South Florida Science Museum

is proud to present:

Jan. 27th 2012 - May 13th 2012

Field Trip Guide

Fellow Educators,

Thank you for your interest in the South Florida Science Museum (SFSM). We look forward to meeting with you and your class while you explore our exciting new exhibition *Dinosaur Attack.*

This Field Trip Guide is designed to enhance your Museum experience by helping you and your students to best prepare for your visit. This guide will answer questions such as: how long you can expect to spend at the museum and where you can eat your lunch. As you know, by preparing students in advance for their trip, they will better focus on the science content.

Additionally, our Education Team has created pre- and post-visit activities perfect for use in the classroom to introduce the content they will experience at the Museum, and then follow-up the visit in hopes of extending the experience and enhancing retention. These activities are also contained in this guide. In this guide, as well, are suggested educational programs that our Expert Science Educators can present to your class either at the museum or at your school that directly relate to this exhibit. Have additional questions? Please call our Group Sales office at (561)832-2026. It is our sincere hope that your experience embodies our mission of "exciting curiosity and furthering the understanding and appreciation of science and technology." We'll see you at the Museum!

Sincerely,

Education Team
South Florida Science Museum

Table of Contents

Field Trip Planner

If you would like to schedule a trip to the South Florida Science Museum, please call our Group Sales Office at 561-832-2026. Field trips may be scheduled at any time during the year; *Dinosaur Attack* will be available from January 27th, 2012 until May 13th, 2012.

Pricing

Pricing for groups scheduled in advance
Self-guided visit admission per student……..$6.00
Visit plus an additional educational program per student……..$7.50
Visit plus a laboratory program per student…… $9.00-$12.00
Chaperones……..$6.00

Policies

• A 20% non-refundable deposit is due within 14 days of confirming your reservation.
• Final payment and headcount are due 14 days prior to your scheduled visit.
• No refunds will be made for no-shows the day of visit.
• If final payment has not been received by the indicated day, reservations are subject to cancellation. NO REFUNDS WILL BE GRANTED. A $25 fee will apply to any cancellations and rescheduling. Cancellations made seven (7) or more days prior to scheduled visits will be refunded less the 20% deposit. Rescheduling cannot be guaranteed due to limited availability.
• Reservations will be made when final payment is received. All reservations are nonrefundable and non-exchangeable (if applicable).
• On the day of your scheduled visit, check in for your group at the Front Desk under your group/contact name. Additional tickets may be purchased at the group rate, on the day of your scheduled visit, providing space is available.
• Increase in headcount should be called in as soon as possible to ensure availability.
• Acceptable forms of payment are check, money order, or credit card (Visa, Discover, or Master Card).
• Please make checks or money orders payable to the *South Florida Science Museum* and mail to:

South Florida Science Museum
4801 Dreher Trail North
West Palm Beach, FL 33405
Attention: Group Sales

• Surcharges may apply for special event days and holidays.
• Museum Memberships, coupons and other discounts are not applicable with school group rates.
• Teacher Members receive $25 off the total cost of any educational programs.

Directions and Map

The South Florida Science Museum is located at:

4801 Dreher Trail North,
West Palm Beach, FL 33405.
Phone: (561) 832-1988

From the Florida Turnpike:

Take the Southern Boulevard exit 97 east, and continue just past I-95. Make a right into Dreher Park. Follow Dreher Trail to the South Florida Science Museum.

From I-95, heading south:

Take exit 68, Southern Boulevard and head east. Immediately over the I-95 bridge, make a right into Dreher Park.

Follow Dreher Trail to the South Florida Science Museum.

From I-95 heading north:

Take exit 68, Southern Boulevard and head east. Make first right into Dreher Park and continue through the park to the Museum.

Museum Manners

PLEASE REVIEW THESE GUIDELINES WITH YOUR STUDENTS BEFORE YOU ARRIVE AT THE MUSEUM.

Please walk, do not run, while in the museum. This is for your safety, as well as the safety of other visitors.

Please do not touch the glass on any exhibits, including the aquarium, as fingerprints and smudges can make it hard for everyone to see.

Please enjoy yourselves and the hands-on exhibits, but leave them the way you found them.

Please keep eating and drinking to the vending machine area and outdoors only.

Please have students remain with their chaperone at all times.

Violation of the rules could result in your group being asked to leave the museum.

No refunds will be given.

Museum Store Rules

Please do not allow more than 5 children per chaperone in the store at one time.

All sales are final, so please choose carefully.

Most importantly, enjoy your visit!

What to Do at the Museum

Arrival

Welcome! Once you arrive at the museum, have students either remain on the bus or sit on the benches leading up to the front doors. Have your group leader check in at the front desk and get directions on where to go first. One of our SFSM staff members will welcome and orient your group as a whole.

Exhibits

There are lots of exciting things to see at the SFSM!

Dinosaur Attack

Dinosaurs will invade the South Florida Science Museum and offer lots of hands on fun! Come face-to-face with these historical creatures in this very intense, engaging exhibit. Guests can actually touch real 70 million year old dinosaur bones, dig for fossils in the Museum's dig pit, and talk with local dinosaur hunters, Robert de Palma and Rudy Pascucci to see & learn how paleontologists discover dinosaurs with field techniques and tools that are still in use today. Join the expedition through this exhibit to uncover historical facts from this time period on our planet.

Egypt Gallery

Discover the lives of Ancient Egyptians through the funerary artifacts from the late Ptolemaic to the Roman Period (ca. 625 BCE to 600 AD). Our gallery features an authentic Egyptian child mummy on loan from the Michael C. Carlos Museum at Emory University, in addition to authentic artifacts including a mummified falcon, canopic jar, Ushabti figures, and more.

Apollo 14 Moon Rock

Part of the Ambassadors of Space Exploration, the Museum was honored by Apollo 14 Astronaut Dr. Edgar Mitchell with a long-term loan of an authentic Moon rock collected during the Fra Mauro expedition. Mitchell was the Lunar Module Pilot on NASA's 3rdMoon expedition where Mitchell became the 6th man to walk on the Moon. Authentic mission footage accompanies this rare display.

McGinty Aquariums

See ocean life from around the world in over 5,000 gallons of salt-water sea life. A living coral reef, sharks, eels, mangrove sea life and a "touch tank" create this wonderful undersea room.

Marvin Dekelboum Planetarium

Sit back and be transported through the Universe with daily star shows, weekend laser concerts and interactive astronomy shows. It’s only $1.50 more per adult/child visitor to book as a group.

Science Trail
Our newly renovated interactive nature trail includes hands-on exhibits: Bubbleology, fossil dig, whisper dishes, more classic physics demos, and a newly created butterfly garden.

Suzie: The Ice Age Mastodon
See the only adult female Mastodon on display in the state! "Sue" was discovered in Palm Beach County in 1961. Her incredible story gives us a glimpse back in time when glyptodons, giant sloths and saber-toothed cats once called sunny Florida home during the Ice Age.

WS4FSM HAM Radio Center
Welcome to WS4FSM, the museum's exciting new HAM radio station, where you can broadcast to others in Argentina, Amsterdam, St. Kitts, or one of two million amateur radio operators around the world! HAM radio is a hobby and a service in which participants, called "hams", use various types of radio communications equipment to communicate for public services and recreation. The West Palm Beach Amateur Radio Club will assist visitors in writing their name in Morse code and in making contacts with other "hams" worldwide.

Bugz! Exhibit
Our new bug-themed exhibit lets you step into the shoes of an insect. Students can learn about the basic parts of an insect, study the steps in the cycle of metamorphosis, learn about some insect habitats, and even observe live ants and caterpillars.

States of Matter
Explore the basic principles of science with hands-on displays representing the states of matter, including solid, liquid, gas, and plasma displays. Continue through the gallery for more basic principles of electricity revealed through conversion machines and Jacob's Ladder. Perfect for all beginning science students and science enthusiasts of all ages.

Twister Exhibit
Experience a tornado, the most intense of all atmospheric phenomena. This hands-on exhibit allows you to discover how a tornado is formed and learn about its immense size.

Lunch
The SFSM now offers Subway catering options for your school so please inquire when booking your program. We also have onsite vending machines with sandwiches, snacks, and drinks as well as a Subway cart located at the Museum. If your students are packing lunches, we recommend storing them on the bus until they are ready to eat. Picnic tables are available on the Science Trail or you can eat within Dreher Park surrounding the Museum.

Programs
Favorite programs such as planetarium shows, Nitromania, or Touch Tanks can be scheduled for a small fee to be added in with your field trip. Call (561) 832-2026 in advance to schedule.

Related Educational Programs

Everglades – All About Alligators

Meet a living relic from the age of the dinosaurs - the American alligator! Alligators can trace their ancestry all the way back to the Cretaceous period and since about 150 million years ago the species has gone virtually unchanged. This program introduces students to the most fascinating ecosystem in South Florida. The program is demonstrated through the eyes of its top predator, the alligator. Students will learn all about the food webs existing in the Everglades and have the opportunity to explore the anatomy of a real alligator.

Big Idea 14, 17, SC.K.L.14.3, SC.K.N.1.2, SC.1.E.6.1, SC.1.E.6.2, SC.1.L.14.1, SC.1.L.16.1, SC.1.L.17.1, SC.2.L.17.1

Shark Tooth Lab

Sharks are one of the oldest groups of animals alive today with ancestral species dating as far back as 420 million years ago. Since then, the general shark blueprint has not been significantly changed and has allowed many shark species to climb to the top spot in their food chain. Explore the fascinating world of sharks and their relatives. Students will work together, utilizing scientific observation to sort and classify genuine fossil shark teeth. Students will also learn about the animal's amazing senses. While studying shark jaws, students will gain knowledge of various habitats and will create their own shark tooth necklaces.

Big Ideas: 14, 15, 16, 17

Shark Dissections

Study the inner workings of an animal whose general body plan has remained virtually unchanged for millennia. Students will enjoy expanding their knowledge of body systems with hands-on dissections. Under the guidance of our expert educators, Students will study anatomical structures and discuss how they relate to specific functions in sharks and how they compare to structures in the human body.

Big Idea 14, 17, SC.6.L.15.1, SC.6.L.14.5, SC.6.L.14.1

Fossil Finders

In this unique program, students learn about fossils and Ice Age Florida. Students dig for real Florida fossils outside in our specially designed excavation pit. Best of all, participants keep a souvenir from the fossils they find!

Big Idea 1, SC.3.L.15.1, SC.3.N.1.1

Jurassic Theater

Have dino-sized fun in this live presentation about fossils and dinosaurs! Learn about how fossils are formed and what they teach scientists about life in Earth's distant past. Students will examine and handle authentic fossils including petrified wood, a dinosaur egg, and even a woolly mammoth tooth while participating in this exciting show.

Big Idea 1, SC.3.L.15.1, SC.3.L.17.1, SC.4.E.6.4, SC.4.L.17.4, SC.5.L.15.1, SC.5.L.17.1

Minerals 101

Dig into a topic that involves things even older than dinosaurs. This lesson will lead students to understand the difference between rocks and minerals. Through investigation of an assortment of minerals, students will study different physical characteristics and properties of these natural minerals and compare their observations with the rest of the class.

Big Idea 1, 8, SC.8.P.8.4

Dinosaur Attack Exhibit

Dinosaurs are arguably the ultimate kid favorite when it comes to museum exhibits. Even adults can appreciate the nostalgia and the mystique associated with these ancient animals. Our new *Dinosaur Attack* exhibit is a unique and interactive way to learn about these fascinating creatures and explore the science of paleontology. The exhibit features authentic fossils and replicas arranged in dynamic dioramas focused on the interactions between predator and prey. Additional areas include an interactive dig pit and a model field camp that gives a behind-the-scenes glimpse of what goes on at an actual fossil dig site.

Juvenile Triceratops and tyrannosaurid

This attack diorama is the centerpiece of the exhibit and showcases two authentic fossil skeletons. The scene focuses on a battle between a juvenile triceratops and its assailant - a tyrannosaurid.

Raptor attack diorama - 4 *Sinovenator* troodontids, one 8-foot-long *Psittacosaurus sibiricus*

This station features detailed replicas in a dynamic representation of an attack scene from the Ilek Formation (Early Cretaceous) of Siberia, showing an attack on an 8 ft. long *P. sibiricus*, the largest described psittacosaur species.

***Dilong paradoxus* attack scene**

This scene is an attack diorama featuring *Dilong paradoxus* and *Prenocephale*. The diorama combines real fossils and painstakingly crafted realistic replicas and provides an exciting view of one of the smallest tyrannosaurids ever discovered.

Touch Bone

Visitors can see what an actual fossil dinosaur bone feels like when they get hands-on with an original *Maiasaura* femur.

Hands-On dig box

Experience the thrill of unearthing your very own dinosaur fossil skeleton - a replica *Sinovenator*.

Prehistoric Creation Station

Let your creativity loose for some prehistoric projects. This station features assorted dinosaur tooth, claw, and bone replicas for use in hands-on education, rubbings, and other art activities.

Field Camp Display

This display features a facsimile of field life. It includes a tent, camp and field equipment, and original dinosaur bones in field jackets for the purpose of illustrating excavation techniques.

Dinosaur Attack Sunshine State Standards

K- 2:

SC.K.L.14.2 Recognize that some books and other media portray animals and plants with characteristics and behaviors they do not have in real life.
SC.K.L.14.3 Observe plants and animals, describe how they are alike and how they are different in the way they look and in the things they do.
SC.K.N.1.1 Collaborate with a partner to collect information.
SC.K.N.1.2 Make observations of the natural world and know that they are descriptors collected using the five senses.
SC.K.N.1.3 Keep records as appropriate -- such as pictorial records -- of investigations conducted.
SC.K.N.1.4 Observe and create a visual representation of an object which includes its major features.
SC.K.N.1.5 Recognize that learning can come from careful observation.
SC.1.L.14.3 Differentiate between living and nonliving things.
SC.1.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.
SC.1.N.1.2 Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size, weight, color, and motion, and compare their observations with others.
SC.1.N.1.3 Keep records as appropriate - such as pictorial and written records - of investigations conducted.
SC.1.N.1.4 Ask "how do you know?" in appropriate situations.
SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.
SC.2.N.1.3 Ask "how do you know?" in appropriate situations and attempt reasonable answers when asked the same question by others.
SC.2.N.1.5 Distinguish between empirical observation (what you see, hear, feel, smell, or taste) and ideas or inferences (what you think).
SC.2.N.1.6 Explain how scientists alone or in groups are always investigating new ways to solve problems.

3-5:

SC.3.L.15.1 Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.
SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
SC.3.N.1.4 Recognize the importance of communication among scientists.

SC.3.N.1.5 Recognize that scientists question, discuss, and check each others' evidence and explanations.
SC.3.N.1.6 Infer based on observation.
SC.3.N.3.2 Recognize that scientists use models to help understand and explain how things work.
SC.4.N.1.1 Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
SC.4.N.1.7 Recognize and explain that scientists base their explanations on evidence.
SC.4.N.1.8 Recognize that science involves creativity in designing experiments.
SC.4.N.2.1 Explain that science focuses solely on the natural world.
SC.4.N.3.1 Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model.
SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.
SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.
SC.5.N.1.6 Recognize and explain the difference between personal opinion/interpretation and verified observation.
SC.5.N.2.1 Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.

6-8:
SC.6.N.1.5 Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.
SC.6.N.2.2 Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.
SC.6.N.2.3 Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.
SC.6.N.3.4 Identify the role of models in the context of the sixth grade science benchmarks.
SC.7.E.6.3 Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.
SC.7.L.15.1 Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.
SC.7.L.15.2 Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.
SC.7.L.15.3 Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.
SC.7.N.1.3 Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.
SC.7.N.1.5 Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.
SC.7.N.1.6 Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.

SC.7.N.1.7 Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.
SC.7.N.2.1 Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.
SC.8.N.1.5 Analyze the methods used to develop a scientific explanation as seen in different fields of science.
SC.8.N.1.6 Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

9-12:
SC.912.L.15.1 Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.
SC.912.L.15.2 Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.
SC.912.L.15.3 Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.
SC.912.N.1.3 Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
SC.912.N.1.4 Identify sources of information and assess their reliability according to the strict standards of scientific investigation.
SC.912.N.1.6 Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.
SC.912.N.1.7 Recognize the role of creativity in constructing scientific questions, methods and explanations.
SC.912.N.2.4 Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.
SC.912.N.2.5 Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.
SC.912.N.3.1 Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.
SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science.

Pre-Visit Activity: The Extinction Game

Purpose

In this activity, students will be introduced to the geological time scale and classify animals into major groups according to their physical characteristics. Then, compare and contrast the characteristics of the major animal groups of the Mesozoic Era and today. Students will play a game that reinforces the concepts that animals can only live in habitats that meet their basic needs and natural events can impact the environment in which animals live.

Sunshine State Standards

K-2, SC.K.L.14.3, SC.K.N.1.4, SC.1.L.17.1, SC.2.L.14.1, SC.2.l.17.2, SC.2.L.17.1
3-5, SC.3.L.15.1, SC.3.L.17.1, SC.4.L.16.3, SC.4.L.17.4, SC.5.L.17.1
6-8, SC.6.L.15.1, SC.7.L.15.2, SC.7.L.15.3
9-12, SC.912.L.151, SC.912.L.15.3, SC.912.15.4

Vocabulary

-**Mesozoic** *adj.* relating to an era of geological history (245 million to 65 million years ago); this period is marked by the presence of dinosaurs, marine and flying reptiles, and the appearance of mammals and birds.
-**Triassic** *adj.* era of geological history (245 million to 210 million years ago)
-**Jurassic** *adj.* an era of geological history (210 million to 145 million years ago.
-**Cretaceous** *adj.* an era of geological history (145 million to 65 million years ago)
-**geologic time scale** *noun* a system of chronologic measurement relating the study of rock layers to time that is used by geologists, paleontologists and other earth scientists to describe the timing and relationships between events that have occurred during the history of the Earth
-**extinction** *noun* no longer in existence; "the extinction of a species"
-**evolution** *noun* a gradual process in which something changes into a different and usually more complex or better form
-**adaptation** *noun* the process whereby a population becomes better suited to its habitat

Material List

-scissors
-markers or crayons
-pencils
-reference book on dinosaurs
-index cards or paper
-empty coffee can or container
-photographs/illustrations of:
-crocodiles
-turtles
-birds
-mammals
-Pterosaurs
-other assorted dinosaurs

Identifying Key Characteristics of Major Animal Groups

Divide the class into 10 groups and give each group a number. Provide photographs or illustrations of modern day crocodiles, birds, turtles, lizards, mammals, and a variety of dinosaurs at each table. Each group will work together to analyze the key characteristics that make each animal unique (for example: birds- have feathers, lay eggs, toothless beaks, varied diet, etc.). These characteristics are then written down and a group spokesperson is chosen to read out their list of characters. Discuss the results and make corrections or suggestions where appropriate.

Understanding Geologic Timescale / History of Mesozoic Life

Display for the students the geologic time scale. Indicate to them the age of the earth, the age of the dinosaurs, and when humans show up in the fossil record. Discuss the terms evolution, extinction, and adaptation. Explain to the students how certain adaptations can give a group of animals an advantage under a certain set of ecological conditions but that the same adaptation may not give a group of animals an advantage given a different set of ecological conditions. (Example: animals with a thick layer of feathers or fur might do well in a cool, wet climate, but if the climate dries and becomes very warm, their numbers in that area may decrease. If drastic and global changes occur, they may even go extinct.). Explain in more detail the Mesozoic Era 245 – 65 million years ago (mya), and have students draw a small timescale showing the three periods: Triassic 245-210 mya, Jurassic 210-145 mya, and Cretaceous 145-65 mya.

The Mesozoic – Adaptation and Survival (preparing for the game)

The students will first make game cards, or the instructor can make the cards in advance to save time. While still in 10 small groups, give each student 3 index cards. On the back of each card, have them write Triassic on the back of the first, Jurassic on the back of the second and Cretaceous on the back of the third.

(*The number of game cards depends on the total number of students participating in the activity*.). The students then take the card marked Triassic and have each group write the name of an animal (see below) and draw its picture.

TRIASSIC CARDS WRITTEN AS FOLLOWS:

Groups 1 and 2- Crocodiles; Group 3- Turtles; Group 4- Mammals; Group 5- Pterosaurs; Groups 6 and 7- Prosauropod dinosaurs (“Plateosaurus”); Group 8- Coelurosaurs (A) (“Coelophysis”); Group 9- Coelurosaurs (B) (“Dilophosaurus”); Group 10- Ornithischians- (“Hypsilophodon”).

(Next, have them repeat the procedure with the Jurassic and then the Cretaceous.)

JURASSIC CARDS SHOULD BE WRITTEN AS FOLLOWS:

Group 1-3 Sauropods (“Apatosaurus”); Groups 4-6- Ornithopods (“Camptosaurus”); Group 7 Allosaurs (“Allosaurus”); Group 8- Stegosaurs (“Stegosaurus”); Group 9- Turtles; Group 10- Birds

CRETACEOUS CARDS SHOULD BE WRITTEN AS FOLLOWS:

Groups 1-3 Duckbilled dinosaurs; Groups 4-6- Ceratopsians ("Triceratops"); Group 7- Birds; Group 8- Mammals; Group 9- Raptors; Group 10- Tyrannosaurs

After this, you should have a complete set of Triassic, Jurassic, and Cretaceous cards. Keep each set of period cards separate.

The Mesozoic – Adaptation and Survival (playing the game)

(The game would need to be modified for middle school grades)

Rules of the game: There are three rounds of play during the extinction game; Triassic round, Jurassic round, and Cretaceous round. Each round has 3 phases: a story telling phase, select a card phase and a play phase. At the start of each round, the instructor, or a chosen student, describes the environmental and geologic conditions that existed during that period. The 1st set of cards (Triassic), are placed into an empty coffee can or container and mixed up. Each student then draws a card without looking. The instructor then yells "Let the Triassic begin", and the students get to act out the characters of the animal on the card they have drawn. Let them play like this for a few minutes. The instructor then yells, "The Triassic period has ended!" Students quickly gather around the instructor. Instructor asks "Where are my crocodiles". The crocodiles raise their hands. The instructor informs the crocodiles that they have survived the Triassic/Jurassic boundary, and that they are doing quite well. The students keep their crocodile cards. This continues with the other students, calling out the name of each animal and telling them whether they survived, went extinct, or evolved. (You could ask them first what they think). Animals that have gone extinct then draw from the 2nd set of cards (Jurassic). The three phases (story-telling, drawing (if necessary), and play) are repeated for each round.

EXAMPLE: The class goes outside to the playground. Students gather around the instructor. Instructor tells them the following: "We now step back in time to the Triassic Period over 210 million years ago. The dinosaurs evolved around this time. They started out as crocodile-like animals and eventually became dominant. Mammals were here too, but they were often very small. Etc. etc…. Draw your card!" (Results below)

TRIASSIC	JURASSIC	CRETACEOUS	END CRETACEOUS
Crocodile	Survives	Survives	Survives and becomes very successful
Turtle	Survives	Survives	Survives and becomes very successful
Mammals	Extinction of many but does survive in smaller forms	Survives	Survives and expands
Pterosaurs	Survives	Survives	EXTINCT

Prosauropods A	EXTINCT		
Prosauropods B	EVOLVE to Sauropods	Sauropods Extinct	
Coelurosaurs A	EVOLVE to birds	Survives as birds	Survives as birds
Coelurosaurs B	EXTINCT		
Ornithopods	EVOLVES - Iguanodon	EVOLVES - Duckbills	EXTINCT
Sauropods		EXTINCT	
Allosaurs		EXTINCT	
Stegosaurs		EXTINCT	
Birds		Survives	Survives and expands
Duckbills			EXTINCT
Ceratopsians			EXTINCT
Raptors			EXTINCT
Tyrannosaurs			EXTINCT

Pre-Visit Activity: Fun with Fossils

Purpose

In this activity, students will enhance their understanding of fossils and explore the work of paleontologists. Students will describe how a fossil is formed and then create their own fossil imprint.

Sunshine State Standards

K-2, SC.K.L.14.1, SC.K.P.9.1, SC.1.L.17.1, SC.1.E.6.1, SC.2.L.14.1, SC.2.l.17.2, SC.2.E.6.1, SC.2.E.6.2
3-5, SC.3.L.15.1, SC.3.L.17.1, SC.4.L.16.3, SC.4.L.17.4, SC.5.L.17.1
6-8, SC.6.E.6.1, SC.7.E.6.2, SC.7.E.6.4, SC.7.L.15.1, SC.8.P.9.2
9-12, SC.912.L.151, SC.912.L.15.3, SC.912.P.8.2

Vocabulary

-fossil *noun* a remnant or trace of an organism of a past geologic age, such as a skeleton or leaf imprint, embedded and preserved in the earth's crust
-paleontology *noun* the study of the forms of life existing in prehistoric or geologic times, as represented by the fossils of plants, animals, and other organisms
-**geology** *noun* the study of the solid and liquid matter of Earth
-**geologic time scale** *noun* a system of chronologic measurement relating the study of rock layers to time that is used by geologists, paleontologists and other earth scientists to describe the timing and relationships between events that have occurred during the history of the Earth
-evolution *noun* a gradual process in which something changes into a different and usually more complex or better form
-**extinction** *noun* no longer in existence; "the extinction of a species"
-**physical change** *noun* substances are not altered chemically; may affect size, shape or color of a substance but does not affect its composition
-**chemical change** *noun* substances are altered chemically and display different physical and chemical properties after the change; it is irreversible

Material List

-“fossils” to imprint
    -twigs
    -leaves
    -dead, hard-shelled bus like roly-polys
    -seashells
    -chicken bones
    -plastic dinosaur models for skin textures or footprints
-tray
    -play-doh/clay **OR**
    -“stone” dough (recommended for higher grade levels)
        -1 part salt
        -1 part brewed coffee (cold)

-2 parts flour
-2 parts used coffee grounds
-wax paper
-measuring cups (per group)
-mixing spoon (per group)
-mixing bowl (per group)
-computer with Internet access, if available

Optional Materials

-plaster of Paris
-water

Introduction

Go over the term extinction. Ask students, "How do you think scientists get information about extinct animals?" Record answers on the board. (Some possible answers may include books, remains, fossils, museums, other people, etc.) Explain to students that scientists piece fossils together, like pieces of a puzzle, to discover what life was like when dinosaurs lived. Tell students that they will be making pretend fossils today.

Lay some dog toys (or other items can be substituted) out on a table. Tell students that there was a visitor earlier in the day, but he had to leave. Have students guess who the visitor was according to the items on the table. Explain that scientists do the same type of reasoning when learning about animals that are now extinct.

Ask, "Can someone tell me what a fossil is?" (Fossils are the remains of skeletons and shells of animals from the past.) Discuss how fossils are formed. (When an animal died it lay where it fell, and in time its body became covered with sand and mud. More sand and mud buried it as the years went by. This slowly hardened into rock, and the bones and shells were confined in the ground. After millions of years, the bones and shells became hard and stony, or fossilized.)

Tell the students that they will be making fossil prints, very much like the way real fossil prints were created. A long time ago, plants, bugs, or animals left impressions in soft mud, which dried out and eventually became rock.

Much of what we know about ancient, extinct plants and animals comes from such prints. For example, that is how we know what the texture of dinosaur skin was, and how we are still tracking down the evolution of birds—since neither skin nor feathers are likely to survive as actual fossils, the way bones do.

OPTION 1: Play-Doh Fossil Imprint Activity

Divide students into groups of two. Pass out the Play-Doh and “fossils.” Students should flatten out the Play-Doh until it is about one half inch thick (depending on the size of the plants or animals students will be making the imprints with). Then the “fossil” should be pressed into the Play-Doh. Next, carefully remove the “fossil.” Set the Play-Doh aside on a tray...untouched until it hardens.

If you would like the students to make a cast using their fossil imprint: Mix Plaster of Paris with water. Pour the Plaster of Paris into the Play-Doh mold and let it dry. Gently peel out the Plaster of Paris, and the result is the fossil. [Tip: To make the "fossil" come out more easily, lightly spray the Play-Doh imprint with a non-stick spray before pouring in the Plaster of Paris.]

OPTION 2: “Stone” Fossil Imprint Activity

(For more advanced students, discuss the difference between the chemical change of the substances as they mix the ingredients to make dough and the physical change as they make the imprint into the dough). Have students work in groups of 2 or 3. Each group will need a mixing bowl, mixing spoon, and measuring cups. Have students take turns pouring in the salt, flour, coffee, and grounds into the bowl, and then mixing all ingredients together. Place dough onto wax paper and knead until smooth. Students will break off even pieces of the dough that they will use to make their imprint. Each student should roll their piece into a ball and then use the heel of their hand to flatten it out.

Allow students to choose the “fossil” that they want to use. Have the students press that object firmly into the dough. Carefully remove the object to leave the print behind. Place the fake stone in a tray to dry overnight and you have an imitation fossil!

Lesson Extension

Using the classroom computer(s), go to Zoom Dinosaurs (www.zoomdinosaurs.com). Students can go to the sections on "Fossils" and "Paleontologists" for information relevant to this lesson. After viewing the web site, students can share any new information that they learned.

Students can write stories from a fossil’s point of view. The students can act as the fossil explaining such things as what animal it was, how it died, what happened to it when it was alive, where it was found, etc.

Pre-Visit Activity: Excavating Fossils

Purpose

In this activity, students will simulate how scientists study the past, as they participate in their own excavation. Students will understand that the collection of accurate data is critical by recording their observations.

Sunshine State Standards

K-2, SC.K.N.1.2, SC.K.N.1.4, SC.K.N.1.5, SC.1.N.1.2, SC.2.E.6.1, SC.2.E.6.2, SC.2.P.8.1
3-5, SC.3.N.1.7, SC.3.P.8.3, SC.5.N.1.6
6-8, SC.7.E.6.3, SC.7.E.6.4, SC.7.L.15.1
9-12, SC.912.L.15.1, SC.912.N.31

Vocabulary

-fossil *noun* a remnant or trace of an organism of a past geologic age, such as a skeleton or leaf imprint, embedded and preserved in the earth's crust
-**excavate** *verb* recover through digging
-strata *noun* layers of rock with fossils that scientists use to understand the past
-**law of superposition** *noun* in any undisturbed sequence of rocks deposited in layers, the youngest layer is on top and the oldest on bottom, each layer being younger than the one beneath it and older than the one above it

Material List (one per student)

-chocolate chip cookie
-2 toothpicks
-paper plate
-paper
-pencils, crayons, or markers

Introduction

Discuss with the students the terms fossil and excavate. Tell your students that they will be participating in their very own excavation. Pass out to every student a paper plate and a chocolate chip cookie. This paper plate with the cookie on it is the fossil site.

Making Observations

A big part of science is observing, so have your students start off by observing their "site" and have them draw what they see. Remind the students to sketch the exact positions of the "fossils," or chocolate chips.

The Excavation

Then tell the students that they will be given 2 toothpicks to use as their digging tools while they try to excavate the chocolate chips (fossils) from the rest of the cookie (the rock). The one rule is that they cannot turn or move the cookie because in the field you can't just turn or move the land or huge rocks. Allow the students about 3 minutes to work on the first excavation.

After 3 minutes of digging, have your students go back and record their new observations. Once they made their new observations, allow the students three more minutes to continue digging. (You can do this a few times.)

Conclusion

At the end, discuss how this could be related to a real fossil dig. Discuss their experience. Ask your students if they think the fossils found right on top were older or younger than the fossils that they found toward the bottom of the cookie. That is known as the Law of Superposition.

Post-Visit Activity: Making Theories

Purpose

In this activity, students use the information they learned from the field trip to create their own theory of what they think may have happened to the dinosaurs.

Sunshine State Standards

K-2, SC.K.L.14.2, SC.1.N.1.4, SC.2.N.1.3, SC.2.N.1.5
3-5, SC.3.N.1.5, SC.3.N.1.7, SC.4.N.1.7, SC.5.N.1.6
6-8, SC.6.N.3.1, SC.7.L.15.3, SC.7.N.1.7, SC.8.N.3.2
9-12, SC.912.N.1.3, SC.912.N.2.4, SC.912.N.3.1, SC.912.N.3.2

Vocabulary

-**scientific theory** *noun* (also known as empirical theory) explains a phenomenon by combining the knowledge of scientific laws and empirical data of observations
-**scientific law** *noun* a concise verbal or mathematical statement of a relation that is always applies under the same conditions

Material List

-paper
-pencil
-books and websites on dinosaurs

Introduction to Theories

Discuss what a theory is and the process that scientists go through before they are able to come up with a theory.

Making Theories

Allow the students to come up with their own theory of what they think may have happened to the dinosaurs. The length and depth of this paper would vary depending on the age and ability of the students. Very young children can draw pictures depicting their theory.

Post-Activity: Dino Hands

Purpose: Students will experience how we are adapted to a different way of living than dinosaurs were and see what it would be like to have dinosaur claws instead of hands.

Vocabulary:
-Adaptation: a trait or characteristic that helps an organism live in a certain environment.
-Opposable Thumb: a special adaptation in humans and other primates that allow us to grip, hold, and use items in ways that other animals can't.

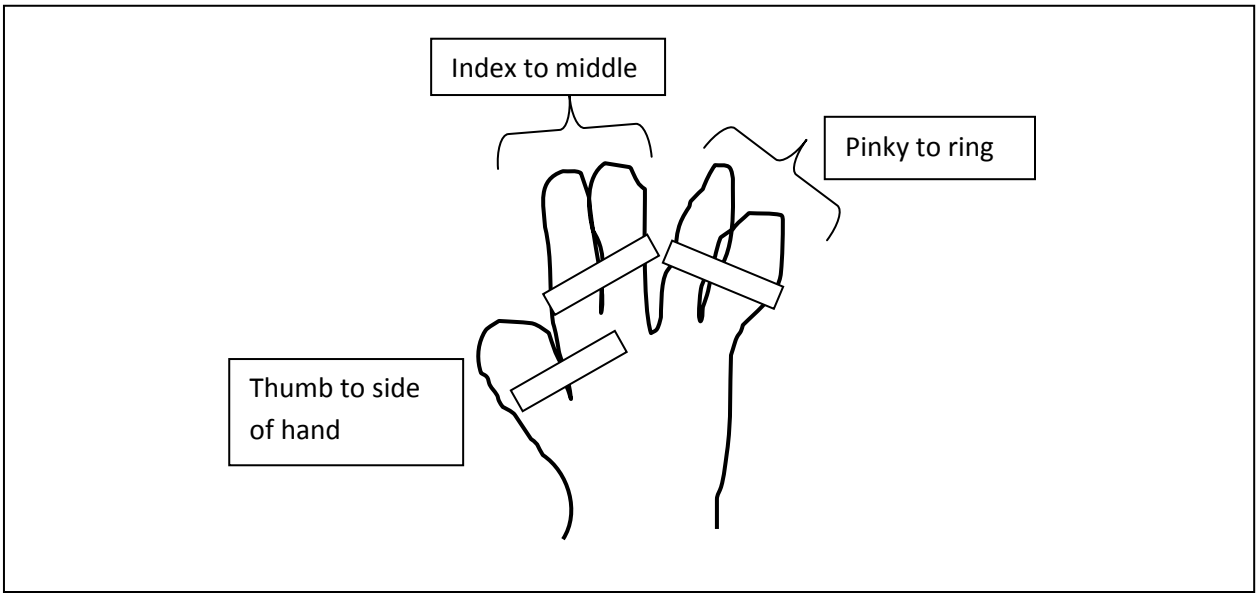
Materials:

-Small pieces of paper, paper clips, erasers, other small objects
-Yarn or string
-Tape or rubber bands
-Pens or pencils

Background:
One adaptation that gives humans an edge over other animals is our thumbs. Our thumbs are described as "opposable" which means that they move in such a way that we can grip, hold, and manipulate objects and tools in ways that other animals simply can't manage. This really comes in handy when we do things like pick up small objects, write, tie our shoes, play an instrument, throw a ball, and countless other everyday activities.

In this activity, you will get to experience what it's like not to have thumbs. In fact, you're going to see what it might be like to have a dinosaur claw for a hand (minus the sharp talons, of course)!

What to Do:
Use the tape, string, or rubber bands to turn your hand into a dinosaur claw. Secure your thumb to the side of your hand, your index finger to you middle finger, and your pinky to your ring finger. Sort of like Spock's "Live long and prosper" sign but with your thumb stuck to the side of your hand.



Once you have your fingers secured, you shouldn't be able to use your thumbs at all. Try doing some simple tasks like picking up and sorting some of the small objects, tying your shoes, tying a knot in a piece of string, writing your name, etc.

Now free your fingers and try the same tasks over again. Notice how much easier it is? Amazing the difference something like a little thumb can make!

Experiment/Competition option

Split the students up into groups of 2. One student will be the dinosaur and the other will be the human. Secure the dinosaur's hand as shown. Then have the human challenge the dinosaur to a competition by seeing who can complete a set of predetermined tasks the fastest.

If you want to do a more traditional experiment, have each pair of students time each other to see how long it takes to complete a predetermined set of tasks - once with a regular human hand and once with a dinosaur hand. Record the results and compare with the rest of the class. What is the average human time for completing the tasks? The average human time? Which is faster? Is there a significant difference between the times?

Related Books & Websites

These websites feature lots of information about dinosaurs in general. Many feature interactive games, quizzes, and other educational activities. They are geared towards younger students (K-2) but may be useful for older groups as well.

http://funschool.kaboose.com/time-warp/dinosaurs/

http://pbskids.org/dinosaurtrain/index.html

http://www.kidsdinos.com/

http://www.cotf.edu/ete/modules/msese/dinosaurflr/meet.html

http://www.amnh.org/ology/paleontology

Dinosaur discovery: everything you need to be a paleontologist McGowan, Christopher.

Publisher: Simon & Schuster Books for Young Readers,
Pub date: c2011.
ISBN: 9781416947646

Dinosaurs : a visual encyclopedia

Publisher: DK Publishing,
Pub date: 2011.
ISBN: 9780756682309

Dinosaur dinners Davis, Lee

Publisher: DK Publishing,
Pub date: 2011, c1998.
ISBN: 0756675855

Ultimate dinopedia : the most complete dinosaur reference ever Lessem, Don.

Publisher: National Geographic,
Pub date: 2010.
ISBN: 9781426301643

Dinosaurs life size Naish, Darren.

Publisher: Barron's,
Pub date: 2010.
ISBN: 9780764163784

Dinosaurs Burnie, David.

Publisher: Kingfisher ;
Pub date: c2010.
ISBN: 9780753464144

Tyrannosaurus rex Gray, Susan Heinrichs.

Publisher: Child's World,
Pub date: c2010.
ISBN: 9781602532441

Name _____ Date _____

Museum Scavenger Hunt – Elementary School

Directions: Answer the following questions by exploring the Museum and reading signs and exhibit information.

1. Breeding season of the American Alligator lasts from _____ to

_____. The female will lay _____ - _____ eggs. They will hatch in_____ weeks.

2. Baby gators face many challenges once they leave the protection of their_____. They are eaten by a variety of predators including _____, _____, _____, _____, and other _____. Out of an average 36 baby alligators born, only 6 will see their _____ birthday and only _____ will reach adulthood.

3. A few decades ago the Florida Alligator was nearly extinct. Thanks to

Conservation efforts they have made a great _____.

4. Gar Fish are the _____ living bony fish around today. They emerged from an ancestor in the Cretaceous period over _____ million years ago.

5. Fossil evidence show that gars have not changed in _____ million years.

6. Like all gars, the Florida Gar uses an air bladder to breathe and survive in poor water conditions. They are often seen near the _____ swallowing air. If they cannot come to the surface, they could _____.

7. Invasive Species are those not from the local environment. Often competing with native plants and animals can change and destroy the balance of the natural _____.

8. The largest shell in the Museum_____.

9. The four states of matter are _____, _____,

_____, and_____.

10. The bicycle changes mechanical energy to _____ energy.

11. Microscopes – What are the Latin words on the one dollar coin?

_____

12. Astronauts in space exercise for _____ hours a day.

13. What materials is the Museum's meteorite made from? _____

14. On which mission was the Moon Rock collected? _____ What year was this? _____

15. Suzie the Mastodon was discovered by_____

16. Translate your name to hieroglyphics below:

_____

Name _____ Date _____

Museum Scavenger Hunt – Elementary School

Answer Key

1. Breeding season of the American Alligator lasts from __April to May___.

The female will lay ___25-60__ eggs. They will hatch in____9___ weeks.

2. Baby gators face many challenges once they leave the protection of

their____Mother_____. They are eaten by a variety of predators including

_raccoons___, __otters__, __birds___, __fish_, and other __alligators__. Out of an average 36 baby alligators born, only 6 will see their __first___ birthday and only __4___ will reach adulthood.

3. A few decades ago the Florida Alligator was nearly extinct. Thanks to

Conservation efforts they have made a great _recovery_____.

4. Gar Fish are the __oldest_____ living bony fish around today. They emerged from an ancestor in the Cretaceous period over _144____ million years ago.

5. Fossil evidence show that gars have not changed in _110_ million years.

6. Like all gars, the Florida Gar uses an air bladder to breathe and survive in poor water conditions. They are often seen near the __surface__ swallowing air. If they cannot come to the surface, they could _die or suffocate_____.

7. Invasive Species are those not from the local environment. Often competing with native plants and animals can change and destroy the balance of the natural _____ecosystem_____.

8. The largest shell in the Museum is ___Giant Clam (Tridacna Gigas)__.

9. The four states of matter are __solid__, _liquid____, _gas_, and _plasma.

10. The bicycle changes mechanical energy to ___electrical____ energy.

11. Microscopes – What are the Latin words on the one dollar coin?

__ E Pluribus Unum _____

12. Astronauts in space exercise for ___2 __ hours a day.

13. What materials is the Museum's meteorite made from? _____Nickel-iron____.

14. On which mission was the Moon Rock collected? ____Apollo 14____ What year was this? ___1971_____

15. Suzie the Mastodon was discovered by a thirteen year old boy named _____Charlie Wilkins_____

16. Translate your name to hieroglyphics below:

Name _____ Date _____

Museum Scavenger Hunt – Middle School

Directions: Answer the following questions by exploring the Museum and reading signs and exhibit information.

1. Breeding season of the American Alligator lasts from _____ to _____. The female will lay _____ - _____ eggs in a mound. They will incubate and hatch in _____ weeks.

2. _____ gators face many challenges once they leave the protection of their mother. They are eaten by a variety of predators including _____, _____, _____, _____, and other _____. Out of an average 36 baby alligators born, only _____ will see their first birthday and only_____ will reach sexual maturity.

3. A few decades ago the Florida Alligator was nearly extinct. Thanks to_____ _____ they have made a great recovery.

4. _____ _____ are the oldest living bony fish around today. They emerged from a primal ancestor in the _____ period over _____ years ago.

5. Fossil evidence show that gars have not changed in _____ million years.

6. Like all gars, the Florida Gar uses an _____ _____ to breathe and survive in poorly oxygenated water. They are often seen near the_____ swallowing air. If they cannot come to the surface, they could_____.

7. _____ _____ are those not natural to the native environment. They often _____ the native plants and animals thus changing and destroying the balance of the natural _____.

8. The largest shell in the Museum is _____.

9. The four states of matter are _____, _____,_____, and _____.

10. The bicycle changes mechanical energy to _____ energy.

11. Microscopes – What are the Latin words on the one dollar coin? _____

12. Astronauts in space exercise for _____ hours a day.

13. What chemicals is the Museum's meteorite made from? _____ When and where did it fall to Earth? _____ in _____

14. On which mission was the Moon Rock collected? _____ What year was this? _____

15. Huge Mastodons like Suzie are collectively referred to as_____

16. Translate your name to hieroglyphics below: _____

_____

17.The fossil record of horses shows that they evolved in _____

18. The position of the Great Pyramids lines up perfectly with _____, in a process of lining up buildings to celestial bodies known as _____.

19. For ancient Egyptians the image of a finger was equal to _____ units; while a frog or tadpole was equal to _____ units. A god with his arms up equaled_____ units.

20. The god _____ would judge the weight of the _____ against the weight of a feather, which represented "_____" and/or "_____."

21. I am the name of the Royal Scribe. Who am I? _____

22. About how old was the child mummy when it died? _____

23. There have been at least_____ Ice Ages in the Earth's past.

Name _____ Date _____

Museum Scavenger Hunt – Middle School
Answer Key

1. Breeding season of the American Alligator lasts from April to May . The female will lay 25-60 eggs in a mound. They will incubate and hatch in 9 weeks.

2. Juvenile gators face many challenges once they leave the protection of their mother. They are eaten by a variety of predators including raccoons , otters , birds , fish , and other alligators . Out of an average
36 baby alligators born, only 6 will see their first birthday and only 4 will reach sexual maturity.

3. A few decades ago the Florida Alligator was nearly extinct. Thanks to conservation efforts they have made a great recovery.

4. Gar Fish is the oldest living bony fish around today. They emerged from a primal ancestor in the Cretaceous period over 144 million years ago.

5. Fossil evidence show that gars have not changed in 110 million years.

6. Like all gars, the Florida Gar uses an air bladder to breathe and survive in poorly oxygenated water. They are often seen near the surface swallowing air. If they cannot come to the surface, they could die/suffocate .

7. Invasive Species are those not natural to the native environment. They often compete with the native plants and animals thus changing and destroying the balance of the natural ecosystem .

8. The largest shell in the Museum is Giant clam (Tridacna Gigas) .

9. The four states of matter are solid , liquid, gas , and plasma .

10. The bicycle changes mechanical energy to electrical energy .

11. Microscopes – What are the Latin words on the one dollar coin?
E Pluribus Unum

12. Astronauts in space exercise for 2 hours a day.

13. What chemicals is the Museum's meteorite made from? Nickel-iron
When and where did it fall to Earth? 22, 0000 in Winslow, AZ

14. On which mission was the Moon Rock collected? Apollo 14 . What year was this?
1971

15. Huge Mastodons like Suzie are collectively referred to as mega fauna or very large animals

16. Translate your name to hieroglyphics below:

17. The fossil record of horses shows that they evolved in _North America_

18. The position of the Great Pyramids lines up perfectly with __Orion's Belt_, in a process of lining up buildings to celestial bodies known as Dwat.

19. For ancient Egyptians the image of a finger was equal to _10,000_ units; while a frog or tadpole was equal to __100,000_ units. A god with his arms up equaled__1,000,000_ units.

20. The god _Osiris__ would judge the weight of the __heart_ against the weight of a feather, which represented "__truth__" and/or "__order_____."

21. I am the name of the Royal Scribe. Who am I? ____Ani_____

22. About how old was the child mummy when it died? ___5___

23. There have been at least___5___ Ice Ages in the Earth's past.