ISSUE VI APRIL 2006

NARG Newsletter

North America Research Group

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Oregon Fossil Fest '06 Recap

The Oregon Fossil Fest is held each year at the OSU Hatfield Marine Science Visitors Center in Newport, Oregon. This was NARG's 3rd year participating in the show and it gets better each year.

Two presentations where given and the auditorium was packed. Guy DiTorrice presented on "Uncovering Oregon's Beach Fossils" and presented information on what kinds of rocks hide fossils inside and how do you get them out as well as the rules and regulations for collecting fossils on Oregon beaches.

Dr. William Orr presented on "Fossil Form and Function," which looked at some of the mechanical devices one might think define human culture such as the zipper, snap fasteners, Velco, and others. We leanred that not only are plants and animals capable of producing virtually the same things, but they have been quietly doing it for literally hundreds of millions of years.

In addition to NARG's display table of Jurassic and Cretaceous ammonites from Central Oregon, Guy "the Oregon Fossil Guy" DiTorrice showcased a wide variety of prepared beach plant and animal fossils, along with specimens of Metasequoia, Oregon's new official state fossil. Guy's table was always busy with visitors as he explained the specimens.

NARG member MacKenzie at his table of Astoria Formation fossils

One of NARG s tables displaying ammonites from Central Oregon

NARG had additional tables setup including one for the kids. The activity this year was to allow kids to screen for Bone Valley shark teeth from Florida. Two tubs where set up where they could screen for the teeth in sand and keep up to five that they found. We started out with about 2,000 teeth including about 100 Megalodon teeth fragments. It was a huge success and an estimated 130 to 150 kids screened for the teeth.

Another draw to the show was the opportunity for visitors to bring in their fossils for identification by Dr. William Orr. Many interesting fossils were brought in by coastal residents, including numerous marine mammal skulls.

Many NARG members were in attendance. Thanks to Chuck and Barb Hunt, Andrew Bland, Steven Bland, MacKenzie Smith, Bill Sullivan, and Aaron Currier for volunteering at the festival.

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Snow Crabs

An Alaskan Mis Adventure

By Don Brizzolara

The birch and aspen turn gorgeous shades of golden yellow for about two weeks and then, with the first big wind, are gone.

It seems that all good NARG members have a great fondness for one particular fossil group, the decapods. Of course this means crabs, more specifically, lots of crabs. In fossil form they certainly are elegant and from a preparator's point of view they are very challenging. We, the northernmost NARG members, felt left out in this regard as we are largely ammonite specialists. We decided to initiate our own quest for Alaskan (fossil) crabs. My name is Don Brizzolara and I am a petroleum geologist living in Alaska. Together with my good friend Greg Keith, petroleum geophysicist, we decided to get into the NARG ballgame and put Alaskan fossil crabs on the map. This is our story.

Late September in Alaska is a beautiful time; however, our fall is very short. The birch and aspen turn gorgeous shades of golden yellow for about two weeks and then, with the first big wind, are gone. Winter and its seemingly unending snows can begin in early October in the Anchorage lowlands but "termination dust" (early snow) in the high country can actually begin in mid-September. Our objective on this trip was in our old stomping grounds, the eastern Talkeetna Mountains about 110 miles north of Anchorage. Earlier workers have described an upper Cretaceous crab fauna along Alfred Creek. En route to this location are numerous poorly collected middle Jurassic outcrops, which can yield a wonderful and varied ammonite fauna. We decided that a day trip was in order to explore these prolific sites, but it would be a race against time. We had waited until the last weekend of September and in Alaska this means one may be challenged by the early snows of winter.

Rare complete Matanuska Formation crab

Greg and I consulted the weather charts and it appeared very promising for the time period selected. Our meteorological recon had yielded negative reports of snow in the area and none was forecast. The trip would be a one-day, surgical strike. We would be targeting the small round concretions that yield, at worst, disarticulated claws and legs, but with luck complete crabs with all appendages intact. Trips completed earlier in the summer gave Greg and me considerable experience with the 8-wheeled ARGO all-terrain vehicle. It had taken us into hell and back on numerous occasions and we felt confident that we could advance, collect our objectives and extract ourselves during the ever shortening days of late fall. The ARGO along with all of our personal gear and emergency supplies was loaded into Greg's truck and at 6 a.m. (our usual jump-off time) we departed from Greg's home. We made a brief stop at our local coffee hut for the mandatory early morning caffeine jolt but then, we were "on the road again" knowing we couldn't waste a second of the day. We headed north towards the eastern Talkeetna Mountains west of the Copper River Basin. It was still dark at 8 a.m. when we started up into the heart of the mountains but the weather was looking good, albeit a little cloudy off to the northeast. There appeared to be no need for concern. It was just late September after all, and it smelled like fall. We proceeded but continued to notice an increasing gloom off to the northeast.

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Snow Crabs An Alaskan Mis Adventure

continued from page 2

Our trip was periodically delayed by road repair work. Alaska with its eternal freeze/thaw cycles creates havoc to the state's roadways. Potholes, sinkholes, fractures and collapses are common along this windy, steep stretch of road and the road crews were frantically trying to get everything patched before winter drove them out for the season. We were patient. We knew our little crabs frozen in stone were going nowhere and, as expected, we had encountered very agreeable weather thus far. Crossing the last major drainage before our jump off point, we came to yet another construction stop. As we were waiting to be flagged ahead, we noticed a bit of rain starting to fall. We rolled up to the flag person and noticed a few errant flakes of white, fluttering matter descending from the heavens. "Greg is that snow?" I asked. "Don, you're an Alaskan, what the heck do you think it is of course, its snow!!!" Greg muttered back.

Now, now Don, calm down. We'll be OK.

We immediately did our best ostrich impersonation and ignored the obvious. It was just a few flakes here and there; it shouldn't be a bother to us. We chatted with the construction crew flagger. The report wasn't good. According to the crew the snow was just starting at our current location but it had been coming down for about four hours near our jump off destination. As expected the flagger wanted to know if we were out moose hunting. It is impossible to describe the look on the person's face when we said, "No we aren't really moose hunting, we are just prospecting for crabs." I'm sure the entire road crew concluded that we were escapees from the local psychiatric facility. Despite the funny looks, we finally got the green light to go and, with quite some trepidation, drove on. Despite the growing daylight the skies were getting darker and darker. Now it wasn't just scattered, occasional flakes

Typical "parts and pieces"
Matanuska Formation crab material

falling but a steady, consistent downfall of heavy wet snow. "Greg, I don't like the looks of this. It's only going to take and inch of snow and we're finished." Greg, ever the optimist said, "Now, now Don, calm down. We'll be OK."

As we drove on our hearts collectively sank. It looked like about 1/2 to 1 inch of snow was covering the ground. As it seemed fairly warm we decided to delay our start to the crab location by an hour or so and see if the snow might melt off. To kill some time we went to the so-called "Lizzie" quarry where a few years ago portions of an Edmontosaur skeleton had been uncovered in the upper Cretaceous Matanuska formation. Greg had previously collected the site and had found some ammonite material there. We thought we would take a quick look around for some Cretaceous goodies and then be on our way. It was no good. When we arrived we were frustrated to see not 1 inch but 2 1/2 inches of snow covering the quarry. It had become so bad that we slid almost 100 yards down the road trying to make the turn into the quarry. It was amazing what a thin veneer of snow could do to an outcrop. We drove a few miles up the road to see if there was any hope for our ARGO trip. It was really coming down now. We arrived at our traditional jump off point and looked northward to the high country we would need to climb. It looked grim. All the preparation, the long drive, and all of our dreams of

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To kill some time we went to the so-called Lizzie quarry where a few years ago portions of an Edmontosaur skeleton had been uncovered in the upper Cretaceous Matanuska formation.

Oregon Paleo Project

Imagine

visiting a hands-on science learning center where you can discover fossils, enjoy a program and watch a video of volcanoes, earthquakes and other cataclysmic events that rocked, burned and ravaged Oregon's landscape for millions of years.

North Central Oregon is still littered with some of the most diverse prehistoric plant and animal fossils in North America. Casual visitors can easily stumble upon small flakes and chunks of old mudflows and ash falls, with fragile mammal bones, fish scales and bones, and the leaves and nuts from Oregon's first ancient forests, imbedded in stone. For example, The John Day area is unique in the world for its complete fossil record of the age of mammals and mammal environments. The Nimravid, a 4.5 ft "false saber toothed cat" and one of the earliest true carnivores, once lived in the ancient forests of the area. It was an awesome predator. The Nimravid is found in the John Day formation and featured on the Blue Basin trail in the National Monument. Mammal fossils come from ancient streambeds, and ash beds, and paleosols (buried soils) in the region. The region's rock palisades, volcanic mud flows and ancient seafloor plains and riverbeds contain enough geological importance that it has reached a global scale. Scientists from all corners of the world have been scouring the hillsides and riverbanks for over a century.

The region hosts four rock formations and each one represents a unique piece of the world famous John Day Fossil Beds puzzle. Many of the sedimentary rocks in eastern Oregon contain fossil leaves or bones. Leaf fossils are especially abundant in the rocks at the far side of the athletic field at Wheeler High School in the town of Fossil. Although it is rare to find a complete animal fossil, a search conducted in riverbeds and even smaller streams may turn up chips or even teeth. Read on. The main objective of the Oregon Paleo Project is simply to educate. Paleo Learning Center will be considered a "base station" in Fossil.

Educational programs will originate from Fossil and be the result of many minds working together to provide the ultimate learning experience. It will not stop at the present faculty, as new participants will always be encouraged to make an impact. The concept of the Paleo Project closely involves the North Central Education District, which established the Paleo Academy. "We need to let the world know "world class fossils are just three hours from Portland."

OREGON PALEO LANDS INSTITUTE MISSION

"Oregon Paleo Lands Institute (OPLI) helps Northwest residents and visitors of all ages to explore, understand and enjoy the world-renowned natural history of north central Oregon, its ancient and living landscapes and cultures, and the full fossil record of earth's last 50 million years.

OPLI, with its partners, works actively with the region's communities and residents, to expand educational horizons, research opportunities, community vitality and economic wealth, and to promote and sustain the region's special natural and cultural assets."

Executive Director: Dr. Ellen Mooris Bishop
Website: www.oregonpaleoproject.org
Phone: (541) 763-4480

Cephalopods in a Blanket

Paleo Kids

This recipe uses a variation of the old pigs-'n-a-blanket theme in order to make edible cephalopods. Cephalopods were squid-like animals that lived in shells. They were very common in Paleozoic-era seas. They would probably have tasted like calamari (a fancy name for squid to trick people into eating it).

You'll need:

- Hot dogs
- Crescent roll batter, in standard tube with precut dough works best
- Mustard and ketchup for eyes and enjoyment of the dogs.
- Baking pan
- Knife
- Oven

Preparation time: 30 to 45 minutes

1. To prepare the tentacles of the squid-like cephalopod animal, make two or three vertical slices in the end of a hot dog. Don't cut pieces off, just cut into the hot dog, along its length. The slices should be made as if you were cutting the top of the hot dog into equal slices. For appetizer dogs, make two slices, ½ to ¾ inches deep. For regular-sized dogs make three cuts, each 1 to 1 ½ inches deep. The hot dog will curl back from these cuts during cooking to form the "tentacles."

View from side View from end

2. Now unroll the precut crescent batter dough. The dough will form the "shell" of each hot dog/cephalopod. For small appetizer dogs, start wrapping the dough at the base of the cuts. For larger dogs, leave ½ inch for the eye before starting your wrap. You can wrap the dough in a spiral around the dogs, and leave it coiled, or smooth the dough with your hand. Try to make the dough come to a cone shape at the end of the hot dog (pointed end opposite the side of the hot dog that you cut). For regular-sized hot dogs, you may want to cut off an inch of hot dog so it fits the precut dough sheets. Also, cutting the end of the dog into a cone, can help in keeping a conical shape to the dough. For appetizer-hot dogs, you can cut the precut triangles into smaller triangles to make more shells. When finished, the side of the hot dog with the cuts should be sticking out of the dough, and the other side should be covered in the dough, with the dough coming to a point just beyond where the hot dog ends.

3. Bake in the oven according to the directions on the batter roll, usually until the dough is slightly golden.

4. Remove from the oven. If the "tentacles" haven't opened, open them up with a knife.

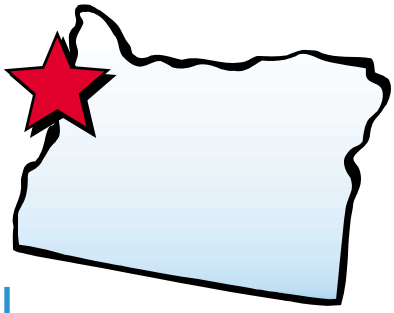
5. You can use your imagination for putting eyes on the cephalopod. The easiest way to do this is to place a drop of mustard on the side of the cephalopod first, and then put a dab of ketchup on a toothpick or the end of a fork, so as to place a smaller spot of red ketchup within the larger yellow circle of mustard. For regular-sized hot dogs, place the eye on the hot dog between the "tentacles" and the crescent-dough shell. For appetizer hot dogs there isn't enough room for the eye on the hot dog, so just put it on the crescent-dough shell. You can also slice an olive and pimento and attach with a dab of ketchup.

6. Eat and enjoy!

Paleo Kids

Family Friendly Collecting Sites

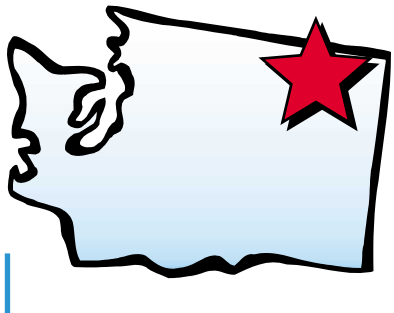
There are hundreds of fossils collecting locations throughout the Pacific NW but not all are easily to get too and sometimes finding fossils is difficult. We are going to review 3 fossil locations that are prefect for the entire family.



Newport, Oregon

If your plans include a visit to the Oregon Coast you might want to spend some time on the beaches north of Newport. While most people are looking for agates or flying kites they are missing out on an excellent opportunity to collect 15 million year old fossils from the Astoria Formation. The marine fossils from the Astoria Formation weather from the cliffs and can be found laying along the beach. The best collecting locations are from Moolack Beach north to Beverly Beach. In addition to the numerous species of mollusks that are found you might also find a vertebra to a whale or seal. No special tools are needed for collecting and there is no digging in the sea wall. We rated collecting 3 our of 5 dinos, 5 being the best. Accessability is excellent but it's sometimes difficult locating fossils so we knocked off 1 dino. This is primarily due to sand washing on shore covering the fossils We also knocked off another dino due to the fact that the best time to collect is during the winter months, which isn't usually when most plan a visit to the beach. Be careful and watch for watch out for sneaker waves.

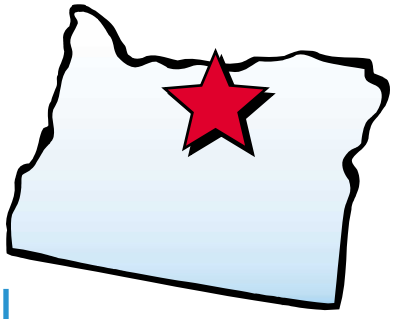
RATING



Republic, Washington

Visitors to Republic can see examples of local fossils at the Stonerose Interpretive Center where if interested, may purchase an admission sticker to hunt for fossils at the Stonerose Boot Hill fossil site. You can bring your own tools (hammer and chisel) or you can rent them at the Center. All finds must be shown to the Curator or staff personnel. You may take home three fossil pieces per person per day. The Stonerose Interpretive Center reserves the right to retain any fossils that are of scientific value or significant to the Stonerose collection. What you will be primarily collecting for are 50 million year old leaf fossils from the Klondike Mountain Formation. The leaf imprints are of exceptional quality. You might get lucky and find a flower an insect or even a fish! One thing you might want to bring with you is flat cardboard and masking tape. The fossils are sometimes delicate and should be wrapped properly. We rated this location 4 out of 5 dinos. It was docked one dino due to it's limited hours of operation. For more information check out the Stonerose Interpretive Center's website at: www.stonerosefossil.org.

RATING



Fossil, Oregon

Paleo Kids

Wouldn't it be great if there were fossils in the town you lived in? It doesn't get any better than that in Fossil, Oregon. Fossil can be found on the hillside behind high schools football field. Here you can find leaf imprints that include maple, ash, willow, and other temperate deciduous leaves. You can also find Metasequoia, Oregon's State fossil, and if you're lucky you might find a flower, nut or seed. The fossils you find here are Oligocene (37–20 million years old) Bridge Creek Flora from the John Day Formation. The preservation is exceptional due to the fine-grained volcanic ash that covered them. No tools are necessary to collect as numerous fossils can be found on the ground. If you want to do a little digging bring along a pick hammer, chisel, safety glasses, and gloves. The plates you dig up are sometimes fragile so include some masking tape, newspaper, and flat cardboard to wrap them in so they don't break. There is a $3 fee to collect and your allowed to keep 3 fossil specimens you find. We rated this site 4 out of 5 dinos. Walking can be difficult; the hillside is fairly steep and is littered with loose material.

Preservation of leaf imprint fossils

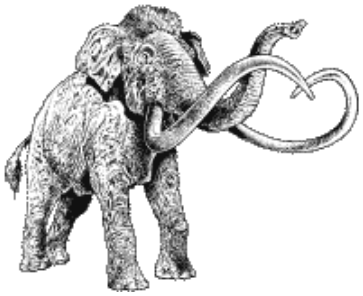
It's important to preserve the leaf fossils you find and here are a few steps to follow once you get them home.

1. Use a soft brush, like a toothbrush, and brush the shale to remove any dirt. Be careful when working around the leaf imprint and do not use water. Using water could wash way the fossil that you worked hard to collect

2. Make sure the shale is dry. Even though you didn't use water when cleaning it, the fossil may be damp. Just place it in a warm area of the house for a week or two.

3. For this step I like to use Krylon-Interior/Exterior Clear Acrylic in either flat or satin finish. Take your fossils out into a well ventilated area and place on newspaper. First spray the side that has the leaf imprint and let dry. Turn over and spray the back. This helps preserve the fossil and prevents moisture from absorbing into the shale.

Now the only thing left to do is find a suitable place in your home to display your treasures.

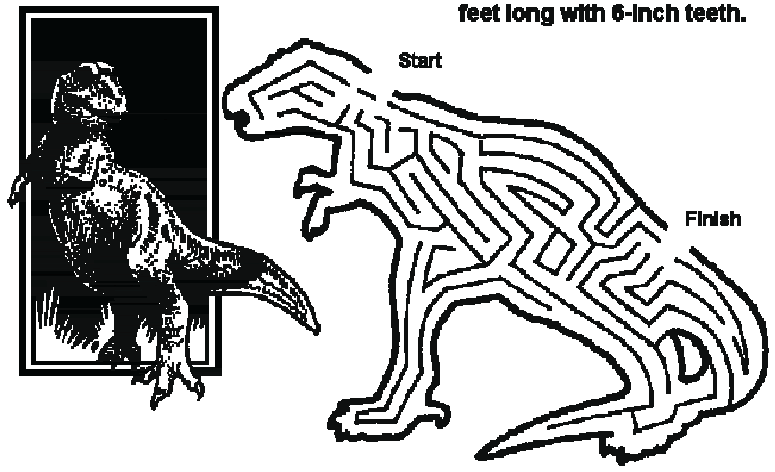


Washington's State Fossil

Mammuthus columbi

The Columbian mammoth entered North America via the Bering Land Bridge around one million years ago and roamed the grasslands of North America from Alaska to Mexico, and down into parts of Central America during the Pleistocene (~ 900,000–10,000 years ago).

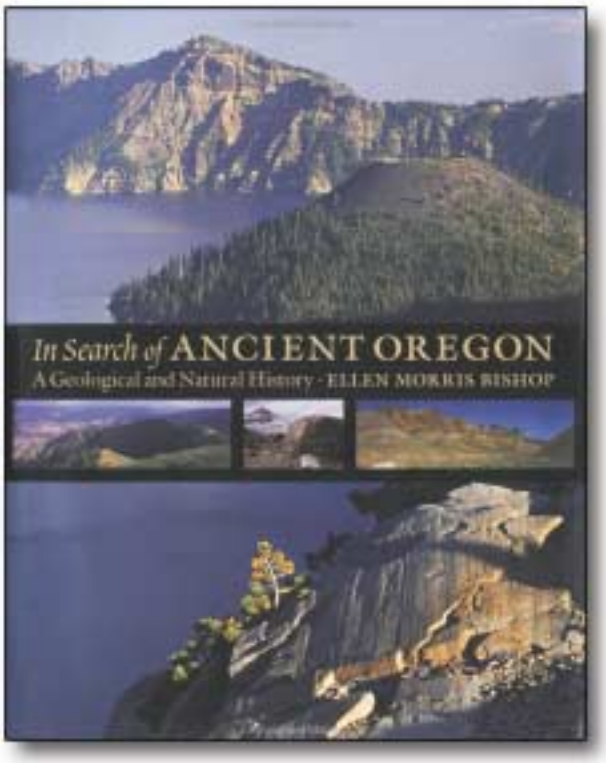
Tyrannosaurus



"Once upon a time, when dinosaurs roamed Montana and pterosaurs ruled the skies, there was no Oregon..."

In Search of Ancient Oregon

By Dr. Ellen Mooris Bishop



Until about 110 million years ago, the land we know as Oregon simply did not exist. The development of the state's distinctive and beautiful landscapes is a classic and dramatic tale, 400 million years in the making and greatly affected by global events. In the beginning, Oregon's foundations lay far off the Idaho seacoast as tropical volcanic islands. Collision with these exotic terranes produced the first land that was truly Oregon. Subsequent eruptions of volcanoes in central and eastern Oregon — where bananas grew and tiny horses browsed on figs and lotus leaves — built the coastline westward. As the climate cooled, Columbia River basalts and collision with a chain of offshore seamounts built Oregon's coast to today's position, while faulting uplifted now-familiar mountain ranges. When mastodons and dire wolves prowled the Willamette Valley at the end of the Ice Age, great floods from Montana transformed the valley into a 100-mile-long lake. Today, earthquakes and eruptions still shape our landscapes.

Geology is an extremely visual subject, and In Search of Ancient Oregon is a beautifully photographed, expertly written account of Oregon's fascinating geological story. Written by a passionate and professional geologist who has spent countless hours in the field exploring and photographing the state, In Search of Ancient Oregon is a book for all those interested in Oregon's present and past landscapes, plants, animals, and climates. It presents fine-art-quality color photographs of well-known features, including Mount Hood, Crater Lake, Smith Rock, Steens Mountain, the Columbia River Gorge, and Oregon's rugged coast, as well as scenic and more remote places, including Diamond Craters, the Owyhees, Abert Rim, Hells Canyon, the Wallowas, and Three Fingered Jack. Clear and compelling writing accompanies the more than 215 stunning photographs. Finally, here is a book that tells the tale of how Oregon's diverse landscapes, climates, and wildlife evolved — and what we may expect in the future.

Until now, no book has presented this dynamic story in a way that everyone interested in Oregon's natural history can easily understand. Extraordinary photographs and the author's lucid explanations make this book both unique and essential for those curious about our own contemporary landscape.

Other great books on Oregon Paleontology

Oregon Fossils
by Elizabeth L. Orr, William N. Orr

Fossil shells from Western Oregon: A guide to identification
by Ellen J. Moore

Common Fossil Plants of Western North America
by William D. Tidwell

Fossil Preparation: Pyrite Stabilization

By Andrew Bland

My first experience with pyritic material was with a beautiful ammonite assemblage held together by Drusy pyrite. I didn't realize that decomposition of pyrite is common and it wasn't more that a few months after I got it home from Tucson, AZ that the pyrite began to rot.

Moisture and oxygen from the air provide the necessary elements for the decomposition of pyretic material. The products of pyrite disease are hydrogen sulfide, sulfur dioxide, and various iron sulfates, sulfur and sulfuric acid. One test that can perform to determine if decomposition has started is to give it a sniff and any sulfurous or "rotten egg" odor will be the first indications that your specimen needs treated.

In order to treat the disease one must first neutralize the acids and then apply a sealant to prevent further deteriorations.

Step 1: Remove Disease

If your specimen already suffers from pyrite disease, remove what you can, using mechanical methods and wash the specimen thoroughly in water.

Step 2: Neutralize Acid

To effectively neutralize the acid generated from the deterioration of the pyrite a strong base chemical is needed. To create the neutralizing solution, Bannister (1933) suggests using 17 parts distilled water to 1 part ammonium hydroxide. This is about the same concentration you'll find in the ammonia available at the local supermarket. Allow your specimen to soak in the solution for several hours. Then remove and rinse well in water, followed by a bath in acetone, which will remove all the water.

Step 3: Sealing

Now that your specimen is disease free it is necessary to seal the specimen to prevent a recurrence of the disease. This can be accomplished with a solution of Polyvinyl Acetate (Vinac) and acetone. It is suggested to use a 1 to 1 ratio but a thinner solution such as 4 parts acetone to 1 part Vinac may be more effective as it will penetrate further than a thick solution.

Use of vacuum chamber or jar will aid in the penetration of the neutralizing solution and sealant.

References

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BIRKER, I., AND J. KAYLOR. 1986. Pyrite disease: case studies from the Redpath Mueseum, p. 21-27. Life Sciences Miscellaneous Publications, Royal Ontario Museum.

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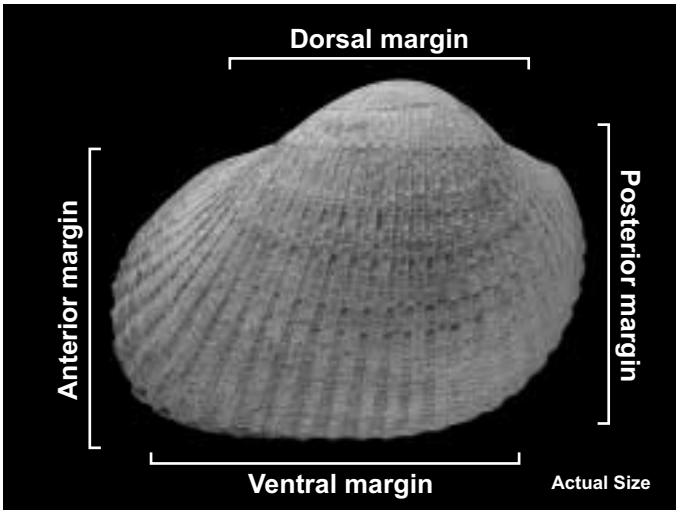
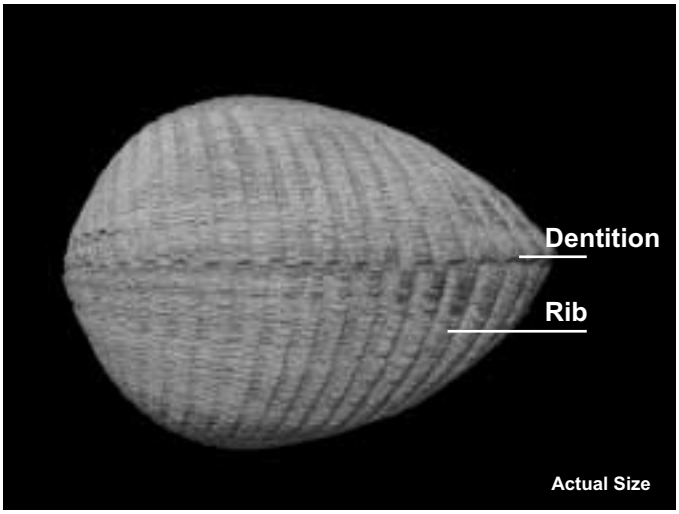
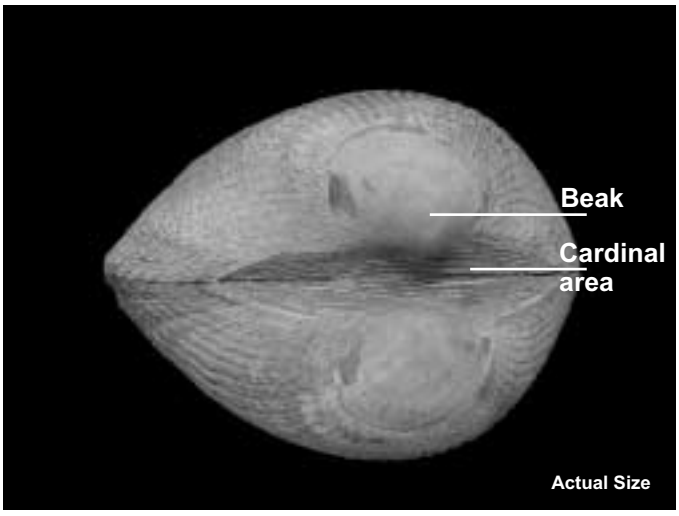
Featured Fossil: *Anadara devincta*







Photograhs taken with a Sony Cyber-shot 3.3 megapixel digital camera.
Light source: 5500k Fluorescents.

Anadara devincta is the most common bivalve fossils found in the Astoria Formation. A distinguishing feature of the ***Anadara*** is the Cardinal area, which is a flat area between the beak and hinge and is sculptured with chevron-like grooves.

Size:	Moderate
Shape:	Subquadrate
Dentition:	Taxodont
Sculpture:	Flat ribs

Inflation, position of the beaks and the number and sculpture of the ribs help to differentiate the ***Anadara*** from other species of bivalves.

Bivalve Dentition Patterns

The teeth guide the two valves into alignment when the valves close. The teeth fit into corresponding depressions on the opposite valve called sockets.

Desmodont	Teeth are reduced or absent all together
Dysodont	Small simple teeth located near the edge of the valve
Taxodont	Numerous teeth arranged in a radial pattern fanning out upwards
Actinodont	Numerous teeth arranged in a radial pattern fanning out downwards
Isodont	Large teeth found either side of the internal ligament pit
Schizodont	Large teeth, sometimes grooved
Pachyodont	Very large blunt teeth
Heterodont	Cardinal and lateral teeth

Bivalve Shapes

The Bivalve shape refers to the general shape, in silhouette, of a valve.

Subcircular	Silhouette almost circular.
Subelliptical	Silhouette elongate with rounded anterior and posterior margins.
Subovate	Silhouette roughly oval with one side more flattened.
Subquadrate	Silhouette with roughly four sides, and the length and height subequal.
Subtrapezoidal	Silhouette with roughly four sides, the length being greater than the height.
Subtriangular	Silhouette roughly three sided, or the anterior end of the valve is an equilateral triangle.

Featured Formation: Birdsong Outcrop

By Andrew Bland

In last months newsletter we learned about exotic terranes of Oregon so I thought it would be a great opportunity to highlight a locality we visit on occasion that is part of the Grindstone terrane of East-Central Oregon. Included in the Gridstone terrane is an exposure of Devonian limestone, which has been informally referred to as the Birdsong Limestone by Danner (1977). The Birdsong outcrop is Middle Devonian in age and is some of the oldest rock that can be found in Oregon. The fauna from the outcrop include corals, sponges, brachiopods, crinoids, conodonts, and I heard that it's the only locality in Oregon that produce a trilobite, but that's still unconfirmed.

I've visited some amazing geologic places in Oregon but the Birdsong outcrop is my favorite. The outcrop is surrounded, for the most part, with rolling hills dotted with sage. On our cross-country drive in we spotted a group antelope and flushed out a covey of sage hens. The remoteness of this location really adds to its appeal.

From where we parked we had a good quarter mile hike up to the exposure. With hammer in hand I gave the limestone a good whack and it rang out like a bell. Man that stuff is hard. I don't know what I was thinking but I always thought of limestone as being a soft material.

Most of our collecting from there on was picking up weathered chunks of limestone from around the base. We ended up with sponge and coral specimens as well as a few brachiopod and crinoid fragments. It wasn't until six months later that I learned of conodonts so I dissolved some of the limestone I brought back in a week acid solution, but no conodonts for me. Most people, looking at what was collected, wouldn't think much of it, but for me it's amazing to have found some of Oregon's oldest fossils.

Eastern side of the Birdsong outcrop. If you look closely you might be able to see Andy Berkholtz at the base of the 100ft face.

Here is a closer view of Andy Berkholtz up on the face and you might be able to see Bill Sullivan as well.

Reference: CHARLES D. BLOME - Field guide to the geology and paleontology of pre-Tertiary volcanic arc and melange rocks, Grindstone, Izee, and Baker terranes, east-central Oregon; U.S. Geological Survey, MS 919.

Taxonomy Report #5: Marine Mammals

By Aaron Currier

One of the important aspects of research is not only the labeling of specimens with accurate scientific binomial names, but understanding how a species fits into the hierarchal tree of life... otherwise known as the scientific system of classification, or taxonomy. In the "Taxonomy Report" we look at how species fit together, both in relation to other related species, as well as their ancestry.

As coastal tides ebb and flow, the remains of fossil marine mammals are scoured from their burial grounds to be cast upon the shore. Most beachcombers pass these important records of a time long ago in search of other treasures. However, with a well-trained eye, paleontologists as well as avocational fossil collectors have found the preserved bones of ancestral marine mammals for over a hundred years. Some of these finds result in furthering the study of the connection between the past and the present, filling in answers to questions that have challenged scientists for centuries.

In Oregon, vertebrate material found amidst the rocks within the ocean tidal zone can be collected as a "souvenir" or for scientific research as long as it is not for commercial purposes. The disadvantage of this is the potential for the loss of valuable information as more and more people collect specimens for their mantle, or in many cases, their yard. It is therefore important for the purpose of scientific study to document information about significant finds of marine mammal fossils. Locality is the primary information that is helpful for both identification and species and environmental correlations. If this is all the information a collector has, the rest can be left to a museum or research scientist who might have (or want) the opportunity in the future to examine the specimen.

If however, a collector wants to put a name on the specimen for the duration of propriety, then further research is necessary. This article will help with the basic categorization and a brief look at the identified species of marine mammals in Oregon to this point.

All marine mammals, like land mammals are placed in the Class Mammalia under the Phylum Chordata. Marine mammals are divided into three key Orders: Carnivora, which includes cats, dogs, bears, as well as seals and sea lions; Cetacea, which includes whales and dolphins; and Sirenia, which are the manatees and dugongs. Oregon's fossil record includes members of all three orders.

The most common marine mammals in the Order Carnivora are known as the pinnipeds. The commonly used term 'pinniped' is scientifically outdated, but may be found in literature or on the internet describing the SubOrder or SuperFamily containing the three key Families: Otariidae, Phocidae, and Odobenidae. Terrestrial carnivores are similarly classified as Fissipedia.

Otariidae are the "eared" or "walking" seals; more commonly known as sea lions. The first Genus of Otariid identified in Oregon was by Thomas Condon in 1906. That specimen was found in the Astoria Formation (Miocene) and was named *Desmatophoca oregonensis*. Since then Lawrence Barnes has published numerous papers on other enaliarctine otariids from the Astoria Formation, including the species: *Pteronarctos goedertae*, *P. piersoni*; and *Pacificotaria hadromma*. Enaliarctine refers to the SubFamily Enaliarctinae, which names a group of more 'bear-like' sea lions than the other important SubFamily, Desmatophocinae. A second species of *Desmatophoca* discovered in the Astoria Formation near Knappton, Washington was described by Barnes as well. A more recent otariid, *Eumetopias*, was collected and described from Pleistocene strata near Cape Blanco. This specimen represents an animal that is far more similar to the sea lions that exist today.

The difference between the otariids, as fossil fragments, is not easy to determine without scientific literature and perhaps the assistance of a professional vertebrate paleontologist. The Family level is about as accurate as a collector can typically identify.

Two other pinniped families are the Phocidae, comprised of the 'earless' or true seals, of which only two specimens (*Phoca*) have been described, also from the Cape Blanco Pleistocene; and the other Family Odobenidae, commonly known as walruses, of which one Oregon specimen has been described from the late Miocene Empire Formation at Fossil Point.

One other Family in Carnivora worth noting is Mustelidae, which includes the sea otters. A single specimen of *Enhydra* was described from the Cape Blanco Pleistocene, while another otter-like, beach-dwelling bear called *Kolponomos* has been reported on the coast in Miocene strata.

If, as believed by some mammalogists, sealions and walruses were derived from bears (Ursidae) and true seals from weasels (Mustelidae), such a taxon would be 'polyphyletic.' Recent molecular evidence indicates, however, that all three families of marine carnivores (Otariidae, Phocidae, and Odobenidae) are descended from weasel-like ancestors. Separation of this 'holophyletic' group as a separate order would make the remaining "fissiped" group 'paraphyletic.' Such an arrangement would not be acceptable to

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Taxonomy Report #5: Marine Mammals

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phylogenetic taxonomists, but might be to traditional taxonomists. (For an excellent explanation of terms in this paragraph, go online to: http://www.miketaylor.org.uk/dino/faq/s-class/phyletic/)

Whale and porpoise bones are the other commonly found mammal fossils in the Astoria Formation. Whales, dolphins, and porpoises are classified in the Order Cetacea. Taxonomists have separated the cetaceans in categories based on their teeth (or lack thereof), among other characteristics. Strangely, dolphins and porpoises, although they are not whales have more in common with the Sperm Whale than they do Grey Whales because of their similar types of teeth. The SubOrders are Odonticete (toothed whales) and Mysticete (baleen whales).

Fossil toothed Odonticete whales have not been reported in Oregon. However, partial skeletons of a primitive toothed whale called *Aetiocetus* have been found both on the coast near Seal Rock in the Yaquina Formation and in the Cascade Mountain Foothills in the Scotts Mills Formation. Aetiocetidae was a smaller whale (around 12 to 15 feet long) and is intermediate between baleen whales and archaeocetes. They have teeth, but these teeth were fairly small and were loosely rooted in the jaws. Therefore, it is thought that they didn't struggle with prey (they could lose teeth — and mammals don't replace teeth like sharks), but filter fed like crabeater seals do today. Without the teeth the skull is similar to a mysticete, although a primitive one, and is classified as such. Porpoises on the other hand are common in the Astoria Formation. Research is currently underway to describe the first of numerous proposed genera and species within the Family Phocoenidae. Fossil representation of the Family Delphinidae (dolphins), although common on the East Coast, is not reported in Oregon.

Hundreds of fossil whale bone fragments, however, are recovered every year along the Central Oregon Coast beaches. Most of these fragments come from the Astoria Formation and are likely the extinct Mysticete whale *Cophocetus oregonensis* as first identified in 1934 by Packard and Kellogg. Five or more full *Cophocetus* skeletons have been documented, although perhaps hundreds may have been preserved and ultimately disarticulated by erosion. *Cophocetus* is placed in the extinct Family Cetotheriidae. Contemporary baleen whales are in the Family Balaenidae.

One final group of marine mammals found in Oregon is the Desmostylians; a very primitive "sea cow." These animals are considered to be very much like sirenians (manatees and dugongs) but are also similar to proboscidians (elephants), and perhaps were an ancestor. Researchers propose that *Desmostylus*, the most common Desmostylid, not be classified in the Order Sirenia, but be raised to its own ordinal group, because of the numerous differences. A second genus of Desmodstylidae, *Benemotops emlongi,* was identified from a jaw, teeth, and tusk. A single sirenian specimen, Halitherininae, has been described from Nye Mudstone.

In conclusion, specimens of marine mammals, although found throughout Western Oregon, are abundant along the Central Oregon Coast, and primarily from the Miocene Astoria Formation. Furthermore, this is the only locality in Oregon where vertebrate material can be (responsibly and non-commercially) collected without a permit. The most frequently found mammals can be roughly identified as the pinniped otariids *Desmatophoca*, *Pteronarctos*, and *Pacificotaria* (sea lions); Mysticete cetacean *Cophocetus oregonensis* (baleen whale); the Odonticete phoenids (family of porpoises); and the unique *Desmostylus hesperus*.

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With special thanks to James L. Goedert,
Affiliate Curator, Fossil Marine Vertebrates
The Burke Museum of Natural History and Culture
University of Washington

Astoria Formation

Age: Early to Middle Miocene

Environment: Marine

Rock Type: Silty sandstone

Thickness: 200 meters

Locality: Lincoln County Beaches near Newport, Oregon

Snow Crabs - An Alaskan Mis Adventure

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Cretaceous crabs was put to waste by a measly two inches of snow. We knew it would be pointless to go on. Crab fossils covered by snow "Snow crabs," indeed. Depression started to set in. What could we do now? Greg had brought his rifle along just in case we spotted a moose; more importantly, he had a big bag of candy bars to munch on so we decided to find a convenient overlook, scan for moose, and hope that the skies would open and melt the thin snow cover. None of this happened. No moose were spotted. No clear, warming skies developed. Greg ate all of the good candy bars. The fossil trip had come to a dead halt and the finger pointing and blaming were about to commence. We felt pretty low and were desperately thinking up something constructive to do to salvage our trip before we fell on each other like Neanderthals. At almost the same instant we thought of the coal mines. There was a small settlement about 20 miles back down the road where at one time there had been an active coal mining operation. Both Greg and I knew that the Eocene Chikaloon formation located there contained extraordinary plant fossils. In all my years in Alaska I had never visited the site, but Greg had been there on numerous occasions and was excited to go again. On one of his previous trips, with the help of his father, he had collected an enormous (300#) petrified tree stump which now graces his front yard. He had also collected numerous, quite impressive leaf fossils there with his family. It was decided to head back and stop off at the mines and try our luck with leaf fossils. As we headed back down the mountain, the snow started to taper off until it quit completely and the skies cleared. Our brief thoughts of returning to crab country were stifled when we looked back up the pass and observed the heaviest cloud mass either of us had ever seen this side of a Texas thunderstorm. It looked like our only hope lay in the mines ahead.

Slab of Sutton Arca Eocene Leaves Similar to Don's Prize Piece

We turned off the main road onto a less than stellar mining trail and climbed the serpentine, dusty dirt road to the old coal mining operation. I was thinking "This is great, all this planning and effort just for a few plant fossils, how booooring!" Greg and I both love invertebrate and vertebrate fossils of all kinds, but we have never been greatly into plants. Still, as true amateur paleontologists, we went into it with the attitude that you never really know what you're going to find. Perhaps the world's first Eocene non-marine ammonite or, maybe, some left over relic of the dinosaur age that slipped into the Eocene. Could we be the ones to find the first swamp dwelling crabs Eocene in age? That would make this a tale worth telling our NARG readers. One must always be optimistic and open

Metasequoia Cone

Our brief thoughts of returning to crab country were stifled when we looked back up the pass and observed the heaviest cloud mass either of us had ever seen this side of a Texas thunderstorm.

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Snow Crabs - An Alaskan Mis Adventure

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minded despite overwhelming negative odds. The scene at the open pit mine was interesting. Large, petrified tree stumps dotted the landscape. Huge, upturned rock masses littered the grassy slopes. It was on the rock float, ripped up during the mining process that we began to find wonderful fossils.

Hickory Leaf

The plant material is beautifully preserved with jet-black carbonaceous films perfectly outlining a wide variety of Eocene plants. Sequoia, Metasequoia, alder, elm, magnolia and poplar were the most dominant forms. Occasionally seedpods were found and on rarer occasions early cones can be located.

As usual, serious competition set in between Greg and me. We competed heavily, using the quality of our finds to determine who was the better paleontologist, Greg or me? First, I found the best, only to see Greg grab a bigger more defined piece. Later I seized the upper hand again with a larger multi-specimen slab only to see the title slip back to Greg with his first ever se-quoia cone specimen. We became obsessed with finding the best plates, the largest slabs with multiple, varied plant fossils displayed. We became charged. Yes, plant fossils can be a total blast. Soon each of us had a large, cotton cloth bag filled with gorgeous material. We each probably carried 50 to 70 pounds of rock material out of the quarry. With such heavy burdens we decided to call it quits for the day and returned to Greg's truck and the long ride home. I awarded Greg the top prize for the day with his cone discovery, although my largest slab clearly outshone his in both quality and quantity of specimens. It didn't hurt Greg's voting outcome when he plied the judges (me) with more of the better candy bars he had hidden away from me earlier in the day.

Sycamore Leaf Plate

What a day it was! It started out in pursuit of the elusive Alaskan Cretaceous crabs but ended in an open coal pit feverishly collecting Eocene plant fossils. Such is life for the Alaskan paleontologist. Conditions are always rapidly changing. One always has to have a back-up plan in mind. We came through with a good fall back position that day. The sadness of our misadventure to the land of Crabdom in Alfred Creek had ebbed.

We returned home refreshed and laden with new and exciting material. The crabs could wait until the snows of winter once more retreated leaving them exposed to our searching eyes. Snow crabs are much overrated anyway.

We Alaskans are used to partaking of the mighty King Crab. Yes, this summer we'll be headed back to Alfred Creek and the location of our elusive crab friends, but you can be sure it will be in July. A hot day in July sounds very good. After all, it never snows in July in Alaska does it?

The End

The plant material is beautifully preserved with jet-black carbonaceous films perfectly outlining a wide variety of Eocene plants.

Oregon Fossil Fest 06 Recap

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Visitors looking over the fossils on Mackenzie's table

A beautiful Aturia that was Guy had on display

Guy's display tables that included Oregon coast fossils

Steven showing off some of his nice Jurassic ammonites

Bill, Tiffany and Rose

NARG's shark tooth screening setup

Shark teeth screening in action

More shark teeth screening activity

Dr. William Orr (right) identifying fossils

Fossil Collecting Rules and Regulations

The data in the below matrix was compiled from federal and state government websites regarding fossil collecting rules and regulations.

Plant	Invertebrate	Vertebrate	
P	P	P	**National Parks** All collecting within National Park Service areas requires a permit, and these permits are only issued for scientific research with an approved research proposal. Research proposals must include a research design describing how a hypothesis will be tested and affiliation with a research institution.
Y	Y	P	**National Forests**
Y	Y	P	**Bureau of Land Management** (Includes both Oregon and Washington) Fossils of plants and invertebrates that are rare or scientifically important for research projects may require a special paleontological collecting permit.
P	P	P	**Oregon State Parks, Forestry, and Fish & Wildlife lands**
Y	Y	P	**Oregon Beaches** Exception to Oregon Administrative Rules 736-020-0035: In accordance with ORS 390.725, natural products of the ocean shore, such as agates, small amounts of marine algae, driftwood or souvenirs of the ocean shore, may be taken by any person, for their own, noncommercial use, from the State recreation areas as described by ORS 390.635, without a permit, except that no person shall collect any amount of natural product of the ocean shore where prohibited by state or federal regulation or right of private ownership.
Y	Y	P	**Oregon - Highway Right of ways** Per the Oregon Department of Geology and Mineral Industries: Collecting of fossils is permitted state-wide within highway right-of ways, unless excavation is destructive to the roadcut.
P	P	P	**Washington State Parks, Forestry, and Fish & Wildlife land** WAC 232-12-251 states: It is unlawful to remove petrified wood, minerals, fossils, wood products or artifacts from department lands unless such removal is authorized by a permit issued by the director.
A	A	A	**Private Property** All private land requires permission from landowner.

Key: P=Permit required, **Y**=Collecting permitted, **A**=Ask for permission

- Specific areas may be posted, or designated, with different regulations. Before collecting, check with the local agency office to assure compliance.
- Fossil collecting on public lands for commercial reasons is strictly prohibited.
- Check with the agency managing the land in question before collecting.

NARG Newsletter

Thanks for all the contributions to the newsletter and keep them coming. If you have a story or an article you'd like to have included in the NARG Newsletter please submit them to newsletter@narg-online.com.

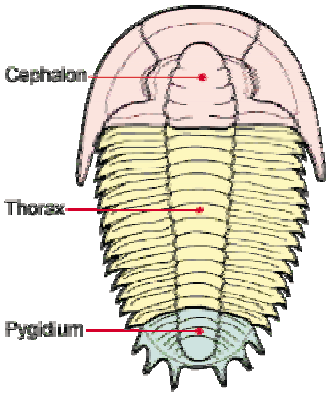
Introduction to Trilobites

By S. M. Gon III

Trilobites are hard-shelled, segmented creatures that existed over 300 million years ago in the Earth's ancient seas. They went extinct before dinosaurs even came into existence, and are one of the key signature creatures of the Paleozoic Era, the first era to exhibit a proliferation of the complex life-forms that established the foundation of life as it is today. Although dinosaurs are the most well known fossil life forms, trilobites are also a favorite among those familiar with Paleontology (the study of the development of life on Earth), and are found in the rocks of all continents.

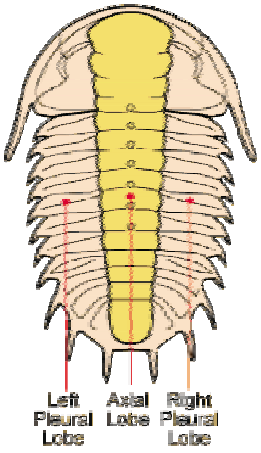
ANCIENT ARTHROPODS

Trilobites were among the first of the arthropods, a phylum of hard-shelled creatures with multiple body segments and jointed legs (although the legs, antennae and other finer structures of trilobites only rarely are preserved). They constitute an extinct class of arthropods, the Trilobita, made up of nine orders, over 150 families, about 5000 genera, and over 15,000 described species. New species of trilobites are unearthed and described every year. This makes trilobites the single most diverse group of extinct organisms, and within the generalized body plan of trilobites there was a great deal of diversity of size and form. The smallest known trilobite species is just under a millimeter long, while the largest include species from 30 to 70 cm in length (roughly a foot to two feet long!). With such a diversity of species and sizes, speculations on the ecological role of trilobites includes planktonic, swimming, and crawling forms, and we can presume they filled a varied set of trophic (feeding) niches, although perhaps mostly as detritivores, predators, or scavengers. Most trilobites are about an inch long, and part of their appeal is that you can hold and examine an entire fossil animal and turn it about in your hand. Try that with your average dinosaur!



THE TRILOBITE BODY PLAN

Whatever their size, all trilobite fossils have a similar body plan, being made up of three main body parts: a cephalon (head), a segmented thorax, and a pygidium (tail piece) as shown at left. However, the name “trilobite,” which means “three lobed,” is not in reference to those three body parts mentioned above, but to the fact that all trilobites bear a long central, or axial lobe, flanked on each side by right and left pleural lobes. These three lobes that run from the cephalon to the pygidium are what give trilobites their name, and are common to all trilobites despite their great diversity of form. You can examine the trilobite body plan in more detail using the links on the navigation bar below.



Next Issue: Trilobite Ecology and Ancient Environments

Scanning Electron Microscope (SEM) Imaging: SEM's are designed for direct study of the surfaces of solid objects. By scanning with an electron beam that has been generated and focused by the operation of the microscope, an image is formed. The SEM allows a much greater depth of focus than the optical microscope. For this reason the SEM can produce an image that is a good representation of the three-dimensional sample.

Fossil Gallery

This ¼ inch unidentified fly was found in the Parachute Member of the Green River Formation at Douglas Pass, Colorado. I was primarily collecting flora until a friend pointed out that I was overlooking insects. This is one of many that were found and is favorite fossils.

Andrew Bland

Woo Hoo! How about this super huge mussel (*Mytilus californianis*). It's from a Miocene formation in Northern California. It is truly one of the best I've ever seen.

Ron Bushell

This Nautiloid is an *Aturia angustata* is from the Lincoln Creek Formation (Eocene) of SW Washington. It's one of the most complete and largest I've found, or for that matter, seen.

Andrew Bland

This *Dentalium schencki* from is another fossil from the Lincoln Creek Formation. It is one of two found in the LC formation and is much more common that *D. pseudonyma.*

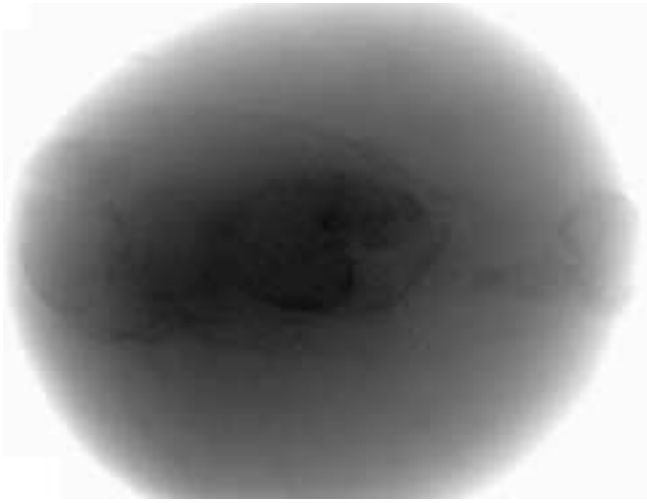
Andrew Bland

If you have a fossil you'd like showcased in the Fossil Gallery email the image along with a sentence or two of information to: fossilgallery@narg-online.com.

Crab X-Ray Image

Here is an X-Ray image of a crab concretion from the Lincoln Creek Formation. This particular specimen had exposed claws, so we knew it contained a crab fossil.

You can see the claws, which are slightly projected from the right surface and an outline of the body is somewhat visible. The contrast of the image is not great, but surprisingly, one would likely be able to tell if a crab was in a particular concretion and in what general orientation.



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