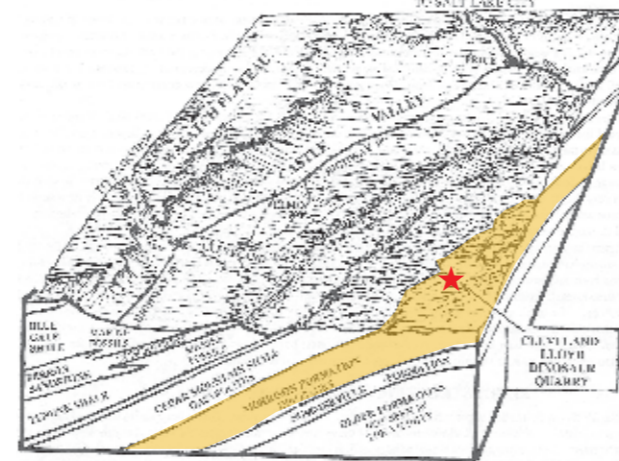
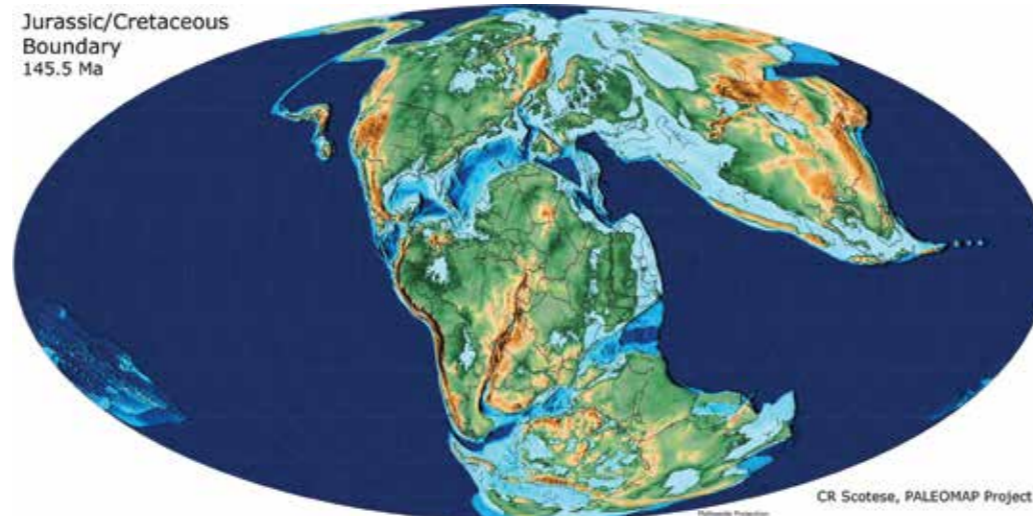


# The Life – and Afterlife – of Al, the Princeton Allosaurus



## Geologic Setting



2016 Google Earth “street view” of Quarry. Photo credit: Don Bri.

Adapted from Fig. 1 of Stokes, 1985.

By the Late Jurassic, Pangea was in the process of rifting – the North Atlantic Basin has formed separating North America from Eurasia, but the South Atlantic Basin has not formed yet (South America and Africa are still attached). The Morrison sedimentary basin is marked with a red star.

“The Morrison Formation was deposited during the Late Jurassic... across rivers, floodplains, (and) lakes... the Rocky Mountains did not yet exist. Flowering plants had not yet evolved; instead, the land was covered by ferns, cycads, and horsetails, with stands of conifer trees, ginkgoes, and tree ferns. Freshwater mussels and snails thrived in the rivers and lakes, which were also populated by fishes, turtles, and crocodile relatives. On the land, immense sauropod dinosaurs, plated stegosaurs, and beaked ornithomimids browsed and grazed while avoiding carnivorous theropod dinosaurs. Much smaller amphibians, lizards, lizard-like reptiles, mammals, and mammal cousins foraged around these giants, while insects and pterosaurs flew by.”  
(from Quarry brochure)

## What happened to Al?

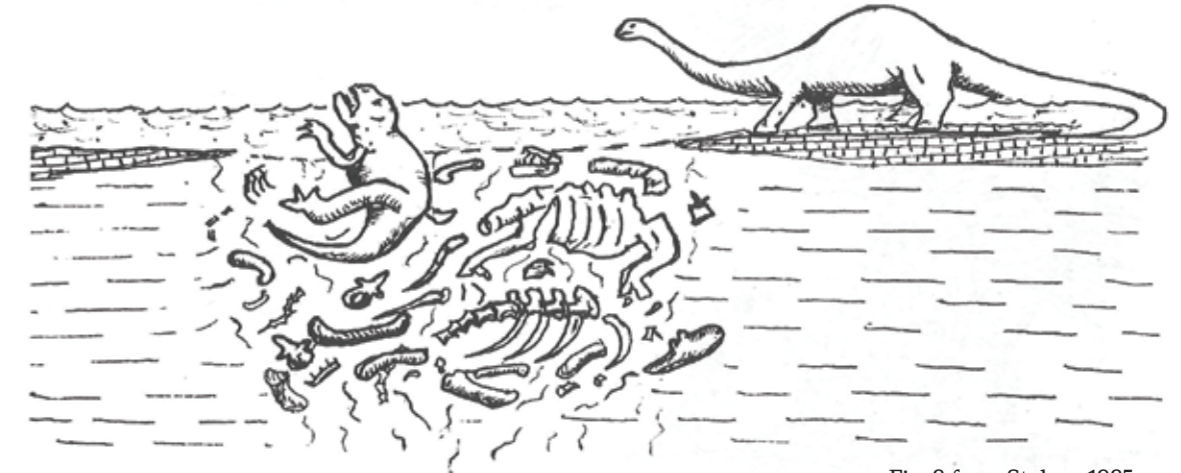


Fig. 8 from Stokes, 1985.

Allosaurs are thought to have had savvy hunting skills and it is suggested that they may have hunted in packs. So how did Al (and his associates) end up in the Morrison formation sediment? Here are some of Stokes’ and others’ observations of the quarry deposits:

- Individuals of all but the youngest are represented;
- There are more carnivores than herbivores;
- There are no articulated skeletons. Instead, the bones are separated and mingled, but not broken, gnawed, or weathered;
- The bones are buried in fine grained clay-rich sediments associated with fresh-water organisms.

One hypothesis by Stokes, illustrated by his figure above, was that this was a prehistoric bog into which dinosaurs inadvertently walked, became trapped, and sank. As the bodies decayed, bones were released and dispersed by internal movement and circulation in the bog; but buried quickly enough that they were not scavenged or weathered.

The deposit may be analogous to the much younger La Brea Tar Pits in Los Angeles, where Late Pleistocene and younger animals were trapped and preserved in natural asphalt deposits. The predominance of predators species at La Brea is commonly interpreted as a “predator trap” which drew predators looking for a “free lunch” of earlier trapped animals.

## History of the Excavations

- More than a hundred years ago, local cowboys and shepherds observed large black bones buried in the rocks. These were clearly not those of their livestock!
- In 1939, paleontologists from Princeton University started a three-year excavation of the quarry to provide bones for its museum exhibits (led by Princeton graduate student **W. Lee Stokes**, Ph.D. 1941.) In his memoir of the expedition, Stokes writes, “A very wealthy individual, Mr. Malcom Lloyd (Princeton class of 1894)... announced he would like to provide Princeton with a dinosaur! It was by combining the name of this benefactor, with that of nearby Cleveland, that the quarry received its name. Opportunity met capability and Dr. Jepsen (‘27 \*30 faculty 1934-1975) gave me \$1000 to see what I could do...”
- After a successful first season, additional funding was provided and over the next three years Stokes’ team excavated bones from several Allosaurus individuals that make up “Al.” But World War II intervened, and it was not until 1960 that the bones were prepared at Yale University, assembled, and put on display at Princeton.
- In 2001 the University of Utah returned to investigate the deposit where excavations are still ongoing. Modern research takes into account not only the bones, but many other details including the regional geology, rock types surrounded by bones, and vertical and horizontal bone placement.
- Over the years, more than 12,000 bones have been excavated from Cleveland-Lloyd and are on exhibit in more than 65 museums worldwide.

### References:

The Cleveland-Lloyd Dinosaur Quarry brochure:  
<https://www.blm.gov/sites/default/files/documents/files/Cleveland%20Lloyd%20Brochure.pdf>

Scotese, C.R., 2014, *Atlas of Jurassic Paleogeographic Maps, PALEOMAP Atlas for ArcGIS*, volume 4, *The Jurassic and Triassic*, Maps 32-42, Mollweide Projection, PALEOMAP Project, Evanston, IL.

Stokes, W. Lee, *The Cleveland-Lloyd Dinosaur Quarry Window to the Past*, U.S. Department of the Interior, Bureau of Land Management, 1985.



Prof. W. Lee Stokes \*41 excavating at the quarry in the 1960s.



Princeton University excavators lived under the overhanging edge of a large boulder and in a small canvas tent.



Typical appearance of bones in process of removal.

Figures from Stokes, 1985

## What’s next for Al? (He’ll be back!)

- **October 2024: Documentation of Guyot Hall exhibit**
  - 360-views by team from the Princeton Broadcast Center (Daniel Quiyu, Kayce West, Jared Montano) and 3-D scanning by Dr. Ryan Manzuk.
  - Disassembly and crating captured in time-lapse by the Princeton Broadcast Center team.
- **Winter 2025:** Spending the winter at **Research Casting International (RCI)** facility in Ontario, Canada for refurbishment and correction of anatomical positioning. (RCI is known for many, many dinosaur exhibits, including the Titanosaur at AMNH in NYC.)
- **Spring 2025:** Reassembly in the new ES building across Washington Road – also to be captured in time-lapse by the Princeton Broadcast Center team.