

Arkansas' Oldest Rock



Hominy Hill, Pulaski County, Arkansas. 1985.

Metagabbro

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History of the Metagabbro in Arkansas

In 1891, John C. Branner, State Geologist, discovered an unusual rock at a site known as Hominy Hill, near Little Rock, during his survey of Arkansas. The rock is located on private property and special permission must be received to access it. Geologists were given permission to visit the site and determined the rock was a type of metamorphosed gabbro.

The term metamorphosed gabbro was shortened to metagabbro by the geologists studying it. Like most forms of rock, it is found in many places of the world, but this is its only known occurrence in Arkansas.

In the 1980's, several geologists received permission to revisit the site of the metagabbro and obtain pictures and samples to study.

The geologists concluded that over time, the rock has undergone many changes. It began as gabbro, a coarse-grained dark colored igneous rock, and then went through metamorphic changes after it was faulted into the surrounding rock. The metamorphic gabbro that now exists is classified as a greenstone because it contains epidote and chlorite.



Hominy Hill, Pulaski County, Arkansas, 1985.

The Age of Arkansas' Metagabbro And Cross Cutting Relationships

The majority of Arkansas is covered in sedimentary rocks and sediments (99.9%). These rocks and sediment are from the Cambrian to Quaternary Periods and range in age from around 500 million years to less than a few thousand years old.

The geologists determined that the gabbro was formed elsewhere and was faulted tectonically into its sedimentary host during the Ouachita mountain building event. The younger sedimentary rock in which the gabbro is encased was mapped as the Womble Shale by geologists. The Womble Shale has been dated, using stratigraphic and radiometric aging methods, as mid-Ordovician age, which makes it 458 to 470 million years old.

After the metagabbro was faulted into the shale, it was cross-cut by younger quartz veins. These veins range in age from around 280 to 245 million years old and formed during the end of the Ouachita mountain-building process in Arkansas.

Also cutting across the metagabbro, is an igneous dike that is younger than any of the quartz veins.

Almost all of the igneous rocks that are exposed are from the Cretaceous Period and are approximately 144 million years to 65 million years old.

The metagabbro discovered near Little Rock, Arkansas has been radioactively dated to be about 1,025 million years old, from the Pre-Cambrian period, making this the oldest rock in Arkansas.

That makes the metagabbro or greenstone about 570 million years older than the rocks surrounding it!



E. Mullins –Collecting metagabbro samples at Hominy Hill, Pulaski County, Arkansas, 1985.



Hominy Hill, Pulaski County, Arkansas, 1985. M. Howard – Collecting metagabbro samples

Unanswered Questions

The rock presents many questions to today's geologists.

Is it related to transform motion or rifting in the early Ouachita trough? Or, does it represent transformations related to fragments of the oceanic crust that once covered the area? Is it related to serpentine rock formations in similar structural settings in nearby states?

The rock awaits future geologists and further detailed study to help answer these questions.

Suggested reading material for further information:

Introduction to Minerals and Rocks (with special emphasis on Arkansas materials)

Edited by Angela Chandler, AGS, July 2009

Methods of Determining the Age of Rock

Stratigraphic (Law of Superposition) Geologists generally assume that in a layer of undisturbed rocks, the older deposits are on the bottom and, as you move upwards, you encounter progressively younger rocks, compared to the rocks beneath them.

Paleontologic (Fossils) Geologists compare the fossils found in rocks to those found worldwide. Index fossils have been determined to live during a certain time period. When these fossils are found in rocks, then it can be presumed that the rock is relatively the same age as the fossil.

Radiometric (Radioactive Dating) geologists use the known half-life of radioactive elements found in rocks and minerals to determine their age. Geologists began using radiometric methods to determine the age of rocks in the 1960's. Since that time, radiometric dating has been continually refined using new methods and technology.

This pamphlet was created by Debra Daugherty, STRIVE teacher for the Arkansas Geological Survey, June 2012.

References

Morris, E.M. and Stone, C.G. 1986, A preliminary report on the metagabbros of the Ouachita core *in* Sedimentary and Igneous Rocks of the Ouachita Mountains of Arkansas, a guidebook with contributed papers, Part 2: Arkansas Geological Commission Guidebook 86-3, C.G. Stone and B.R. Haley, eds., 87-90.

Stone, C.G and Howard, J.M. In house data communication. Circa 2010.