earth sciences

PALEOMAGNETISM

Reversals and radiolarian extinctions

More evidence of changes in animal life at the time of magnetic reversals in the earth's past has been reported. It suggests an environmental change accompanying the magnetic shift.

Long sea-floor cores with nearly continuous records of sedimentation in a variety of latitudes make it possible to analyze the ages of layers composed of the residues of radiolarian marine organisms. These can be related to changes in the earth's magnetism.

The record studied by Dr. James D. Hays of the Lamont-Doherty Geological Observatory goes back to the Upper Miocene, about 10 million years ago. During this interval the climate has fluctuated numerous times.

His analysis shows that during the last three million years at least nine radiolarian species became extinct, seven of them disappearing within a few tens of centimeters of magnetic reversals.

GEOLOGY

New York City's marine sediments

Solid wastes from New York City have now become probably the largest single source of sediment entering directly into the Atlantic Ocean from North America.

An annual average of about 10 million tons of solid wastes, excluding rubbish and floatable debris, were dumped into the ocean near New York City from 1959 through 1968, Dr. M. Grant Gross of the State University of New York at Stony Brook reported at the Geological Society of America meeting.

The most important parts are the solid wastes derived from dredging, construction and demolition activities in the metropolitan region, he says. These wastes are being dumped in areas where little modern sediment from natural sources is accumulating. The metropolitan waste is therefore the dominant sediment on part of the continental shelf and is having a marked effect on the abundance and distribution of organisms on the bottom.

GEOLOGY

Volcanic deposit in Antarctica

Seven years ago a geological study of south Victoria Land in eastern Antarctica found a 100-kilometer-long area of rock and solidified gravel that scientists felt had been produced by glacial deposition in the Jurassic Period, about 150 million years ago. This conflicted with some reconstructions of what the continents in the Southern Hemisphere looked like before continental drift. These reconstructions place Antarctica too close to the equator during the Jurrassic to be the site of such extensive glaciation. Also, glacial deposits of this age have never been reported from the other Southern Hemisphere continents.

Two geologists from the University of Maine, Drs. H. W. Borns Jr., and B. A. Hall, have completed a new study of the area. Their work discloses no evidence for a glacial origin of the rock. In fact, they say the main mass of the rock is apparently of volcanic origin.

All the evidence, they report in the Nov. 14 SCIENCE, points to the view that the Jurassic in that part of the East Antarctic was a time of intense volcanism, not glaciation. The earlier conflict with drift theory is thus eliminated.

GEOCHEMISTRY

Evolution of earth's oxygen

Oxygen may have been much more abundant on the primitive earth than was previously believed.

There are only two important means for producing the oxygen in the earth's atmosphere. One is the action of the sun's ultraviolet light to break apart molecules of water vapor. The other is photosynthesis, which requires extensive and highly developed plant life.

The most commonly accepted idea is that the dissociation of water vapor by sunlight is not efficient enough to have produced a large portion of the present earth's oxygen. In this view, until photosynthesis got underway fairly recently in earth's geological history, oxygen was no more than one-thousandth as plentiful in the atmosphere as it is now.

Dr. R. T. Brinkmann of the California Institute of Technology has now completed new calculations. They show, he says, that the oxygen level could have reached an appreciable fraction of the present amount in the absence of biological activity. As much as a quarter of the atmosphere's oxygen may have been formed before the evolution of widespread plant life.

Studies on which the earlier conclusions were based erred in several ways, he says in the Oct. 20 JOURNAL of GEOPHYSICAL RESEARCH. They overrated the degree to which the breakup of water vapor by sunlight is reduced when oxygen accumulates to a certain level, he says. And they did not take into consideration the decreasing effectiveness of oxygen molecules to block out sunlight from reaching the water vapor at lower levels of the atmosphere.

SEDIMENTOLOGY

Filling the Peru-Chile trench

The Peru-Chile trench that runs along the west coast of South America is a natural trap for sediments eroded by rain from the nearby high Andes. Geologists have often wondered whether all the eroded sediments are in the trenches, or whether, as plate theory might suggest, some are missing.

A group of geologists has now completed an analysis of the volume of sediments in the trench compared with the volume estimated to have been eroded from the mountains in the last two or three million years. The quantities, they say, are in good agreement. No significant volume of land sediments seems to be missing.

This apparently means, they say, that the sloping movement of the oceanic crustal plate beneath the South American continent (SN: 10/8, p. 430) has not carried any significant portion of the sediments down with it.

The report was made by Drs. David W. Scholl, Roland von Huene and Michael S. Marlow of the U.S. Geological Survey and Dr. Mark N. Christensen of the University of California at Berkeley, at the annual meeting of the Geological Society of America.