold and floor, allowing these unique shapes to be formed. The cooled copper is then heated with a torch to create vibrant color patterns.
This summer we have been playing with a fun (and tiny) exhibit called “Write it!” The case is located in our lobby and encourages visitors to create their own labels for mystery fossils in the case. Below is a small selection of the fun, unedited, “labels” that our visitors have written. (Fossils: ammonite, coral, and tylosaur toe bone.)

- The Fibonacci shell
- Petrified sponge
- A bow ties bone
- Cereld Werm (circled worm?)
- Astroyd
- Puckered coral
- Lollipopsnails
- Dragon femer
- Ammonites – A tribe from Cretacia
- Moon rock (cause it looks like the moon)
- Opposum tail
- Snail skeleton
- Snailonite
- Smallpox coral
- Lizard tail

Also, we have been updating several other small existing exhibits along the south side of the mineral “hall.” By next spring, we hope to have the extractive resources spread out into three cases and a small oil and gas exhibit installed. In order to do that, we have to move some exhibits around. Currently we have installed “Making a Mineral” that introduces the very basic ideas behind combining elements to make minerals. We are going to move the “Rock Cycle” into the same case, and have consolidated the “White River Reptiles” to make room. The meteorites and a “Geology and NASA” exhibit are going to move into the case at the west end of the mineral hall where the Triceratops jaw is currently housed. That will empty the central case along the north wall and allow for the expansion of the extractive minerals exhibit.

In the meantime, however, until all of the moving can be completed, we are pleased to announce that the museum will be hosting a small traveling exhibit from the Wyoming State Museum titled “Those Holes in the Earth: Centuries of Mining.” This exhibit showcases mining practices in Wyoming from the past to the present. This exhibit fits perfectly into the theme of the area and will bring a new visual element to the “Hall of Minerals.” This exhibit will be up from September 5 through December 1.
To answer this question, let’s first review how the nervous system works in modern animals. Higher brain functions – learning, decision-making and memory – always take place inside of the skull and nowhere else. But many reflexes are handled by the spinal cord. When you step on a pin, for example, the pain impulse doesn’t go all the way up to your brain and back before you react. Instead, it travels up to a slight enlargement of the spinal cord in your lumbar vertebrae. For once the anatomists haven’t given this organ a jaw-breaking Latin name; it’s simply called the ‘lumbar enlargement.’ (In birds and reptiles the enlargement is located farther back along the spine and is called the sacrolumbar enlargement.) Your lumbar enlargement signals your leg muscles to jerk your foot away from the pin. Certain repetitive motor functions can be handled by the enlargement as well. You’ve undoubtedly heard the expression ‘running around like a chicken with its head cut off.’ That actually happens. When the chicken sees the farmer approaching with the axe, its brain signals the sacrolumbar enlargement to start the ‘running’ cycle. The simple operation of moving the legs can be handled entirely by the enlargement, and indeed, can even continue for a bit after the chicken’s head has been cut off.

Brains and spinal cords don’t fossilize, of course, but vertebrae do. The spinal cord runs through a sort of tunnel in the sacrum called the sacral canal. In certain dinosaurs, including stegosaurs and sauropods (the ‘long-necks’) the sacral canal expands into a very large chamber, sometimes as much as twenty times the size of the animal’s brain. Early workers assumed that the entire chamber was filled with spinal tissue and postulated a gigantic ‘second brain!’ In reality, a small portion of that space would have been taken up by the sacrolumbar enlargement, while most of the rest would have been filled with a glycogen body, just as it is in modern birds.

One final note: in some dinosaur books written for children during the 60’s and 70’s, the sacrolumbar expansion is referred to as the ‘sacral ganglion.’ This is incorrect. Ganglia, by definition, are only found outside of the spinal cord.
2012 Tate Museum Event Calendar

September 8
MEMBERS ONLY Kids Expedition to Casper Mountain

September 12
Coffee, Tea & Dee

October 6
Saturday Club

October 17
Coffee, Tea & Dee

October 17
National Fossil Day
(Featuring a Russell Hawley art show)

November 3
Saturday Club

November 14
Coffee, Tea & Dee

December 8
Holiday Open House

December 12
Coffee, Tea & Dee

Scan to find out more about the Tate Geological Museum!