age, the glaciers advanced over the land. Most of Canada and northern Europe lay under a crushing weight of ice, and in the Southern Hemisphere even parts of Australia were in its grip.

Glaciers, moving relentlessly down valleys, plane off the rocks in their path, carving the valleys into U-shapes. When the glaciers began their retreat, about 18,000 years ago, the melting waters were sometimes trapped in valleys. North America's Great Lakes and Britain's Lake District were formed in this way.

The ice ages brought extinction to many species of animals but allowed others to expand their range, for it gave them a route over the frozen sea between continents. The ancestors of the modern horse, for instance, crossed from North America to the plains of Eurasia, more than 1.5 million years ago, using the land bridge over what is now the Bering Strait.

The same bridge was used, in the opposite direction, by the ancestors of the American Indians, who crossed from Siberia to Alaska to begin the colonization of America.

WILL THE ICE AGE RETURN?

The world is cooling—helped by man

Some scientists are convinced that the world's climate is getting colder every year, threatening a return to the conditions of the last ice age, which reached its peak about 18,000 years ago.

Geological and historical records leave no doubt that the earth's climate is constantly changing. From about 400 B.C. to A.D. 1300, the climate in Europe was much milder than it is today.

During the little ice age, from about 1300 to about 1890, glaciers advanced, and bodies of water in the northern latitudes, such as the Baltic Sea, remained frozen for long periods of time.

From 1890 to 1940 worldwide temperatures rose about 0.18°F every 10 years. Some animals extended their ranges northward, the sea was less frozen than before, and icebergs from Greenland did not penetrate as far south.

Since 1940 temperature has been dropping. According to a survey by the National Oceanic and Atmospheric Administration, the average ground readings for the Northern Hemisphere have, in the years from 1945 to 1968, fallen by one-half degree F. In the United States, east of the Continental Divide, temperatures in the last decade averaged one to four degrees cooler than in the past 30 years. Another study by the same agency noted that the amount of sunshine reaching the ground in the United States decreased by 1.3 percent between 1964 and 1972.

Dr. James D. McQuigg, director of NOAA's Center for Climatic and Environmental Assessment, points out that in crop-growing regions at higher latitudes an apparently small change in the average annual temperature may have sufficient impact on the length of the growing season to cause certain crops to be abandoned. He also notes that the range of year-to-year weather-induced variability in world production of wheat and other grain crops—the difference between production in a highly favorable weather year and that in a definitely poor year—is now equal to about 10 percent of annual world consumption. "In a real sense," he says, "the fact that we have a margin of reserves at all is the result of good luck with weather through a few most recent years."

Most experts would agree that the basic cause of cooling is a change in the amount of the sun's heat reaching the earth. How this change comes about and keeps the world in a recurring cycle of ice ages, followed by warm interglacial periods, has been the subject of a long debate among scientists. Many ideas have been proposed, but the one that seems to provide many answers and has much support was developed in the 1920's and 1930's by a Serbian physicist, Milutin Milankovitch.

In addition to spinning on its own axis and orbiting the sun, the earth also performs three other delicate motions. It wobbles on that axis, like a child's top about to come to rest; the axis itself changes the pitch of its tilt in relation to its plane of orbit; and, finally, the ellipse that the earth describes around the sun periodically becomes more circular. These movements are hardly violent—it takes 21,000 years for the earth to complete a simple wobble, for instance—but they are enough, according to Milankovitch's theory, to account for the great climatic changes that have occasioned the ice ages.