Volume 21, Number 3

Dinosaur Ridge

Come see our new dinos!

Ridge Report – Winter 2009

Mission of the Friends of Dinosaur Ridge (FODR), To protect the natural resources on Dinosaur Ridge and Triceratops Trail, and to educate visitors about the area's geological, prehistoric, and natural features.

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* Golden Civic Foundation
* Dan & Mac Turner Estates
* Colorado Geologic Survey
* Xcel Energy Foundation

Cover Photo:
Marj MacLachlan poses with the new Stegosaurus

Friends of Dinosaur Ridge 2009

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TABLE OF CONTENTS

4. **President's Message**

5. **Executive Director's Report**

6. **Program Director's Report**

7. **Collections and Library**

7. **IRA in 2009**

7. **Dinosaur Mural along Cherry Creek**

8. **Mesozoic Moments #14**

9. **Fire Clay Pits**

11. **Dinosaur Ridge Trivia & Tracknapping**

13. **Rock Out for the Ridge Awards**

14. **New Ash-bed Dates at Dinosaur Ridge**

15. **On The Re-Discovery Of A Fossil Bird Track From The Dakota Sandstone**

T Caneer to the Stego: "Who are you calling old?"

MANAGEMENT REPORTS

President's Message

In May of 2004, the Friends of Dinosaur Ridge Board of Directors held a retreat to scope out a 5-10 year development plan. We feel it is time to review and revise those plans for the next 5-10 years. The new interchange at C470 and Alameda Parkway, closing Alameda over the Ridge to thru traffic, and real estate development in the Rooney Valley motivates us to define FoDR's long-range goals.

First, we will review out accomplishments identified in the last 5-10 year plan. Significant accomplishments include remodeling the barn to create the upstairs Chevron Classroom/Meeting Room and the Trek Through Time exhibit area downstairs. Educational accomplishments include publishing field guides to the Dinosaur Ridge area and Triceratops Trail (TT), a guide to the Trek Through Time exhibits, and the Junior Paleontologist activity booklet for Dinosaur Ridge and Triceratops Trail (and also a joint effort with the Morrison Natural History Museum for an activity booklet). Also included in that list is Beth Simmons and Kathy Honda's book on the life of Arthur Lakes.

Preservation accomplishments to protect our fossils (and resources) include construction of a temporary rock support system for the tracksite, stabilization of the bulge site with steel supports, providing Plexiglas covers for the ash bed, and additional stabilization to the bone site. We installed motion detector lights at the bone and bulge sites, and completed final design for a tracksite enclosure and a roof over the tracksite in the hadrosaur pit at Triceratops Trail.

General site improvements completed from the 5-10 year plan include an *Allosaurus* sign and expanded parking at the Visitor Center. In addition to these accomplishments, we improved our partnership with the Colorado School of Mines to support our program through services and personnel, and improved our educational partnership with the Morrison Natural History Museum through joint tour programming.

Obviously, the above list does not include all of FoDR's accomplishments during the last five years, but only those outlined in the 5-10 year plan developed at the 2004 retreat. Nevertheless, this list is impressive indeed!

Even with this impressive list of accomplishments, there remain many items from the 5-10 year plan to be completed, including most of the 10-year items. We will then evaluate the effects of closing the roadway over Dinosaur Ridge and the consequences of the Rooney Ranch sale to developers. Despite the complex future for Dinosaur Ridge, it is critical that we, the Friends of Dinosaur Ridge, try to look into the future to best position ourselves in control of our own destiny.

It is always good to sit down periodically with our stakeholders to review current plan completions, look at expected future accomplishments, revise the long term plan if needed, and address new issues that have come up since the last retreat. The need to review our future plans is probably as critical as any time in our past. We need to continually try to peer into the future to put ourselves in the best position we can to anticipate change rather than react to those changes after-the-fact.

If you have any ideas for the future of the Friends of Dinosaur Ridge, please pass them along to Joe or me so that we can incorporate them into our vision.

-Sam Bartlett

MANAGEMENT REPORTS

Executive Director Report

Fundraising

We have received funds from the following organizations and individuals since the last Ridge Report:

- Scientific and Cultural Facilities District (SCFD): ($54,700) for general operations/tours ($53,040) and the purchase of two full-sized dinosaur replicas ($1,660) as featured on the cover of this Ridge Report.
- Harvey Family Foundation: ($18,750) to hire a consultant to help the Friends of Dinosaur Ridge design a fundraising campaign to raise $2.2 million for construct a structure over the dinosaur tracksite. The Friends contracted with Intersector Partners in September.
- Majorie MacLachlan (Board Member): Marj made a major contribution to purchase the two dinosaur replicas installed in October at the Visitor Center.
- The Western Interior Paleontological Society (WIPS): ($3,000) for the purchase and installation of two full-sized dinosaur replicas and the installation of two interpretive signs.
- David Claybaugh (Operator of Lakewood's Motocross Park): ($2,000) Unrestricted donation.
- We have requested funds from the following organizations and individuals since the last Ridge Report:
- Golden Civic Foundation: ($8,000) for the construction of the Palm Frond Wall Protective Cover along Triceratops Trail.
- MDU Resources Foundation: ($25,000) for the construction of the Palm Frond Wall Protective Cover along Triceratops Trail.

Concerns

The Friends of Dinosaur Ridge have concerns with regard to future development of the Rooney Ranch. FoDR is in the process of responding to two actions by the Three Dinos, LLC, a company which has purchased 120 acres of the Rooney Ranch for development.

The first concern is how the developer will gain access to their property north of our existing Visitor Center. A preliminary proposal showed roadways being constructed on each side of our 1.4-acre property, essentially making us a traffic island. We wrote letters to Jefferson County and the developer expressing our concerns and they pulled their preliminary plat from further consideration. We suggested a couple of options that would make their proposal acceptable to the Friends, but they have not yet responded.

The second concern is over a Complaint that Three Dinos, LLC submitted to Jefferson County claiming ownership of Alameda Parkway from C470 to a point just north of our main tracksite. The Rooney's sold this property to the City and County of Denver in 1936 for construction of a public roadway (now known as Alameda Parkway). There was a reverter clause in the deed to Denver that said if the roadway was "abandoned in whole or in part" it would "revert" to the "heirs and successors" of Rooney Ranch. Three Dinos, LLC purchased the reverter clause and feel the land should revert back to them because Jefferson County gated the roadway and restricted traffic over the Ridge to our tour buses, bicyclists, pedestrians, and emergency vehicles. Three Dinos, LLC is of the opinion that the roadway is abandoned and should be deeded back to them. FoDR submitted letters to Jefferson County and the Three Dinos, LLC rejecting their assumption that the roadway has been abandoned and the FoDR should be part of the "mediation" process to resolve the Complaint. Jefferson County has until January 2nd, 2010 to respond to the Complaint.

The Friends have met with the National Park Service (they designated Dinosaur Ridge a National Natural Landmark), the State Historical Society (they designated Dinosaur Ridge as a State Historic Site), and State Parks (they designated Dinosaur Ridge as a State Natural Area). These entities have written letters expressing their concerns about reopening the road to all traffic.

National Scenic and Historic Byways Designation

Dinosaur Ridge has been a part of the Lariat Loop Scenic and Historic Byway since it was designated a state byway in 2002. This is a 40-mile scenic drive connecting Morrison, Golden, and Evergreen. On October 16th, 2009, Joe Tempel – president of the Lariat Loop Heritage Alliance that oversees Lariat Loop – was flown back to Washington D.C. to participate in an event at which he accepted the formal designation as a National Scenic and Historic Byway.

The designation should attract more visitors to Lariat Loop and to Dinosaur Ridge in particular. The next project of the Alliance is to construct a $300,000 interpretive area and parking lot for 15 cars at the Buffalo Overlook (I70/Genessee Exit) in the spring of 2010.

-Joe Tempel

MANAGEMENT REPORTS

Program Director's Report

1st 9 Months, 2009

Visitation, Attendance and Sales

Program	2008 1st 9 Mos.	2009 1st 9 Mos.	Change
Visitors to Visitor Center	39,331	46,871	+19%
Tours (Total Attendance) *	14,122	24,524	+74%
Trek Through Time	7,957	17,684	+122%
Chats, Hikes, Field Trips	252	202	-20%
Traveling Exhibit Visitors	10,000	3,400	-66%
Dino Discovery Days (6)	4,800	4,800	
Triceratops Trail Day	63	100	+59%
Sales ($) **	133,501	179,344	+34%

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

***includes receipts from Gift Shop, Shuttle Bus, and Trek Through Time*

Double-digit growth continued in most categories during the third quarter, based mostly on a change in the business model in mid 2008 and increased marketing efforts. A mailing sent out to school teachers contributed to record reservations for school tours in October. However, poor weather caused a number of cancellations.

August, September, and October Dinosaur Discovery Days Successful

DDD-RMF (Rocks, Minerals, & Fossils)
Sponsored by the **Greater Denver Area Gem & Mineral Council**, this event was attended by about 600 visitors on August 8. The Council gave out free specimens of fossil wood. Guests from the **Colorado Scientific Society** facilitated many of the sites on the Ridge. The **Denver Botanic Gardens** presented a booth with modern plants that resemble Late Jurassic plants, and the **Morrison Natural History Museum** assisted with interpretation of the Bone Site. With the help of volunteers, Erin Fair, Dinosaur Ridge Education Assistant, introduced and tested a new hands-on activity for kids: "Exploring for Hard Parts." This activity consists of sieving special sand in order to find small fossils such as teeth, bone fragments and shells. "Exploring for Hard Parts" proved to be a success and was presented at DDD-RRR, the Denver Gem & Mineral Show, STEMapalooza, and DDD-Girl Scout Day. Altogether an estimated 2,500 kids (and adults) enjoyed the activity.

DDD-RRR (Reading Really Rocks)
September 12 was held on a cool day with intermittent sprinkling. Fortunately, serious rain showers held off until after the event. An estimated crowd of 550 attended. The **Jefferson County Public Library** promoted reading by presenting recently published dinosaur books and holding dinosaur story times for our young visitors. FODR author, **Andy Taylor**, sponsored the event and FODR author, **Beth Simmons** and illustrator, **Gary Raham** signed their latest book, *The Legacy of Arthur Lakes*. Board member, **Lou Taylor**, organized a used geology book sale that brought in more than $300. Most of the books were donated by long-time FODR member, **Jerry Forney**. Thanks Jerry for your generosity!

DDD-ESW (Earth Science Week – also Girl Scout Day)
Postponed one week because of snow and cold, DDD-ESW was held October 17. Event co-sponsor, **Girls Scouts of Colorado**, registered over 800 scouts and family members – about 600 came to the rescheduled event with a total attendance, including the general public, of 1000. The **Association for Women Geoscientists** co-sponsored Girl Scout Day for the fifth year in a row, the maximum number of years allowed by their bylaws. Many thanks to the AWG for their consistent support beginning with the

MANAGEMENT REPORTS

first scout day in October, 2005. Even though a number of exhibitors and registrants were not able to attend because of the postponement, we thank **Pioneer Natural Resources, Colorado Groundwater, Legendary Ladies**, and **Solterra** for making presentations. Members **Dan Fanelli** and **George Daggett** introduced molds of recent discoveries at Hawks Nest and Lena Gulch on Dinosaur Ridge and **Richard Kerr** talked about how local climate change can affect the growth of tree rings. Thanks to all the volunteers!

Colorado Mountain Club and FODR Collaborate

The Friends of Dinosaur Ridge and the Colorado Mountain Club are collaborating on school tours at Triceratops Trail. The CMC schedules and presents many classes at the American Mountaineering Center in Golden. A few of these classes include rock identification and a short trip to the Triceratops Trail where staff and volunteers from FODR help lead the tours. Presently the Colorado Mountain Club has a rock climbing program for merit badge counselors who help Boy Scouts earn a climbing merit badge. CMC plans to participate in FODR's Boy Scout Day and other programs as a way to promote their climbing badge program and FODR's geology badge program.

Visitor Center at Triceratops Trail – Feasibility Study

FODR conducted a feasibility study to determine the economics for FODR to rent an available house near the trailhead at Triceratops Trail, remodel it, and operate a Visitor Center/Museum there. Efforts led by **Clare Marshall** included searching for partners to share rent. Final results were that such a visitor center would operate at a loss too large for the Friends of Dinosaur Ridge at this time. Future efforts may include attempts to secure grants and a search for a third party to purchase the property.

-Tom Moklestad

Collections and Library

Members continue to donate fossil specimens to the collection. Recent acquisitions include a possible cycad and a possible Baculites, both from the Dakota Formation of Dinosaur Ridge. Both of these specimens are being studied for identification. Norb Cygan continues to be a major contributor to the collection.

The library continues to grow, thanks to even more donations from Jerry Forney. Jerry donated so many geology books that we were able to hold a book sale at the September Dinosaur Discovery Day. Jan Jacobson and Lou Taylor donated additional books for the sale. The book sale raised $304, and was so successful that we will hold more of them when the warm weather returns. John Ghist donated books for the future sales. We urge all members who have paleontology or geology books that they are willing to part with to bring them to Dinosaur Ridge. We hope to have a giant book sale in the spring.

-Lou Taylor

IRA in 2009

Don't forget to make a contribution to Dinosaur Ridge from your IRA in 2009.

This may be the last year you can deduct a contribution from your IRA to a non-profit organization. The current rule states that if you are 70.5 years of age, you can deduct up to $100,000 from your income if you contribute that amount from your IRA to a nonprofit. While the rule may be extended, there is no assurance that it will. If you do make a contribution, the Friends of Dinosaur Ridge will write you a letter of acknowledgement, a requirement for your contribution to be tax deductible.

-Joe Tempel

Dinosaur Mural Along Cherry Creek

This mural will be installed at Confluence Park along Cherry Creek. It is the first of many to be installed over the next year. The mural project was initiated by the Platte River Greenway to involve students in the Colorado area in creating a series of murals that depict Denver through time. What better way than to start with dinosaurs from Dinosaur Ridge!

Their goal is to make a "Mile High Mural" that is a mile long.

-Joe Tempel

For more pictures of the mural project, visit
http://spreeweb.org/home/emails/aotr/mhmural.html

ARTICLES

Mesozoic Moments

MeMo #14

Who Made Those Tracks?

We have some great examples of tracks and trackways at Dinosaur Ridge. One thing that we (and our visitors) always like to know is 'who made those tracks?' It is an easy question to ask, but not always an easy one to answer. To answer this question, we need to know: 1) which dinosaurs were living at the time the rocks were deposited; 2) which dinosaurs were living in the right geographic location and environment represented by the deposit; and 3) which dinosaurs had foot characteristics that match the tracks.[1]

In the case of our 'brontosaur bulges', this is an easy problem. We have fossil bone evidence for the dinosaurs that were living right here at Dinosaur Ridge and are preserved in the Morrison Formation. So, the timing and the geographic range of the dinosaurs that made these tracks are not problematic. The size of the largest bulges suggests that they could only be made by the large sauropods. The only question would be whether they are from a *Diplodocus*, an *Apatosaurus* (=*Brontosaurus*), perhaps a *Camarasaurus*, or maybe even an unknown Sauropod (such as *Barosaurus*).

The main Cretaceous tracksite at Dinosaur Ridge is the holotype of the ichnogenus *Caririchnium leonardii*.[2] These include the large, round-toed tracks that we loosely refer to as the 'Iguanodon' tracks. The specific animal that made these tracks is problematic. No known *Iguanodon* species properly fits the timing and geographic location of these tracks and no bone fossils have been found locally in the Dakota Group. Members of the larger group (superfamily), iguanondontoidea did exist during the time interval of Dakota Group deposition and one genus, *Eolambia*, has been identified in the upper Cedar Mountain Formation in Utah, which is the age equivalent of our track site and relatively proximal.[3] *Eolambia* is the dinosaur that is seen in the *Trek Through Time* exhibit because it is a good candidate for the genus that made the *Caririchnium* tracks at Dinosaur Ridge.

The Dinosaur Ridge Cretaceous track site is also the holotype for *Magnoavipes caneeri*[2], the bird-like tracks that we see. Identifying the track maker for *Magnoavipes* is more problematic. FODR guides sometimes refer to these tracks as being made by *Ornithomimus*, but that genus existed over 20 million years later than the deposition of the Dakota Group. Other species within the larger groups of Ornithomimidae and Onithomimosauria that are identified by fossil bones do not correlate correctly with the geographic range or time ranges to explain the Dakota tracks.[3] We may not be able to identify the track maker for *Magnoavipes* any closer than being in a general group such as the coelurosaurs or even the larger theropod group.

Discussion about how we analyze the evidence from these trackways may be more important than assigning an exact scientific name to the animal that made the tracks. It may be very cumbersome to continue to talk about the 'iguanodon-like' animal that made the tracks or the 'unknown theropod', but it is important not to overstate our confidence in the identity of the track maker. This also may be a very important teaching point for our visitors; they should understand the uncertainty that scientists face in analyzing 100 million year old trace fossil evidence.

-Kermit E. Shields

REFERENCES

[1] Lockley, M and Hunt, P.H., Dinosaur Tracks and other fossil footprints of the Western United States, 1995, pp 11-12.

[2] The Paleobiology Database. http://www.paleodb.org/

[3] Weishampel, D.B., Dodson, P., and Osmolska, H, "The Dinosauria" 2nd Edition, 2004.

Visit the MeMo repository in the Dinosaur Ridge Volunteer Room.

ARTICLES

Fire Clay Pits

Our research this summer at Dinosaur Ridge led to an extensive investigation of the "fire clays" of the Ridge and nearby region. The Hawks Nest Site sits in a major fire clay mine pit, and there are clay pits just west of the new fossil crocodile track site along West Colfax. There were clay pits and mines the full length of the hogback, including one just west of the Dinosaur Ridge Visitor Center, and some south along the Ridge on the east side. Even the "back wall" at Bandimere Speedway was the west face of a clay mine.

There were different types of clay – some used for pottery, others for tiles, pressed building bricks, and for fire bricks in the smelters and furnaces. The finest clay came from the Van Bibber unit of the Dakota Group, a black shale layer that is exposed at the I-70 Road Cut. Elsewhere it has mostly been quarried out. Other clays in the Laramie Formation, excavated from Parfet clay pits, now Parfet Prehistoric Preserve, were abundant and easy to access and mine. Even Arthur Lakes wrote to Marsh in 1879 about perhaps selling the green fire clay that he and his men had excavated from his quarries.

In June 1880, the following article appeared in *The American Manufacturer*, published in Pittsburg, Pennsylvania, entitled "The Fire Clays of Golden". George West reprinted it in the *Colorado Transcript* on June 16th, 1880, in Golden:

"Traversing the eastern slope of the Rocky Mountains for many hundreds of miles and running parallel with the range usually at about half a mile from the granite is a characteristic outcrop of uplifted grey quartzitic sandstone forming a hog back, as it is called, but more resembling an advancing wave rearing toward the mountains.

This ridge is very permanent in character by reason of the hardness of the rock, which has resisted the erosive forces which have debased the surrounding country underlaid by the jura trias [sic] and softer cretaceous [sic] beds and the more horizontal strata of the lignitic and tertiary. It is known to geologists at the Dakotah group of the lower cretaceous [sic], and is everywhere a well-defined horizon from which to determine contiguous strata, as well as an excellent point from which to view the landscape o'er.

Along the foot-hills this stratum usually stands at a high angle, in many places quite vertical, in others from 60-80 degrees, or even overthrown slightly beyond the vertical. This is due to the violent folding to which the stiff sandstones have been exposed in the general uplift of the Rocky Mountains. The upper portions of these folds have been removed by erosion, leaving the straight part standing erect. This is particularly noticeable in Golden, where the beds are much nearer to the granite axis than elsewhere. The strata here is vertical; further south towards Canyon City the angle is much more acute. The fine gray quartzitic sandstone composing the ridge shows ample proofs of the violent forces to which it has been subjected by its jointed, faulted and fractured condition. Slicken occurs abundantly, bringing out the quartz crystals latent in the sandstone to the surface, and polishing many portions especially noticeable over patches of oxide of iron, which may also have been drawn to the surface by friction. The sandstone is largely quarried, and makes and excellent building stone.

The thickness of the Dakotah group varies from 200 to 300 feet. In the middle and lower portion are belts of a steel blue fire-clay of from 8 to 12 feet in thickness lying between two massive vertical walls of the sandstone. The polished, glistening appearance of the clay reminds one almost of graphite; it has a very unctuous feeling to the touch; the lainae appears to be coated over with minute crystals of silica. Both the crystals as well as the vitreous shining hue and unctuous polish of the clay are apparently produced by the friction of the laminae one against the other, forming a slicken like that so noticeable in the wall rock about them, caused, as we have remarked, by the violent uplifting and folding to which these strata have been exposed. The steel blue and glistening clay is nearest the wall rock, which originally constituted the bed bottom, the lighter and duller above it.

The beds have been opened at intervals for four miles along the strata, and they run north and south. There are three

(continued on page 10)

ARTICLES

(continued from page 9)

fire-brick works in operation and doing well: the Mineral Land and Coal Company, the Cambria Works, built lately, and the Colorado Pressed Brick Company's Fire Brick Works.

At present the clay is mostly manufactured for fire-brick, but its excellent quality would suit it for all purposes to which fire-clay is adapted.

The Cambria Works has three kilns, of 20,000, 30,000, and 50,000 capacity. The Pressed Brick Company has two kilns of 35,000 capacity each.

The analysis of the steel blue fire-clay made by Mr. John Causley, under the supervision of Prof. Moss, of the State School of Mines, gives the following:

Silica	*52.41*
Alumina	*32.21*
Sesquioxide of Iron	*.68*
Lime	*.20*
Magnesia	*.05*
Potash	*.01*
Water	*14.05*
Total	*100.20*

The blue clay differs from the lighter colored by about 5 percent more silica and as many percent less alumina. In every other respect percentage composition remains essentially the same.

Four determinations of the alkalis contained in the different clays gave, according to Prof. Lawrence Smith's method 0.61 percent of alkali, almost entirely potash.

Geologically this Dakotah formation is of peculiar interest, for both in the sandstone and clays, especially those near the base, we find at Morrison and Golden, and come other localities, the first signs of dicotyledonous leaves without, so far as discovered, any connecting link with the conocotyls of preceding ages, and also, singularly enough, specifically quite different from the Dicotyledons of the great lignitic but a few hundred feet above it, or from any of our present age. The genera are mostly willows, maples, poplars, sassafras, Arabia, proteoides, etc.

From a few inocerami [sic]and marine shells found at the base of these leaf-bearing strata we may suppose that this formation represent low islets in the cretaceous ocean covered with foliage. The fire-clays may not improbably represent the fine mud in the swamps and ponds on the islets.

Above this Dakotah the cretaceous beds are all marine, and come of them deep sea, till we reach the brackish beds of the lignitic containing our great coal fields.

Below the atlantosaur beds in the Jurassic limestone is worked for miles around Golden, and this is capped by a friable massive cream-colored sandstone, forming the dividing line between the jurassic and Triassic rocks [sic]. This affords silica of a superior quality so that coal, lime, silica, fire-clay and building stone open up many industries in Golden."

-Beth Simmons

New Iguanodon Replica from Poland

Dinosaur Ridge Trivia & Tracknapping

1.	What is the official fossil of Weld County?
a.	Triceratops, so designated in 1985. (Source: Rocky Mountain News, May 22, 1985, p. 24)
2.	What names were given to the Hogback and the road from Morrison to Golden on the west side of the Hogback in the 1920s-1950s?
a.	"Dinosaur Mountain" and "Dinosaur Trail," "at foot of mountain from which fossil monsters were taken for eastern museums" (Source: Photograph at DPL of crew removing the cast of the rocks on the Ridge for the bear habitat at the zoo, captioned "Dinosaur Mountain," also in Denver Municipal Facts, April-May 1920, p.8 & April, 1925, p. 29)
3.	Where in Colorado and in what year was the moniker "Dinosaur Ridge" first applied?
a.	In 1950, "Dinosaur Ridge" was first used to designate a hill south of the Colorado River at Fruita, northwest of Devil's Canyon, west of the Biggs Quarry (Source: Weight, Harold O., April 1950, "Ridge of the Terrible Lizards," Desert Magazine, p. 10-15.
4.	Who found the original tracks on Dinosaur Ridge and how many were there?
a.	In June of 1938, the Rocky Mountain News reported that WPA workmen had exposed seven tracks found by H. H. Nininger, meteor curator at the Denver Museum (called the City Park Museum by the reporter), while driving by in his automobile. Curator of paleontology Philip Reinhemier, identified them to be from a theropod dinosaur, about 75 million years old.
b.	The city manager of parks and improvements, George E. Cranmer, wanted to erect a railing to protect the tracks and develop them as a road-side attraction. Cranmer's daughter Sylvia and Cecily Jansen were photographed in floral dresses with bows in their hair, studying the tracks.
c.	The original seven tracks, identified from another photograph published by the USGS and a photograph in the DMNS archives, were lower down the hill from today's track site, north of the "swamp" and "channel." They have all since disappeared.
5.	When was the first "tracknapping" at the Ridge reported?
a.	If you look for the original tracks, you will see, instead of the tracks, two large holes, obviously workings by some over-zealous "tracknaper." One episode was reported by Pasquale Marranzino of the Rocky Mountain News on June 22, 1961: (see the article "He just wanted a Dinosaur Track" on page 12)

ARTICLES

"He just wanted a Dinosaur Track.

This article is reprinted from the Rocky Mountain News on June 22, 1961 by Pasquale Marranzino

The telephone rang with the urgency that suggests one of my agents was on the line with a report. It was agent X, reporting from the Hogback. The dinosaur tracknapers were at it again. Some twinkles coming low in the Western night skies had attracted his attention. At first it might have been Echo or Samos or the Evening Star. But it proved to be sparks flying from the tracknaper's chisel as it chopped into the shale ribs of the Hogback. My agent behaved in the prescribed manner. He drove up to the tracknaper and asked what in the shale he was doing. The tracknaper answered he was taking a dinosaur track as a souvenir, which brought a lecture on the preservation of wonders along highways and the tracknaper shouldered his hammers and chisels and roared off in his pickup truck.

My agent thought there should be a law. And I agreed. But of all the thousands of laws on our books, I couldn't find one against dinosaur tracknaping. These dinosaur tracks on the Hogback came into prominence about 1938 when the city of Denver and the WPA were carving out a road which would join Alameda Ave. past the Federal Center-which came much later-with Red Rocks Park. It was one of George Cranmer's dreams. George was manager of parks in those days and had induced WPA to do Red Rocks and now he wanted access. And, archaeologist he is, George knew the road would be traversing a dinosaur trail that ran through the area in the days when the great seas that covered this area had dried up and dinosaur herds chomped on palms and ferns where Russian Molseyev Dancers will be kicking heels June 30 and July 1. You might say they lived high on the Hogback.

The dinosaur tracks uncovered by the road were- and still are- an attraction. The shale weathers badly and they keep dribbling off the ribs. Then there are the tracknapers. I couldn't find anybody who had any kind of wardship over the tracks. The State Parks and Recreation Board man I talked to hadn't heard of the tracks. They really belong to Denver. But a few years ago Quigg Newton found it pretty hard to keep up Denver Mountain Park's roads and he convinced the Jefferson County people they should help. My agent said somebody ought to put up signs banning parking along the track area to protect them from tracknapers. But George - wise as he always is – got the Legislature to pass a bill prohibiting the erection of signs along the road to protect its viewpoint advantage! There are dinosaur protectors around. But these people run museums. Denver Museum of Natural History has a few skeletons. And a few years back the Cleveland Museum took one away from Canon City. But we have no Dinosaur Rules of Protection."

Things have changed since 1961. The proposed railing never was built, but the state highway department erected the fence around the upper track site in 1980. And even then, some tracks were pilfered. But one has recently returned and is on exhibit in the Trek Through Time exhibit. It would be wonderful to see the original seven tracks, or their casts, return to the Hogback or at least to Dinosaur Ridge Visitor's Center, where they belong. And these stories lend credence to increasing protective measures of the paleontological treasures of the newer designated "Dinosaur Ridge."

-Beth Simmons

Rock Out For the Ridge Awards

Arthur Lakes Legacy Award 2009

Dr. Peter Modreski received his B.S. in geochemistry from Rutgers and his M.S. and Ph.D. from Penn State. His research interests include mineralogy, gemstones, Colorado geology, ore deposits, and alkaline igneous rocks. He is the USGS geologic resource specialist for abrasives, gemstones, quartz, beryllium, cesium, and rubidium. He is presently responsible for public communications and educational outreach for the USGS and serves as a Research Associate with the Earth Sciences Department at the Denver Museum of Nature and Science.

Dr. Peter Modreski was one of the early promoters and members of the Friends of Dinosaur Ridge and just recently yielded his long-standing position on the Board of Directors. You can see him in the video tour of Dinosaur Ridge shown in the Trek Through Time exhibit hall.

The Friends of Dinosaur Ridge are delighted and proud to honor Dr. Peter Modreski with the 2009 Arthur Lakes Legacy Award – for that person who best exemplifies Lakes' qualities – teaching, writing, and communicating geosciences to the general public.

Morgan Grey, Michelle Harvey, and Eileen Bartlett enjoy Rock Out for the Ridge

Distinguished Service Award 2009

How often does an entire family devote themselves to the promotion and welfare of a non-profit organization? Working every day, the Davidson family members – Jack, Barb, and Brian – have met the public head-on, answered telephones and recited driving directions for a combined total of 24 years!

Jack Davidson started working in the Gift Shop at the turn of the century, nine years ago. Barb followed when we needed more help a year later, and Brian has greeted visitors for seven years. This one family has made sure the inventory is presented neatly, been stocked, cleaned the SST, shoveled the sidewalks, cleaned the kitchen, and faced every emergency that has come up year after year.

They always greet visitors with a smile, answer all questions (or find someone who can) and pose a helpful "Can we help you?" Dinosaur Ridge would not be the place it is today without these kind, generous people who have given so much of their lives to the endeavor.

The Friends of Dinosaur Ridge proudly present the Distinguished Service Award of 2009 to Jack, Barb, and Brian Davidson.

-Beth Simmons

Brian Davidson

ARTICLES

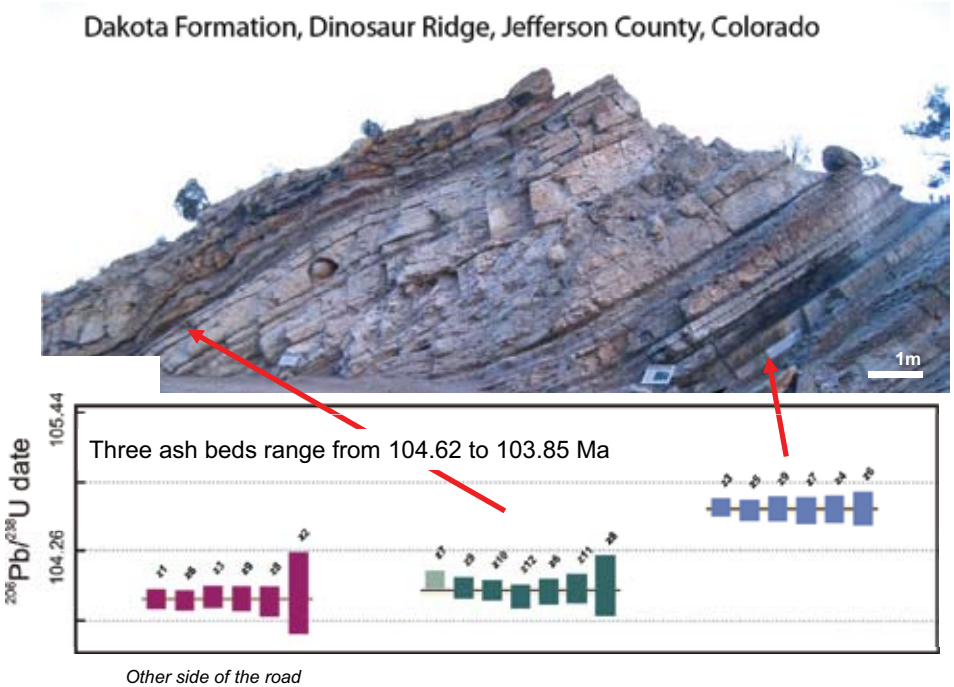
New Ash-bed Dates at Dinosaur Ridge

As part of the EARTHTIME initiative (www.earth-time.org), MIT dated three layers of volcanic ash from Dinosaur Ridge using the U-Pb (Uranium-lead) zircon method of radiometric dating. MIT's goal for this project was to communicate the power and utility of modern high-precision geochronology to a large cross-section of the general public. Dinosaur Ridge is a perfect place for this project due to the large number of visitors that pass here each year and the occurrence of multiple ash beds in stratigraphic sequence.

Sam Bartlett of the Friends of Dinosaur Ridge, Kirk Johnson of the Denver Museum of Nature and Science, and Sam Bowring of the Massachusetts Institute of Technology collected the ash beds. The dating was done at MIT by Robert Buchwaldt and Sam Bowring. Three ash beds in stratigraphic succession yield distinct dates (103.8ma, 103.9ma, 104.6ma) with uncertainties that are less that +/- 40,000 years (see figure 1). This means that the sequence of 14.4 meters accumulated in 733,000 years or an accumulation rate of 18.6 meters per million years.

Several years ago, a U-Pb date for the lowermost ash bed was obtained by the USGS, reported as 105.6 million years +/- 1.3 million years. The new dates are much more precise and reflect the latest analytical developments. One of the biggest differences in the new approach is the ability to analyze carefully selected single grains of zircon. The ultimate test of the techniques is to analyze ash beds in succession as a test of the resolving power. Therefore, the age of the ash bed (next to the interpretive sign) as determined by the USGS was within the margin of error of the process they used, one million years!

The EARTHTIME initiative is an international effort focused on minimizing all sources of geochronological uncertainty so as to allow high resolution calibration of earth history. It involves cooperation between all major geochronology labs in North America and Europe, the sharing of standards and techniques, and the elimination of interlaboratory differences when dating the same rock. In addition, EARTHTIME is dedicated to educating the public about geochronology and establishing a timeline for earth history.



Other side of the road

ON THE RE-DISCOVERY OF A FOSSIL BIRD TRACK FROM THE DAKOTA SANDSTONE

by Amanda Falk, University of Kansas
and Martin Lockley, University of Colorado at Denver.

In 1887, in a paper entitled *On the discovery of a fossil bird-track in the Dakota Sandstone*, Prof. F. H. Snow of the University of Kansas reported that, in 1885, a single bird track (Fig. 1) had been discovered in tailings dug from a well near Thompson's Creek in Ellsworth County, Kansas. The bird track evidently was associated with a leaf-bearing horizon in the Dakota Sandstone identified "on Thompson's Creek, at a distance of about a mile and a half from the well."

This report was highly significant because it represented the first bird track ever discovered in the Mesozoic. The only previously reported fossil bird tracks were those of the giant 'moa,' first documented from the Holocene of New Zealand in 1872. Despite the importance of this track, Ligget (2005) reported that "unfortunately... the specimen seems to have been lost"...at some time after its discovery. We herein report that, unbeknownst to Ligget, it had been re-discovered in the mid 1960s by fossil bird expert Larry Martin, but not studied. This provids us with the opportunity to re-examine the specimen and describe it in detail in a future publication.

Snow had illustrated the track in a woodcut (Fig. 1), and noted that the track may have been attributable to a bird similar to a modern snipe or other wading bird. He suggested that it was probably a right footprint and that a hind toe, what we would call the 'hallux,' was elevated so that it 'just' reached the ground 'at its extremity.' He gave the length of the footprint as 'only two inches' (~5.0 cm). He suggested that this size was slightly larger than that of the foot of the famous, tern-like sea bird *Ichthyornis* described by O. C. Marsh in 1872 on the basis of skeletal material from the Cretaceous chalk (Niobrara). Snow noted therefore that "The discovery of this avian footprint in the Dakota rocks considerably lowers the geological horizon of Kansas birds."

We agree with most of Snow's general observations though some will require re-evaluation in detail. However, it is interesting to note some of Snow's more lyrical observations about modern terns which he watched "continuously performing their graceful evolutions... [and that]...It was a rare occurrence to see these birds alight upon the shores..." Despite the discovery of a distinctive type of bird track, named *Ignotornis*, in the Dakota Sandstone near Golden Colorado (Mehl, 1931; Lockley et al., 2009), and the very recent report of a new bird track site, yielding the track type known as *Koreanaornis*, from northeastern Utah (Anfinson, 2009), it is indeed rare to find evidence that Dakota birds ever 'alighted on the shores' of the Cretaceous Western Interior Seaway.

Despite the occurrence of at least 70 dinosaur and crocodile tracksites in the Dakota Sandstone of Colorado, New Mexico, Oklahoma and Kansas, we are aware of only three bird track sites. It is therefore perhaps a little surprising that this footprint came to light long before any dinosaur or crocodilian tracks were reported from the Dakota. Future studies require that we determine whether the Kansas track is similar to any named track type (ichnospecies). Our preliminary observations suggest that it is not the same as either *Ignotornis* or *Koreanaornis*. If this is the case, we have three different bird track types from three different and widely spaced localities in the Dakota Sandstone: i.e., in Kansas, Colorado and Utah.

It was only very recently that we learned, from two 'lost' newspaper articles, that in 1902 Arthur Lakes had discovered dinosaur tracks in the Dakota Sandstone near Colorado Springs (Simmons et al., 2007, Honda and Simmons, 2009). Here we had a case of known tracks but what appeared to be lost information regarding their discoverers, provenance and date of discovery. In the case of the Kansas tracks we had what appeared to be a lost track with a known discoverer, provenance and date of discovery. Both of these examples attest to the importance of the work done by early researchers on footprints from the Dakota Sandstone, and point out the danger to science of lost information. Happily in both cases, the outcome has been to complete the record. With this happy ending we may quote the final sentence of Snow's 1887 article:

"It is hoped that the discovery of our bird track may stimulate search for other tracks, and that the evidence for the existence of birds in the Lower Cretaceous may not long depend on a single "footprint upon the sand [of Dakota] time."

(Article references on back page)

Fig. 1. Wood cut of a bird track from the Dakota Sandstone of Kansas: after Snow 1887

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