The Ice Age: *mountains of ice*

Although today the plates are still drifting and the Atlantic Ocean continues to widen, the dynamic plate tectonic activity of the geologic past has temporarily quieted along the east coast. However, despite the minimal tectonic activity in the Northeast throughout the Cenozoic (with the exception of periodic uplift and movement of faults), the face of the land continued to change due to erosion and a series of advances and retreats of glacial ice.

A cooler climate contributes to the growth of continental glaciers. The continental glacier that repeatedly covered parts of North America during the Quaternary, had its origin in northern Canada. As the climate cooled, more snow fell in the winter than melted in the summer, causing the snow to pack into dense glacial ice.

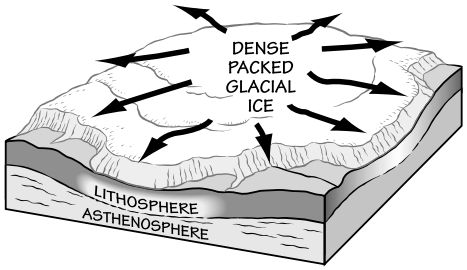


Figure 1.26: As dense glacial ice piles up, a glacier is formed. The ice begins to move under its own weight and pressure. Figure by J. Houghton.

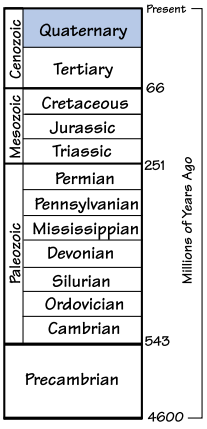
As more snow and ice accumulated on the glacier (and less melted), the ice began to move under its own weight and pressure. The older ice on the bottom was pushed out horizontally by the weight of the overlying younger ice and snow. Glacial ice then radiated out from a central point, flowing laterally in every direction away from the origin *(Figure 1.26)*. And thus, a continental glacier originating in far Northern Canada began to move south towards the northeastern U.S *(Figure 1.27)*. The ice sheet crept slowly forward, scraping off the loose rock materials and gouging the bedrock beneath the ice as it advanced.

Figure 1.27: The movement of the ice sheet over North America. Figure by J. Houghton.

Nearly two million years ago, the

What happened between the breakup of Pangea and the ice age?

The Northeast gradually rifted away from the rest of Pangea during the Mesozoic. Throughout the Tertiary period (which followed the breakup of Pangea) a warm climate promoted chemical weathering and erosion of rocks of the Northeast. Periodic uplift and significant erosion of the land shaped much of the topography of the Northeast. Though Tertiary deposits are thick along the continental shelf and parts of the Coastal Plain (evidence of significant erosion during this time), there are very few Tertiary deposits on much of the Northeast coast. This is because as the climate began to cool and the ice age set in, glaciers scraped up most of the sediments deposited during the Tertiary and pushed them southward. Uplift during the Tertiary created the Adirondack Mountains of New York.



Earth's climate shifted towards ice age conditions. Since that time, there have been several dozen intervals of glaciation separated by warmer intervals not unlike the present. The most recent glacial advance reached its maximum extent 25-20,000 years ago and lasted until 10,000 years before the present. Though the glaciers are long gone from the Northeast, they have left behind evidence of their advances and retreats, smoothing over the mountains and blanketing the surface with glacial deposits. The Northeast owes a large share of its present topography and drainage patterns to the last glacial advance.

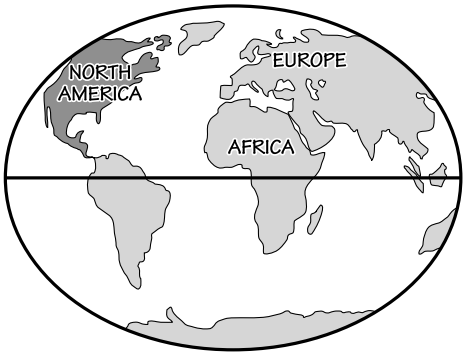


Figure 1.28: Modern geography.

Although the entire Northeast region was affected by the cooling climate during the last advance of the ice sheet, the glaciers only extended as far south as northern Pennsylvania and Long Island. Today, the Earth is technically in an interglacial time, as the ice sheets have retreated for now. There is every reason to believe, however, that the Earth will return to a glacial maximum unless ***global warming*** resulting from human activities pulls the Earth from another ice age.

Throughout the Earth's history, the continents have been periodically plunged into an ice age, dependent upon the climate and position of the continents. Over the last million years, North America has experienced glaciation approximately **once every 100,000** *years and once every 40,000 years during the previous two million years.*

With the coming of the Industrial Age and exponential increases in human population, large amounts of gases have been released to the atmosphere (especially carbon dioxide) that contribute to **global warming.**

see Glaciers, p.57

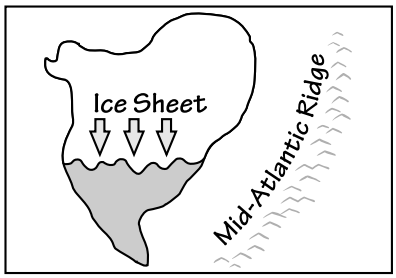


Figure 1.29: Ice Age
-Northern Canadian ice sheet forms
-repeated advances and retreats of ice sheet over the Northeast
-put the finishing touches on the topography of the Northeast