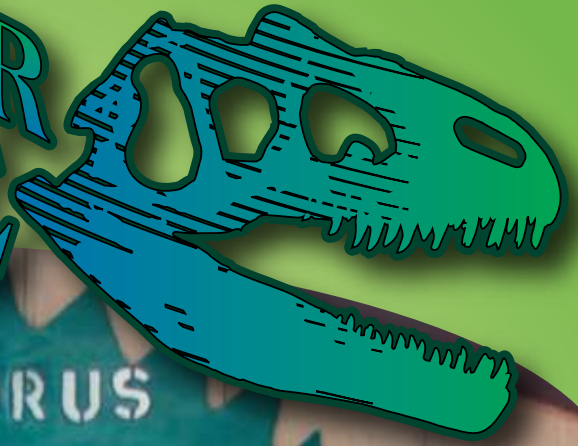


DINOSAUR RIDGE



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

The mission of the Friends of Dinosaur Ridge is to preserve the paleontologic, geologic and historic resources on Dinosaur Ridge, Triceratops Trail and the outlier sites in the Golden-Morrison Fossil Area 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)
- * Golden Civic Foundation
- * Dan & Mac Turner Estates
- * Xcel Energy Foundation
- *Western Interior Paleontological Society (WIPS)



**Scientific & Cultural
Facilities District**

Making It Possible.

Cover Photo: Scott Kilgore and Austin Pearson
man the Stegosaurus Snack Shack, open
May-September. Credit: Erin Fair.

FRIENDS OF DINOSAUR RIDGE 2010

Executive Committee:

President	Sam Bartlett	Bureau of Recl. (Ret.)
Vice-President	Kathleen McCoy	Lawyer
Secretary	Beth Simmons	MSCD Geo. Instructor
Treasurer	Keith Meakins	Accountant
Norb Cygan	Geologist	
Pete Martin	U.S. Bureau of Reclamation	

Board of Directors:

Marsha Barber	Science Coordinator Jeffco Schools (Ret.)
Chris Carroll	Colorado Geologic Survey
Tim Connors	National Park Service
Harald Drewes	Geologist (Ret.)
DuWayne Ebertowski	Trans. Planner (Ret.)
John Ghist	High School Earth Science Teacher
Jonna Gentry	High School Earth Science Teacher
Martin Lockley	University of Colorado, Denver (Ret.)
Marj MacLachlan	Geologist (Ret.)
Judy Peterson	Paleo Artist
Betty Rall	Geologist (Ret.)
Robert Reynolds	Denver Museum of Nature & Science
Kermit Shields	Geologist (Ret.)
Lou Taylor	Denver Museum of Nature & Science

Committee Chairs:

Sub Committee Chairs:

Beth Simmons

- Martin Lockley
- Lou Taylor
- Clare Marshall
- Tom Moklestad
- Marsha Barber

Kermit Shields

- Tom Moklestad

Clare Marshall

Bruce Wyre

- Pete Martin
- Robert Reynolds
- Keith Meakins

Sam Bartlett

Tom Moklestad

Joy Thompson

Committees:

Sub Committees:

Education

- Publications
- Curation/Ridge Report Editor
- Exhibits
- Tours, Events, Brochures, Posters, Signs
- K-12 Education

Volunteers

- Community Outreach

Membership

Finance

- Budget
- Investments
- Accounting

Preservation & Long Range Planning

Marketing

Development

Staff - Friends of Dinosaur Ridge:

Executive Director	Joe Tempel
Programs & Operations Director	Tom Moklestad
Education Programs Assistant	Erin Fair
Visitor Center Manager	Roger Bennett
Visitor Center Assistant	Jack Davidson
Visitor Center Assistant	Barbara Davidson
VC Assistant and Computer Tech	Brian Davidson
Driver/Birthdays/Visitors Center	Bobbi Kilgore
Membership/Exhibits	Clare Marshall
Driver/Maintenance	Ted Gildea
Driver/Tour Guide	Morgan Gray
Driver/Tour Guide	Amber Cain
Driver	Sue Kaberline
Driver	Dan Fanelli

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Astronomy will return to Scout Day May 7th.

CALENDAR OF EVENTS

Fireside Chats are held at Lutheran Church of the Master, northeast corner of Bear Creek Parkway, Jewell Avenue, and Alameda Parkway, Lakewood, CO.

Other events will be held at the Dinosaur Ridge Visitor Center, 16831 W. Alameda Parkway, Morrison, CO 80465, unless otherwise indicated.

Wednesday, March 16, 2011 — Friends of Dinosaur Ridge Annual Meeting, dinner, volunteer awards for 2010, Fireside Chat *Tracking Chinese Dinosaurs* by Martin Lockley. 6 p.m. at the Solterra Club House. To find the Solterra Club House drive a half mile east on Alameda Parkway from the Alameda/C470 exit. Turn south on South Indiana Street and follow the signs to Solterra. Look for the tall bell tower.

Saturday, March 19, 2011 — Dinosaur Detectives: *Footprint Frenzy*. Short outdoor course on dinosaur footprints at the Visitor Center with a short field trip up to the track site on Dinosaur Ridge. For 6 to 9 year olds, other ages welcome. 10 a.m. - 11:30 a.m. Free.

Saturday, May 7, 2011 — Dinosaur Discovery Day: *Cub Scout/Boy Scout Day*. Geology exhibits and hands-on fossil exhibits at the Visitor Center. Expert guides on the Ridge trail. Activities suitable for scouts to earn the belt loop, academic pin, and the geology merit badge. Small section of astronomy exhibits with activities that apply toward scout awards. 10 a.m. – 3 p.m. Scouts must register. Free to general public. Hike free or take the optional shuttle bus (\$3, 4 & 5 years half price, 3 & under ride free). Registration form at www.dinoridge.org

Saturdays, May 14 and 21, 2011 — Teacher Enhancement Course, *Introduction to Paleontology and Geology (K12)*, at Visitor Center. Taught by Dr. Louis Taylor. Lecture and field trips. 8 a.m. – 5 p.m. Continuing education credit available through Colorado School of Mines. For more information and to register go to <http://te.csmospace.com/register.php> or te@mines.edu or call 303-279-3855.

Saturday, June 4, 2011 — Triceratops Trail Day on National Trails Day. Guides stationed along the trail will point out dinosaur tracks and other fossil evidence. Directional signs one block east of 6th Ave and 19th St. in Golden. See the new Palm Frond Structure.

Thursday & Friday, June 9-10, 2011 — Teacher Enhancement Course, *Dinosaur Ridge Teachers' Workshop*, taught by Dr. Pete Modreski & Dr. Norb Cygan, classroom and outdoor instruction, 8:30am to 5pm. Continuing education credit available through Colorado School of Mines. For more info or to register visit <http://te.csmospace.com/register.php>.

Saturday, June 11, 2011 — Dinosaur Discovery Day: *National Get Outdoors Day*. Geology exhibits and hands-on fossil activities at the Visitor Center. Expert guides stationed along the Ridge trail. Hike at your own pace or take the shuttle bus (\$3, 4 & 5 yrs. half price, 3 & under ride free). Outdoor activities include gold panning and fossil sieving. 10 a.m. – 2:30 p.m. Free (except for optional shuttle).

CALENDAR OF EVENTS

Thursday through Saturday, June 22-24, 2011 — Teacher Enhancement Course, *Geologic Principles for Educators*, by Mike Zawaski, geologist and educator. College credit available through Western State College. Visit www.ObservantNaturalist.org or call Mr. Zawaski at 970-302-8043.

Saturday, July 9, 2011 — Dinosaur Discovery Day: *Reptile Day*. Live reptiles on display and hands-on activities at the Visitor Center. Expert guides stationed along the Ridge trail. Hike free or take the optional shuttle bus (\$3, 4 & 5 yrs. half price, 3 & under ride free). 10 a.m. – 2:30 p.m. Free (except for optional shuttle).

Monday through Thursday, August 1-4, 2011 — Teacher Enhancement Course, *Hands-on Rock & Fossil Activities for Middle School Students, Aligned to Dinosaur Ridge and Triceratops Trail* by Marsha Barber, K12 educator. Continuing education credit offered through the Colorado School of Mines.
marshabarber@mywdo.com

Saturday, August 13, 2011 — Dinosaur Discovery Day: *Geocaching Day*. Rockhounding activities and hands-on fossil searches. Expert guides stationed along the Ridge trail. Hike free or take the optional shuttle bus (\$3, 4 & 5 yrs. half price, 3 & under ride free). 10 a.m. – 2:30 p.m. Free (except for optional shuttle).

Saturday, September 10, 2011 — Dinosaur Discovery Day: *Reading Really Rocks*. Festivities will include a storytime for kids. Hands-on activities include gold panning and exploring for fossils. Expert guides stationed along the Ridge trail. Hike free or take the optional shuttle bus (\$3, 4 & 5 yrs. half price, 3 & under ride free). 10 a.m. – 2:30 p.m. Free (except for optional shuttle).

Saturday, October 8, 2011 — Dinosaur Discovery Day: *Girl Scout Day and National Fossil Day* as part of Earth Science Week. Geology and hands-on fossil activities suitable for scouts to earn patches and awards. Expert guides stationed along the Ridge trail. Hike free or take the optional shuttle bus (\$3, 4 & 5 yrs. half price, 3 & under ride free). Small astronomy section as part of International Astronomy Day. 10 am – 3 pm. Scouts must register. Free admission to general public.

Friday, November 4, 2011 — Annual FODR Fundraiser: *Rock Out for the Ridge*. Includes dinner, a silent auction, live auction, and a program. Red Rocks Visitor Center (at the top of the amphitheater).

Saturday, November 19, 2011 — Dinosaur Detectives: *Backyard Bones*, short course on dinosaur bones at the Visitor Center includes a dig. For 6 to 9 year olds with all ages welcome. 10 a.m. – 11:30 a.m.

RECENT EVENTS

ROCK OUT FOR THE RIDGE

The Red Rocks Visitor Center was again the venue for the 2010 Friends of Dinosaur Ridge Rock Out for the Ridge dinner and silent auction. The theme was western to honor the Rooney Family and featured the newly published book *Rooney Ranch* authored by Jack Davidson, Kathy Honda, and Beth Simmons.

The auctions for 2010 went quite smoothly due to the efforts of **Janie Bennett, Beth Simmons, T. J. Geise, Jonna Gentry, Bobbi Kilgore, Clare Marshall, Pat Morris,** and **Beth Simmons**, who had items well organized. This year's auction was a dual affair with a live auction to accompany the usual silent auction. U.S. Bureau of Land Management Regional Paleontologist, **Brent Breithaupt**, volunteered to be the evening's auctioneer. Brent is well known in the vertebrate paleontology community as the originator and long-time auctioneer at the Society of Vertebrate Paleontology annual meetings. Thanks Brent, for getting the Friends' first live auction off to a most successful and enjoyable start. The fundraiser netted over \$6,000 this year for FODR preservation efforts.

Two of the top items in the silent auction again were donated by **Triebold Paleontology, Inc.** and **Neffra Matthews**. Tracie Bennett, head of sales and marketing for Triebold Paleontology, brought an outstanding cast of a *Selmasaurus johnsoni* skull from the most complete specimen of this mosasaur known. Neffra, well known for the beautiful paleontological-design quilts that she makes, again brought an outstanding example of her work, a quilt to

honor the Rooney Valley. Other popular items in this auction were condominium vacations at Keystone and Grand Lake donated by **Betty Rall** and **Sam Bartlett**.

The live auctioning of two hand-woven scarves made of hand-spun wool was lots of fun as Beth Simmons modeled them, only to be outdone by Drs. **Martin Lockley** and **Vince Matthews** who bought and displayed them. The scarves, each with iguanodontid tracks as the design, were the result of hard labor by **Sue Jenne** and **Jean Olson**.

Entertainment this year was the provided by the magical guitar and mandolin of **The Borscht Brothers, Jay Halpern** and **Bruce Geller**. You can enjoy a taste of their music on theborschtbrothers.com.

Thank you to all who so generously donated auction items and those who took the time to enjoy the evening with Friends of Dinosaur Ridge. It was especially nice to see former FODR Board Member **Sue Landon** at Rock Out with her husband **Dick Deitz**.



Kermit and Beth Shields hold the Rooney Valley Quilt they won in the silent auction. Neffra Matthews created the quilt. Martin Lockley models the dinosaur track scarf he won in the live auction.



The crowd enjoys the festivities at Rock Out for the Ridge.

Photos by Neffra Matthews

RECENT EVENTS

Continued from previous page

DR. MARTIN LOCKLEY RETIREMENT PARTY

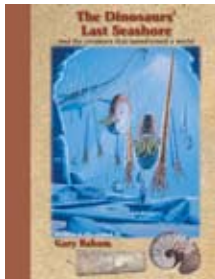
Martin Lockley, a founding member and enthusiastic supporter of all things FODR, retired this fall from his professorship at the University of Colorado Denver. About 35 of his friends and colleagues attended a party at the Tivoli Center on the CU Denver campus to wish him luck in his retirement. Martin received a lovely framed map of Great Britain from the Geography Department. A number of FODR members attended the affair.

Martin has either authored or edited over a dozen volumes for FODR, and he has been an active board member since the origins of the organization. He keeps the Publications, Education, and Preservation Committees in line. Many of the specimens in the FODR collection resulted from Martin's generosity. We thank him for his many services to FODR and trust that he will continue to be a good friend to Dinosaur Ridge for many years to come.

RECENT FIRESIDE CHATS

On November 30, 2010 **Gary Raham** presented *The Dinosaurs' Last Seashore*. Gary, a well-known local artist and author of children's science books, including *Deep Time Diaries*, illustrates his books with his own diagrams and illustrations. The talk title is also the title of his most recent book, the story of a time traveler venturing along the shore of the Cretaceous Western Interior Seaway.

Dr. James "Whitey" Hagadorn, Curator of Geology at the Denver Museum of Nature & Science, presented a talk titled *Death of a Megapredator: Debunking, Downsizing and Constraining the Record of Predation in the Paleozoic*. Dr. Hagadorn, who gave this presentation on Tuesday, January 25, 2011, is a student of early colonization of land and prevegetated coastal systems. One of the questions that interested him is why organisms began constructing biomineralized skeletons.



Left: *The Dinosaurs' Last Seashore* by Gary Raham



Right: Dr. James "Whitey" Hagadorn

The FODR Board held a retreat January 29, 2011 to work on its task of "organizing for success." The board will keep the membership updated as it continues its journey to a more streamlined, efficient, and influential Friends of Dinosaur Ridge. A special thanks to Dr. Didi Fahey for facilitating this event. -BETH SIMMONS

JOHN M. KELLY MEMORIAL FUND

The following donors (shown in the far right column) contributed to Friends of Dinosaur Ridge in memory of John Kelly, a dedicated member of the FODR Board of Directors and a dedicated volunteer Ridge guide.

Robert N. Balcells
James Baroffio
Tom and Deborah Bergstresser
Cherie Brown
David & Tracy Bruce
Barbara Butler
Bob Christy
Helen Betty Clark
Norb Cygan
William and Lisa Davis
Barbara Day
Connie Dineen
Jeanette and Dean DuBois
Leroy & Lois Flohr
Barb Harning
Lester Hines
Agnes Hucks
Neale and Margaret Linzbach
Jennifer O'Neil Sajbel
Nancy Papazian
Betty Rall
Christy Reed
B. G. Richardson
Frank Royse Jr.
E. R. Sajbel
Joseph Sajbel
Miriam Sajbel
Joan and Owen Schooler
Joe Tempel
Bruce & Lois Thompson
Lawrence & Theresa Turner
Lynette or Rod Turner
Robin and Renee Turner
Merrily Williams
Melvin and Joan Young
David and Mary Zwart

MANAGEMENT REPORTS

PRESIDENT'S MESSAGE

Operationally, 2010 was another very successful year for the Friends of Dinosaur Ridge. Overall visitation increased and school tours increased a staggering 31%. This phenomenal growth record is a tribute to the extensive efforts of FODR programs staff members **Tom Moklestad** and **Erin Fair** and to the dedication of the many **FODR tour guides**. *Trek Through Time* attendance was up 3% thanks to the dedication of **Clare Marshall** and the cadre of docents manning the desk and answering a multitude of questions about the displays. Dinosaur Discovery Day visitation was up 1% this year, reaching a total of 4,850 visitors. Once again, this growth was due to the concerted efforts of all staff members, volunteers, and FODR sponsors. What makes this growth even more phenomenal is that we have experienced three years of continued double-digit growth during a time of deep recession when other non-profits are struggling with lower visitation and decreased funding. **Well done everyone!**

On the financial side, gift shop revenues continue to grow at an impressive rate, 9% this year, thanks to **Roger Bennett** and the friendly, dedicated staff manning the visitor center. Shuttle bus revenue was up a tremendous 23%. Not to be outdone, the fledgling birthday party program, under the leadership of indefatigable **Bobbi Kilgore** brought in over \$7,000 in its first year.

We are experiencing some growing pains, however. Limited calendar space and taxing our cadre of tour guides and docents to the max means that we have a constantly increasing need for more volunteers and members. So a plea: We need your support! If you can possibly volunteer or if you know of someone who is interested in dinosaurs, please encourage them to become members and Friends of Dinosaur Ridge volunteers.

One serious concern this year is the stress being put on **The Turner Fund**. This fund provides financial support for underprivileged school children from the Denver Metro

Area to visit the Ridge and experience the quality outdoor experience we provide. This fund now holds less than \$7,000. I encourage you to write a check in whatever amount you can to the **Friends of Dinosaur Ridge Turner Fund** so this program can continue.

Strategically 2010 has been less successful. On January 4th, we learned that the Jefferson County Commissioners had decided not to allow FODR to construct a visitor center on the 19 acres that had just been purchased for Jefferson County Open Space, west of our visitor center. This was disappointing because we had been discussing a new visitor center with the developers after they had purchased the Rooney Valley property.

Then, we were told that FODR would also not be permitted to construct the track site cover for which we had just completed the final design, partially funded by the commissioners. At that time we received no explanation, even though this strikes at our core values and the FODR mission to preserve the dinosaur tracks. We hope to bring this issue to resolution in 2011.

Also, as we began to address this issue, one important fact stood out: Dinosaur Ridge is well known internationally and throughout the United States and Canada, but is less well known to local residents. We are working hard to remedy this situation.

To address the two issues of phenomenal growth and the impasse with the county commissioners, the FODR Board of Directors has taken on the goal of “organizing for success” and has been diligently working towards this goal. We may not know what the revised organization will look like when set in place, but we do know that the governance of FODR will change substantially. For instance, an Executive Board will be created to handle the short-term issues, leaving a pared down Board of Directors to handle policies and long-range initiatives for the Friends of Dinosaur Ridge. We plan to hold a series of board retreats during 2011 to meet this goal.

-SAM BARTLETT

MANAGEMENT REPORTS

EXECUTIVE DIRECTOR'S REPORT

Preservation

Protective cover over the palm frond impressions and tracks at Triceratops Trail -- FODR raised \$103,000 in 2010 and signed a contract with Yenter Company to build the 100' structure. Construction will begin in February, 2011.

Protective Cover over the dinosaur tracks at Dinosaur Ridge -- In 2010 the Jefferson County Commissioners said they did not want a structure constructed on Dinosaur Ridge because they felt it was more important to protect the mountain backdrop along the Front Range. Although the Friends respect the mountain backdrop, we feel it is possible to protect the tracks and the mountain backdrop with a well-designed structure that blends into the scar that was created in 1938 when the construction of Alameda Parkway exposed the tracks. We hope to resolve of this impasse in 2011.

Explore the option of creating a National Monument that includes Dinosaur Ridge, Triceratops Trail, and the Hogback north of Golden -- In 2010 the Friends explored the option of creating a Historic District that would be listed on the National Register of Historic Places. This could be a precursor to a National Monument designation. We will continue to explore the idea of creating the Historic District in 2011.

Play an active role in the development of Rooney Valley west of C470 -- The Friends have participated in the comprehensive land planning process conducted by Jefferson County. Jeffco designated the area around our Visitor Center an Activity Center for commercial, retail, office and multi-family land uses. Jeffco recognizes our Visitor Center as a valid land use where it is currently located as well as somewhere else in the activity center. The plan states that Jefferson County should consider leasing other Jeffco Open Space property to the Friends for a new visitor center, but they have not yet chosen to do that.

Graduate students from the Daniels School of Business at the University of Denver conducted an economic study that assessed the impact of our operations on the economy of Jefferson County. The results of this study should be very helpful to us in our planning for a new visitor center.

Education

Our school tour program in 2010 was up 31% over 2009! This partially fulfills our goal of providing a tour to every elementary student in the Denver Metro Area. We gave tours to 14,370 school children in 2010. Our bus tour program was up 26% over 2009! We provided bus tours for approximately 24,000 people in 2010.

Facilities

We completed a variety of improvements on Dinosaur Ridge in 2010, including an enclosure around the portable toilet and two interpretive kiosks. All three were Eagle Scout projects. Boy Scouts also built an interpretive kiosk at Triceratops Trail in Golden. In 2011 we will install the interpretive signs on the kiosks. We will also install an automatic gate opener on the west side of the Ridge to improve the flow of school buses and increase the safety of children on the Ridge.

Many projects were completed at our visitor center. A Boy Scout troop completed a bus stop in front of the visitor center to provide shade and traffic control for visitors wishing to take our bus tours. Many storage and shelving projects were completed by volunteer Richard Kerr. Although we made no progress on planning or constructing a new visitor center, we are in the process of revising our current lease with Jefferson County to streamline our relationship with Jefferson County. The revised lease would include our activities on the Ridge. The ownership of Alameda Parkway was transferred from Denver to Jefferson County in 2008, so it will be more efficient to have one lease covering both properties than two separate leases, as we currently have. We are disappointed that a new 25-year lease could not have been written this year, but we will continue with our revised lease that terminates in the year 2018.

Continued on next page

MANAGEMENT REPORTS

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The 1999 Memorandum of Understanding (MOU) with Jefferson County is in the process of being revised. It states that when the Alameda/C470 interchange was opened to traffic Alameda Parkway over the Ridge would be restricted to pedestrians, bicyclists and tour buses. We have reviewed one draft in 2010 and will be completing the revised MOU in 2011. Many actions have been taken since the MOU was signed in 1999 and the interchange was opened to traffic in 2008. I expect the MOU to be revised in 2011.

Funding

In February Clare Marshall began to coordinate the membership program for the Friends, along with helping Executive Director Joe Tempel raise funds for various educational programs and projects at Dinosaur Ridge. Even though we haven't increased the number of members (approximately 175) of the Friends of Dinosaur Ridge, we did increase the amount of money raised through memberships (\$12,500). We added a Life Membership (\$1,000) as a new membership category and we received three life memberships in 2010. Gift shop sales were up 9% over 2009! We have also added the job title of "Multitaskers," for those who are the jacks of all trades, especially during the busy season from May through October. These people give school tours, bus tours, work in the gift shop, or do anything else that needs to be done.

In 2010 FODR raised a total of \$189,750.

The major grants received:

Dinosaur Discovery Day Sponsors:

\$1,000	First Bank to sponsor the 2009 Annual Meeting on March 17, 2010 and to sponsor Boy Scout Day at the Ridge.
\$1,000	Rocky Mountain Association of Geologists Foundation to sponsor Boy Scout and Girl Scout Days.
\$1,000	from the American Institute of Professional Geologists to sponsor National Get Outdoors Day.

\$500	Greater Denver Area Gem and Mineral Council to sponsor Geocaching Day.
\$500	The Association for Women Geoscientists for Girl Scout Day
\$500	Paleo Designs and Bandimere Speedway for Dino Discovery Days.

Improvements on Dinosaur Ridge:

\$15,000	Jefferson County for the construction of two kiosks, split rail fence, and privacy fence on Dinosaur Ridge.
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Palm Frond Cover at Triceratops Trail:

\$15,000	Jefferson County
\$4,000	Golden Civic Foundation
\$5,000	MDU Foundation
\$10,000	Gates Family Foundation
\$10,000	Adolph Coors Foundation
\$25,000	Harvey Family Foundation
\$ 5,000	City of Golden

Improvements at Triceratops Trail:

\$2,500	Greater Denver Area Gem and Mineral Council for the interpretive kiosk
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Educational Programs:

\$2,000	Greater Denver Area Gem and Mineral Council to produce educational brochures .
\$2,500	Chevron Mining Inc. Employee Contribution Committee, Denver to produce educational posters .
\$56,250	SCFD for tours, operations, and the printing of the Rooney Ranch Guide .
	Marj MacLachlan for the dinosaur mural mounted at Confluence Park.

General Operations:

\$10,000	1772 Foundation
\$24,000	Anonymous donation

Continued on next page

MANAGEMENT REPORTS

Continued from previous page

Additional Donors:

Marsha Barber	John Ghist	Keith Meakins	Stephen Strachan
Sam Bartlett	Michael & Susan Harkness	Terry Pease	Andy Taylor
Bruce & Sandy Bryant	Hugh and Michelle Harvey	Judy Peterson	Louis and Mary Taylor
Chris Carroll	Jan & Willis Jacobs	Betty Rall	Bruce and Lois Thompson
Jo Anne and Julian Clark	Martin Lockley	Robert Raynolds	Bruce Wyre
Tim Connors	Marjorie MacLachlan	Fred Roth	Bruce & Jackie Young
Norb Cygan	Peter Martin	Clifford and Betty Shields	
DuWayne Ebertowski	Kathleen McCoy	Kermit Shields	—JOE TEMPEL

PROGRAM DIRECTOR'S REPORT

Visitation, Attendance and Sales			
Program	2009	2010	Change
Visitors to Visitor Center	55,822	55,111	-1%
Tours (Total Attendance)*	30,097	38,347	+27%
Trek Through Time	20,622	21,217	+3%
Chats, Hikes, Field Trips	228	203	-11%
Traveling Exhibit Visitors	2,200	2,250	+2%
Dino Discovery Days (6)	4,800	4,850	+1%
Triceratops Trail Day	100	61	-39%
Sales (\$) **	244,855	290,517	+19%

*Includes guided school tours, shuttle bus tours, and school outreach

**includes receipts from gift shop, shuttle bus, *Trek Through Time*, school tours, snack shack and birthday parties.

2010 was a record year for the gift shop, school tours, shuttle bus, visits to *Trek Through Time*, non-scout DDD's, and birthday parties. Even though visitation was about the same as in 2009, gift shop sales were up 9%, school tour attendance was up 31%, and shuttle bus ridership was up 26%. With an average of nearly one party a week, birthday parties brought in over \$7,000. The four nonscout DDD's also had record attendance despite some bad weather. This success is achieved only through the effort of FODR volunteers who led tours on the Ridge, staffed booths and stops at DDD's, and presented in *Trek Through Time*, together with staff members who drove the shuttles and operated the gift shop. **FODR will thank these hard workers formally at a ceremony during the annual meeting on March 16, 2011. Be sure to attend.**

Community Outreach Continues to Contribute

In 2010 volunteers and/or staff members represented Friends at 27 community events—about average for the past four years. These venues included street fairs and parades, gem and mineral shows, and science meetings and conferences. Unfortunately Friends had to pass on some great community events because of scheduling problems and lack of volunteers. **Please consider volunteering** or helping find others who can become members and FODR volunteers. Special thanks to volunteer **Merlin Barnes**, who arranged for Friends to have a booth at the grand opening of the Old Navy store in Lone Tree and then manned it.

Continued on next page

MANAGEMENT REPORTS

Continued from previous page

A preliminary list of outreach events for 2011:

02/05/11	Boy Scout University, Colorado Springs
02/12-13/11	WIPS Symposium, Colorado School of Mines, need volunteers
02/25/11	Denver Gem & Mineral Guild Show, Jeffco Fairgrounds, 02/25-27/11
03/19/11	Junior League of Denver Storytime, Molholm Elementary, Lakewood
03/25/11	Ft. Collins Rock Hound Show, 03/25-27, Ft. Collins
04/22/11	Boy Scout Show, Denver Coliseum, need volunteers
06/04-5/11	Capitol Hill People's Fair, Civic Center Park, need volunteers
06/29/11	Buffalo Bill Days, Parfet Park, Golden, 06/29-30/11, need volunteers
09/16/11	Denver Gem & Mineral Show, Merchandise Mart, 09/16-18, need volunteers
TBA	STEMapalooza, Denver Convention Center, usually October, need volunteers
11/18/11	Colorado Science Conference (Colorado Association of Science Teachers), Merchandise Mart

Saturday Activities for the Visiting Public (May-September)

FODR will begin to offer smaller, more frequent events in addition to the six large Dinosaur Discovery Days held monthly on Saturdays from May through October. The current plan is to have an educator facilitate a variety of activities all day every Saturday from Memorial Day weekend through Labor Day weekend. Dinosaur Discovery Days would replace "Saturday Activities" once a month.

Monthly Events and Exhibits for the Off Season (November-April)

We plan to offer a few small exhibits or activities on certain days, usually weekends, during the slower season. In January we displayed an exhibit of uranium-bearing dinosaur bones and volcanic ash for National Nuclear Science Week. FODR will mark NASA's Sun-earth Day on March 19 with our sundial and another outdoor booth. Contact Program Manager Tom Moklestad at tom_moklestad@dinoridge.org or 303-697-3466 X103 if you have suggestions or would like to participate.

Friends of Dinosaur Ridge on Facebook

Follow the Friends on Facebook. Access to the fan page is through the home page on www.dinoridge.org. Education Programs Assistant Erin Fair, our facemaster, posts the latest FODR news and related happenings about once a week. Send suggestions for postings to Erin at tours@dinoridge.org.

A Record Four Teacher Training Classes Scheduled for 2011

The coming year provides four opportunities for teachers and others interested in paleontology and geology to learn more about these subjects and Dinosaur Ridge. Follow the FODR Calendar of Events in the *Ridge Report* and on the web site (www.dinoridge.org) for more information on classes being offered by Drs. Pete Modreski, Norb Cygan, and Lou Taylor, educator Marsha Barber, and geologist Mike Zawaski.

—TOM MOKELSTAD

COMMITTEE REPORTS

GIFT SHOP COMMITTEE

2010 was another good year for the FODR Gift Shop; we significantly exceeded 2009 sales. Each year continues to see increased sales despite our limited space. The new point of sales accounting program is working out very well as we slowly work out the bugs.

We appreciate the good suggestions from our members, guests, and staff in our constant search for new items to carry. Our goal is to offer dinosaur related items for parents and grandparents as well as for the kids.

We offer books with focus for all and also have many home decorative and gift items. The reproductions of rare dinosaurs we offer are quite amazing. Our supplier also makes reproductions for museums, and the only way to tell our reproductions from the original specimens is by their lighter weight. We now offer a new reproduction of tracks that were found at Triceratops Trail many years ago.

EDUCATION COMMITTEE

Part of the FODR mission is to provide education to people of all ages. Toward that goal, we host monthly Fireside Chats during the winter months for adult learners.

2010 Fireside Chat speakers included:

Mr. Gary Raham, local paleontological author and illustrator, gave two presentations during which he discussed naturalist Loren Eiseley and presented his new book *The Dinosaurs' Last Seashore*.

Mr. Dan Fanelli, FODR's own Crocodile Dundee, discussed his discovery of the crocodile swim tracks at the north end of the Dinosaur Ridge Hogback.

Dr. Ned Sterne held forth on his favorite topic, *Faults of the Front Range*.

Dr. Nora Noffke, Old Dominion University Professor, Norfolk, VA, the world's expert on microbial mats in the fossil record, told us about evidence of cyanobacterial mats she discovered in South African Precambrian rocks.

Gift shop guests and customers donate very generously. Kids love to put coins in the mouth of the small dinosaur at our front entrance and watch it go down into the visible stomach. They seem to never be satisfied with putting in only one coin! Our goal is to have a dinosaur head that growls when you put money its mouth. Even adults like to do this. **If anyone can help us in this regard let us know.**

We could also use more volunteers. Having someone "float" in the gift shop and talk to visitors about items for sale helps boost sales. Roger can help you learn about the unique items for sale if you would like to help. As those of us who staff the gift shop do, you would find it is fun to talk to visitors from all over the world.

We look forward to this next year and hope to see you in the gift shop. Visitors frequently comment on how reasonable our prices are. **Stop by—you won't find a better deal anywhere else.**

—ROGER BENNETT

Dr. Lindsey Rocks, Front Range Community College Professor, described what the heavens looked like to the dinosaurs.

Mr. John Sibbick, British dinosaur artist gave us a special presentation.

Dr. Bruce Geller, director of the Geology Museum at Colorado School of Mines and a good friend to FODR, talked about his visit to the Chinese National Museum.

Check the FODR Calendar of Events in the Ridge Report and on the web site for future Fireside Chats that will include presentations by FODR board member John Ghist and Dr. Kent Hups who will tell us about his discovery of the first *Ankylosaurus* tracks.

All Fireside Chats are held at the Lutheran Church of the Master on the northeast corner of Bear Creek Parkway, Alameda Parkway, and West Jewell Avenue at 7:00pm. Donations appreciated.

—BETH SIMMONS

COMMITTEE REPORTS

PUBLICATIONS COMMITTEE

A tribute to the world and work of Paul Koroshetz (1962-2006)

-- The latest book to roll from the Dinosaur Ridge Press, titled **Colorado's Dinosaur Artist**, with the subtitle above, is a tribute to the world and work of the late Paul Koroshetz, who we dubbed the Resident Artist at Dinosaur Ridge, a role he fulfilled from 1994, until his untimely death in 2006. The following excerpts give an indication of Paul's breadth of talent and interest, as well as the humor he interjected into his work.



A portrait of Paul Koroshetz, in pensive mood, by Tiffany Miller

Paul was a gifted artist with a passion for dinosaurs and other larger than life experiences. Paul, who lived most of his rather short life in Colorado, certainly embodied something of the rebellious spirit of the artist, but he always did so with a congenial smile, a twinkle in his eye and a humorous tongue-in-cheek. His interests and passions ranged from dinosaurs and rock music, to football, Colorado's landscapes and deep spirituality. These interests all manifested in his artwork, and in his undoubted musical talents, and justified the label of 'renaissance' man.

The renowned dinosaur artist John Sibbick, from Bath, England, who visited Dinosaur Ridge this past June, has this to say about Paul's art work:

I first came across Paul's work in the Dinosaur Ridge publications – the reconstructions of the trackmakers and the environments they lived in. These were dramatic and evocative illustrations from an obviously serious dinosaur devotee!

Only quite recently did I appreciate the full range of his work... the beautiful natural history drawings and landscape paintings, on the one hand to his other areas

of interest... the jazz portraits, cartoons and fantasy – an area I have also dipped into.

Paul is one of those rare illustrators, who in a time of specialization, worked in many styles and media, from small drawings to murals, leaving behind a body of work to be proud of.



Paul Koroshetz's depiction of iguanodontid dinosaurs making tracks at Dinosaur Ridge

Paul's book - **Colorado's Dinosaur Artist** - is an eye-catching, 60-page book containing more than 90 black and white and color illustrations, many of which have been used in Dinosaur Ridge publications. In addition to illustrations of most of the better-known dinosaurs, there are examples of sketches of dinosaurs made by Paul as a young school boy. There are also examples of his mature work including Colorado landscapes and iconic animals, such as the mountain lion and bighorn sheep. Paul was an accomplished musician and his fine portraits of musicians reflect this other artistic dimension to his character. His humor is reflected in his whimsical caricatures of rock and roll dinosaurs and dinosaur sports heroes.

Continued on next page



Paul's whimsical depictions of dinosaurs as rock and rollers and sports icons

COMMITTEE REPORTS

Continued from previous page

The text is by **Martin Lockley** with contributions from **Tiffany Miller**, **Joe Tempel** and the Friends of Dinosaur Ridge. Thanks to **Gary Raham** for layout. Special thanks to the **Koroshetz family** and **Heather Thompson** for their help in making Paul's artwork available. **Jackie Koroshetz** also donated an original piece to Dinosaur Ridge, where Paul's many contributions will be long remembered and enjoyed.

—MARTIN LOCKLEY

The Rooney Ranch – A New History Book

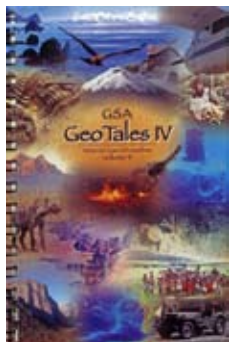


Dinosaur Ridge historical researchers Jack Davidson, Kathy Honda, and Beth Simmons have added another blockbuster to the Dinosaur Ridge bookshelf! *The Rooney Ranch*, a 40-page booklet, tells the story of Colorado pioneers Alexander and Emeline Rooney, their development of the ranch and the early ways of life in pioneer Jefferson County. Historic members of the Rooney family are highlighted by biographies and family photos. The book reveals, for the first time, the history of Mt. Vernon and its role in the fledging stone industry of Colorado. The book illustrates the development of the valley's railroads and highways, coalmines, clay pits, and the lime kilns and the lime business that were especially important to Mt. Vernon and Morrison. It includes the history of paleontological discoveries and historic photographs of the first track discoveries on the east side of the Ridge. The story of the filming of the earliest "westerns" in the Rooney Valley forms another intriguing chapter. FODR Executive Director Joe Tempel's photo of the ranch graces the cover, as does Barb Davidson's picture of the yellow roses of Morrison which "stem" from Emeline Rooney's country roses from Iowa. **Buy your copy of *The Rooney Ranch* at the FODR Gift Shop for only \$9.95.**

—BETH SIMMONS

CURATION AND LIBRARY COMMITTEE

New Fossil — Mr. Paul Brott recently donated a specimen of fish vertebrae impressions and other skeletal parts to FODR. Fish specialists are helping us, but it appears that this well-preserved specimen lacks diagnostic skeletal elements. The specimen (DR-0333) was collected from the Benton Shale on Dinosaur Ridge in 1957. Casts of this specimen soon will be available in the FODR Gift Shop.



New Book — Dr. Norb Cygan, long-time FODR board member, donated a copy of *Geo Tales IV: Memories from GSA Members*, a 2009 Geological Society of America publication. Several of Norb's recollections are included. Some of us knew of his adventures on oil rigs and in China, but little did we know of his attempt to be a "cowboy." This book is available for checkout from the FODR Library in the Chevron Classroom.

A Reminder — We were reminded not long ago that collecting specimens, fossils or other types, is forbidden. FODR received a box of fossil specimens that included a note that demonstrates how important it is to advertise about collecting laws. It read:

Dear Friends of Dinosaur Ridge:

On a recent visit we thoughtlessly picked up the enclosed fossils. To our dismay, we learned on the internet later that removing fossils from the area is forbidden. We return the specimens with apologies and assurance that we will not remove specimens from you [sic] site or other sites in the future if it not permitted (we've taken time to learn the laws/rules on removing fossils). They were found at the Western Interior Seaway road-cut.

Thank you for your efforts in taking care of Dinosaur Ridge.

[Name Withheld]

-LOU TAYLOR



A detail picture of the specimen noted in first paragraph

COMMITTEE REPORTS

VOLUNTEER COMMITTEE

2010 was a busy and productive year for the Friends of Dinosaur Ridge. Much of this success can be attributed to the many volunteers who contributed a total of nearly 9,000 hours, equivalent to about five full time staff members. FODR volunteers lead tours, staff *Trek Through Time*, make casts, help at DDD events and do a variety of jobs around the Ridge and around the Visitors Center.

We had one successful volunteer training session in 2010 and many informal training and mentoring sessions. The new volunteers who came on board this year have been highly productive.

Due to the continued growth of Dinosaur Ridge programs, we need to improve our efforts in 2011 to attract new volunteers, train and support new and existing volunteers, and reward and recognize the achievements of all of our volunteers. One area that needs attention is increasing the number of qualified and available tour guides, so that the FODR staff can be freed from filling in so frequently for these tours.

—KERMIT SHIELDS

MEMBERSHIP COMMITTEE

The Membership Committee continues to work toward the goal of doubling the FODR paid membership. They are working to constantly improve the membership plan. The current breakdown of paid members is shown in the table at right. In addition to the members in this table, FODR has three Honorary Life Members, 20 members from our partnership with the Colorado Association of Science Teachers (CAST), and 15 complimentary members.

The committee designed, printed, and distributed 200 membership brochures. We regularly send emails with information for members as well as links to high resolution copies of the *Ridge Report* when it is published.

The committee is looking forward to having Elnore Grow join our group and help with our membership plan. Elnore organizes the CAST newsletter.

—CLARE MARSHALL

MARKETING COMMITTEE

During the past year FODR and Douglas County Libraries began collaborating on the Adventure Pass, a program similar to the Culture Pass program with Jefferson County Public Library. The Voice of America interviewed Executive Director Joe Tempel for a story on Colorado dinosaurs. Channel 8, KATV in Arvada, filmed sites on the Ridge and the Visitor Center as part of a story on the Passport Program in which FODR participates with the Jefferson County Historical Commission.

Beginning with an article on December 16 by Karen Groves in the *YourHub* supplement of the *Denver Post*, articles, editorials, letters to the editor, columns, television news, and radio news followed for at least three weeks concerning the merits of FODR building a structure over the main track site. Many visitors have commented on seeing the publicity. A scale model of the structure is now displayed in *Trek Through Time*.

—TOM MOKLESTAD

Life Members	3
Corporate members	3
<i>Ornithomimus</i> Members	8
Sponsor Members	17
Board Members	25
Family Members	57
Individual Members	59
Junior Members	3
Total	175

COMMITTEE REPORTS

PRESERVATION COMMITTEE

Dinosaur Ridge

Neffra Matthews' project to remap the track-site and determine how many tracks have been lost over the years is to be completed this spring. It is important to complete this project because the track-site continues to deteriorate. FODR continues to fund and apply temporary preservation methods, but we estimate that the tracks have an estimated life of 10-15 years remaining. We continue to investigate alternative techniques for temporary preservation, but have put work toward a permanent solution on hold.

Working with the FODR Education Committee, we have embarked on a search for Arthur Lakes' Quarry #1. After obtaining the necessary permits, FODR members have been conducting preliminary mapping under the direction of **John Ghist** and **Beth Simmons**. The discovery of drill holes has narrowed the search and we hope to resume this program in the spring. We welcome new volunteers into the mapping party.

During 2010 FODR experienced vandalism of the bone site on the west side of the Ridge. Fortunately the vandal was apprehended, tried, and sentenced. The sentence was a fine of \$400 for restitution, 30 days of community service, and to not break the law for nine months. FODR learned, even though Executive Director Joe Tempel testified on its behalf, that it is very difficult to procure a tough sentence in cases like this.

We continue our efforts to protect the ash bed by repairing the protective cover and to protect visitors and the road from falling rock. An Eagle Scout candidate will construct a protective fence in the coming spring.

Triceratops Trail

Deterioration continues to be our foe at this site as well. The **Yenter Construction Company** should have a protective Palm Frond structure completed this spring. This wall will replace the previous protection, which proved to be inadequate. **Mike Muller** of the Yenter Construction Company designed the protective covering at no cost to FODR and the company has become a corporate sponsor of FODR. We thank Mike and the company for their generosity.

We have a few areas of concern at Triceratops Trail that we are working to resolve. One is an area of the exhibit with some falling rock. Currently there is no way to stabilize this area, but we will inquire of the Yenter crew when they begin work this spring. Another is the purchase and closure of Jones Road, removing access to the five parking areas we have been making available to visitors. Lastly, vandals have destroyed one of the crack meters at the *Hadrosaur* pit.

Landmark Status

Martin Lockley's effort to add sites to the National Natural Landmark continues. He submitted documents to the National Park Service to add Triceratops Trail, a site at Colorado School of Mines, and the bird and crocodile tracks at the north end of Golden to the Landmark. If successful, these sites may be added by this summer.

Thanks go to new FODR member **Jude Burton**. Jude volunteered to follow through on the never completed application for National Historic Landmark Status for Dinosaur Ridge. The Ridge is a Colorado State Historical Landmark.

LONG RANGE PLANNING

This committee was created in the spring of 2010 to work toward implementation of the FODR Vision Statement formulated at the November 2009 retreat and to support the FODR Mission. Currently the committee is developing plans for revamping the organization to position it to meet future challenges. We anticipate changes in the structure of the Board of Directors, committees, and staff.

A major goal of this committee is to work toward better communication with the local community and to advertise the impact that FODR has on the Rooney Valley and the entire Jefferson County. We have been working with a team of graduate students from the Daniels School of Business at the University of Denver. **Kelsey Wasylenky**, **Jon Bortles**, **Matt Anderies**, and **Takujiro Haase** presented their *Economic Impact Study for FODR* at the November Board meeting. They present us with many good ideas that we plan to use.

IN MEMORIAM

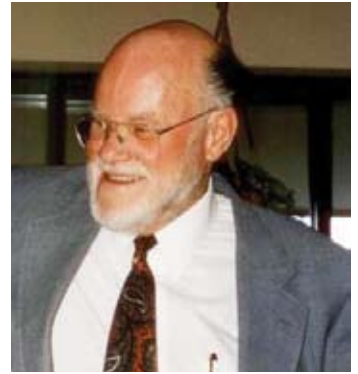
ED WARREN

Former Friends of Dinosaur Ridge President and *Ridge Report* editor Ed (Edward M.) Warren died November 11, 2010, of natural causes at the age of 85. Ed was a member of the FODR Board of Directors from 1998 to 2007. He served as FODR President in 2000-2002, and edited the *Ridge Report* for many of years.

Originally from Barberton, Ohio, Ed moved to Colorado from San Antonio, Texas, some 35 years ago. He served in the U.S. Navy from 1943 to 1946, and graduated from the Colorado School of Mines in 1950.

Ed was employed as an independent geologist for most of his career. He was also a compliance officer for several Colorado casinos.

Ed is survived by his wife, Pat, his wife of nearly 61 years, one son, two daughters, seven grandchildren, and two great granddaughters.



—ADAPTED FROM THE CANYON COURIER, EVERGREEN COLORADO

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FINALLY, EVIDENCE OF CAMARASAURUS AT DINOSAUR RIDGE



Figure 1. The best camarasaurus tooth yet discovered at Dinosaur Ridge consisting of a damaged crown partly embedded in sandstone matrix. Credit: Nicholas Drew. Courtesy of the Peabody Museum of Natural History, Yale University, New Haven, CT, USA.

Last year we reported on what is believed to be the first definitive fossil evidence of *Camarasaurus* at any of Arthur Lakes' fossil collecting sites along Dinosaur Ridge near Morrison (Brinkman and Drew, 2010). Our work on the unprepared fossil material from Lakes' Quarry 5 housed at the Yale Peabody Museum of Natural History (YPM) resulted in the recognition of as many as seven fragmentary teeth most likely attributable to *Camarasaurus* sp. (species indeterminate); the best one of which consists of a damaged crown partially embedded in sandstone matrix (Figure 1; Brinkman and Drew, 2010). Our recognition of probable *Camarasaurus* teeth from Lakes' Quarry 5 greatly excited several members of the Friends of Dinosaur Ridge (FODR)—so much so that we were asked to submit a follow-up article to the *Ridge Report*, illustrating more of the probable *Camarasaurus* teeth collected by Lakes and his crew at Dinosaur Ridge. According to Foster

(2007), *Camarasaurus* is the most abundant dinosaur and the single most abundant genus known from the Morrison Formation. Therefore, it is somewhat surprising that, prior to our report last year, no definitive remains of *Camarasaurus* had ever been reported from any of Arthur Lakes' excavations near Morrison.

Our recognition of probable *Camarasaurus* teeth among the unprepared materials from Lakes' Quarry 5 occurred in the fall of 2009 as an unexpected result of a major air-handling-system renovation project in the Kline Geology Laboratory (KGL) building at Yale where much of the YPM's Division of Vertebrate Paleontology is housed. These renovations forced the division out of several of its rooms in the KGL basement, necessitating not only the reshuffling of its collections within the YPM-KGL building complex, but also the relocation of portions of the collections to Yale's new West Campus

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facility in Orange, Connecticut. Material moved to West Campus included tons of the unprepared material from Lakes' Quarry 5 originally catalogued as *Stegosaurus armatus* YPM 1850. The rock at Quarry 5 consisted of very hard sandstone that was especially difficult to break. Removing fossils from such hard rock proved frustrating and Lakes and his men resorted to using sledgehammers to break the rock apart. Unfortunately, the brittle, fossilized bones and teeth were indiscriminately broken along with the rock, creating a complex, three-dimensional jigsaw puzzle of shattered pieces with which YPM's fossil preparators still must contend.

YPM employees Nicholas Drew and Scott Poglitsch were assigned the task of packing and moving the unprepared Quarry 5 material to Yale's West Campus. This meant that they had to examine each chunk of sandstone for the presence of fossilized bone or tooth fragments and then bag and label each specimen. This represented the first piece-by-piece examination of this material in more than a century, if ever (Figure 2). Fossils thought to belong to animals other than *Stegosaurus* were turned over to Daniel Brinkman for identification. Unfortunately, given their fragmentary nature and the incredibly hard matrix encasing them, all of the fossils recognized during this endeavor remain unprepared and uncataloged.

In addition to the *Camarasaurus* teeth reported here, several fragmentary teeth and a couple of jaw fragments probably attributable to *Diplodocus lacustris* were recognized among this unprepared material from Quarry 5, as were three fragmentary teeth of a



Figure 2. Yale Peabody Museum employee Nicholas Drew examining a large block of sandstone from Lakes' Quarry 5 that contains probable *Camarasaurus* tooth fragments. Credit: Daniel Brinkman. Courtesy of the Peabody Museum of Natural History, Yale University, New Haven, CT, USA.

large meat-eating dinosaur (possibly *Allosaurus*; Brinkman and Drew, 2010). Unfortunately, all of the non-stegosaur specimens recognized by us in this Quarry 5 material were heavily damaged when originally excavated, thereby making their precise taxonomic identifications difficult. Most of the probable *Camarasaurus* teeth consist of elongated, roughly spoon-shaped cross-sections in matrix (Figures 3 through 5). However, the enamel-covered crown of the best tooth, though partially embedded in sandstone and damaged somewhat, is fairly intact and compares very well (albeit as a mirror image) with the well-preserved crown of YPM 1907, a specimen of *Camarasaurus grandis* from Como, Wyoming (Figure 6). The tongue side of both crowns is strongly concave with a well-developed medial ridge formed

near the apex of each tooth (Figure 7). Furthermore, both specimens closely resemble the worn tooth of *Camarasaurus grandis* YPM 1905(?) from Como illustrated in Plate 7 of Ostrom and McIntosh (1966). All three tooth crowns are similar in size and shape and share the same W-shaped apical wear pattern characteristic of *Camarasaurus* (Figure 7; see also Plate 7 of Ostrom and McIntosh, 1966), though we refrain here from assigning the best camarasaur tooth from Dinosaur Ridge to a particular species. This tooth, along with the other, less-well-preserved camarasaur teeth from Quarry 5, are, for the time being, identified here as being *Camarasaurus* sp. for species indeterminate.

Figures 3-7 & References on next page

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Figure 3. The second best camarasaur tooth yet discovered at Dinosaur Ridge consisting of a roughly spoon-shaped cross-section in matrix. Credit: Nicholas Drew. Courtesy of the Peabody Museum of Natural History, Yale University, New Haven, CT, USA.



Figure 4. Three probable Camarasaurus tooth fragments preserved as cross-sections in the large block of sandstone shown in Figure 2. Credit: Nicholas Drew. Courtesy of the Peabody Museum of Natural History, Yale University, New Haven, CT, USA.



Figure 5. Close-up of the best preserved of the three probable Camarasaurus teeth shown in Figure 4. Credit: Nicholas Drew. Courtesy of the Peabody Museum of Natural History, Yale University, New Haven, CT, USA.



Figure 6. The best camarasaur tooth crown from Dinosaur Ridge (left) compared to a similar-sized tooth crown of Camarasaurus grandis YPM 1907 from Como, Wyoming (right). Credit: Nicholas Drew. Courtesy of the Peabody Museum of Natural History, Yale University, New Haven, CT, USA.



Figure 7. The W-shaped wear facet on the well-preserved tooth crown of Camarasaurus grandis YPM 1907 from Como, Wyoming (left) compared to that of the best, though still unprepared, tooth crown of Camarasaurus sp from Dinosaur Ridge (right). Credit: Nicholas Drew. Courtesy of the Peabody Museum of Natural History, Yale University, New Haven, CT, USA.

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—DANIEL BRINKMAN AND NICHOLAS DREW
Division of Vertebrate Paleontology
Yale Peabody Museum of Natural History
170 Whitney Avenue
New Haven, CT 06520-8118, USA

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FOSSIL MICROBIAL MATS AT DINOSAUR RIDGE

What is a microbial mat?

Microbial mats are coherent organic layers at least 0.5 mm thick constructed by trillions of *benthic* microorganisms (mostly *bacteria*) such as *photoautotrophic cyanobacteria* (blue-green, oxygen-producing chlorophylls). The microorganisms construct a network of intertwined filaments that look like the meshwork of a carpet on a marine deposit such as sandy tidal flats.

Surfaces of microbial mats range from a film-like surface in early biofilm stage of mat development to a well-developed spongy, pock-marked, carpet-like surface. Microbial mats cannot tolerate wave action and high energy tidal actions.

Why are microbial mats important?

Following Steno's Principle of Uniformitarianism, "The Present is the Key to the Past," we can use microbial mats as a window into the past by comparing modern microbial mats with fossil microbial mats. Microbial mats are evidence of the first life on earth, some 3.2 billion years ago. The earliest microbial mats helped to create the oxygen-rich atmosphere that now exists around Earth. They also tell us something about the tenacity of life, having survived 3.2 b.y. with little change. Fossil mats are keys to past environments, such as that represented on the east side of Dinosaur Ridge. The study of fossil microbial mats requires knowledge of biological and geological interactions, and emphasizes the need for a geological scientist to be familiar with all fields of science.

What was the environment in which the Dinosaur Ridge microbial mats were formed?

The microbial mats at Dinosaur Ridge were formed in the higher reaches of the tidal zones, the lower portions of the supratidal zone, where only very high tides, such as *neap* or *spring tides*, or storm events infrequently cover this zone to keep it wet only for a very short time before water drains back through the basal sand.

These very high tides and storm events supplied the nutrients for the mats and provided mobility to the bacteria that formed the mat colonies. The east side of Dinosaur Ridge was mostly a very quiet environment accessible to dinosaurs and other land creatures except during storm events.



Dinosaur Ridge, Fossil Microbial Mat Surface (100-95 Ma); Coalescing erosional Remnants. Credit: Sam Bartlett

What are tidal flats?

Tidal flats are coastal zones with relatively gentle slopes that are affected by periodic tides (flood and ebb tides) and storms. Tidal flats are divided into zones. Each zone is subdivided using the time that the zone is inundated by a tide and the intervening time of exposure to the atmosphere:

Subtidal zone (lowest) – The area below normal tide zones, not affected by ebb or neap/spring tides

Intertidal zone (intermediate) – The area normally flooded daily by tides, above the lowest neap tide level and below the normal high water line

Supratidal zone (highest) – The highest area of a tidal flat, above the normal high water line and not affected by daily tidal currents. Further divided into sub zones:

Lower Supratidal zone – The area between the normal high water line and spring/neap tide high water line; flooded every fortnight (two weeks)

Upper Supratidal zone – The area above the high neap/spring tide water line; flooded by spring tides reinforced by strong storms pushing water into this area

What are ripple marks?

Within the tidal zone, ripple marks are formed as the incoming tide ascends the sandy slope. The resulting dissipation of energy results in movement of sand grains to form the typical ripple marks that we see on portions of Dinosaur Ridge. Ripple marks are made on tidal flats during the advancing tide, not the retreating (ebb) tide, which is more likely to form ripple marks in tidal channels.

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Where do microbial mats grow?

Benthic microorganisms can form, among other organisms such as *stromatolites*, coatings from simple *biofilms* to the more complex microbial mats in tidal, lagoonal, and continental shelf environments.

The microbial mats on Dinosaur Ridge most likely formed in the quiet, very shallow tidal environments of the lower supratidal zone, possibly behind a shore barrier. They are *epibenthic* microbial mats, the type that form on top of sediments, smoothing out the original surface and flattening out the original ripple marks. Epibenthic mats are a coherent, carpet like network embedded in EPS. These lower supratidal mats are seasonal but do not decompose in the fall as do *endobenthic* mats. However, they might suffer from erosion by severe storms during the fall and winter months. Epibenthic microbial mats can cover square kilometers of the surface.

The epibenthic mats colonize the pre-existing surfaces, including ripple marks, leaving a smooth surface at the base of the mat. The endobenthic mats colonize and incorporate the top of the existing sand grain surface into the mat itself. Marine life, such as worms, cannot penetrate or tolerate a microbial mat, but snails often graze on them. Worms live in the higher energy environments until the mats colonize and force them and other species to abandon their growth area.

What are Microbially Induced Sedimentary Structures (MISS)?

Microbial traces in sandy deposits are termed “microbially induced sediment structures” (MISS) and form at the intersection of a solid (sand), a fluid (water) and gas (air) called the sedimentary surface. Tidal flats represent such a surface. MISS can be seen in modern environments as well as in sedimentary rocks. The 17 main types of MISS belong to five categories:

1. Structures arising from growth of microbial mats
2. Structures arising from biostabilization of microbial mats
3. Structures arising from baffling and trapping
4. Structures arising from binding
5. Structures arising from the interaction of all four of the above categories

What types of microbial activity are evident on Dinosaur Ridge?

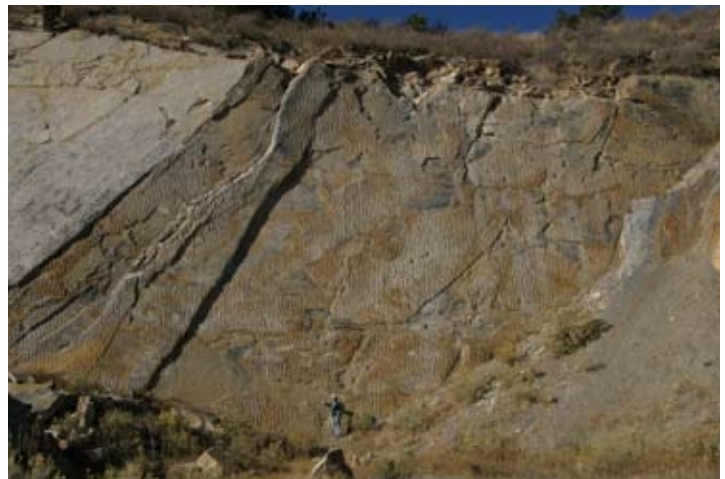
Along the east side of Dinosaur Ridge, mats belonging to nearly all five MISS categories occur at different locations. However, the main mat that is just north of the track site, the primary microbial mat on Dinosaur Ridge, belongs to category five. This mat contains evidence of the other four MISS categories and represents a microbial mat experiencing stages of growth and simultaneous degradation prior to burial.

As were the dinosaur tracks, the microbial mats, particularly the primary mat, were buried quickly by another layer of sediment.

How do erosional remnants and pockets form and what do they look like?

Erosional remnants, the primary structures on the main mat, are formed by currents acting on an obstacle such as a clam shell deposited on the microbial mat surface. Erosion around this obstacle creates a triangular hole in the mat, exposing the bare sand layer below. The apex of the triangle points downslope. This exposed sand layer is then subjected to tidal currents that form the ripple marks. Often, as we see on Dinosaur Ridge, these erosional pockets join or coalesce to form irregular patterns that resemble overgrown ruffle potato chips within the mat surface.

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Microbial mat? Ripple marks near the Hawk Nest Site. Clare Marshall for scale. Photo by Lou Taylor.

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What other features exist on the main microbial mat surface at Dinosaur Ridge?

The main Dinosaur Ridge microbial mat displays most of the life cycle of a microbial mat:

1. The healthy, fully developed mat surface
2. The start of the degradation process (possibly by dinosaurs)
3. Further degradation shown by cross ripple marks
4. Continued degradation shown by detritus in the ripple- marked, remnant pockets
5. The clean remnants and pockets with pronounced ripple marks
6. The healing of the mat as shown by oxidation in the remnant pockets

Summary

The sand that now forms the uplifted Dakota Sandstone of Dinosaur Ridge was once within a nearly horizontal tidal zone along the shore of the 95-100 Ma advancing seaway. It was within the lower portion of the supratidal zone where only very high tides, such as *neap or spring tides*, or storm events reached it.

The mats formed through the action of cyanobacteria in areas frequented by the dinosaurs whose tracks were preserved on the Ridge. The ripple-marked patches in the main microbial mat surface on Dinosaur Ridge resulted from erosion and subsequent tidal current action.

—SAM BARTLETT

Definitions:

Benthic - bottom of the sea or a lake

Bacteria - one-celled organisms without a nucleus

Photoautotrophic cyanobacteria – blue-green bacteria that produce oxygen through photosynthesis

Neap or spring tides – Very high tides affected by the combined gravitational pull of the moon and the sun. The highest gravitational tides

Storm tides – Very high tides pushed ashore by storms, such as hurricanes, that can cause tides up to eight meters or more above normal tide levels

Stromatolite – Carbonate secreting microbial mats that form reef like structures; they are found only in carbonate-rich environments

Biofilms – very thin films, less than 0.5 mm thick, of benthic cyanobacteria which attach to the surface of sand grains and start to secrete EPS. The very early stages of microbial mats

Epibenthic – referring to planer microbial mats that colonize the lower supratidal zone and develop on top of the sediment surface

EPS – Extra-cellular polymeric substances or mucous matrix binding biofilms and microbial mats together

Endobenthic – referring to planer microbial mats that colonize the upper intertidal zone and develop within the upper surface of the sediment

Multi-directional ripple marks – ripple marks oriented in multiple directions on the same surface, usually involving seasonal tides

References

Noffke, N. 2010. *Geobiology: Microbial Mats in Sandy Deposits from the Archean Era to Today*. Springer-Verlag, Berlin Germany.

Noffke, N. 2010. *Microbially Induced Structures on the Cretaceous Dakota Sandstone, Dinosaur Ridge, Denver, Colorado, USA*. May 21st – 23rd, 2010 Field guide. SEPM Field Conference Denver, Colorado, USA. (Unpublished).

ARTICLES

DINOSAUR RIDGE HISTORY

Rocky Mountain News, June 28, 1938, Tuesday Morning, p. 1

Dinosaur Footprints Found Here

Denver Museum to Make Exhibit of WPA Discovery

Seven dinosaur tracks made 75 million years ago have been discovered within three feet of the Alameda paved highway, 10 miles west of Denver.

The tracks were found by H.H. Nininger, meteor curator for the City Park museum, who noticed the formations while driving by in his automobile.

“They were made about 75 million years ago by a three-toed dinosaur, near the closing of the life period of the species,” said Philip Reinheimer, curator of paleontology of the museum, who studied the tracks yesterday.

18 inches long

WPA workmen exposed the tracks while constructing the new highway and failed to notice them.

Each of the tracks is 18 inches long and 15 inches wide. The dinosaur

was walking on two hind legs. The distance between each right foot step is seven feet. They are exposed on a semi-vertical face of rock on the east slope of the hill known as the Hogback and are formed in solid limestone.

Ripples of Lake, Too

“The footprints were made on a lake bottom,” Mr. Reinheimer said. “An upheaval hurled the geological formation of the lake bottom into its present position. Ripples made by the lake’s waters can be seen near the dinosaur tracks.

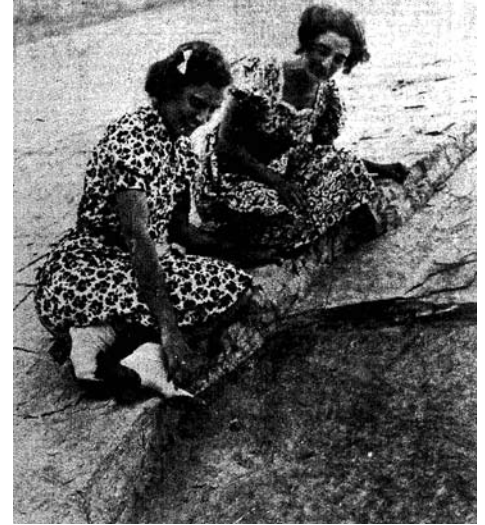
Museum officials said the tracks are the nearest to a highway of any found in this region.

Denver park officials are considering erecting a railing to protect the tracks and to develop them as a road-side attraction.

Hunt More Tracks

Additional excavations will be made In an effort to uncover more tracks, George E. Cranmer, city manager of parks and improvements said:

“From all indications, we believe we can find at least five or six more tracks by removing a layer of rock just south of the discovery.



Miss Cecily Jansen, left, and Miss Sylvia Cranmer study the dinosaur footprints found alongside the Alameda highway. Miss Cranmer is a daughter of George E. Cranmer, manager of parks and improvements. The tracks were found by the WPA.

We will construct a protective railing right away, and take the necessary steps to preserve the tracks. We think this discovery is one of the best examples of its type in this region.

Signs giving information about the animal and the manner will be erected beside the highway,” Mr. Cranmer said.

—BETH SIMMONS

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ARTICLES

DINOSAUR RIDGE PUBLICATIONS 1990-2010.

The Friends of Dinosaur Ridge has established itself as a small publishing house, specializing in the production of local guidebooks and books of historical interest, as well as videos, DVDs and numerous pamphlets. The following list details 14 guidebooks and books produced between 1990 and 2010, including two that have been through multiple editions. 18 authors, editors and artists have contributed to these publications: almost all have been board members or regular members. A few publications were produced in partnership with other publishers. Most publications are still in print.

Lockley M.G. 2001. *A Field Guide to Dinosaur Ridge*. A joint project of the Friends of Dinosaur Ridge and University of Colorado at Denver Dinosaur Trackers Research Group. Fully revised 3rd edition. 34p. (First edition published as: Lockley, M. G. 1990. *A Field Guide to Dinosaur Ridge*, Friends of Dinosaur Ridge and the University of Colorado at Denver Dinosaur Trackers Research Group, 29 p. Second edition published as Lockley, M. G. and Marquardt, L. 1995. *A Field Guide to Dinosaur Ridge*. Fully revised second edition, Friends of Dinosaur Ridge and the University of Colorado at Denver Dinosaur Trackers Research Group, 33 p.).

Lockley, M.G. 2003. *Fossil footprints of the Dinosaur Ridge and Fossil Trace areas*. Friends of Dinosaur Ridge, Morrison Colorado, 66p. (First edition published as: Lockley, M. G., and Hunt, A. P. 1994. *Fossil Footprints of the Dinosaur Ridge Area*, Friends of Dinosaur Ridge and the University of Colorado at Denver Dinosaur Trackers Research Group, with the Morrison Museum of Natural History, 53 p).

Black, K.D. 1994. *Archaeology of the Dinosaur Ridge Area*. A Publication of the Friends of Dinosaur Ridge 37p.

Hartmann R. (ed.) 1999. *The Friends of Dinosaur Ridge, 1989-1999: an Oral History*. Friends of Dinosaur Ridge, 40p.

Hunt, A., Lockley, M. G., and White, S. 2001. *Historic Dinosaur Quarries of the Dinosaur Ridge Area*. Friends of Dinosaur Ridge in conjunction with the University of Colorado at Denver and the Morrison Museum of Natural History. 44p.

Marquardt, L. *The Dinosaur Ridge Coloring Book*

Lockley, M.G., and Taylor, A. (eds.) 2001. A special issue on Dinosaur Ridge: celebrating a decade of discovery. *Mountain Geologist*, 38(3):87-194.

Lockley, M.G. and Peterson, J. 2002. *Fossil footprints of the world*. A Lockley-Peterson Publication, Boulder Colorado, Published in conjunction with the Friends of Dinosaur Ridge, 128p.

Continued on next page

ARTICLES

Continued from previous page

Drewes, H. and Townrow, J. 2005. *Trailwalkers guide to the Dinosaur Ridge, Red Rocks and Green Mountain area.* Friends of Dinosaur Ridge 86 p + 1 pl. (First edition published informally in 1999).

Fair, E., Tempel, J. and Moglestad, T. 2008. *A guide to Triceratops Trail.* Friends of Dinosaur Ridge 16p.

Honda, K. and Simmons, B. 2009. *The Legacy of Arthur Lakes.* Friends of Dinosaur Ridge 194p. + CD-ROM.

Marshall, C. 2009. *Guide to Trek Through Time: An Exhibit at Dinosaur Ridge.* The Friends of Dinosaur Ridge, 16 p.

Davidson, J., Honda, K., and Simmons, B. 2010, *The Rooney Ranch.* Friends of Dinosaur Ridge 35P.

Lockley, M. G. 2010. *Colorado's Dinosaur Artist: A Tribute to the Work and World of Paul Koroshetz 1963-2006.* Friends of Dinosaur Ridge, Morrison CO. 60 p.

W.I.P.S. 2011 SYMPOSIUM

The Western Interior Paleontological Society held their semi-annual Symposium on February 12th and 13th at the Green Center on the Colorado School of Mines campus. The theme was “The West That Was: Exploring Colorado’s Fossil Past”.

The Friends of Dinosaur Ridge sponsored the event and provided a booth where we sold books and showcased the new Hawk Nest dinosaur tracks discovery. The keynote lectures at the symposium featured several different discoveries and new comparisons of Colorado’s fossil past. Dr. Ian Miller, Denver Museum of Nature and Science, spoke about the SnowMastodon Discovery Project, and Dr. James Kirkland gave evidence of mammal abundance in the Fruita Paleontological Area. Dr. Kirk Johnson, Denver Museum of Nature and Science, provided evidence that the KT Boundary is 66 MYA!

Friends of Dinosaur Ridge Board Member Judy Peterson once again rounded up great artists for the Paleo Art section and it was a huge success thanks to her efforts. Board Member and Ridge Report editor Dr. Lou Taylor was the moderator as well as a speaker on the Colorado State Fossil, *Stegosaurus*, and similar fossils in Portugal. Board Member Dr. Martin Lockley spoke about the dinosaurs and the dinosaur tracks of Colorado.

The next WIPS symposium will be in 2013 so check their website for information! www.westernpaleo.org

-ERIN FAIR

FINANCIAL SUMMARY

FRIENDS OF DINOSAUR RIDGE FINANCIAL SUMMARY Fiscal and Calendar Year 2010

(Detailed financial statement available upon request. Call (303) 697-DINO, e-mail joe_tempel@dinoridge.org, or write to FODR at 16831 West Alameda Parkway, Morrison, CO 80465)

Investment Fund (\$)

Total value as of 12/31/09	341,509
Earnings during 2010	30,097
New donations	25,305
Withdrawals	-61,500
Broker fees	-3,382
Total value as of 12/31/10	332,029

Operating Funds

INCOME (\$)

Classes, Lectures	726
Food Sales	10,877
Grants, Donations, Fund Raisers:	
General Operations	107,927
Special Projects	75,002
Memberships	10,364
Merchandise Sales	178,077
Tours	111,440
TOTAL 2010 INCOME (\$)	494,413

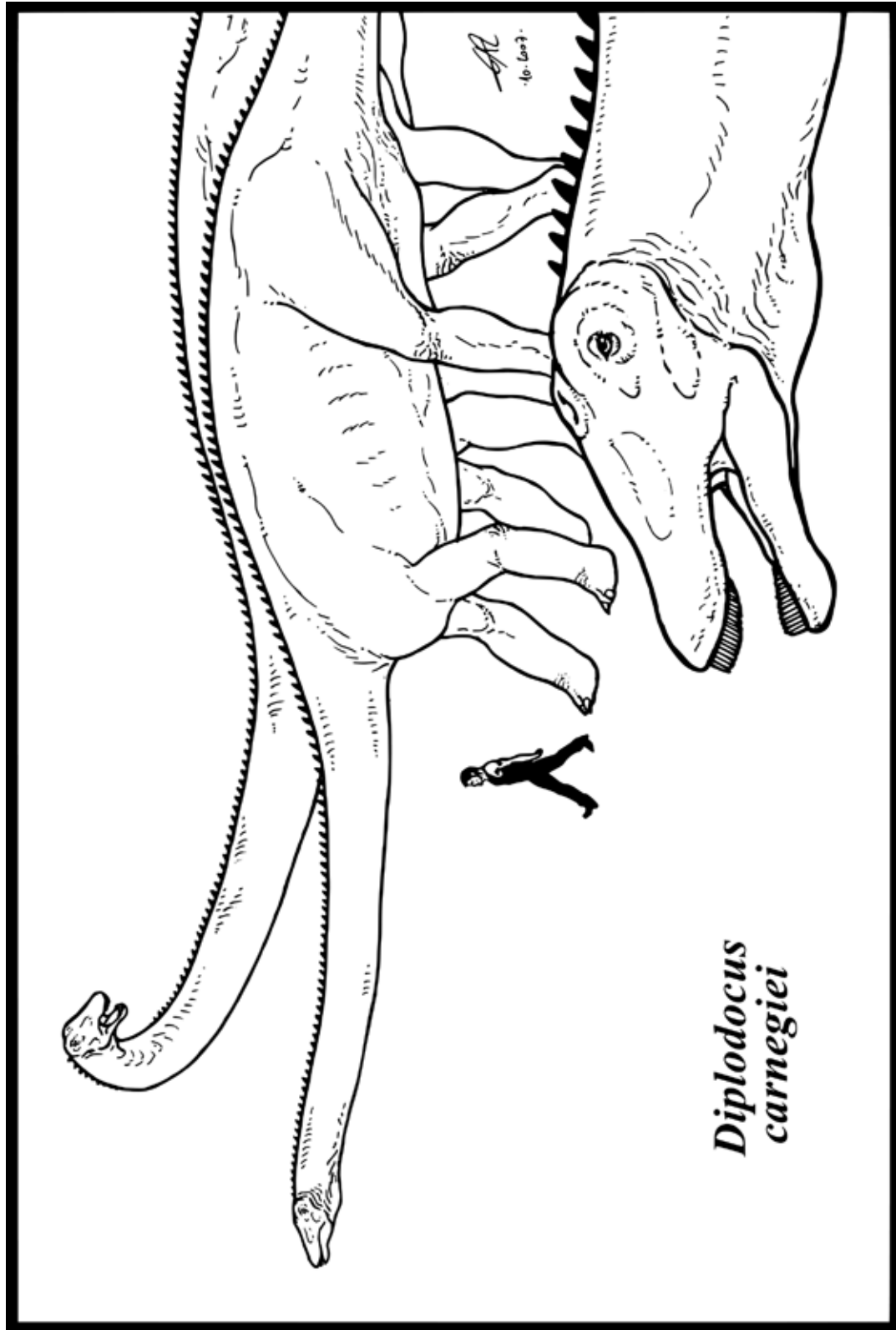
STORE EXPENSES (\$)

Merchandise Purchases	55,790
Other Store Expenses	21,555
TOTAL STORE EXPENSES	77,345
ADJUSTED INCOME (\$)	417,068

EXPENSES (\$)

Accounting Fees	5,378
Advertising	6,517
Bank Fees	134
Charitable Donation	75
Computer Hardware & Software	5,393
Conference & Meeting Attendance	313
Designated Project Expense	9,370
Facilities & Equipment	1,085
Fundraising Expense	2,494
General Business Expense	601
Insurance	9,982
Maintenance & Repairs	4,808
Mileage & Phone Reimbursement	5,380
Newsletter & Annual Report	2,203
Office Supplies & Equipment	8,475
Organizational Dues	1,485
Payroll Expenses	245,162
Postage, Copying, Office Expense	3,891
Publicity & Outreach	4,188
Special Events	2,772
Tour Expenses	12,397
Training (Staff & Volunteers)	1,372
Utilities, Trash, Security	19,014
Vehicle Expense	12,098
Volunteer Appreciation	1,033
TOTAL EXPENSES	365,620
ADJUSTED INCOME	417,068
NET INCOME	51,448

COLORING PAGE



*Diplodocus
carnegiei*

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