

Gus Ruybal  
Earth Processes II  
Innovation Abstract

This innovation is meant to supplement the 8<sup>th</sup> grade science curriculum for preparation for the 8<sup>th</sup> grade honors biology test. In our district, students must test out of their physical science class to take honors track science. Because earth science is not taught in the 8<sup>th</sup> grade, students often need to review earth science topics covered in 6<sup>th</sup> and 7<sup>th</sup> grade in order to pass the test. This webquest is designed to give students a review of these concepts. The webquest is based on the standards and links to websites and videos.

Gia DeSelm  
Damien Kunda  
Earth Process II  
Abstract

The basis of our innovation had three main objectives. We wanted students to be able to write and test a hypothesis, be able to understand differences between observations and ~~hypo~~ inferences and to understand the importance of careful and precise excavation of fossils.

Students will take a pre and post test to assess our objectives.

The basis of the experiment involves creating a hypothesis about the best "tool" to use in order to excavate a "fossil" (chocolate chip) from a formation of land (cookie). By testing the hypothesis, students will use a data table to observe and record information.

- **Innovation for Geology II Course Work**
- **Field Trip to Dinosaur Ridge / Morrison**
- **Carl Berg / Mitchell Elementary / JFCO**

- **Objectives:**

My first priority, and one nearest and dearest to my heart, is to get the students out into the field, experiencing science first hand, not simply from a text book or "piles of papers" approach. To that end, this field trip handily fits the bill.

Dinosaur Ridge is readily available, providing many opportunities for learning across a rather wide spectrum of abilities and grade levels. Material significant to a host of other academic interests is presented here by experienced geologists and teachers.

Given the historical nature of this area, it is quite clear that students will benefit greatly from a field trip here. For example:

- ✓ The first stegosaurus fossil was found here. It is our state fossil.
- ✓ The geology of the area will be explored, thus connecting to our "Colorado Unit," which introduces students to basic geology and landforms. By examining what we see in the field (making some simple observations) it is my hope that the students will begin to comprehend the dynamic nature of our planet's geology.
- ✓ By comparing environments of today with those of long ago, we can challenge our students to ***think about changes upon the earth's surface as ongoing processes***, nicely complimenting our science unit called "The Changing Earth."
- ✓ Several different ancient environments will be seen here. Since we have just received a brand new science unit generically known as "Environments," this field trip should be a tremendous opportunity to open the students minds to biomes of long ago, asking them to compare to those of today, with the goal of comparing and then contrasting them.
- ✓ By discussing the so-called Western Interior Seaway, I have been able to draw comparisons with our "Africa Unit," i.e., of the similarities of migratory behaviors found in the Serengeti region of Africa and the habits of the dinosaurs of yesteryear.
- It seems to me that there is a great deal to benefit from by visiting this site!

- **Teaching Methodology:**

There are several crucial phases of instruction required in order to ensure a meaningful and educational experience:

**(A.) Introduction to the Site / Baseline Information-**

After determining my young students obviously basic knowledge of the many higher level concepts potentially represented at Dinosaur Ridge, I immediately set about the task of "filling in the blanks."

To that end, I created a simple Dinosaur Ridge center display, with some visuals of the area, each with some sort of pertinent challenge question. The students will visit this center in small groups, examine it, and write down their questions. We will then have a discussion of what we have learned (student lead), followed by a Q+A session, in order to further fill in the blanks, so to speak.

It will be the teachers responsibility to ensure that basic concepts are "understood" according to their ability levels. It is my sincerest intent to present this site as a living model, and a small representation of the Earth as it was long ago. I want the kids to think about life then, and compare and contrast it to that of today.

**(B.) Field Trip Visit to Dinosaur Ridge-**

Using a grade level appropriate field manual, complete with essential knowledge questions and some challenge questions, the students will experience the site with some guidance then (I hope!!) towards their learning. Each of the four major sites will have a section for them to take notes, draw, and answer said questions. This ties in nicely to teaching the kids about "field notes," as required in the new fourth grade "Environments" unit.

**(C.) Post Visit Classroom Discussion and Q+A-**

The most important part of this phase is to make sense and clarify any information which confused/ excited them on the field trip. My class will then complete and answer all the questions in their field manual according to my expectations in writing.

☺ **This completes our field experience...for now!**

- ☞ **Dinosaur Ridge Field Manual**
- ☞ **Student's Name \_\_\_\_\_**
- ☞ **Teacher's Name \_\_\_\_\_**
- ☞ **May 14th, 2007**

- **Student Goals for this Field Trip:**
  - ✓ **Observe, record, explain important information.**
  - ✓ **Draw and label pictures about the sites.**
  - ✓ **Answer the questions found in the manual.**

**It is expected that you use complete sentences. All writing rules do apply!**

**Dinosaur Quarry Site:**

**This is a site wherein many bones were found. Draw a simple picture of the quarry. Label and explain the important details of your drawing.**

**Who discovered this quarry and what year was it?**

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**What kind of rock are the bones found within?**

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**What kind of dinosaurs have been found here?**

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**In your opinion, what was the most interesting part of this particular site?**

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• **Ripple Marks Site:**

**We have discussed the formation of ripple marks. Draw what you observed and explain what you know about them and their formation. Don't forget to label and explain your drawing.**

**In what kind of environment were the ripple marks most likely formed?**

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• **Dinosaur Tracks Site!**

**Here you can see the tracks of several dinosaurs! Pick out one set of your favorites and draw them below. Label and explain your drawing.**

**What dinosaur made these tracks? What do you know about this creature? List three facts.**

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• **The Ancient Mangrove Swamp Site:**

Here we see evidence of life as it was long ago. Take some time to really observe things here. Some of it is very small and requires you to be a science detective! Draw what you have observed, and label it.

**What was the most fascinating thing you observed or learned about here?**

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• **Extra Credit!**

**If there is anything else you would like to share?  
You may write about this or draw and explain what  
you wish to share.**

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**Drawing Space:**

### **Purpose/Rationale for Innovation:**

I attended a wonderful session this summer where we learned about paleontology. I would like to focus my innovation on teaching the students to incorporate things like graphing quadratic equations, measuring, and ratios from Algebra into the real-world example of dinosaurs.

### **Goals:**

#### **A) Increase student achievement of Content Standards:**

*Algebra:* Analyzing and representing linear functions and solving linear equations and systems of linear equations

*Data Analysis and Number and Operations and Algebra:* Analyzing and summarizing data sets

(<http://nctm.org>, 10/4/06)

#### **B) Improved Instruction:**

*Algebra:* Students encounter some nonlinear functions (such as the inverse proportions that they studied in grade 7 as well as basic quadratic and exponential functions) whose rates of change contrast with the constant rate of change of linear functions. They view arithmetic sequences, including those arising from patterns or problems, as linear functions whose inputs are counting numbers. They apply ideas about linear functions to solve problems involving rates such as motion at a constant speed.

*Data Analysis:* Building on their work in previous grades to organize and display data to pose and answer questions, students now see numerical data as an aggregate, which they can often summarize with one or several numbers. In addition to the median, students determine the 25th and 75th percentiles (1st and 3rd quartiles) to obtain information about the spread of data. They may use box-and-whisker plots to convey this information. Students make scatterplots to display bivariate data, and they informally estimate lines of best fit to make and test conjectures.

(<http://nctm.org>, 10/4/06)

**Implementation Plan:** I have two lessons on which to focus their learning. One is a dinosaur tracks activity where they have to find the ratios of their own height vs. leg vs. foot size and walking vs. jogging vs. running stride lengths and then compare them to how an actual dinosaur would step. The second lesson allows them to design their own dinosaur and use their data to predict where the tracks would be and how far apart. Since I was working with parabolas, I told them these were fictional dinosaurs (some of them even had two or three heads!) so we would have them skipping rope and they had to design where the jump-rope would be, writing the equation of the line and sketching it in around their dinosaur. They had to use their knowledge of quadratics to correctly place the line around the dinosaur and find the equation.

# Algebra and Dinosaurs

Earth Processes II  
Innovation  
By Joanne Roybal

## Purpose/Rationale for Innovation

- ◆ Integrate Summer Dino-Dig experience with current curriculum
- ◆ Create a fun activity for the 8<sup>th</sup> graders incorporating current algebra standards
- ◆ Activity should be real-world oriented

## Goals

**Increase student achievement of Content Standards:**

- ◆ **Algebra:** Analyzing and representing linear & non-linear functions and solving linear & non-linear equations
- ◆ **Data Analysis and Number and Operations and Algebra:** Analyzing and summarizing data sets  
(<http://nctm.org>, 10/4/06)

## Goals

**Improve Instruction:**

- ◆ **Algebra:**
  - Understanding of Graphs
  - Quadratics & Linear Functions
- ◆ **Data Analysis:**
  - Use data to find new solutions

## Part I: Tracks Activity



Track

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Track	Length	Width	Depth



## Part II: Create Your Own Dinosaur



## What Worked?

- ◆ Improved Interest In topic
- ◆ Connection of concepts to real-world example
- ◆ Able to encourage extended learning opportunities in the area of paleontology
- ◆ Laminated samples to re-use next year

## What Would I Change?

- ◆ Worksheet needed to be tweaked a bit to run more smoothly
- ◆ Expand the Dino-Creation lesson to include actual dinosaur measurements
- ◆ Work with tracks more—visit to Colorado School of Mines or CU-Denver?

# Tracks

Dinosaurs left more than just their body fossils behind, they also left evidence of their existence through tracks. Palaeoichnologists (people who study fossil trackways) have certain methods to determine what kind of dinosaur left a track and even how fast they were going!

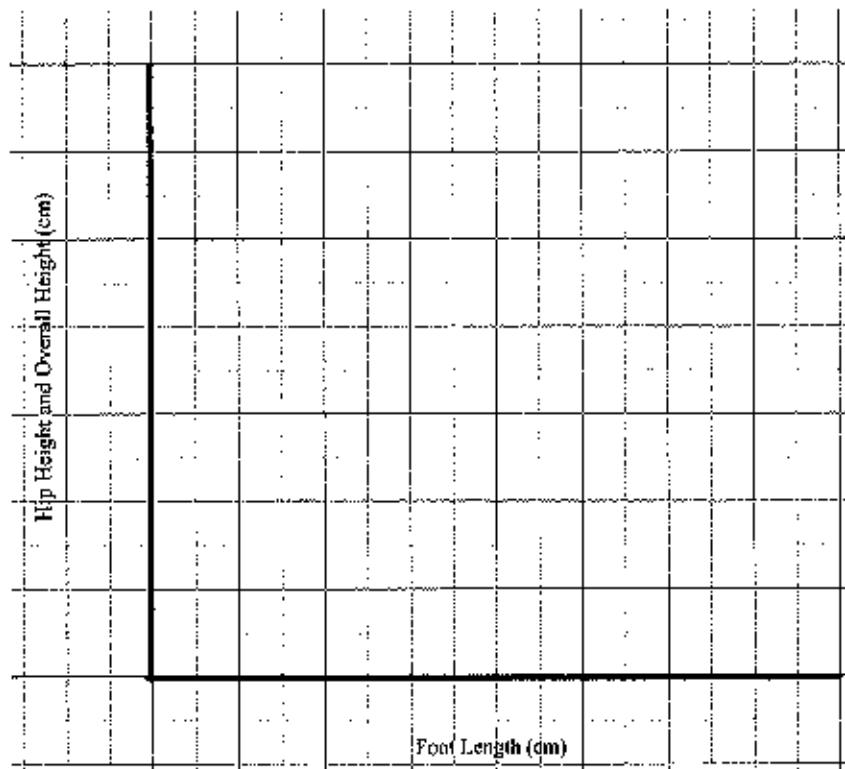
Today you are going to see if there is a relationship between your size and your stride. You will do this activity with your group. **Make all measurements for this activity in METRIC.** You will be working out speeds in meters per second.

## Part 1:

Measure the foot (heel to toe), the hip height (ground to where your leg bends at the hip—lift your knee up in front of you and you will find the joint), and overall height of everyone in your group. Record your data in the data table **and** on the class calculator.

Name	Foot Length (cm)	Hip Height (cm)	Overall Height (cm)
1.			
2.			
3.			
4.			

Graph your group's data on one graph (one line for foot vs. hip; one for foot vs. overall):



Name: \_\_\_\_\_

Period: \_\_\_\_\_

**Questions:**

1. Is there a strong correlation between the two?
2. If there is not, why do you think that is?
3. If you measured the feet and hip heights of animals, do you think the correlation would be weaker or stronger? Why?
4. If you wanted to determine the speeds of fossilized mammals from their tracks, would you use the same ratios? Explain.

**Part 2:**

Measure out a course of 20 meters, using tape to mark the beginning and end. There will be four jobs: one person to be the **timer**, one person to be the **counter** (counting strides—remember 2 steps = 1 stride!), one person to **record** the data, and one person to be the **walk/jog/runner**. Take turns rotating through all the jobs until you have everyone's data. Record you group's data below **and** on the class calculator.

Name	Walking (s)	Speed (m/s) (20m/# of seconds)	# of Strides	Stride Length (20m/# of strides)
1.				
2.				
3.				
4.				

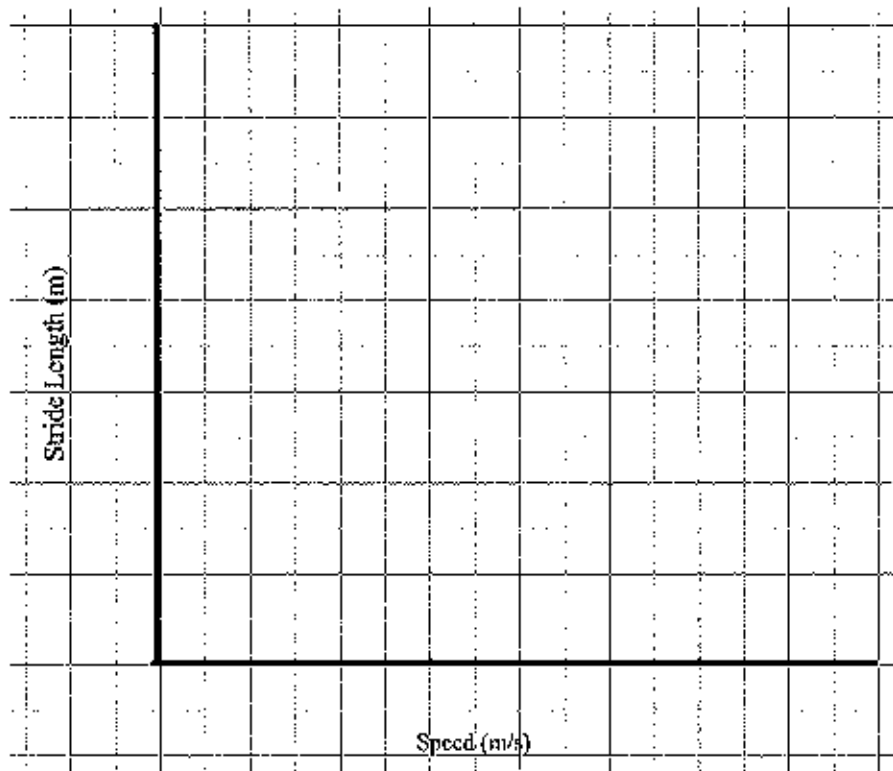
Name	Jogging (s)	Speed (m/s) (20m/# of seconds)	# of Strides	Stride Length (20m/# of strides)
1.				
2.				
3.				
4.				

Name	Running (s)	Speed (m/s) (20m/# of seconds)	# of Strides	Stride Length (20m/# of strides)
1.				
2.				
3.				
4.				

Name: \_\_\_\_\_

Period: \_\_\_\_\_

Graph your group's data using 3 colored lines—include a key:



**Questions:**

1. Is there a strong correlation between speed and stride length?
2. If there is not, why do you think that might be the case?
3. If you combined your data with the whole class, do you think it would strengthen or weaken the correlation?
4. After carrying out this experiment, what do you think about the accuracy of this method and its application to dinosaur tracks?
5. Do you feel confident you could apply the same methods to dinosaur trackways?

# Abstract

Aarika Capra and Jon Smedes  
Family Field Trip

During our course work in RMMSP Geology course we were exposed to a variety of new geologic information about ancient environments, prehistoric organisms and fossilization. We also visited several local regions that displayed excellent specimens and examples of these geologic events. We decided to design a field trip to explore these areas, including: Dinosaur Ridge, Red Rocks Amphitheater, and the Colorado School of Mines Mineral Museum. Unfortunately our school budgets need to be submitted at the beginning of the school year, so we were unable to plan a in-school field trip for this year. Instead we developed an Extra Credit Field Trip for students to do with their families. This field trip allows the student to show off their geologic knowledge they have gained in Physical Science by being the tour guide for the trip. The field trip also ties into our school goals, which include involving the families of students in the educational process. Several Colorado State Science Standards and Benchmarks are addressed in this field trip: Standard 4.1 Benchmark 3 and Standard 5 Benchmark 1.

Marcia L. Aden  
Field Studies-Earth Sciences  
RMMSI Follow-up  
April 12, 2007

## PROJECT ABSTRACT

This geology challenge project was designed as the culminating field activity for a seventh grade earth science/geology unit. Prior to this, students had completed learning activities giving them background in plate tectonics, seismology, volcanoes, three types of rocks, their formation and resulting landforms, mineralogy, weathering and erosion, fossilization, and the geologic time scale. The geologic challenge is presented in the powerpoint: In groups, the students do some interpretation of the layers of the Denver Basin (from "Ancient Denvers"), and then proceed to a field study at three locations (I-70 Roadcut in Morrison, Dinosaur Ridge, and Red Rocks Park). At each location, they collect data, examine rocks, do drawings, measure dip angles, and develop their hypothesis as to the sequence of events that led to the landscape they live in, the Denver Basin, and Front Range of the Rocky Mountains. On April 4<sup>th</sup>, 191 seventh graders took the geology challenge, and we all learned something.

# 3-13 Colorado Fossils

Time: 1 period

Student Text: 93-95

## PURPOSE

In this *elaborate* lesson, students learn about Colorado fossils that are similar to the ones they modeled in the previous lessons.

## OBJECTIVES

*Nature of Science and Inquiry*

This lesson allows students to practice

1. using evidence to generate explanations.

*Earth Science*

After doing this lesson, students will be able to

1. describe what we learn from fossils.

**MATERIALS** Students work independently.

The instructor will need

transparency

3-1 Colorado Natural Features

wall map of Colorado (optional)

## PROCEDURE

1. Decide on a reading strategy to help students comprehend the text. The reading will probably be very engaging to the students since it is about fossils in Colorado.
2. Read each section separately. Show students the location of each site on the *Colorado Natural Features* transparency.
3. Have several students summarize the main points from each section of the reading.
4. As a class, review the analysis questions.

**Assessment:** Ask: "Why are fossils important to paleontologists?"

**Answer:** Fossils tell paleontologists about the past plants and animals that lived on Earth. If the organisms are extinct, they tell paleontologists about what these organisms looked like. They also tell paleontologists about the past climates (tropical, moderate, arctic) and past environments (oceans, rivers, land features) of an area.

## ANALYSIS QUESTIONS

1. Name several kinds of information paleontologists learn from a fossil site such as Dinosaur Ridge or Dinosaur National Monument.

Paleontologists learn what plants and animals lived in an area in the past. They can learn specifics about the size and kind of organisms that lived. The site can also give evidence of past climates and past environments (oceans, rivers, land features).

2. Why do you think complete dinosaur skeletons are rare?

In order for the whole dinosaur to be preserved, it must be covered quickly in mud or sand. Most dinosaurs are huge so it is unlikely for the whole animal to be totally buried with all the bones in place.

## FIELD TRIP IDEAS

- Dinosaur Ridge: See trace fossil footprints, ripple marks (ocean water), and mangrove tree roots. There is also a small museum. For information, call (303) 697-DINO.
- Morrison Natural History Museum: Observe various fossils found in the Morrison area and dig in a fossil pit on site. Call (303) 697-1873 to schedule a tour.
- Denver Museum of Nature and Science: Tour Prehistoric Journey that shows how fossil evidence helps put together Earth's geologic history. Many other fossils on exhibit. Call (303) 322-7009 for reservations.

# **Geology**

## **Minerals, Rocks, and Features on Earth's Surface**

### **Sedimentary Rocks & Fossils**

6<sup>th</sup> Grade

October 2002

Jefferson County Public Schools  
Golden, Colorado

## 3-13 Colorado Fossils

You have now learned about several kinds of fossils and how they form. Geologists who study fossils are called **paleontologists**. They use the fossil evidence to learn about the past climate that existed when the plants and animals lived. The fossils also tell them about plants and animals that no longer live on Earth such as trilobites and dinosaurs. Paleontologists say that these organisms are **extinct**.

### Trace Fossils – Dinosaur Ridge

If you've ever driven out to Dinosaur Ridge near Red Rocks, you've probably stopped along the highway to look at the dinosaur footprints. These footprints were discovered in 1937 when engineers were building Alameda Parkway, the road that goes up and over the Dakota Hogback.

Based on studies of the sedimentary rocks in the area, paleontologists believe that this part of Colorado was near a large ocean millions of years ago. The area of the tracks probably was a beach near the ocean or a river where lots of dinosaurs roamed while looking for food. The parallel tracks left by the dinosaurs indicate that they were travelling together.

Two types of fossil tracks have been identified at Dinosaur Ridge. The larger tracks belong to an Iguanodon that walked on four legs. The smaller tracks belong to an ostrich-sized theropod that walked on two legs. The picture below shows an artist's interpretation of two Iguanodons walking along a beach at that time.



Modified with permission from *A Field Guide to Dinosaur Ridge*, Martin Lockley, Friends of Dinosaur Ridge, 1991.

## **Animal Parts – Dinosaur National Monument**

If you've ever traveled to the northwestern part of Colorado (on the Utah border), you may have camped or stopped at Dinosaur National Monument. This site has some of the most prized fossils ever found in the United States. The jumble of over 2,000 dinosaur back and leg bones exposed in the exhibit shows the bones as they were scattered in nature over 145 million years ago.



Paleontologists who study the site believe that the bones represent dinosaurs that died naturally along an ancient river. Most of their skeletons decayed without a trace, but at least in one spot, floodwaters washed a number of bones onto a sandbar in the river. These bones were buried by deposits of sand that were eventually cemented into sandstone.

In 1909, Earl Douglass made the first discovery of dinosaur bones in this area while he was on an expedition for the new Carnegie Museum in Pittsburgh, Pennsylvania. After many complete dinosaur skeletons were removed, the site became a national monument in 1915 to protect the remaining fossils for all future visitors to see.

Today in Colorado, there are several places that you can go to see dinosaur tracks and fossils. You can walk along Dinosaur Ridge near the town of Morrison. You can walk along the sedimentary rocks and see lots of evidence of fossils—not only the dinosaur tracks. At Dinosaur National Monument, you can see paleontologists still at work excavating the fossil bones of hundreds of dinosaurs from the sandstone. And at the Denver Museum of Nature and Science, you can walk through geologic time in the Prehistoric Journey exhibit. On the next page, you'll read about some other fossils in Colorado.

## FLORISSANT FOSSIL BEDS

Although most fossils form in sedimentary rock, there are a few examples where fossils form in igneous rock. Of course, animal and plant parts could not survive in magma or lava. But occasionally when ash is blasted out of volcanoes, insects, trees, and other animals are trapped and killed by the ash. When this happens quickly, the animals and plants are preserved to become fossils as the ash hardens.

Florissant Fossil Beds National Monument is a place that contains many fossils formed in volcanic ash. It is located southwest of Colorado Springs. About 35 million years ago, active volcanoes in the area spewed out ash that trapped and buried thousands of plants and animals. The Monument is especially famous for the fossilized insects (butterflies, wasps, and spiders) and fossilized redwood trees found there.



Probably similar conditions occurred at Mt. St. Helens during its last big ash eruption in 1980. It takes a very long time for fossils to form. Maybe paleontologists in thousands of years will find evidence of fossils from this eruption!

### ANALYSIS QUESTIONS

1. Name several kinds of information paleontologists learn from a fossil site such as Dinosaur Ridge or Dinosaur National Monument.
2. Why do you think complete dinosaur skeletons are rare?

## Lesson Plan: 3-13A Colorado Fossil Sites

**Time:** 1 hour

**PURPOSE:** In this extension lesson, students will learn about 3 major Colorado fossil sites that have contributed to the knowledge of fossils and dinosaurs.

### **OBJECTIVES:**

#### *Nature of Science and Inquiry*

This lesson allows students to

- explore and investigate the geologic history of three natural areas of Colorado renown for fossils.
- practice sorting and categorization of terms and vocabulary associated with fossils.

#### *Earth Science*

After doing this lesson, students will

- have a better understanding of processes associated with paleontology.
- have learned about Colorado geography by comparing historic and physical properties associated with three separate localities.

**MATERIALS** Students work in teams. Students will need:

- Background information packets on each fossil site
- Word sort handout
- Scissors, Glue, Large paper for poster

### **PROCEDURE:**

1. Students read background information provided for each fossil location. Encourage students to use discriminatory skills to highlight or underline important information while reading.
2. Students will create a poster which will describe each fossil location.
3. Students will cut out words from the word-sort sheet and sort the terms by association to each of the fossil sites.

**Assessment:** As a class students will review and assess the validity of each team poster. Posters should be factually correct and neatly prepared. Each member should have contributed to the finish product.

## Dinosaur Ridge National Natural Landmark

Dinosaur Ridge is a special place, just miles from downtown Denver, near Red Rocks Park. It is designated as a National Natural Landmark which protects the unusual natural resources found there. Another group, Friends of Dinosaur Ridge, built a visitor center. They educate the public, promote the area and help protect the rocks and fossils found in this very special place.

Dinosaur Ridge is a section of the Dakota Hogback, a large hogback that extends in a north-south direction along the foothills of the Rocky Mountains. A hogback is a crest or spine of rocks, formed by uplift of sedimentary rocks, then erosion of the tilted rock layers. The Dakota Hogback consists of hard, resistant Dakota Sandstone, mudstone and shale. During the process of mountain building, the west side of the ridge was uplifted, and erosion exposed older layers of rock that are normally buried under younger layers. This geologic event allows us to 'look back in time' through the Mesozoic Era. Dinosaur Ridge is an ideal laboratory to learn about geologic time.

Dinosaur Ridge first became famous in 1877, when Arthur Lakes and Charles Beckworth discovered dinosaur bones while looking for plant fossils. The bones belonged to dinosaurs that lived 150 mya (million years ago) during the Jurassic period. The bones were found in sediments called the Morrison Formation and are well known for containing dinosaur fossils. Lake's and Beckworth's discovery set off the 'bone wars', a race to see who could find the most and biggest dinosaur bones. Hundreds of bones from ten different quarries were excavated from Dinosaur Ridge. Dinosaur bones were soon found in many other places in Colorado and Wyoming. At some of the sites, the fossils were easier to extract than the ones from the hard sandstone at

100 mya

shale

145 mya

35 mya

150 mya

shale

body fossils

sandstone

ancient riverbank

Mesozoic Era

in situ

body fossils



# Family Field Trip



Dear Parents and Students,

This extra credit field trip is a great opportunity for you to see what your student has been learning in class this semester in Physical Science. The student is your tour guide during the trip. The answers to the questions below should be discussed with the guests of the field trip (family and friends). The answers should both be discussed out loud and written down on paper. During this field trip you will visit three different locations in, or near, Golden, Colorado.

The first stop will be at the exhibits on Dinosaur Ridge, next the Red Rocks Amphitheater and lastly the Free Mineral Museum at Colorado School of Mines.



## 1<sup>ST</sup> STOP: Dinosaur Ridge Visitor Center

Note: Parking on the road is not always easy. You may chose to walk the entire distance (it should take one hour) or you may want to check out where the stops are and then walk from a convenient parking space near by.

Benton Shales:

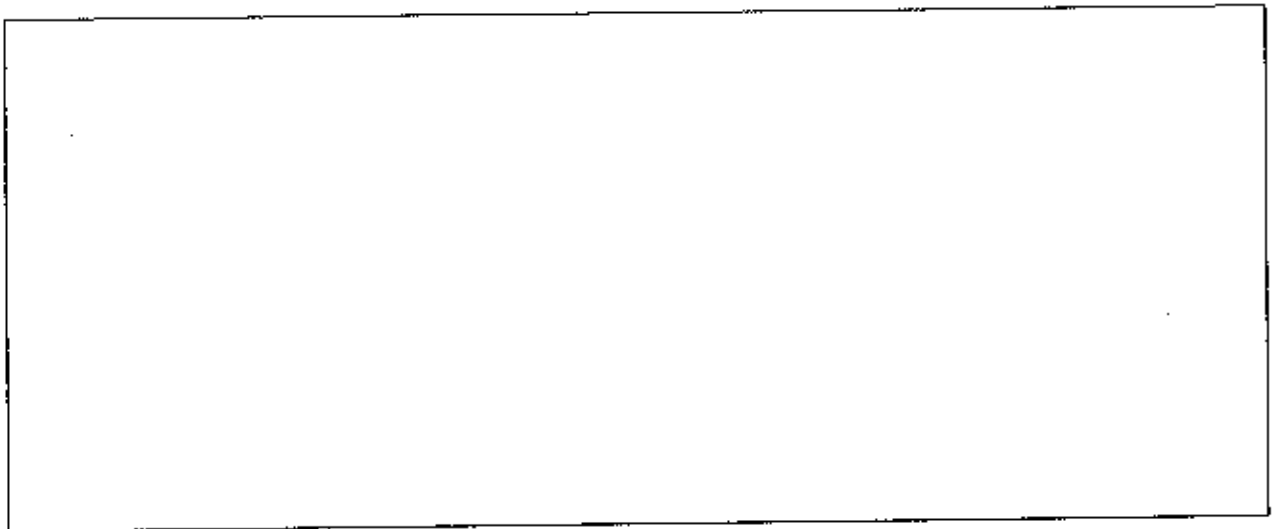
1. What type of sediments form in sea environments?
2. How does this rock show evidence that there was a sea here long ago?

Mangrove Swamp:

3. What evidence is there that this was a swamp in this area at one time?
4. Would plants be more or less easy to fossilize than other things, like large bones? Why?

Tracks:

5. Sketch each of the different TYPES of footprints that you see.



6. Label the footprints, in your sketch above, that you believe belong to a two legged dinosaur and four legged dinosaurs.
7. Explain why you think each print was from a two legged or four legged dinosaur (What evidence, from the past or present, supports your guess).
8. Give a general guess about the size of the dinosaurs that left each type of track.
9. What type of rock are the footprints in?
10. What do you think the environment was like at the time the dinosaurs did the walking?
11. Do you think these dinosaurs were really good at walking on a vertical cliff, or were things different here during the time that they lived? How do you know? (Hint: Think about the "laws")
12. Where would you go to find more fossilized footprints?

### Trace Fossils:

13. What are trace fossils?
14. How are trace fossils different from body fossils?
15. What do trace fossils tell us about an environment?

### Ripple Marks:

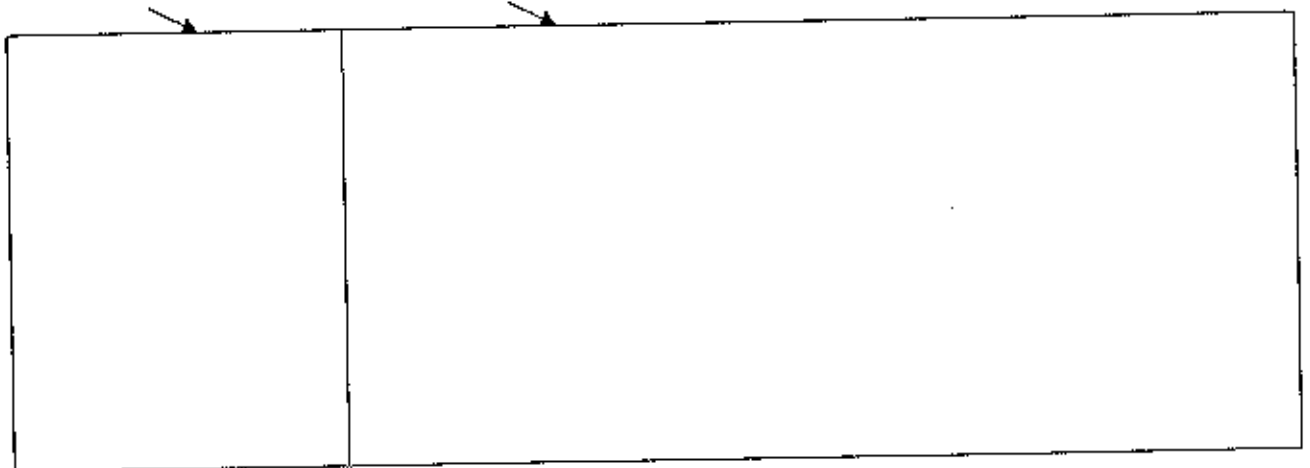
16. What type of environment formed these ripple marks? How do you know?
17. What modern day areas in Colorado might form ripple marks?

### Denver Basin Overlook

18. What observations can you make about our modern day landscape from here?
19. What will the rock be like that is formed from our modern day environment?
20. What evidence will there be in future rock layers that humans existed here?

### Geologic Puzzle:

21. Describe these rock layers and draw a picture.



31. What type of rocks are here in the parking lot? What evidence (clues) do you see that help you identify the rock type?

32. How could this unconformity have happened?

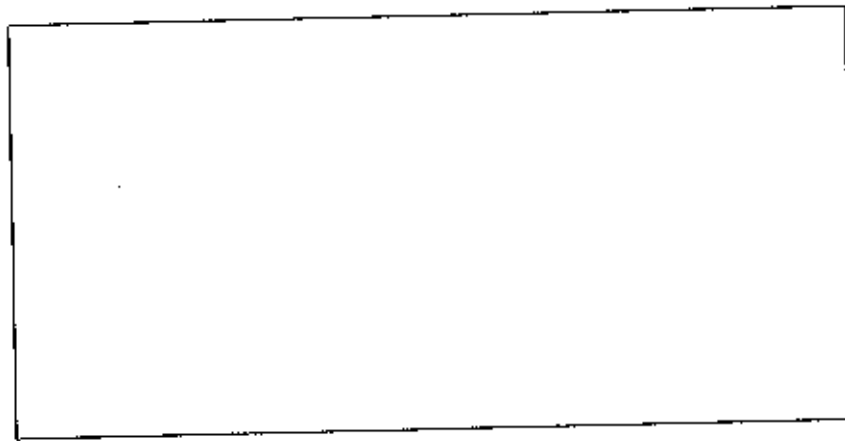
Walk into the Amphitheater:

33. What type of rock is this in the Amphitheater? What evidence (clues) do you see that help you identify the rock type?

34. Describe the layers of rock (include their color, angle, thickness, etc).

35. Why are these rock layers like this?

36. Sketch the rock layers and label which layer is the oldest.












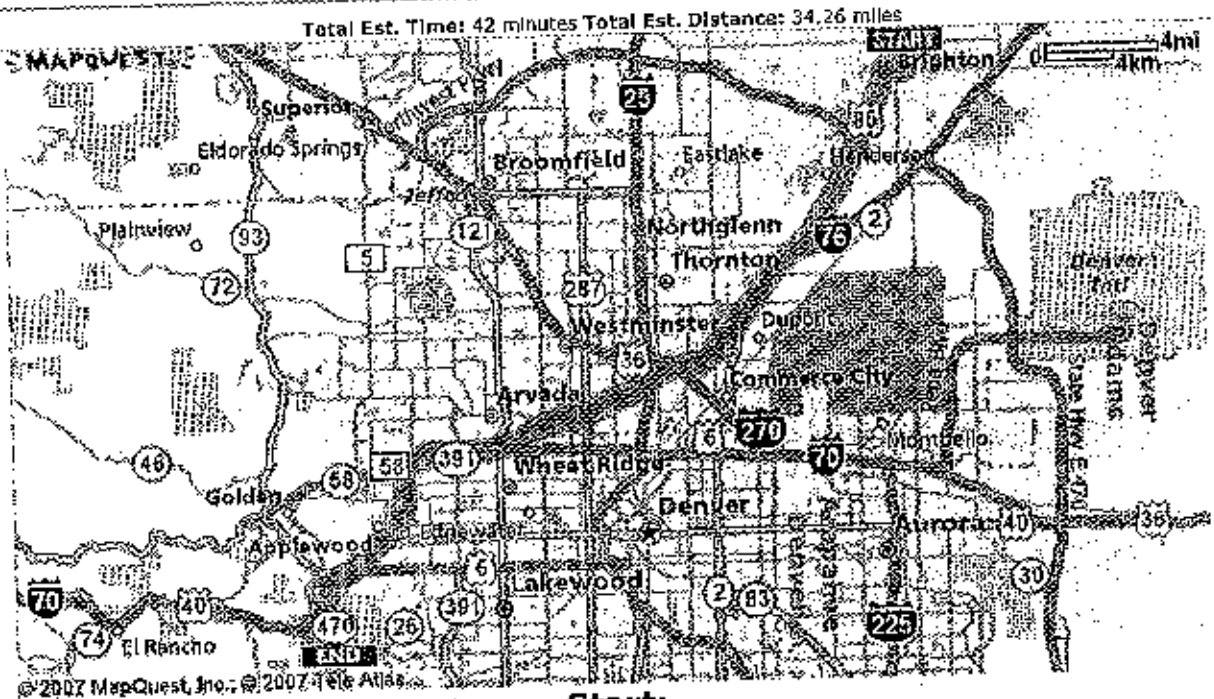
37. a. Explain how these rock layers formed.

b. What were these rock layers like originally, in terms of angle/position?

Take some time to walk down below the amphitheater to get a better view of the rocks. Also, the visitor center has a nice diagram of the rocks which is worth taking a look at if it is open.

# Directions and Map

Directions	Distance
<b>Total Est. Time: 42 minutes Total Est. Distance: 34.26 miles</b>	
1:  Start out going SOUTH on S 8TH AVE toward SKEEL ST.	0.7 miles
2:  Turn RIGHT onto E BROMLEY LN.	0.7 miles
3:  Turn LEFT onto US-85 S.	6.9 miles
4:  Merge onto I-76 W.	12.7 miles
5:  I-76 W becomes I-70 W.	9.9 miles
6:  Take the CO-26 E exit- EXIT 259- toward RED ROCKS PARK / MORRISON.	0.2 miles
7:  Turn LEFT onto I-70 BL W / CO-26 E. Continue to follow CO-26 E.	1.4 miles
8:  Turn LEFT onto CO-26 / W ALAMEDA PKWY.	1.4 miles
9:  End at Dinosaur Ridge Visitor Center: 16831 W Alameda Pky, Morrison, CO 80465, US	



**Start:**  
**270 S 8th Ave**  
 Brighton, CO 80601-2132, US

**End:**  
**Dinosaur Ridge Visitor Center: 303-697-3466**  
**16831 W Alameda Pky, Morrison, CO 80465, US**

### **Day 1 (Engage) United Streaming video**

1. To build and activate background knowledge, show United Streaming video: *Food Chains and Webs*
2. Students complete video quiz, construct basic food chain, and *Name that Critter*.

### **Day 2-3 (Explore) Owl Pellet Dissection**

Students will explore concrete evidence of food chains by dissecting owl pellets in small groups.

1. Groups dissect owl pellets and collect data on the types of bones found in the pellets and the types of animals to which the bones belong.
2. Groups add their data to the class histogram.
3. Whole class interpretation of the histogram.
4. Groups reconstruct the skeletons of the animal found in their pellet.
5. Groups complete analysis questions based on their data.

### **Day 3-4 (Explain) Research and Food Chain Diagram**

1. Students will research owls and their prey animals to help construct a diagram of a food chain.
2. Students will use the program Inspiration to create the final product of their food chain diagram.
3. Students will share out their final products in small groups.

**FOOD CHAINS AND WEBS****Chaining It Together**

1. Using your knowledge of food chains and the following organisms, in the space below, create a diagram of a food chain containing the organisms listed below. Use arrows to show that organisms are eaten by other organisms further along the chain. Also, make a box above each organism, and using color pencils create a drawing of the organism. Leave plenty of room to add other things requested further down the page.

**Phytoplankton**

**Nymph**

**Trout**

**Heron**

2. After creating your basic food chain, label each organism either a producer or consumer.
3. Last, label each step along the food chain with the following labels: first trophic level, second trophic level, third trophic level, and fourth trophic level.

# Owl Pellet Dissection

(a.k.a. Playing With Owl Puke)

## Procedure

1. Unwrap the pellet from the aluminum foil and place it on a clean tray.
2. Carefully tease the bones from the fur using toothpicks and popsicle sticks.
3. Sort the ones based on type (use Owl Pellet Bone Chart).
4. Store the different types of bones in the egg carton and label the carton with your group's names.
5. Complete the *Bones Found Data Table*.
6. Reconstruct the skeletons of your prey animal (use full skeleton activity sheets as a guide). Glue the bones in the appropriate place on the index card. Any missing bones can be filled in on the card using a pencil, then a black felt tip marker. Label the bones on the index card. Write the name of your prey animal on the top of the card.
7. Answer the Analysis Questions with your group.

## Bones Found

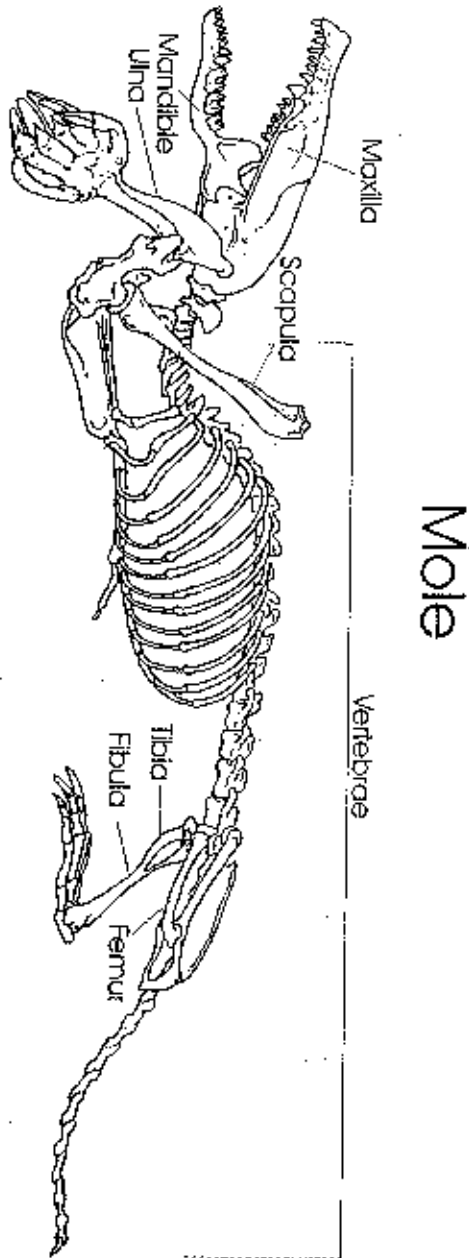
Bone	Type	Number
Skull		
Jaw		
Scapula		
Forelimb		
Hind limb		
Pelvic Bone		
Rib		
Vertebrae		

## Analysis Questions

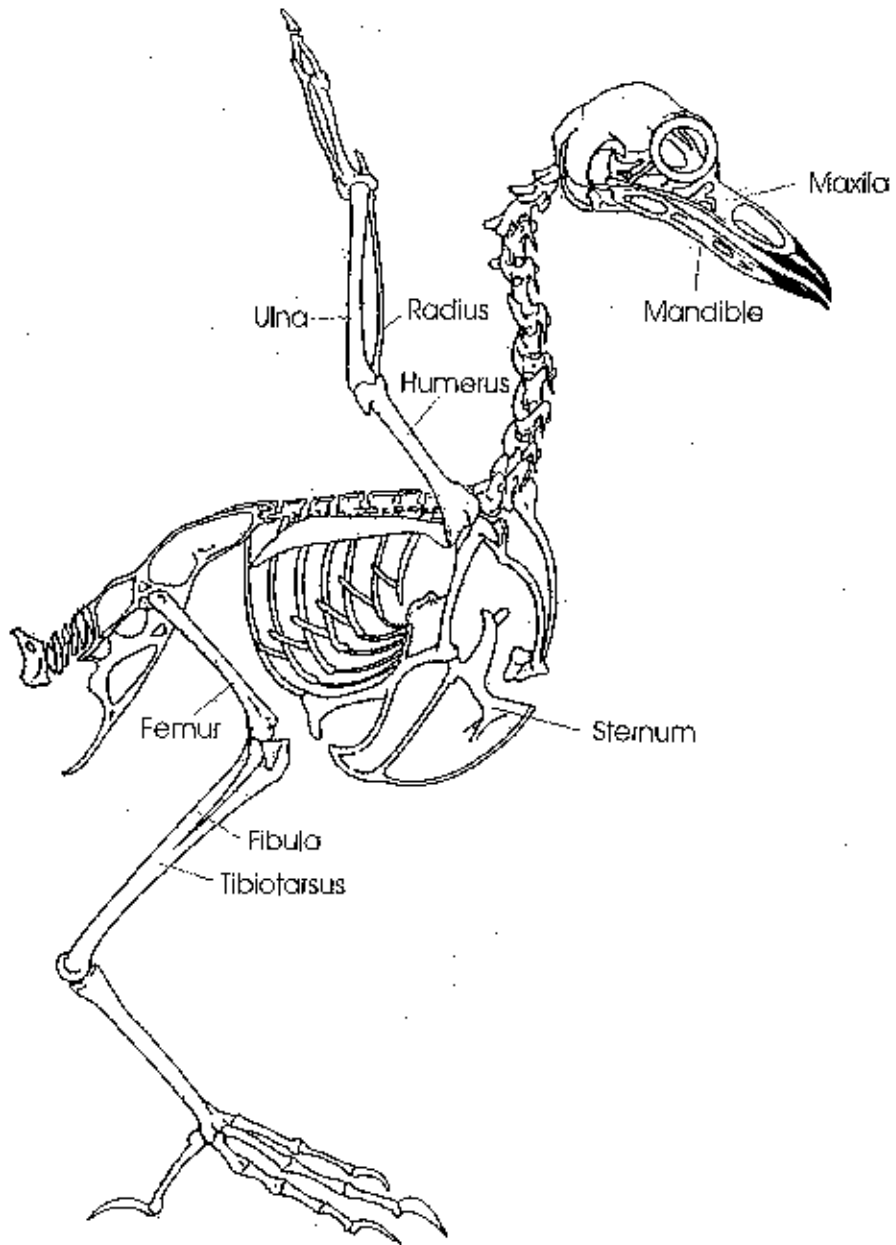
1. Based on your data, how many animals had the owl eaten and partially regurgitated? Explain your answer using specific data.
2. Analyze the bone structure of the skeleton to identify what type of prey animal your owl had consumed to get nutrients and energy. What type of animal(s) was it?
3. How were you able to tell what type of prey animal's bones you found?

# Food Chain

1. Use the resources provided to research the owl and its prey animals (found in our pellets). Then, create a diagram of a food chain with the barn owl in the uppermost level. Your diagram must:
  - Include at least 5 animals.
  - Include arrows and labels to show the direction of the flow of energy.
  - Include names and descriptions of all organisms. Organisms must be labeled as herbivore, carnivore, or omnivore. Organisms must be labeled as producer or consumer.
  - Include a picture of all organisms.
2. Use the space below to construct a rough draft of your food chain diagram.
3. Revise and proofread your draft and create an Inspiration document as your final product.



# Mole



Varied Thrush