

DINOSAUR RIDGE



Friends of Dinosaur Ridge
16831 W Alameda Pkwy
Morrison, CO 80465
Phone: 303-697-3466
Web: www.dinoridge.org

The mission of Friends of Dinosaur Ridge is to preserve the paleontologic, geologic, and historic resources on Dinosaur Ridge, Triceratops Trail and the outlier sites in the Morrison - Golden Fossil Areas National Natural Landmark and to educate the public about these resources.

Major Contributors:

Rocky Mountain Association of Geologists (RMAG)
 Greater Denver Area Gem & Mineral Council
 Jeffco Conservation Trust Funds
 Scientific & Cultural Facilities District (SCFD)
 Gates Family Foundation
 Adolph Coors Foundation
 MDU Foundation
 Western Interior Paleontological Society (WIPS)
 1772 Foundation
 Harvey Family Foundation
 Chevron Mining Inc.



**Scientific & Cultural
 Facilities District**

Making It Possible.

Cover Photo:

Photos from the July Dinosaur Discovery Day: Reptile Day. Children painted tracks, sifted for fossils, and honored their mothers.

Photos by Clare Marshall

FRIENDS OF DINOSAUR RIDGE 2012

Executive Committee:

President	Sam Bartlett	Bureau of Recl. (Ret.)
Vice-President	Kathleen McCoy	Attorney
Secretary	Beth Simmons	MSCD Geo. Instructor
Treasurer	Peter Martin	U.S. Bureau of Reclamation
Member	Chris Carroll	Colorado Geological Survey

Board of Directors:

Marsha Barber	Science Coordinator Jefferson Co. School Dist. (Ret.)
Tim Connors	U.S. National Park Service
Norb Cygan, Ph.D.	Geologist (Ret.)
Harold Drewes, Ph.D.	U.S. Geological Survey (Ret.)
Jonna Gentry	Earth Science Teacher Jefferson Co. School Dist.
John Ghist	Earth Science Teacher Park Co. School Dist.
Martin Lockley, Ph.D.	Paleontologist, University of Colorado Denver (Ret.)
Marjorie MacLachlan	Geologist (Ret.)
Judy Peterson	Paleo Artist
Robert Reynolds, Ph.D.	Geologist, Denver Museum of Nature & Science
Kermit Shields	Geologist (Ret.)
Louis Taylor, Ph.D.	Paleontologist, Denver Museum of Nature & Science

Committee Chairs:

- Research and Publications
- Publications
- Research
- Education
- K-16
- Exhibits
- Tours, Events, Posters, Signs
- Marketing
- Outreach
- Volunteer and Membership
- Membership
- Volunteers
- Finance
- Accounting
- Fundraising
- Gift Shop
- Planning and Budget
- Governance
- Preservation
- Curation
- Facilities
- Advisory Panel

Committees:

- Beth Simmons
- Beth Simmons
- Beth Simmons
- Marsha Barber
- Erin LaCount
- Clare Marshall
- Tom Mokelestad
- Tom Mokelestad
- Tom Mokelestad
- Kermit Shields
- Clare Marshall
- Amber Cain
- Peter Martin
- Shawna Saeedian
- Joe Tempel and Clare Marshall
- Roger Bennett
- Kathleen McCoy
- Norb Cygan
- Chris Carroll
- Louis Taylor
- Tom Mokelestad
- Bob Reynolds

Staff - Friends of Dinosaur Ridge:

Executive Director	Joe Tempel
Programs & Operations Director	Tom Mokelestad
Tour Program Coordinator	Erin Fair
Volunteer Coordinator	Amber Cain
Membership/Exhibits	Clare Marshall
Gift Shop Manager	Roger Bennett
Gift Shop Assistant	Barbara Davidson
G.S. Assistant	Brian Davidson
Lead Guide/Birthdays/G.S. Clerk	Bobbi Kilgore
Maintenance	Jack Evans
Maintenance	Bob Medina
Educator/Tour Guide	Merlin Barnes

Tour Guides

- Dan Fanelli
- Sue Kaberline
- Thornton Geise
- Dan Fogerty
- Kimber O'Brien
- Kevin Thirouin
- Andy Oligmueller
- Greg Huston

Snack Shack

- Leah Cardenas
- Justin Hofferber
- Sierra Goldie
- Katy McHugh
- Taylor Cain
- Hunter Wood

TABLE OF CONTENTS

Management Reports

- 4. **President's Message**
- 6. **Program Director's Report**

Calendar of Events

- 7. **Calendar of Events**

Recent Activities

- 8. **Pterosaur Track at the Hawks' Nest Site**
- 9. **Two New Life Members**
- 9. **DDD Reptile Day**
- 9. **Cartosaurus Topped by *Stegosaurus***

Committee Reports

- 10. **Gift Shop**
- 10. **Preservation**
 - Curation Sub-committee**
- 11. **Research and Publications Committee**
 - Publications Sub-committee**
 - Research Sub-committee**
- 12. **Education**
- 12. **Marketing**
- 13. **Volunteer and Membership Committee**
- 14. **Finance**
 - Fundraising Sub-committee**

Articles

- 15. **The Beast in a South American Garden**
- 15. **The Tracksite on Skyline Drive in Cañon City, Colorado**
- 19. **The Old *Squalicorax* and the Sea, and Other Animals of the Benton Shale**
- 23. **Dino-Reading: Book Review**



Judy Peterson's Crocodile

*FODR Board member and artist Judy Peterson displays the cast of the crocodile *Goniopholis* she made for the Arthur Lakes video. Judy also displayed the drawings she made for the newly published book, *Darin and Denise Discover Denver's Dinosaurs and Other Denizens of Deep time.**

Help FODR Save Money

Postage costs continue to increase. Subscribing to The Ridge Report online will allow FODR to use its limited funds for education and preservation. Please send your e-mail address to Tom Moglestad at Tom_Moglestad@dinoridge.org

MANAGEMENT REPORTS

PRESIDENT'S MESSAGE

As you have probably noticed on the first page of the last two issues of *Ridge Report*, the structure of the FODR Board of Directors has changed. We reduced the number of board members from 21 to a maximum of 17, consolidated the number of committees to better reflect our operations and focus on FODR's core activities, and made changes in committee leadership for more self-sufficiency in and effectiveness of committee functions.

The reasons for the changes are twofold. The first is to increase the efficiency of FODR as we grow and expand the scope of our operations to manage anticipated double digit growth. The second is to attract funding for the tracksite pavilion and a new visitor center. Demonstrating that FODR is a well run non-profit will pay dividends as we start to raise money for these structures. We anticipate that potential funders will want to see a well organized and efficient operating structure that mimics their own. The reorganization of the BOD will make FODR such an organization.

One of the first tasks of the new BOD was to revise our strategic plan in light of our growth and renewed relationship with Jefferson County. The BOD held a retreat on June 16th to renew our strategic plan to guide us through the next 5.5 years to completion of both the tracksite pavilion and the new visitor center.

A new and exciting relationship with Jefferson County, with the completion of the new lease agreement, will provide for direct oversight by Jeffco Open Space, and require a much closer relationship and more direct reporting to the Director of Jeffco Open Space. As part of this more direct relationship, **Tim Sandmark** has been appointed director of several of the Jeffco Open Space parks, including Dinosaur Ridge. Tim has been a very good long-time friend and member of FODR. We appreciate and welcome his increased involvement.

The new strategic plan focuses mainly on the year-by-year requirements to be met as we move through the process of designing, financing, and building these two new structures on Dinosaur Ridge. The plan is divided into three main sec-

tions: education & preservation, funding, and contingencies [See Table 1 on next page].

The education & preservation section builds on the educational foundation we have in place and the current preservation efforts to stabilize the assets and structure of the Ridge. Thus, we will continue to make Dinosaur Ridge a safe educational place for the visiting public. This section of the strategic plan also will address the development and construction of exhibits for both the tracksite pavilion and the new visitor center.

The funding section outlines the funding process and two-phase schedule for the tracksite pavilion and the new visitor center. It is critical to get the tracksite pavilion completed (Phase 1) first as funds become available and complete the visitor center (phase 2) upon completion of the tracksite pavilion. The new strategic plan incorporates a timeline of the fundraising process from forming a fundraising committee and hiring a fundraising consultant, though completion of the visitor center. Given that we must be out of our current visitor center by November 30, 2018, there is much to be done in the next 5.5 years.

The third section of the strategic plan addresses many of the unforeseen pitfalls that could occur should the schedule start to slip. First, we realized a need to add or enhance current venues on the Ridge to keep and increase visitation, especially if the tracksite becomes inaccessible during construction. Second, we realized the potential need for a second, temporary and possibly long term, auxiliary visitor center and exhibit hall if we should have to move before the new visitor center is complete. Third, along with the education and preservation group, we realized the need to develop outlier NNL sites to pick up the slack and continue growth in the future. Obviously we cannot foresee all of the difficulties and pitfalls involved with the process. Therefore we agreed that the process needs to be reviewed once the funding for the tracksite pavilion is in place and a better evaluation of the schedule can be made.

Continued on next page

MANAGEMENT REPORTS

Continued from previous page

With finalization of the new strategic plan, scheduled for the October BOD meeting, we hope to be better able to complete development, design, funding and completion of both the tracksite pavilion and the visitor center in the allotted time. We also hope that we can foresee and act in time to address any pitfalls that might arise in the next 5.5 years. The FODR strategic plan is available to the FODR membership for perusal and comment prior to finalization.

The future looks very bright for the Friends of Dinosaur Ridge with the creation of the infrastructure required to grow the

organization, a new and closer relationship with Jeffco Open Space to realize our combined aspirations, and with a new strategic plan to guide us through the completion of the tracksite pavilion and a new visitor center. These are truly exciting times for the Friends of Dinosaur Ridge.



— SAM BARTLETT

	2012	2013	2014	2015	2016	2017	2018
Track Pavilion	Complete design of building	Raise \$1 million Complete design of exhibits for pavilion	Raise another \$1 million	Construct pavilion Install exhibits			
Visitor Center	Raise \$100,000 for visitor center design	Complete final design of building Begin design of exhibits for building	Raise \$6 million Complete design of exhibits	Raise another \$6 million	Complete fundraising	Construct visitor center	Install exhibits and move in
Educational Programs	Continue to evaluate, improve, and implement existing programs: school tours, public tours, Discovery Days, summer camp, signs, Posters, weekend activities, birthday parties, teacher classes, outreach programs, exhibits, props, publications, and field trips.						
		Plan and construct three new stops along Dinosaur Ridge Plan and construct three new exhibits, either permanent or mobile					
Preservation Activities	Apply for listing on National Register of Historic Places Prepare letter of intent for International Geo Park	Improve access and interpretation of outlier National Natural landmark sites					
		Apply for International Geo park status	Improve access and interpretation of outlier National Natural Landmark sites				
Contingency Plans	Review the progress of the projects, programs, and activities above, and make adjustments as necessary Lease or purchase a building offsite if our new Visitor center is not projected to be completed by the end of 2018						

MANAGEMENT REPORTS

PROGRAM DIRECTOR'S REPORT FIRST HALF 2012

Visitation, Attendance and Sales

Program	2011 (YTD)	2012 (YTD)	Change
Visitors to Dinosaur Ridge*		44,973	
Walkers on Ridge		23,057	
Visitors to Visitor Center	26,507	30,160	+14%
Tours (Total Attendance)**	16,923	21,916	+30%
Trek Through Time	10,887	10,684	-2%
Traveling Exhibit Visitors	1,000	7,000	+600%
Sales (\$)***	\$ 143,705	\$ 175,026	+22%

*includes walkers plus tour attendance. Does not include bicyclists.

**includes attendance for guided school tours, shuttle bus tours, school outreach, "Walk with a Geologist," birthday parties, and teacher enrichment classes.

***includes receipts from Gift Shop, Shuttle Bus, Trek Through Time, School Tours, Birthday Parties, Walk with a Geologist, Teacher Classes, and Facilities Rental.

Visitors to Dinosaur Ridge is calculated using data from an electronic counter installed at Eastgate during the first week of January. Visitation and sales were records for June despite high temperatures and Colorado fires.

Tours attendance was up over the 2nd quarter of 2011 for school tours, shuttle bus tours, school outreach and birthday parties.

Sales increases were led by the Gift Shop and Shuttle Bus Tours.

DDD-BSA (Boy Scout Day), May 12

Heavy rain forecast for the day did not materialize. Nonetheless, there were about 500 no-shows and a disappointing attendance of 800, compared to last year's attendance of 2500. Thanks to **Rocky Mountain Association of Geologists** for sponsoring the event. Thanks to **Lookout Mountain Nature Center, United States Geological Survey, Women in Mining,** and the **Colorado Groundwater Association** for bringing excellent educational booths. Special thanks to the 127 volunteers who braved the cold weather.

DDD-NGOD (National Get Outdoors Day), June 9

Clear skies and near-record heat in the mid nineties may have held attendance down to 400 visitors. Those who came made good use of the shuttle buses, the Gift Shop and *Trek Through Time*, all of which are air conditioned. Thanks to **Bear Creek Lake Park** for bringing an interesting booth on wildlife and to **Bandimere Speedway** for sponsoring the event. Thanks to **One Book, One Denver** for bringing their booth and for giving marketing support. Thanks to all of our volunteers and especially those who worked both shifts in the heat on the Ridge: **Pete Modreski, John McDonald, Paul Walker, Lou Taylor, Leroy Shaser, Connie Knight, Curt Johnson, Brad Morrison, Bill Danley Tim Mulvey** and **Duwayne Ebertowski**.



—TOM MOKLESTAD

CALENDAR OF EVENTS

FRIENDS OF DINOSAUR RIDGE EVENTS

First and Third Saturdays of Each Month – *Walk with a Geologist Tours* – Join us for a 2 1/2 hour detailed walking tour of Dinosaur Ridge with one of our geologist volunteers. Tours start at 9 a.m. Reservations can be made at 303-697-3466 x103 prior to 5 p.m. the night before a tour. Dates are August 18, September 1, September 15, October 6, and October 20.

Saturday, August 11, 2012 -- Dinosaur Discovery Day: Geocaching Day -- Geology exhibits and hands-on dinosaur and rockhounding activities at the Visitor Center. Expert guides stationed along the Ridge Trail. Hike free or take the shuttle ((\$3.00, age 3 and under free). 10 a.m. – 2 p.m.

Saturday, September 8, 2012 -- Dinosaur Discovery Day: Geologic Hazards and Preparedness -- For National Preparedness Month learn about hazards, preparedness and response, as well as hands-on dinosaur and rockhounding activities, at the Visitor Center. Expert guides stationed along the Ridge Trail. Hike free or take the shuttle ((\$3.00, age 3 and under free). 10 a.m. – 2 p.m.

Saturday, October 13, 2012 -- Dinosaur Discovery Day: Girl Scouts Celebrate National Fossil Day -- Geology exhibits and hands-on dinosaur and rockhounding activities at the Visitor Center. Expert guides stationed along the Ridge Trail. Activities suitable for scouts to earn patches and other awards. Scouts must register. Public is welcome. 10 a.m. – 3 p.m.

Wednesday, October 17, 2012 – *FODR Board Meeting* – Chevron Classroom, 6:30 p.m.

Friday, October 19, 2012 – *Ridge Report Deadline* for Volume 24, Issue 3.

Friday, November 2, 2012 – *ROCK OUT FOR THE RIDGE* – The annual FODR fundraising dinner at Red Rocks Visitor Center.

Tuesday, December 4, 2012 – *Colorado Gives Day* – A day set aside for the citizens of Colorado to donate to local charities. Friends of Dinosaur Ridge is on the list of charities. To donate on this day, go to www.givingfirst.org.

Wednesday, January 16, 2013 – *FODR Board Meeting* – Chevron Classroom, 6:30 p.m.

Friday, January 18, 2013 – *Ridge Report Deadline* for Volume 24, Issue 4, the Annual Report.

OTHER EVENTS

Tuesday, September 11, 2012 – Western Interior Paleontological Society – Regular monthly meeting, Ricketson Auditorium at Denver Museum of Nature & Science, 7 p.m. – Dr. Jaelyn Eberle, University of Colorado, *Mammalian Diversity in the Early Eocene High Arctic Rainforests* – www.westernpaleo.org

Monday, October 1, 2012 – Western Interior Paleontological Society – Regular monthly meeting, Ricketson Auditorium at Denver Museum of Nature & Science, 7 p.m. – Annual Show & Tell meeting; members talk about their summer field seasons -- www.westernpaleo.org

Saturday and Sunday, March 16 and 17, 2013 – Western Interior Paleontological Society – Biennial Symposium, *Ice Worlds and Their Fossils*, Green Center at Colorado School of Mines – www.westernpaleo.org

RECENT ACTIVITIES

PTEROSAUR TRACK AT THE HAWKS' NEST SITE

Just over a year ago, Dr. Beth Simmons, FODR Research Committee Chair, spotted a small “scratch” track at the Hawk’s Nest site on top of the Dakota Hogback above the organic land fill on North Rooney Road. Initially, Beth and Dr. Martin Lockley interpreted the track as that of a crocodile. However, the track was not made by a crocodile, it is a pterosaur track. Not just any pterosaur track, this is the first pterosaur track discovered along the Front Range!

This pterosaur track with narrow claw marks and a fully-developed smooth trace of a web between the claws, was found in an old clay pit at the top of the Van Bibber Shale unit, near the iguanodontid tracks discovered by FODR member George Daggett about three years ago.

Pterosaurs were soaring reptiles that behaved much like modern pelicans. They swam and walked in the shallow water along the shore of the Western Interior Seaway, leaving their tracks in soft sediment. Other pterosaur tracks have been found in southeastern and western Colorado.

Pterosaurs lived from the Late Triassic until the end of the Cretaceous. They ranged in size from a specimen from Laioning Province, People’s Republic of China, that had a wing span of 25 centimeters (~10 inches) to *Hatzegopteryx* from Ro-

mania and *Quetzalcoatlus* from the Big Bend area of Texas, both of which had wing spans of approximately 33 to 36 feet (10 to 11 meters). Although often confused with and included in discussions of dinosaurs, pterosaurs were not “flying dinosaurs.” They were a distinct group of diverse flying and soaring reptiles that lived during the Mesozoic.



Above: Hawk’s Nest Pterosaur Track, University of Colorado specimen CU-209.160. Photo by Beth Simmons



Left: Pterosaur in FODR Trek Through Time exhibit. Photo by Joe Tempel

More information on pterosaurs is available in David Unwins book, *The Pterosaurs from Deep Time*. Published in 2006, this book is available for less than \$20. A 1991 book by Dr. Peter Wellnhofer, *The Illustrated Encyclopedia of Pterosaurs*, is also available for about \$16.

— BETH SIMMONS & LOU TAYLOR

RECENT ACTIVITIES

TWO NEW LIFE MEMBERS

Dr. Connie Knight and Lynn Yehle became Friends of Dinosaur Ridge Life Members during the past quarter.

Connie is an independent geologist with four degrees in geology and she possesses a life-long love of education. She has been aware of the *Friends of Dinosaur Ridge* since its inception, and credits Betty Rall for cooperation and communication between her science education projects and Betty's Dinosaur Ridge projects in the late 1980s and early 1990s. Connie generates and sells her own oil and gas exploration prospects, and humorously refers to herself as a huckster. In addition to her economic ventures, Connie serves the American Association of Petroleum Geologists (AAPG) and the Rocky Mountain Association of Geologists (RMAG) in various ways. She is currently the chief editor of a soon-to-be-published joint AAPG/RMAG CD volume titled *The Application of Structural Methods to Rocky Mountain Hydrocarbon Exploration and Development*.

Connie has the utmost respect for the many scientists who serve our public by working and volunteering at Dinosaur Ridge. Her favorite site for Dinosaur Discovery Days is the Denver Basin Overlook. "The Denver Basin is where I drilled my first discovery well in the 1970's while I was working for Amoco Production Company!" Connie decided to become a life member because she believes in giving back, and she wants to support the projects here.



Lynn Yehle became a Life Member after being an individual member for many years. He thinks of his Life Membership as a donation in memory of his wife Fran. Lynn hopes that the Friends will do well.

— CLARE MARSHALL

DDD - REPTILE DAY, JULY 14

The Dinosaur Discovery Day dedicated to reptiles drew an estimated 700 visitors to Dinosaur Ridge despite the very warm (97°F) day. **Mr. Bones** made an appearance and there were displays from **Canyon Critters**, the **Denver Zoo**, the **Morrison Natural History Museum**, and **Wild Wings**. Children sifted through sand to find small fossils, panned for gold, and painted champsosaur footprints, Judy Peterson showed the crocodile skull she created for the Arthur Lakes video and her original drawings of dinosaurs, and the live birds and reptiles thrilled many visitors.



Top: Wild Wings Environmental Education's great horned owl shows how hot the day was by panting to keep cool.

Right: Volunteer Robert Seavey took a break to pet a snake.

Photos by Clare Marshall

CARTOSAURUS TOPPED BY A STEGOSAURUS

The FODR electric cart, Cartosaurus, sports a new look. Brent Norris, a former FODR volunteer, crafted a creative new sculpture for the roof, a skeleton of *Stegosaurus*, the Colorado State Fossil.

Marilyn Curtis took the accompanying photo of the newly decorated Cartosaurus in action.



COMMITTEE REPORTS

FODR GIFT SHOP

We continue to surpass previous years' sales, month after month. I am constantly looking for new products that will complement our inventory and move quickly off the shelves. With our limited space, we need products that sell rapidly. If an item doesn't move fast enough, I don't reorder it.

Consequently visitors can always find new items that they haven't seen before. Some of our new items are the quite beautiful Whistle Creek walking sticks, a large supply of plush dinos in many colors, prairie dogs, dino cookies that passed our taste test, and, as usual, a wide variety of mineral and fossil specimens. We also have some beautiful faceted stones that beg for a new owner. These are at a price you cannot match in any jewelry store.

In addition we have *Velociraptor* and a saber tooth cat skull reproductions and a *Stegosaurus* plate reproduction. We also have a wide variety of fossil specimens and many beautiful butterflies from Peru, Indonesia, and Madagascar. This is but a small sampling of what is available in the FODR Gift Shop.

We have added staff to decrease the wait time for those customers waiting to check out and this seems to be working fine. It even allow us a few moments during the day to restock the shelves.

Come visit us and know that if would like to volunteer in the Gift Shop and explain different items to prospective customers, we can quickly bring you up to speed on details.

— ROGER BENNETT

PRESERVATION COMMITTEE

Curation Sub-committee

Recent donations from Dr. Martin Lockley and the University of Colorado Denver Tracks Museum are great additions to the FODR collections and many of the specimens went directly to the *Trek Through Time* exhibit. Perhaps the most notable addition is a cast of a *Brachiosaurus* skull. Visitors were immediately drawn to this cast of a skull from Tendaguru in Tanzania. The other specimen that changed the look of our displays is a model of a juvenile *Camarasaurus*. Visitors can look up to see the head of this model as soon as they enter the Exhibit Hall.

The donation included a cast of a *Tyrannosaurus rex* foot. Plans are to use this specimen for education and outreach. Kids will fall in love with this giant specimen. Also included in Martin's donation was a large theropod footprint cast in bronze.



FODR has been given two sets of fossils from the John Hanley Memorial Collection. Each set contains about 80 fossils from Hanley's personal collections or from his friends who assembled the educational kits. Hanley was a U.S. Geological Survey geologist. FODR curator Dr. Lou Taylor has refurbished both sets and is in the process of updating the manual that accompanies them. Once completed these educational kits will be ready for volunteers to take to schools or use for education and outreach programs at Dinosaur Ridge.



The addition of the UCD Denver specimens and the fossils in the Hanley Memorial Collection brings the total of specimens catalogues in the FODR collection to over 550 specimens. It continues to grow in both quantity and quality.

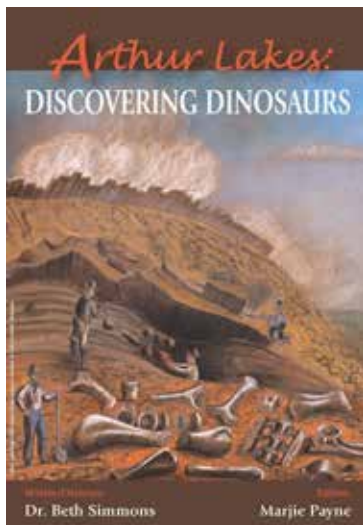
— LOU TAYLOR

COMMITTEE REPORTS

RESEARCH & PUBLICATIONS COMMITTEE

Publications Sub-committee

Great news about two new items from the publications committee!



Arthur Lakes: Discovering Dinosaurs, a 60-minute video documentary, is now on the shelf at the Dinosaur Ridge Gift Shop for sale at \$19.95. Created over the past year and a half, the production reenacts the discoveries of dinosaur bones in Golden and Morrison. Following a script based on Lakes' and other collectors' letters to O.C. Marsh, Lakes' journals, and historic newspaper accounts, **John**

Townrow, FODR's resident "Brit," related the dinosaur discovery story as told from Arthur Lakes' viewpoint. **Dr. Martin Lockley** introduces the movie and ends it with a great promotion for Dinosaur Ridge. Wendy Wham narrated the "present-day" comments and statements. Other historic voices included **Doug Rouse** and **John Ghist**, playing the roles of E.L. Berthoud and Henry C. Beckwith. **Fred Olsen** portrayed Professor Benjamin Mudge and told many stories about the discoveries.

"Talking heads" brought the production to the present day: **Dr. Bruce Geller** told of Lakes' role at the Colorado School of Mines; **Dr. Robert Bakker** related Lakes' attention to detail and correct stratigraphy; **Nick Drew** from the Yale Peabody Museum of Natural History told of discovering *Camarasaurus* teeth in the rocks from Morrison; **Dr. Kenneth Carpenter**, Director of The Prehistoric Museum at Utah State University-Eastern, discussed Marsh's interpretation of *Diplodocus* teeth.

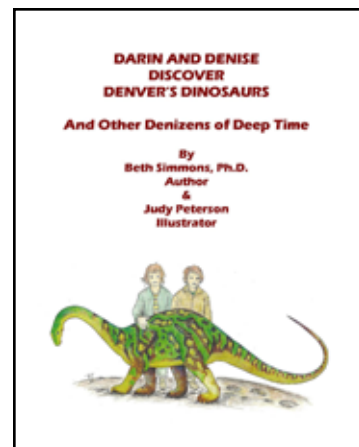
The cast and crew viewed the production many times over the past three months, before the penultimate version went to reviewers **Dan Brinkman** of Yale, **Mike Kohl**, co-editor

of *Discovering Dinosaurs in the Old West*, and Dr. Kenneth Carpenter. Forty FODR staff members, volunteers, and board members attended a July 10th screening at the Sunrise/Sunset Restaurant on Wadsworth. They came away awestruck at the fantastic production!

The premier held at Red Rocks Theater Room on Sunday afternoon, August 12th, at 12:30 included the presentation of certificates of appreciation to those who offered use of facilities and photographs plus the grand "ARTY" Awards for cast and crew members. Many thanks to all who carried off the production, especially editor Marjorie Payne, who tackled a job no one else would think of doing!

Get your copy soon! And regale in the newest presentation of that wonderful story you thought you knew well.

Another publication, *Darin and Denise Discover Denver's Dinosaurs and Other Denizens of Deep Time*, written by Dr. Beth Simmons and illustrated by Judy Peterson, came off the press at the end of June. This delightful story depicts a pair of twins, the "Dynamic Dinosaur Detectives" in their visit to Dinosaur Ridge and Triceratops Trail, escorted by the dapper docent, Dan, from Dinosaur Ridge. Available for \$8.95, this wonderful little book would make a great Christmas present for children and grandchildren!



— BETH SIMMONS

Research Sub-committee

Dr. Nora Noffke asked for our support on an NSF grant application. Dr. Martin Lockley is following up with her request. Dr. Noffke's graduate student who has been working on the Dinosaur Ridge project has elected to take her oral examination rather than write a thesis. Perhaps we can persuade her to provide a summary of her research.

— BETH SIMMONS

COMMITTEE REPORTS

Education Committee

Students from schools around the Denver metro area broke all records in May 2012 with 3,700 students learning about the unique fossils and rocks found at Dinosaur Ridge. Not only did the students apply their classroom learning to the rocks and fossils at the Ridge but they learned about protecting these resources for future generations.

During June, the first summer camp for the season for students in grades 3-5 was held at the Ridge. The camp was successful and many of the budding scientists have asked about a second camp for next summer. **Erin Fair** and **Amber Cain**, the camp instructors,

will be looking into offering two different camps in the future. In the accompanying photograph by Amber Cain, summer camp participants are collecting rocks offsite for their rock formation kits. In addition to young campers, Dinosaur Ridge hosted 25 teachers who learned about the Ridge through Colorado School of Mines classes in 2012.

— MARSHA BARBER



Marketing Committee

FODR had one of its best quarters of free exposure on local broadcast media:

Program	Station	FODR Rep.	Date	Duration
Explore Colorado	Fox31 TV	Erin Fair	04/12/2012	8 min.
	KLOVE Radio	Joe Tempel	04/29/2012	30 min.
Colorado & Co.	Channel 9	Erin Fair	04/30/2012	5 min.
Palabras	1150AM	Erin Fair	05/18/2012	1 hour - Spanish
Radio ads	KOSI	CRRM partner	Prior to 05/19	1 min., repeated
Palabras	1150AM	Erin Fair	06/08/2012	1 hour - Spanish

FODR educator **Merlin Barnes** represented FODR at several events in the second quarter, just prior to the summer busy season. Outstanding contact with the public was made at:

Event	Location	Dates	Assisted by
Discover the Dinosaurs	Merchandise Mart	05/4-6, 05/11-13	Cindy Barnes, Erin Fair
People's Fair	Denver downtown	06/2-3	Cindy Barnes
Parker Days Festival	Parker	06/8-10	Cindy Barnes, Sam Bartlett

Roughly 800 brochures were distributed on all four of the above weekends. Merlin was also at Earth Day in Evergreen on 4/21, Dinosaur Express at the Colorado Railroad Museum on 5/19, and the St. Peter and St. Paul Summer Festival in Wheatridge on 6/23-24. **Erin Fair** took a display to Elitch's on 05/10 and 05/23-25 and **Tom Moglestad** manned a booth at Earth Day at Bear Creek Lake Park on 05/05.

on 1150AM listed above and taped a 30-second TV ad that is being edited to include the track site. Telemundo may tape a short story for national distribution. The accompanying graphic is the design for a billboard Dsound placed on Colorado Boulevard.

—TOM MOKLESTAD

FODR contracted with an ad agency, Dsound, that specializes in Hispanic media. To date more than 20,000 flyers have been handed out and 1,000 posters have been placed in Hispanic businesses. The agency arranged the interviews



COMMITTEE REPORTS

VOLUNTEER AND MEMBERSHIP COMMITTEE

Volunteer Sub-committee

School tours are over and now we have a lot of summer programs for visitor tours. In spite of the heat, people keep coming to visit our exhibit hall and the rest of the Visitor Center, so thanks for the volunteers who have kept this going.

On June 14, **John Townrow** led a Volunteer Appreciation tour up to the Ridge to talk about Colorado environments. About a dozen people attended.

As an aside, I have been monitoring the shuttle bus drivers to insure that we are providing a good and consistent message. We're doing a pretty good job, but Bobbi and I made a few suggestions. I believe that monitoring talks is something that we should also be doing with all of the volunteers, as time permits, to make sure we're all on the same page.

— KERMIT SHIELDS

Membership Sub-committee

2 new life members

2 new Individual members, one from long time friend, other is unknown \$50

3 Family memberships, 2 new and 1 renewed \$120

Total: \$1170

First half 2012 summary:

9 Paid life members

Connie Knight (2012), Lynn and Fran Yehle (2012), Martin Lockley (2011), Keith Meakins (2011), Leroy Shaser (2011), Bruzy Wyre (2011), Marjorie MacLachlan (2010), Robert and Aliene Munger (2010), Kermit Shields (2010)

High Level Members:

Richard Flint, Judy Peterson, Herbert and Libby Gregor

Sponsor Level Members: (\$100 level) - 14 people, 2 of which are new

Family Level Members: (\$40 level) 29 families, 14 new members, 15 renewals

Individual Level Members: (\$25 level) 23 families, 4 new and 19 renewals

Junior Level: (\$10) 3 members, 1 new and 2 renewals

Summary: 76 members with active payments for first half of 2012. This does not include the 68 new Groupon members (from the second deal) nor the 43 members from the ColoradoScience Teachers Association (CAST).

Last Autumn 179 members joined with a Groupon Deal. We want these members to renew (one already has) and we are planning a strategy to make this happen. We will not stop sending them *E-Tracks* until after the August showing of the Lakes DVD at Red Rocks, but will likely stop sending them *E-tracks* after that.

— KERMIT SHIELDS

COMMITTEE REPORTS

FINANCE COMMITTEE

Fundraising Subcommittee

Summary of Grants and Donations June 1st through July 1st

Grants and Donations Received, promised or pending: (\$ 89,883)

Subaru — \$5,000 for the Turner Field Experience Fund. We received communications in May that the local Subaru group is recommending to the national group that we receive full funding.

Scientific and Cultural Facilities District (SCFD) — Recommendations (\$83,203) for our grant requests were received, and the total is a little less than what we received last year. The largest percent change is from Jefferson County, which funded us at 88% of our request last year but only 68% of our request this year. The reasons for the decrease were that JeffCo received 15% less money as it did last year, and there more requests from Tier III applicants this year.

Adams County — Requested \$15,860 for tours, recommended \$12,688, pending

Adams County — Requested \$1360 for guidebooks, recommended \$1,088, pending

Arapahoe County — Requested \$18,900 for tours, recommended \$17,615, pending

Arapahoe County — Requested \$810 for phone app, recommended \$750, pending

Arapahoe County — Requested \$1,620 for guidebooks, recommended \$1,085, pending

Broomfield — Requested \$3,200 for tours, recommended \$3,200, pending

Douglas County — Requested \$20,050 for tours, recommended \$15,000, pending

Jefferson County — Requested \$50,980 for general operating costs, recommended \$34,700, pending

Xcel — \$1,000 for September DDD.

Colorado School of Mines — Drs. Norb Cygan and Pete Modreski's class for teachers: \$680

Grants Pending (requested and in review, alphabetical): \$ 31,000

Shell Oil — \$10,000, submitted 4/26/12

Sprint — Request submitted 5/17/12 for Turner Field Experience Fund

Staples — \$5,000 for Turner Field Experience Fund

Starbucks — \$1,000 for Dinosaur Discovery Day - Geocaching Day (submitted to store 5/25/12)

Toomey Foundation — a letter of request mailed on 5/30/12 for \$5,000 for Turner Field Experience Program Funds

US Bancorp, Request for \$5,000 for Turner Field Experience Program fund, submitted 6/1/2012

Wildlife Cookie Company — Requested \$5,000 for Turner Field Experience Fund on 5/27/12

Wildland Restoration Volunteers — In-kind donation for constructing ramp/stairway in channel to see crocodile and dinosaur tracks

—CLARE MARSHALL AND JOE TEMPEL

ARTICLES

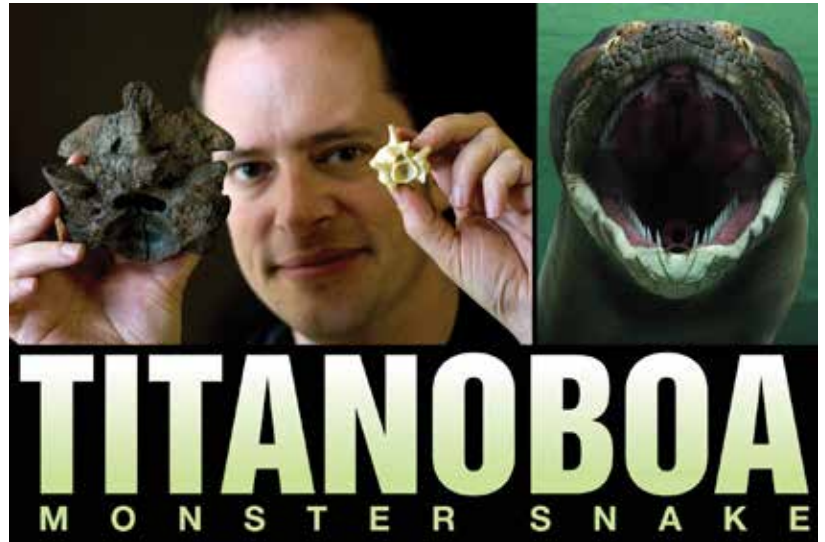
THE BEAST IN A SOUTH AMERICAN GARDEN

If you thought the dinosaurs were scary, think of a one and a quarter ton, nearly 50 foot long, three foot wide carnivorous snake slithering toward you along your garden path.

During exploration that began in 2002, a team of scientists discovered the fossil remains of such monsters while working in an open-pit coal mine in La Guajira, Columbia. *Titanoboa cerrejonensis*, the largest snake ever discovered and thought to be related to modern boa constrictors, lived around 60 million years ago, long after the extinction of the dinosaurs.

We hope that you will join us at Rock Out for the Ridge on November 2, when our guest speaker will be Dr. Jason Head of the University of Nebraska, one of the world's foremost experts on ancient snakes and a member of the team of scientists that made this discovery of a lifetime.

Think of a *T. rex* without legs! *Titanoboa* was featured in the April 2012 issue of *Smithsonian* magazine.



University of Nebraska-Lincoln Assistant Professor Dr. Jason Head holding the vertebrae of Titanoboa (left) with one from a modern anaconda.

Photo from UNL press release.

— KAREN EBERHARDT

A CRETACEOUS TRACKSITE ON SKYLINE DRIVE IN CAÑON CITY, COLORADO

Cañon City is the home of the world-renowned Garden Park dinosaur quarries discovered in 1877. Garden Park vies with Dinosaur Ridge for the honor of being the first large dinosaur bone discovery in the west. The two Garden Park quarries, within a mile of each other, were once occupied by both O. C. Marsh and E. D. Cope's bone collectors without the very serious confrontations made famous during the Bone Wars.

Although rarely visited today, except by paleontologists from the Denver Museum of Nature & Science (DMNS), the Garden Park area continues to produce dinosaur bones. A nearly complete *Stegosaurus* skeleton was removed as recently as 1992. Replicas of this excellent skeleton can be seen on the prominent wall of the Dinosaur Depot museum in Cañon

City, on a wall in the prep lab at the DMNS, and in the University of Colorado Boulder geology building. The original skeleton is now stored in the DMNS paleontology collection.

Also, the *Stegosaurus* displayed in the DMNS Prehistoric Journey exhibit came from the same arroyo in Garden Park as did the 1992 specimen.

In addition to the Garden Park site, Cañon City is also home to a lesser-known fossil locality, a dinosaur tracksite on Skyline Drive along the hogback northeast of town. This Cretaceous tracksite is on the south side of the hogback, near the juncture of the hogback and the Front Range. Construction of Skyline Drive began in October 1905, with labor furnished

Continued on next page

ARTICLES

Continued from previous page



Stegosaurus collected from Garden Park in 1992, displayed at Dinosaur Depot museum. Photo composite: Lou Taylor

by 60 prisoners supplied by Warden Gleghorn of the state prison situated below the hogback. It was financed by money raised by D. E. Gibson, a prominent Cañon City citizen. Upon completion of the road there was much controversy about naming it. The citizens of Cañon City refused to have any name associated with the word “hog” so a compromise resulted in the name Skyline Drive.

The Skyline Drive tracksite may have been first discovered by a local high school science teacher in the early 1950s, but he is said to have sworn his students to secrecy lest the tracks be stolen. Nothing more was heard of this tracksite until early 2000 when William Kurts, a paleontology student at the University of Colorado rediscovered the site. Since the type of dinosaur track appeared to be unknown, Kurtz was able to name it *Nodosauripes canonensis*, meaning footprint of a nodosaur in Cañon City. Abundant plant fossils are also found within the area of the tracks above, below, and among the tracks.

Nodosaurids were a family of ankylosaurs, armored, quadrupedal, herbivorous dinosaurs that lived from the late Jurassic to the Late Cretaceous in North America, Asia, Antarctica and Europe. Nodosaurs, like other ankylosaurs, were medium- to large-sized armored dinosaurs that ranged up to 25 feet in length, and weighed as much as four tons. They were first named by O. C. Marsh in 1890. The age of the tracks on Skyline Drive is estimated at 105 Ma.

Along with the nodosaur tracks with distinctly different front and rear tracks, a second type of track belonging to a small theropod is present in the Skyline Drive locality. The trackways appear to be linear and parallel to the edge of the slope. This configuration gives the false appearance of a single trackway. However the site is composed of different size tracks of individuals likely traveling in the same direction.

Many of the tracks are poorly defined bulges, but some do exhibit very good toe representations. Overall the tracks are similar to the indistinct *Triceratops* tracks at *Triceratops* Trail; none are nearly perfect tracks. There are as many as 70 tracks visible, with more unexposed down dip, beneath the slope. In some cases both the front and back prints in the same step can be seen.



Overview of the tracksite on Skyline Drive.

Photo: Sam Bartlett

Continued on next page

ARTICLES

Continued from previous page

The crew of the local Dinosaur Depot museum has done a good job of enhancing the tracks by excavating the lower shale bed to expose more tracks in a linear pattern. They had to stop the process as the matrix got harder and it became too difficult to distinguish the tracks from the surrounding sandstone.

Geologically the hogback on Skyline Drive is similar to the Dinosaur Ridge Hogback. The Dakota Group at this portion of the hogback strikes N15-20° E and dips 45° to the southeast. The hogback is sustained by the Cretaceous sandstone of the Dakota Group and overlies the Jurassic Morrison Formation. The Dakota Group appears to be foreshortened along and is only 40 to 60 feet (12 to 18 m) thick in this area, making it is hard to tell in exactly which unit the tracks actually lie. There are shale beds above and below the tracks suggesting that the tracks are in the equivalent of the Lytle Formation. If so, the equivalent of the South Platte would be only a few feet thick at this locality.



Set of Tracks at Tracksite on Skyline Drive

Photo: Sam Bartlett

The tracks are approximately 15 feet (4.6 m) above what I picked to be the base of the Dakota Group. This zone is characterized by cross-bedded sandstone with beds of coarse grained sandstone and conglomerate and with alternat-

ing thin beds of shale or mudstone. Red-maroon sandstone stringers are evident, possibly derived from the underlying Morrison Formation. The tracks apparently were created in a fluvial environment. This was a distinctly terrestrial environment, not the beach environment that would be expected so close to the contact with the Benton Formation equivalent.

The tracks are actually sandstone casts that hang off the underside of a single thick sandstone bed. Below the tracks is an approximately 2 feet (0.6 m) thick shale/mudstone bed on which the tracks were originally imprinted. The original tracks were destroyed as the shale/mudstone bed was eroded. Also, much of this lower shale/mudstone bed has been removed by the Dinosaur Depot volunteers as they strived to uncover the nodosaur tracks. The original tracks probably could not have been recovered due to the consistency and friability of the lower shale/mudstone bed. Individual tracks range in size from 9 x 9 inches to 9 x 14 inches, up to 18 x 18 inches (23 x 23 centimeters to 23 x 35.5 centimeters, up to 46.7 x 46.7 centimeters).

Abundant fossil vegetation consisting of cypress and palm logs is present above and below the track layer as well as within the immediate track layer. In addition, there are numerous small iron-rich concretions within the track-bearing sandstone bed. The depositional environment appears to be very much like that of the sandstones of *Triceratops* Trail with abundant vegetation, but with much higher stream energy.

No attempt has been made to preserve the tracks. Unlike the tracks at Dinosaur Ridge, these tracks are casts hanging on the underside of a thick sandstone bed. The tracksite is in no immediate danger, but one track has fallen from the upper sandstone surface. This track is now protected at Dinosaur Depot. At one time a fence was constructed around the tracksite but it was vandalized shortly thereafter and has not been replaced.

Being on the underside of a steeply dipping overhang has protected them from the severest of weather conditions. The

Continued on next page

ARTICLES

Continued from previous page

overhang protects the tracks from direct snow and rainfall contact. The only direct snow/rain fall that can possibly wet the tracks must come from a very low angle, driven by a very intense east wind which is not the prevailing wind direction. The only direct contact with flowing water would be from rain water flowing down the steep face of the hogback and dripping under and along the steeply dipping bedding contact containing the tracks. This does not appear to have happened recently, and would likely affect only a small number of tracks at a time.

The thickness of the rock and the number of bedding planes above the track layer, along with the steep adverse dip of the rock also protect the tracks from direct contact with groundwater. Any groundwater that could come in contact with the tracks must seep through many bedding discontinuities including several impervious shale beds. In addition to preventing groundwater contact in the vertical direction, the dip of the bedding planes forces the groundwater to flow down-dip into the rock.

All of these conditions, lack of direct contact with groundwater, the lack of direct snow/rain water contact and the primary dip of the various strata, further prevent the buildup of groundwater within the tracks. This in turn reduces the susceptibility to detrimental freeze/thaw conditions. However, there is still some remote possibility of wetting the tracks which may then be subjected to freeze/thaw, increasing the potential for them to “pop off” the overlying bedding plane.

The high angle of bedding does increase the effects of gravity. Along with the potential formation of a fracture at the track-bedding contact, gravity will eventually lead to the long term destruction of the tracks. Little can be done to protect the tracks from this mode of failure, witnessed by the track has already succumbed to the effects of gravity.

In conclusion, the dinosaur tracks on the hogback along Skyline drive within the Cañon City limits are well protected from the weather and the effects of flowing groundwater and should not fail for a long time. Gravity appears to have the largest potential to destabilize the tracks over very long periods of time. This tracksite is in a favorable preservation condition and has a great potential to outlast the majority of tracksites that we have observed along the Front Range.

Dinosaur Depot, a museum in downtown Cañon City, is operated by of a group of dedicated dinosaur devotees, much like the Friends of Dinosaur Ridge. In addition to the nearly complete *Stegosaurus* skeleton, Dinosaur Depot contains a complete fossil preparation lab and an abundance of fossils and related displays. Jon Stone, the Executive Director, was kind enough to guide me around the tracksite on Skyline Drive and I am sure that all of the staff and volunteers are equally enthusiastic and helpful. I was very impressed with Dinosaur Depot and encourage our members to visit this museum when in the area. Just the magnificent *Stegosaurus* skeleton is worth a special trip. Perhaps FODR can partner with Dinosaur Depot in the near future to share knowledge and even exhibits.

References:

Fredericks, A.D. 2012. Walking with Dinosaurs, Rediscovering Colorado's Prehistoric Beasts. Johnson Books, a Big Earth Publishing company, Boulder, CO.

Lemons, J. 2000. Discovery the thrill of a lifetime. Daily Record. April 1-2, 2000:1.

— SAM BARTLETT

ARTICLES

THE OLD *SQUALICORAX* AND THE SEA, AND OTHER ANIMALS OF THE BENTON SHALE

A long time ago, in a sea far away, lived a shark. It was not a huge shark at 7 feet (2.1 meters) in length (Everhart, 2005), but it had 13 rows of teeth (Shimada & Cicimurri, 2006). With such an abundance of teeth this shark could eat anything that it wanted, as long it was dead, for it is thought to have been a scavenger shark. On the menu for this animal were fish, other sharks, mosasaurs, plesiosaurs, and other creatures of the Cretaceous Sea. So what is this shark that swam around in the Cretaceous Seaway and became fossilized in what would later be known as the Benton Shale at Dinosaur Ridge? Its scientific name is *Squalicorax falcatus*, but it is commonly known as a crow shark (Everhart, 2005). It was similar to *Galeocerdo cuvier*, the modern day tiger shark (Shimada, 2006). *Squalicorax* did not live alone, but with other animals such as sharks, fish, elasmosaurs, polycotyliids, mosasaurs, and ammonites. *Squalicorax* was not the only fish in the Western Interior Sea; it was one of many who lived vibrant lives during the Turonian Age, some 92 Million years ago (Everhart 2005).



Model of *Squalicorax* (www.wikipedia.com)

The *Squalicorax* is considered to be homoplasious with the modern tiger shark. This means they share the same way of life. They share the characteristics of being opportunistic scavengers with similar teeth, and body forms (Shimada & Cicimurri, 2006). What did *Squalicorax* eat? Everhart (2005) described how the shark *Cretoxyrhina* attacked a mosasaur, leaving its teeth embedded along the reptile's vertebra, but he also found bite marks along the ribs that show long, deep, ripping bites from a *Squalicorax falcatus*. Even though Everhart (2005) notes that the mosasaur was dead

before the incident, it is rare that such interaction occurs between three animals in the fossil record. *Squalicorax falcatus* also ate turtles, mosasaur paddles, and fish such as *Ichthyodectes ctenodon*., as indicated by the fossilized stomach contents of one specimen.

There were other sharks in the sea at the time, such as *Ptychodus anonymous* (Everhart, 2005) and *Ptychodus whipplei* (Sealey et al., 2006). These are called crusher sharks because they had domed conical teeth used for crushing clam shells. They swam along the



Squalicorax tooth. Scale in mm. Photo: Sharon Milito

sea bottom, scooped up mud that contained small clams, and bit down on the clams to get to the meat. For example, a five inch wide fossil clam named *Inoceramus tenuis* contains depressions on its shell that some paleontologists believe resulted from being bitten by a *Ptychodus decurrens*. Sharks with crushing teeth did not crush shells, but they did not go after larger clams like the 20 inch wide *Volviceramus grandis*, they instead preferred baby clams. Paleontologists find calcite prisms of small inoceramid shells, which they interpret as ptychodontid shark coprolites or vomit (Everhart, 2005).

One other fish in the Cretaceous Sea was *Xiphactinus audax*, famous for how it died. This 13 to 17 feet (4 to 5 meters) long (Shimada, 2006; Everhart, 2005) creature ate fish, specifically, *Gillicus arcuatus*. One day, while a *Xiphactinus* was swimming, it must have caught sight of a *Gillicus*, and charged and swallowed it. While the *Gillicus* was being swallowed, its tail may have fatally punctured the heart of the *Xiphactinus*. The *Xiphactinus* must have died shortly after swallowing the *Gillicus* because it did not have time to digest its meal. The great fish sank to the seafloor where it became fossilized along with its meal, the *Gillicus* (Everhart, 2005). There have been 18

Continued on next page

ARTICLES

Continued from previous page



Xiphactinus with *Gillicus* stomach contents (Specimen DMNH 1667) Photo: Merlin Barnes

relatively complete specimens of *Xiphactinus* found, three with stomach contents containing *Gillicus*. One such specimen (DMNH 1667) is on display at the Denver Museum of Nature & Science (Everhart, 2005). Elasmosaurs such as *Thalassomedon haningtoni*, lived in the sea with *Squalicorax*. Elasmosaurs had peculiar feeding habits because, even though they grew to be about 40 feet (12 meters) long, their heads were only about 20 inches long. This means that they could not eat anything longer than about 18 inches, such as the small fish *Enchodus*. Once an elasmosaur captured its prey, it swallowed the meal whole because its teeth and interlocking jaws were good for trapping prey, but not good for tearing away flesh. Elasmosaurs may also have used their stereoscopic eyes, situated directly above their skulls, to find small prey when attacking from below. Their brains were very well adapted for equilibrium and muscular control that allowed them to control their huge bodies during their hunt. Also, they may have used their paddles as hydrofoils, using lift like that used by an airplane. This would have been more efficient than pushing or rowing, given their large size. A specimen of *Thalassomedon* (DMNH 1588) is on display at the Denver Museum of Nature & Science. Another (UNSM 50132) is on display at the Nebraska State Museum (Everhart, 2005).

There is no question that *Thalassomedon* ate fish, but there are other things found in their stomachs. *Thalassomedon*

specimen UNSM 50132 had about 80 gastroliths in its stomach (Everhart, 2009), but there is debate on how these were used. Thompson et al. (2007) wrote that elasmosaurs probably used stones for digestion, similar to how dinosaurs, birds, and seals use gastroliths. However, some elasmosaur stomach contents include uncrushed bones, shells, and other remains that may indicate that gastroliths were not solely used for digestion. Gastroliths may have been used for ballast, keeping the elasmosaur's neck from tipping over its body. Stones kept around the pectoral girdle and/or lung area may have helped it to keep its balance, and may have been helpful when sneaking up on prey fish. Even though some individual gastroliths are quite massive, one weighing three pounds (1.4 kilograms), the usual total weight of gastroliths is about 29 pounds (13 kilograms). When compared to total weight of about 7.25 tons (6,577 kilograms), the use of the gastroliths for ballast may not have been very effective (Thompson et al., 2007). Everhart (2005) still argues for the gastropods being used in digestion because all the stones are found with markings that would indicate that they were ground against each in the stomach. The study of the gastroliths within *Thalassomedon* remains fascinating and unresolved.

Thalassomedon is considered an elasmosaur, but is included within a larger taxonomic group called plesiosaurs. An example of this group are the polycotyliids *Trinacromerum bentonimum* (Everhart, 2005) and *Pahasapasaurus haasi* (Schumacher, 2007). These animals are characterized by having small bodies, small necks, and large heads. Similar to *Thalassomedon*, they had a condition called hyperphalangy, meaning they had several toe and finger bones that presumably allowed them to swim fast (Everhart, 2005; Schumacher, 2007).

Thalassomedon was slowly dying out during the Turonian, and its ecological niche was being filled by polycotyliids, which preyed upon small fish. Polycotyliids are found in limestone and chalk that indicate they lived in shallow water where their preferred food was abundant (Everhart, 2005). *Pahasapasaurus* was found with gastroliths within its body, but the gastropods are smaller than those generally found with elasmosaur skeletons. Many recovered polycotyliid skeletons do not have gastropods, suggesting to Schumacher

Continued on next page

ARTICLES

Continued from previous page

(2007) that they were not needed by them for digestion or buoyancy.

During the time of *Squalicorax* there was fierce competition among predators, with the inevitable losers. The first losers were elasmosaurs such as the *Thalassomedon* because they were being outcompeted by polycotyliids such as *Trinacromerum bentonimum* and *Pahasapasaurus haasi*. However, the polycotyliids were also being outcompeted by really big fish such as *Xiphactinus*, leaving an ecological niche that was replaced by mosasaurs such as *Platecarpus* and *Clidastes* (Everhart, 2005).

Platecarpus means, “oar (paddle) wrist.” They were so named because their wrists are very flat and somewhat immovable. *Platecarpus* grew to reach a length of about 23 feet (7 meters). *Clidastes* means, “one who locks up,” because the bony process along its vertebrae restricts movement and bending of the backbones, making it a better swimmer. It grew to be about 16 feet (4.9 meters) long. Both of these animals’ bones closest to its head were very rigid, but their back and tail bones were broad laterally, which means most of their propulsion was by movement of their tails. They lacked the hyperphalangy of elasmosaurs and polycotyliids, but their phalanges may have been used for steering. Their teeth are cone-shaped, lacking serrations, and slightly recurved, with variable robustness. Also, their skulls are similar to snakes with a joint between the dentary and surangular (back half of lower jaw). This allows them to extend their mouths at varying degrees. They have two rows of teeth on their pterygoids (bones of the roof of the mouth), probably used to pull prey down their throats. *Platecarpus* probably fed on squids and cephalopods, while *Clidastes* fed on fish and other smaller animals (Everhart, 2005). An impression of a *Platecarpus* dentary containing 12 teeth was found in a concretion in New Mexico. Along with the concretion, there was an oyster, *Lopha bellaplicata*, and a clam, *Inoceramus* (Spielmann & Lucas, 2006). This association may offer evidence about what *Platecarpus* may have eaten.

Last, but not least, *Squalicorax* existed with the common invertebrates known as ammonites. There were several

ammonites living during the Turonian: *Prionocyclus wyomingensis*, *P. macombi*, *P. hyatti*, *P. novimexicanus*, *Collignonicerias woldgari*, *Scaphites whitfieldi*, *S. warreni*, and *Coilopoceras colleti* (Ammonites, 2012; Sealey et al., 2006). When ammonites were in their larval stage they fed on primary consumers like protozoans. As adults they fed on tiny fish that, in turn, fed on primary consumers. Ammonites may also have fed on slightly larger fish as well. The well-fed ammonites themselves became prey for sharks, plesiosaurs, and mosasaurs (Everhart, 2005). In New Mexico an isolated mosasaur tooth was found with *Prionocyclus macombi* and *Coilopoceras colleti* (Spielmann & Lucas, 2006). This may



Platecarpus skull from DMNS

Photo: Merlin Barnes

represent a possible scenario of a mosasaur feeding on ammonites.

Even though *Squalicorax* lived with many other organisms in the Turonian aged Western Interior Sea, those included here do not provide an exhaustive list. There were several others that lived at this time, organisms such as algae, rudists, clams, squids, bony fish, sharks, turtles, and plesiosaurs. In the end, the sand and mud once beneath the algae and animals buried them and later became lithified as that today is known as the Benton Shale. *Squalicorax* teeth are found throughout the western U.S. Importantly, they are

Continued on next page

ARTICLES

Continued from previous page

also found on Dinosaur Ridge, making this animal one that can live forever in the minds and hearts of children of all ages who visit Dinosaur Ridge to learn about the ancient seas.

References:

Ammonites. Geological Museum: University of Wyoming Department of Geology & Geophysics. Laramie, WY 82071.

Everhart, M.J. 2005. Oceans of Kansas: A natural history of the Western Interior Sea. Indiana University Press, Bloomington, IN.

Everhart, M.J. <http://www.oceansofkansas.com/longneck.html>

Sealey, P.L., S.G. Lucas, J.A. Spielmann, and S.C. Williams. 2006. Upper Cretaceous (Turonian) ammonites and selachians from the type area of the Juana Lopez Member of the Mancos Shale, Santa Fe County, New Mexico. *In* Lucas, S.G. and R.M. Sullivan (Eds.), Late Cretaceous Vertebrates from the Western Interior. New Mexico Museum of Natural History & Science Bull., 35:131-138.

Schumacher, B.A. 2007. A New polycotyloid plesiosaur (Reptilia; Sauropterygia) from the Greenhorn Limestone (Upper Cretaceous; lower Upper Cenomanian), Black Hills, South Dakota. *In* Martin, J.E. and D.C. Parris (Eds.), The Geology and Paleontology of the Late Cretaceous Marine Deposits of the Dakotas. Geological Society of America Spec. Pap., 427:133-146

Shimada, K. 2006. Marine vertebrates from the Blue Hill Shale Member of the Carlile Shale (Upper Cretaceous: Middle Turonian) in Kansas. *In* Lucas, S.G. and R.M. Sullivan (Eds.), Late Cretaceous Vertebrates from the Western Interior. New Mexico Museum of Natural History & Science Bull., 35:165-176.

Shimada, K. and D.J. Cicimurri. 2006. The Oldest Record of the Late Cretaceous anacoracid shark, *Squalicorax pristodontus* (Agassiz), from the Western Interior, with comments on *Squalicorax* phylogeny. *In* Lucas, S.G. and R.M. Sullivan (Eds.), Late Cretaceous Vertebrates from the Western Interior. New Mexico Museum of Natural History & Science Bull., 35:177-184.

Spielmann, J.A. and S.G. Lucas. 2006. Late Cretaceous marine reptiles (Mosasauridae and Plesiosauria) From New Mexico and their biostratigraphic distribution. *In* Lucas, S.G. and R.M. Sullivan (Eds.), Late Cretaceous Vertebrates from the Western Interior. New Mexico Museum of Natural History & Science Bull., 35, 217-222

Thomas, W.A., J.E. Martin, and M. Reguero. 2007. Comparison of gastroliths within *Plesiosaurus* (Elasmosauridae) from the Late Cretaceous marine deposits of Vega Island, Antarctic Peninsula, and the Missouri River area, South Dakota. *In* Martin, J.E. and D.C. Parris (Eds.). The geology and paleontology of the Late Cretaceous marine deposits of the Dakotas, Geological Society of America Spec. Pap., 427:133-146.

—MERLIN BARNES

FRIENDS OF DINOSAUR RIDGE SEEKS SPONSORS FOR DINOSAUR DISCOVERY DAYS

If you, anyone you know, or any institution or corporation you know would be willing to sponsor one or more Dinosaur Ridge Days, please contact Tom Moglestad at 303-697-3466 x 103.

ARTICLES

DINO-READING: BOOK REVIEW

Walking with Dinosaurs, Discovering Colorado's Prehistoric Beasts: Sites, Destinations, & Adventures by Anthony D. Fredericks (2012)

As I was completing the article on the dinosaur tracksite at Cañon City, I was looking around for an additional reference. I happened to be walking through the FODR Gift Shop when I noticed *Walking with Dinosaurs* and bought a copy for \$16., minus the membership discount. Gift Shop manager Roger Bennett is always picking up great items for the gift shop and his incredible dinosaur book selection is a great source for readers ranging from toddlers to adult experts.

Walking with Dinosaurs is not a technical book, but is intended more for the dinosaur tourist/explorer who is interested in visiting the various dinosaur sites in Colorado. Each chapter covers a different well-known dinosaur venue. At the start of each new site, Fredericks gives his overall description and thoughts of the venue, from a first time visitor's perspective. He provides explanations, descriptions, histories, and discusses the significance of the site. He then takes us on a walking tour of the site with a stop-by-stop explanation of the tour. His narrative is sprinkled liberally with personal anecdotes and curious facts about the stop. At the end of each chapter/site Fredericks presents some pertinent travel information such as directions, contact information, fees, amenities, hours and best visit times, access, difficulty rating, and a further short synopsis of the site.

Walking with Dinosaurs includes chapters on both Dinosaur Ridge and *Triceratops* Trail. At the beginning of each visit the author talks to one of the staff members, in this case FODR Program Director Tom Moklestad, to get the basic information on the site. Tom is described in the book as "A personable and easygoing man, Tom is as passionate about this site as he is about his responsibilities to the public." After getting the particulars from his guide, the author chooses to take a walking tour of the site, using the signage as reference. He describes each of the major stops as experienced from this self-guided walk. For his discussion of Dinosaur Ridge

it would have been better if Tom had accompanied him around the Ridge. There are several errors in Fredericks' descriptions.

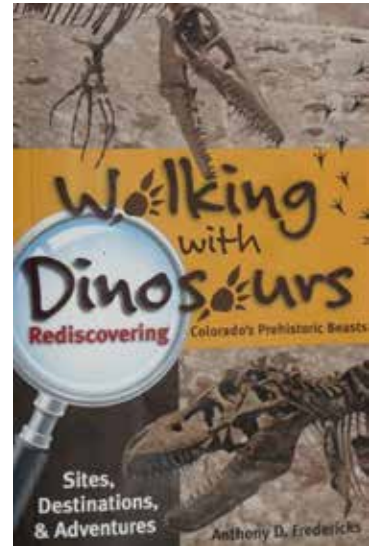
As a sign of thoroughness of Fredericks' on-site research, he discusses the bone wars, their protagonists and the first track discovery in 1937 by Harvey Markman of the (then) Denver Museum of Natural History.

In the final notes of the Dinosaur Ridge chapter, Fredericks describes the staff as "...friendly and care deeply about the exhibits and the people who visit them. They are ready to explain anything thing about the site or answer questions, and they'll even take your photograph next to the red, white and blue Stegosaurus that greets folks on their way into the visitor's center." I don't think we could have asked for a better description of the staff and volunteers; even if we had written it ourselves. Way to go FODR!

All in all, this is an excellent book for the novice paleontological explorer and probably could be used best by the grandparent or parent taking children on a tour of the various dinosaur sites in Colorado, as I have done with my grandchildren. In the future we will stuff a copy of *Walking with Dinosaurs* in the map pocket of our truck and use it to guide us on our family adventures.

This little jewel also points out the fact that FODR members need to periodically peruse the gift shop to review the new resources and continually find new books of interest and information.

— SAM BARTLETT



Friends of Dinosaur Ridge
16831 W Alameda Parkway
Morrison, CO 80465
Return Service Requested

NON-PROFIT
ORGANIZATION
U.S. POSTAGE
PERMIT NO. 36
MORRISON, CO

FRIENDS OF DINOSAUR RIDGE MEMBERSHIP LEVELS AND BENEFITS

Junior Membership -- \$10.00 -- Junior Paleontologist Activity Book, Kids' Page in *Ridge Report*

Individual Membership -- \$25.00 -- 10% discount in FODR gift Shop, *Ridge Report* and *E-Trax*

Family or Group Membership -- \$40.00 -- Individual benefits, Free bus tours, Free admission to *Trek Through Time* for up to four people per visit

Sponsor Membership -- \$100 - \$249 -- Family or Group benefits for up to ten people per visit, Recognition on a plaque in the exhibit hall

Tyrannosaurus Membership -- \$250 - \$499 -- Sponsor benefits, one ticket to the annual Rock Out for the Ridge fundraising dinner

Apatosaurus Sponsorship -- \$500 - \$999 -- Tyrannosaurus benefits, one additional ticket to the annual Rock Out for the Ridge fundraising dinner

Life Membership -- \$1000 -- All of the benefits above