Ice Age

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An ice age is a period of colder global temperatures and recurring glacial expansion capable of lasting hundreds of millions of years. Thanks to the efforts of geologist Louis Agassiz and mathematician Milutin Milankovitch, scientists have determined that variations in the Earth's orbit and shifting plate tectonics spur the waxing and waning of these periods.

There have been at least five significant ice ages in Earth's history, with approximately a dozen epochs of glacial expansion occurring in the past 1 million years. Humans developed significantly during the most recent glaciation period, emerging as the dominant land animal afterward as megafauna such as the wooly mammoth went extinct.

During an ice age, colder global temperatures lead to recurring glacial

expansion across the Earth's surface. Capable of lasting hundreds of millions of years, these periods are interspersed with regular warmer interglacial intervals in which at least one major ice sheet is present. Earth is currently in the midst of an ice age, as the Antarctic and Greenland ice sheets remain intact despite moderate temperatures.

These global cooling periods begin when a drop in temperature prevents snow from fully melting in some areas. The bottom layer turns to ice, which becomes a glacier as the weight of accumulated snow causes it to slowly move forward. A cyclical pattern emerges in which the snow and ice traps the Earth's moisture, fueling the growth of these ice sheets as the sea levels simultaneously drop.

How an Ice Age Changes Earth

An ice age causes enormous changes to the Earth's surface. Glaciers reshape the landscape by picking up rocks and soil and eroding hills during their unstoppable push, their sheer weight depressing the Earth's crust. As temperatures drop in areas adjacent to these ice cliffs, cold-weather plant life is driven to southern latitudes.

Meanwhile, the dramatic drop in sea levels enables rivers to carve out deeper valleys and produce enormous inland lakes, with previously submerged land bridges appearing between continents. Upon retreating during warmer periods, the glaciers leave behind scattered ridges of sediment and fill basins with melted water to create new lakes.

Scientists have recorded five significant ice ages throughout the Earth's history: the Huronian (2.4-2.1 billion years ago), Cryogenian (850-635 million years ago), Andean-Saharan (460-430 mya), Karoo (360-260 mya) and Quaternary (2.6 mya-present). Approximately a dozen major glaciations have occurred over the past 1 million years, the largest of which peaked 650,000 years ago and lasted for 50,000 years. The most recent glaciation period, often known simply as the "Ice Age," reached peak conditions some 18,000 years ago before giving way to the

interglacial Holocene epoch 11,700 years ago.

At the height of the recent glaciation, the ice grew to more than 12,000 feet thick as sheets spread across Canada, Scandinavia, Russia and South America. Corresponding sea levels plunged more than 400 feet, while global temperatures dipped around 10 degrees Fahrenheit on average and up to 40 degrees in some areas. In North America, the region of the Gulf Coast states was dotted with the pine forests and prairie grasses that are today associated with the northern states and Canada.

Ice Age Theory Origins

The origins of ice age theory began hundreds of years ago, when Europeans noted that glaciers in the Alps had shrunk, but its popularization is credited to 19th century Swiss geologist Louis Agassiz. Contradicting the belief that a wide-ranging flood killed off such megafauna as the wooly mammoth, Agassiz pointed to rock striations and sediment piles as evidence of glacier activity from a destructive global winter. Geologists soon found evidence of plant life between glacial sediment, and by the close of the century the theory of multiple global winters had been established.

A second important figure in the development of these studies was Serbian mathematician Milutin Milankovitch. Seeking to chart the Earth's temperature from the past 600,000 years, Milankovitch carefully calculated how orbital variations such as eccentricity, precession and axial tilt affected solar radiation levels, publishing his work in the 1941 book Canon of Insolation and the Ice Age Problem. Milankovitch's findings were corroborated when technological improvements in the 1960s allowed for the analyzation of deep sea ice cores and plankton shells, which helped pinpoint periods of glaciation.

Along with solar radiation levels, it is believed that global warming and cooling is connected to plate tectonic activity. The shifting of the Earth's plates creates large-scale changes to continental masses, which impacts ocean and atmospheric currents, and triggers volcanic activity that releases carbon dioxide into the air.

How Humans Adapted to Ice Age's Harsh

Climate

One significant outcome of the recent ice age was the development of Homo sapiens. Humans adapted to the harsh climate by developing such tools as the bone needle to sew warm clothing, and used the land bridges to spread to new regions. By the start of the warmer Holocene epoch, humans were in position to take advantage of the favorable conditions by developing agricultural and domestication techniques. Meanwhile, the mastodons, saber-toothed cats, giant ground sloths and other megafauna that reigned during the glacial period went extinct by its end.

The reasons for the disappearance of these giants, from human hunting to disease, are among the ice age mysteries that have yet to be fully explained. Scientists continue to study the evidence of these important periods, both to gain more insight into the Earth's history and to help determine future climatic events.

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