The Rocks of Harriman State Park

Talk with the Experts
American Canoe Association

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Part 1

Everything Changes
Very Old
Great Pyramid at Giza
roughly 5000 years old
1 pyramid
5000 years
Imagine what Harriman State Park was like 4 Pyramids Ago?

(20,000 years)
Whitetail Deer
Absolutely nothing lived in the Harriman Park 20,000 years ago
Twenty Thousand Years

not all that long ago
200 pyramids = One Million Years
One Million Years
Death of the Dinosaurs
65 Million Years ago

65 boxes of 200 pyramids
Part 2

Rocks tell a Story
but an incomplete story
Erosion

destroys rocks

but also

brings them to the Earth’s surface
Erosion
destroys rocks
  Bad for Geologists
but also
brings them to the Earth’s surface
  Good for Geologists
2 inches in 20,000 years

40,000 inches in 400 Million Years
2 inches in 20,000 years

100,000 inches in 1000 Million Years

About a mile and a half!
How can you erode a half mile off the land without it being underwater?
Part 3

The Age of Bacteria
(and not much else)
1000 million years ago
Era when most of Harriman Park rocks were formed

Two major rock types
Gneiss
Granite
A Metamorphic Rock
Banded
Brown or Grey in Color
Layers of sand and clay
Deeply buried and “cooked” (metamorphosed) by heat and pressure

An Igneous Rock
No bands
White or beige in Color
Solidified molten rock
Very hard to erode
so tends to form hilltops
(Bear Mountain, Popolopen Torne, etc)
Originally layers of sand and clay.

Formed at surface of earth

Might there have been living things?
Graphite (pure carbon)

all that’s left of life
solid rock .... acting like dough
Needs to be deeply buried
... say 5 miles ...
to get hot enough to be metamorphosed and folded
when was it buried?
An Igneous Rock
Very hot conditions
think volcano

Which is older?
Gneiss, or Granite?
Geological Logic

The granite cuts the gneiss so the gneiss is the older.

Furthermore, the fold were already formed when the granite was emplaced, so the gneiss was already deep underground before the granite was formed.
Geologists have been able to determine the age of the granite about 1000 million years.

So the sediments that formed the gneiss are older than that.
Part 4

The Age of Dinosaurs
(and many other animals)

200 Million years ago
Aerial view of Harriman State Park
do you see the lines?

of hills and valleys?
Lines are Geological Faults
Right-most is the “Ramapo Fault
With some effort you can work out the direction the land moved
Slickenslides – grooves from fault motion
When was the faulting?
rock debris coming out of a steep stream valley into a low lying area
look what else you find in the sandstones
so the faulting looks to have occurred during the age of the dinosaurs

200 million years ago
so the faulting looks to have occurred during the age of the dinosaurs 200 million years ago
Part 5

The Ice Age

which ended

20,000 years ago
Glacial scratches
Boulder carried by glacier

Erratic Boulders
Harriman State Park
Do you recognize this rock?
Looks like granite from Harriman park
Harriman Park as seen from Little Tor
Steep downstream slope

Glacially Plucked Cliff
Glacier in Iceland

Steep downstream slope
The Kitchen Stairs
So when you walk around the Park ... 

*Listen to the Story told by the Rocks!*
and great talking with you!
Addendum

There’s gold in them there hills!
Addendum

There’s gold in them there hills!
Iron Ore
Limestone
Charcoal

fill up the furnace

Set it afire!

Carbon Dioxide
Molten Slag
Molten Iron
Hudson River Chain, Revolutionary War
The magnetite occurs in small veins usually near the granites. Geologists are not sure why it formed.
Slag (waste product of refining process)
Tailings Pile of Black Ash Mine