



Sixty million years ago, the Mojave Desert of southern California was blanketed by a lush tropical forest. Where desert tortoises and sidewinders now roam, early mammals thrived alongside crocodiles and river turtles on a coastal plain. For decades, fewer than a dozen fragmentary fossils were known. Thanks to hundreds of new specimens uncovered by the Alf Museum, our picture of this ancient world is now much clearer. [A scientific paper, just published in the journal American Museum Novitates](#), details 18 kinds of fossil mammals from this time, three of them completely new to science. These include California's oldest primate as well as relatives of modern hoofed mammals.

The rocks of the Goler Formation are exposed near the town of Ridgecrest, about 100 miles north of Los Angeles. The first fossils were reported in the early 1950s, but the formation was notoriously stingy with additional specimens. [Dr. Malcolm McKenna](#) '48, a graduate of The Webb Schools who became a noted paleontologist at the American Museum of Natural History, looked for many years with limited success. In 1993, after Dr. Don Lofgren became director of the Alf Museum, the duo launched an intensive field program to explore the Goler Formation. With the aid of alumni and students from The Webb Schools, as well as paleontologists from other institutions, the Goler Formation gradually yielded its secrets.



The animals of the Goler Formation lived a scant six million years after the extinction of non-avian dinosaurs. At this time, mammals were undergoing a massive radiation into vacant ecological niches. Some of these mammals have close living relatives today, and others represent now-extinct lineages. Teeth and jaws are the most common fossils in the Goler Formation, all of which are highly diagnostic to specific kinds of mammals. Rare skulls and other bones of the skeleton provide additional information. The fossils are typically found by crawling along the surface of the ground, inspecting every pebble for evidence of a tooth or bone inside. Additional fossils were collected by screenwashing, where mesh is used to capture bones and teeth washed out of the rock.



The most common mammal fossils in the Goler Formation are from an animal called *Phenacodus*. *Phenacodus*

was a plant-eater approximately the size of a raccoon, distantly related to today's horses, rhinos, and tapirs (perissodactyls). Animals sharing the environment included early cousins of carnivorans (

*Protictis*

), the bizarre dead-end

*Lambertocyon*

, and taeniodonts, dog-sized burrowing animals, among many others.



Somewhat surprisingly, early primates were another common element in prehistoric southern California. Plesiadapiforms, a group of squirrel-like tree-dwellers, were the closest relatives to today's primates (lemurs, monkeys, and apes). At least three different species are known from the Goler Formation. Most notable among these is a species new to science, *Nannodectes*. *Nannodectes lynasi*

probably weighed around 2 pounds, and is known from a number of teeth and partial jaws.

Careful comparisons with skulls from elsewhere in North America confirmed the uniqueness of

*N. lyansi*

. The species name honors Dick Lynas '55, a Webb alumnus who has assisted in the collection of fossils in the Goler Formation as well as in the operations of the Alf Museum.



Another new species is called *Protoselene ashtoni*, in honor of Webb alumnus R. Larry Ashton '70 and his steadfast support of the Alf Museum.

*Protoselene*

is known from throughout western North America, but

*P. ashtoni*

is unique to California. Only a single lower jaw fragment is known so far. The relationships of the animal are enigmatic, but it is probably closely related to modern artiodactyls (including cattle, hippos, whales, and deer). Another species from the Goler Formation closely related to *Protoselene*

,  
*Promioclænus walshi*

, is known from three partial jaws and honors the late Steven Walsh, a paleontologist responsible for discovering many of the fossils in the Goler Formation.

The fossil mammals of the Goler Formation are the oldest known from the western coast of North America after the extinction of the dinosaurs. As such, the bones are critical for understanding how California has changed over the past 60 million years. Some of the species identified from the Goler Formation are the same as those living elsewhere in North America at the time (e.g., in Colorado, Wyoming, and Texas), but others apparently were unique to southern California.

The just-published paper, focusing on eutherian mammals (the group including placental

mammals but not marsupials or monotremes), is only one facet of [a much larger project](#) . Additional on-going research is identifying the fossil birds, marsupial and multituberculate mammals, and other organisms found in the Goler Formation.



The research team on this project was led by Alf Museum director Dr. Donald Lofgren, in collaboration with the late Malcolm McKenna '48 and the late Jim Honey as well as Randy Nydam (Midwestern University). Several high school students from The Webb Schools participated in the project, including Christine Wheaton '09, Bryan Yokote '09, Lexington Henn '09, Whitney Hanlon '04, Stephen Manning '09, and Carter McGee '09. All fossils were collected under permit from the United States Bureau of Land Management-California, and are housed at the Raymond M. Alf Museum of Paleontology in Claremont, California. The full scientific description of the fossils was published in [the February 6, 2014, issue of American Museum Novitates, and is freely available](#)

### Citation

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