



Mountain Building Part IV: *the formation of Pangea and the Appalachian Mountains*

Today's Appalachian Mountain chain formed 470 million years ago at the time of the Taconic mountain-building event, with the initial squeeze of the margin of North America. The Acadian mountain-building, 380 million years ago, crunched the crust of North America a bit more. Finally, approximately 250 million years ago, the Alleghanian

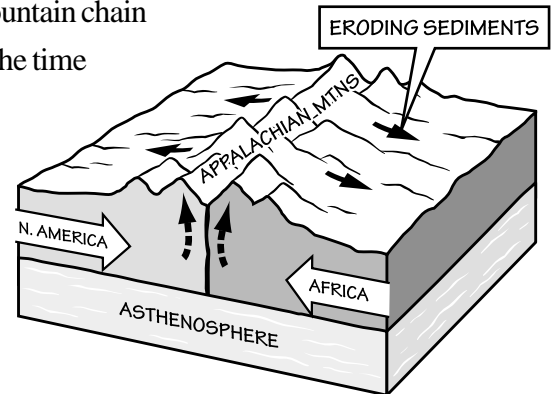


Figure 1.16: When ancestral Africa collided with North America, the Appalachian mountains were formed. Figure by J. Houghton.

mountain-building event occurred as ancestral Africa collided with North America to create the central and southern Appalachians during the Permian (Figure 1.16, Figure 1.17). The Acadian orogeny helped to shape the northern Appalachian Mountains, but the Alleghanian orogeny gave the final squeeze to the margin of the continent to form today's Appalachian Mountain chain, extending from Alabama to Maine and beyond into Canada. From the time of the Acadian mountain-building event until the Triassic, the Appalachians were continuous with the Caledonide Mountains of northwestern Europe and Greenland.

The Appalachian Mountains that we see today, however, are merely the worn down remnants of the Appalachians created millions of years ago. At one time the Appalachians were probably as tall as the modern Himalayas, but today the Appalachians are the

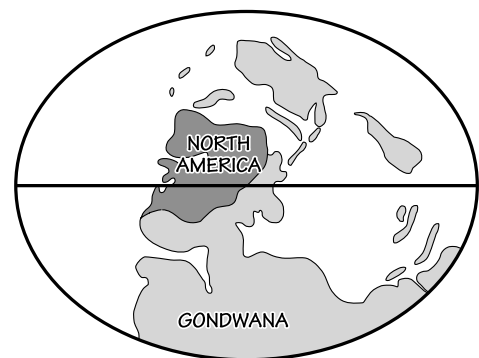
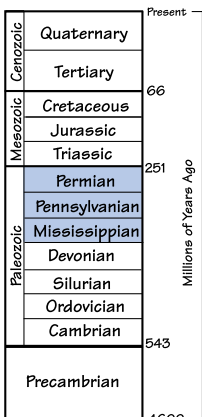
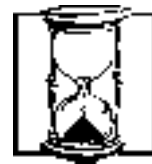


Figure 1.17: Late Pennsylvanian: 306 million years ago.

Why are the Appalachians still here?

Although the Appalachian Mountains were formed over 250 million years ago, they are still around today. The forces of erosion and weathering have worn down the Appalachians over time; periodic uplift of the range, however, has prevented them from completely eroding away.





rounded, weathered and aged peaks of a more mature mountain range that has seen millions of years of erosion and uplift.

The direct cause of the creation of the Appalachian Mountains was the merging of all continents into the supercontinent Pangea as the Iapetus Ocean closed 290 million years ago. Baltica and North America had merged to form one continent during the Acadian mountain-building period in the Devonian, effectively creating the ancestral northern Appalachians. In the meantime, through the Mississippian and Pennsylvanian periods, ancestral Africa (already joined to other continents as Gondwana) drifted closer to North America and Baltica. The Iapetus Ocean narrowed as the oceanic crust was subducted under the North American continental crust. When ancestral Africa finally collided with North America during the Permian, the continental crusts were too buoyant to be subducted like dense oceanic crust. Instead, the crusts crumpled together to create a tall range of mountains. Sediments from the proto-Atlantic ocean basin and the continental shelf and slope of North America, were pushed upwards and squeezed along with the crust.

Though the Appalachian Mountains do not look as tall and rugged as the Himalayas of India, the Appalachians formed through essentially the same geologic processes. The collision of the Indian and Asian plates that is taking place today is raising the Himalaya Mountains, similar to the collision over 250 million years ago between Africa and North America created the Appalachian Mountains.

Evidence For Pangea

How do we know that Pangea existed 250 million years ago? Fossil evidence and mountain belts provide some of the clues. The Permian-age fossil plant, Glossopteris had seeds too heavy to be blown across an ocean. Yet Glossopteris fossils are found in South America, Africa, Australia, India and Antarctica! The mountain belts along the margins of North America, Africa and Europe line up as well and have similar rock types, indicating that the continents at one time were joined as Pangea. The discovery of Glossopteris and the evidence in the rocks helped geologists to formulate the theory of Continental Drift, which, when the processes of continental movement were later discovered, was reformulated under the modern theory of Plate Tectonics.

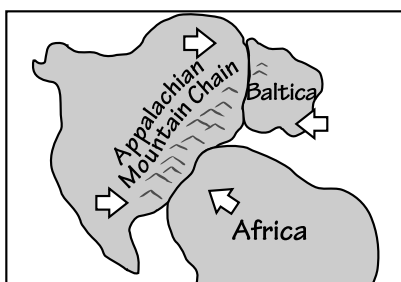


Figure 1.18: Alleghanian Mountain Building
 -Africa collides with North America
 -central/southern Appalachians form
 -Pangea assembled, one supercontinent on Earth

Cenozoic	Quaternary	Present
	Tertiary	
Mesozoic	Cretaceous	66
	Jurassic	
	Triassic	
	Permian	
Paleozoic	Pennsylvanian	251
	Mississippian	
	Devonian	
	Silurian	
	Ordovician	
	Cambrian	
Precambrian		543
		4600

