# GEM SCOOPS

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# Geology Museum Curator to Speak

## SEPTEMBER MEETING

**WHEN:** Monday, September 19, 2016, Refreshments at 6:30 pm

**WHERE:** Meeting room at Central-Clemson Library.

**TOPIC:** "The Fossil Record of Birds: Enigmas and Controversies"

**SPEAKER:** Dr. N. Adam Smith, Curator, Bob Campbell Geology Museum


**ABSTRACT:** Birds are the most diverse group of terrestrial vertebrates and understanding of their evolutionary history is key to understanding broad patterns of extinction and radiation on geologic time scales. Despite an ever growing number of birds known from the fossil record, misconceptions about the paucity of bird fossils and the placement of birds in the tree of life persist. Several key bird fossils elucidate the evolutionary origins of the group and demonstrate the wide variety of species and morphologies that have led to the groups' success. The knowledge that birds are living dinosaurs is crucial to correctly interpreting the biology and ethology of living birds.


## OCTOBER MEETING

The next regular meeting of the PDGMS will be in October on the third **Monday**, Oct. 17, 2016.

**Students learning learning about fossils and minerals from Dr. Adam Smith at the Westminster Elementary School in Westminster, SC.**

### September Speaker

Dr. Adam Smith recently joined the faculty of Clemson University as the Curator of the Bob Campbell Geology Museum. He has a Ph.D. In Geological Sciences from the University of Texas at Austin. His research is focused on exploring the taxonomic diversity, morphological variation and temporal distribution of birds in the fossil record and using those data to better understand how evolutionary patterns in extinct and living birds are linked with changes in climate.

**DIRECTIONS TO LIBRARY:** The Central-Clemson Public Library is located at 105 Commons Way, Central, SC. To get there take Highway 93 toward Central. Commons Way is on the right hand side of the road just before the highway narrows to one lane each direction. The library is the first building on the left after turning onto Commons Way.

### Time to Elect 2017 Officers

The year is almost over and it is time to elect next year's officers. President Lund will appoint a Nominating Committee that will prepare a slate of officers for next year.

**Officers for 2016**

**Robert Lund, President ... 864-888-8719**
**John Palmer, V. Pres.....941-545-3713**
**Teresa Smith, Sec.....864-888-8719**
**John Ishler, Treasurer.....864-885-9126**

**2016 Directors**

**Carol Lund (Past Pres).....864-888-8719**
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**Fred Sias.....864-654-6833**
**Bob Whitmore.....303-565-2727**

## Paleontology

Paleontology is the scientific study of life that existed prior to, and sometimes including, the start of the Holocene Epoch (roughly 11,700 years before present). It includes the study of fossils to determine organisms' evolution and interactions with each other and their environments. Paleontological observations have been documented as far back as the 5th century BC. The science became established in the 18th century as a result of Georges Cuvier's work on comparative anatomy, and developed rapidly in the 19th century. The term itself originates from the Greek. The simplest definition is "the study of ancient life".

Paleontology lies on the border between biology and geology, but differs from archaeology in that it excludes the study of anatomically modern humans. It now uses techniques drawn from a wide range of sciences including biochemistry, mathematics, and engineering. Use of all these techniques has enabled paleontologists to discover much of the evolutionary history of life, almost all the way back to when became capable of supporting life, about 3,800 million years ago.

As knowledge has increased, paleontology has developed specialized sub-divisions, some of which focus on different types of fossil organisms while others study ecology and environmental history, such as ancient climates.

Body fossils and trace fossils are the principal types of evidence about ancient life, and geochemical evidence has helped to decipher the evolution of life before there were organisms large enough to leave body fossils. Estimating the dates of these remains is essential but difficult: sometimes adjacent rock layers allow radiometric dating, which provides absolute dates that are accurate to within 0.5%, but more often paleontologists have to rely on relative dating by solving the "jigsaw puzzles" of biostratigraphy. Classifying ancient organisms is also difficult, as many do not fit well into the Linnaean taxonomy that is commonly used for classifying living organisms, and paleontologists more often use cladistics to draw up evolutionary "family trees". The final quarter of the 20th century saw the development of molecular phylogenetics, which investigates how closely organisms are related by measuring how similar the DNA is in their genomes. Molecular phylogenetics has also been used to estimate the dates when species diverged, but there is controversy about the reliability of the molecular clock on which such estimates depend.

Paleontology seeks information about several aspects of past organisms: "their identity and origin, their environment and evolution, and what they can tell us about the Earth's organic and inorganic past". Paleontology is one of the historical sciences, along with archaeology, geology, astronomy, cosmology, philology and history itself. This means that it aims to describe phenomena of the past and reconstruct their causes. Hence it has three main elements: description of the phenomena; developing a general theory about the causes of various types of change; and applying those theories to specific facts. When trying to explain past phenomena, paleontologists and other historical scientists often construct a set of hypotheses about the causes and then look for a smoking gun, a piece of evidence that indicates that one hypothesis is a better explanation than others. Sometimes the smoking gun is discovered by a fortunate accident during other research. For example, the discovery by Luis Alvarez and Walter Alvarez of an iridium-rich layer at the Cretaceous–Tertiary boundary made asteroid impact and volcanism the most favored explanations for the Cretaceous Paleogene extinction event.

The other main type of science is experimental science, which is often said to work by conducting experiments to disprove hypotheses about the workings and causes of natural phenomena – note that this approach cannot confirm a hypothesis is correct, since some later experiment may disprove it. However, when confronted with totally unexpected phenomena, such as the first evidence for invisible radiation, experimental scientists often use the same approach as historical scientists: construct a set of hypotheses about the causes and then look for a "smoking gun".

Paleontology lies on the boundary between biology and geology since paleontology focuses on the record of past life but its main source of evidence is fossils, which are found in rocks. For historical reasons paleontology is part of the geology departments of many universities, because in the 19th century and early 20th century geology departments found paleontological evidence important for estimating the ages of rocks while biology departments showed little interest.

Paleontology also has some overlap with archaeology, which primarily works with objects made by humans and with human remains, while paleontologists are interested in the characteristics and evolution of humans as organisms. When dealing with evidence about humans, archaeologists and paleontologists may work together – for example paleontologists might identify animal or plant fossils around an archaeological site, to discover what the people who lived there ate; or they might analyze the climate at the time when the site was inhabited by humans.

This summary was abstracted from ***Wikipedia.***