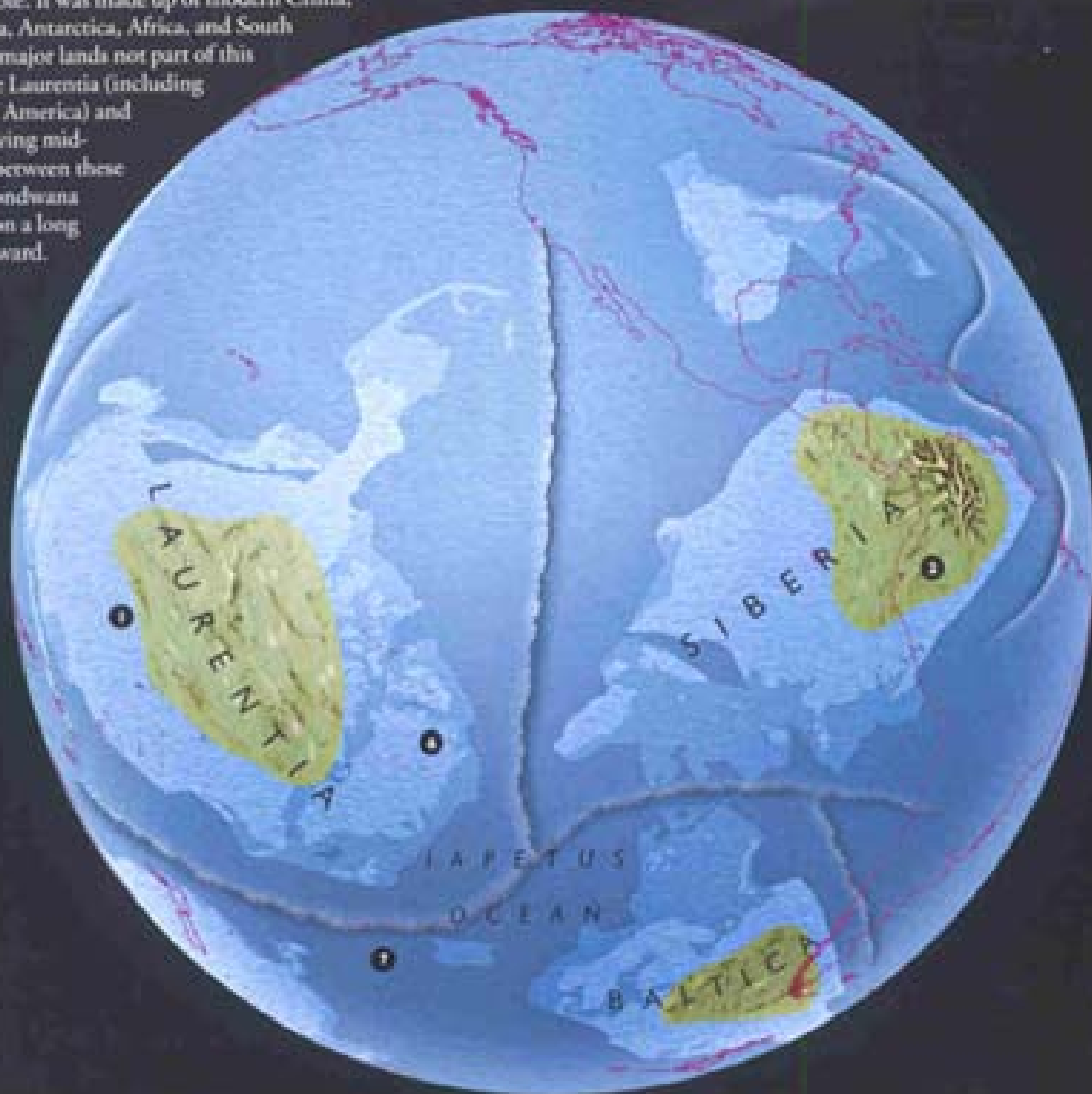




EARLY CAMBRIAN TIMES

SOON AFTER THE START OF THE CAMBRIAN AGE, 540 MILLION YEARS AGO, the world had already experienced major changes. All the continents of the previous Vendian world had come together briefly to form a supercontinent called Pannotia, which had then broken up. By the early Cambrian times shown in these maps, a remnant of Pannotia, called Gondwana, still stretched almost from pole to pole. It was made up of modern China, India, Australia, Antarctica, Africa, and South America. Two major lands not part of this continent were Laurentia (including most of North America) and Siberia. A growing mid-oceanic ridge between these islands and Gondwana pushed them on a long journey northward.



1. IAPETUS OCEAN

In early Cambrian times, a body of water known as the Iapetus Ocean separated Laurentia from Gondwana, Avalonia, and Baltica (which included Scandinavia and eastern Europe). Florida and parts of Central America were on the shores of Gondwana, split off from the rest of North America. East and west Newfoundland also lay on opposite sides of the ocean.

2. LIMESTONE OF LAURENTIA

Laurentia, including much of North America, part of Newfoundland, Scotland, and Greenland, was surrounded by calm seas, which provided the right environment for limestone to form. This limestone contains fossils of tiny, shelled creatures. Conditions in Siberia also fostered the formation of limestone during this period, but the fossils found there are different from those found in Laurentia, indicating that the two landmasses were widely separated.

3. TROPICAL GREENLAND

Peary Land, now in the far north of Greenland within the Arctic Circle, lay in much warmer waters during early Cambrian times. Evidence for this comes from limestone and muddy sediments in the region, which contain fossils of arthropods, sponges, brachiopods, and worms, all inhabitants of calm, warm seas.

1. SIBERIAN MOVEMENTS

Widespread rocks from Siberia record the Earth's magnetic field. The record in the rocks of Siberia shows that, during Cambrian times, it moved northward from its previous position near the South Pole. The data also show that the Siberian continental plate was upside down compared to its present position.

2. NORTH AND SOUTH CHINA

China at this time consisted of two separate and submergent continental masses that lay in warm tropical waters off the coast of the large continent of Gondwana. Both parts of China were slowly moving southward during Cambrian times.

WHOLE WORLD PROJECTION



3. CAMBRIAN AVALONIA

Wales was part of Avalonia, a continental fragment off the coast of Gondwana that also carried England, parts of Newfoundland and New England, and Nova Scotia. Cambrian corals were first mapped in Wales, but, as in Newfoundland, are now used to define the beginning of the period. The starting point is marked by distinctive trace fossils.

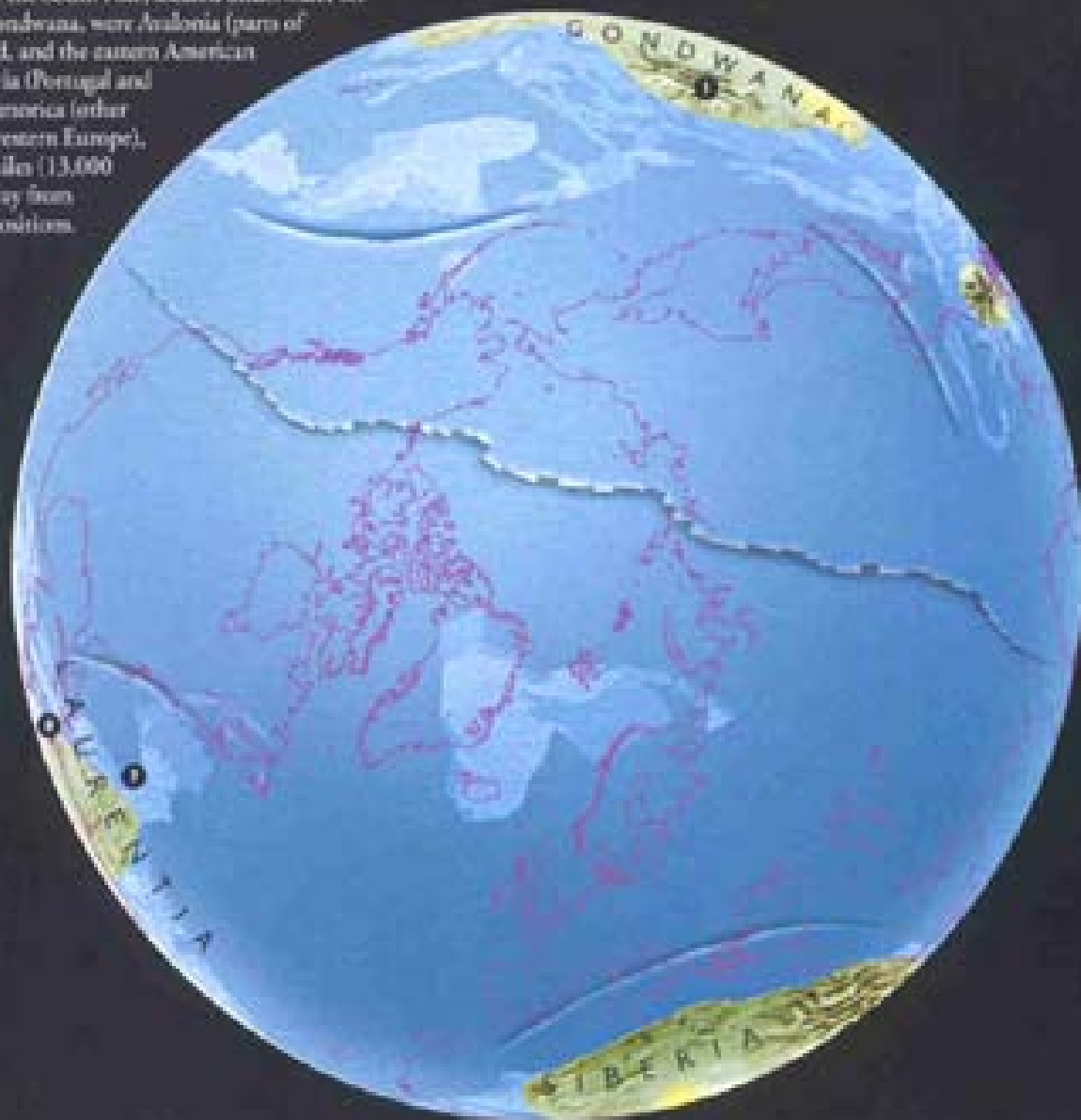
4. NORTH AFRICAN ENICHA

Analyzing the magnetic field of rocks from Morocco suggests that North Africa lay near the South Pole in early Cambrian times, as shown on this map. Fossil evidence in coral reefs and sandstones, however, suggests that the region was hot during this period and may have lain closer to the equator. This conflict has not been satisfactorily resolved.



LATE CAMBRIAN TIMES

THE EARTH'S POLES, AS SEEN 500 MILLION YEARS AGO, PRESENT A surprising view. Today the northern hemisphere (this page, viewed looking down on the pole) is crowded with land, but half a billion years ago it was almost empty, except for a submerged fragment of modern Russia close to the North Pole. The southern hemisphere contained further surprises. Near the South Pole, located underwater off the coast of Gondwana, were Avalonia (parts of Britain, Ireland, and the eastern American seaboard), Iberia (Portugal and Spain), and America (other fragments of western Europe), about 8,000 miles (13,000 kilometers) away from their present positions.



1 AUSTRALIAN BUILDUP

The area that is now eastern Australia was on the northern coast of the great landmass known as Gondwana. It contained a series of mountain belts formed as the ancient core of the continent collided with the sliver of continental shelf called "microcontinents" beginning about 100 million years ago.

2 BRITISH COLUMBIA

During these times, Laurentia circled the equator (the perimeter of the globe on these pages). Rising sea levels flooded more and more of the continent during the Cambrian, so that by the end of the period half of the land was under the sea. In the eastern part of modern British Columbia, underwater mudflats trapped the famous fossils of the Burgess Shale.

3 ALASKAN ACCRETION

Laurentia is the ancient continent that now forms the core of North America. In late Cambrian times, what is now the west coast of North America looked different than it does today. Alaska was just a small peninsula. Slivers of land called terranes collided with the coast of Laurentia south of Alaska. Plate movement then pushed these north until they reached Alaska, which gradually increased in size.

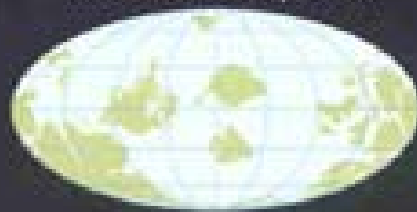
1. ROCK OF AGES

Traces from scattered regions of ancient Avalonia and Armorica show how sea levels changed during Cambrian times: the coarser the grains in a sedimentary rock formed underwater, the closer to shore it formed. The earliest Cambrian rocks in the region is coarse sandstone. Later rock is mostly mudstone, made of much smaller particles. This shows that sea levels rose during Cambrian times.

2. NAMING TIME

The Cambrian period is named for the Roman word for Wales, "Cambria," because early mapping of rocks from this period took place in north Wales early in the 17th century. These strata consist of slate, sandstone, and some volcanic rocks and contain fossils of worms and early shellfish.

WHOLE WORLD PROJECTION



3. MUD DEPOSITS

Flats of sediment, mud, and sand up to 1 mile (1.6 kilometers) thick were deposited in deep marine basins in north Wales and southeast Ireland. The marine mud of north Wales was later compressed into slate, which is extensively used today as roofing material.



4. BUILDING UP

At the end of the Cambrian period, 495 million years ago, a mountain chain started to appear in Baltica in the northernmost parts of what is now Scandinavia. The mountains formed as Baltica collided with a series of volcanic islands, the start of a process that later led to the building of the Caledonian Mountains in Scotland and the Appalachian chain in America.

5. OCEAN CROSSING

By late Cambrian times, the Iapetus Ocean was a huge body of water separating Gondwana, Baltica, and Laurentia. Over the next few million years, plate movements detached Avalonia, Armorica, and Baltica from the coast of Gondwana and carried them toward Laurentia, closing Iapetus while at the same time opening up a new sea, the Rheic Ocean.