earth sciences

PALEONTOLOGY

Record duckbill dinosaur

Among the most prominent dinosaurs of the Upper Cretaceous, about 75 million years ago, were the duckbills, so named because of their broad elongated jaws. Specimens of this reptile have been found in many parts of the world. Their average length is about 30 feet, though remains of duckbills up to 50 feet long have recently been found in Asia.

In Baja California, however, a team of paleontologists headed by Dr. William J. Morris of Occidental College in Los Angeles has recently unearthed the granddaddy of them all. The animal whose fossilized bones they've found, says Dr. Morris, measured a full 100 feet in length.

Furthermore, he says, it appears to be of a previously unknown species. The remains are about 73 million years old.

The paleontologists made their discovery at the base of a hill near the town of El Rosario, about 250 miles south of Los Angeles. Since the find came near the end of the summer digging season, only four bones could be extracted, but Dr. Morris hopes to continue digging next year.

GEOLOGY

Niagara Falls erosion

While the American side of Niagara Falls has been gradually eroding, the Canadian Horseshoe Falls have remained relatively stable. But this stability may not last, says Dr. Shailer Philbrick of Cornell University.

The Horseshoe Falls have been regressing up the Niagara River for about 4,200 years. Since the Horseshoe's characteristics and environment have been nearly constant, he says, the rate of retreat should also have been constant.

But the rate of retreat, reports Dr. Philbrick in the December GEOLOGICAL SOCIETY OF AMERICA BULLETIN, has in fact varied greatly, depending on the stability of the horizontal configuration of the falls' crest.

He outlines three stages in the development of crest configuration. There is an unstable vertical cross wall which deteriorates into a relatively stable horizontal arch. The arch eventually breaks up when a slab of rock breaks off the edge, creating a notched crest which is rapidly reduced to another arch.

Historical surveys of the falls and the downstream profile of the river bottom, he says, indicate that the Horseshoe Falls have followed this pattern and are now at the arch stage. To preserve the present stability, he concludes, development of a notch in the crest must be prevented.

METEOROLOGY

Crown flash

Last summer, as a thunderstorm cell passed north of Ann Arbor, Mich., at sunset, thin layers of cirriform cloud formed above the cumulus column and began to stream ahead of it. As the column boiled upward, it impinged on these cloud layers, shaping them into a sort of dome. Lightning began to flash within the storm cloud, and with each flash came a strange radiance that lasted after the stroke had dimmed. This radiance spread fan-like from a region just west of the cumulus peak, sometimes extending into blue sky.

Two University of Michigan researchers, Dr. John C. Gall Jr. and Maurice E. Graves, observed this event and describe it in the Jan. 15 NATURE. They believe it may be a newly recognized phenomenon.

They speculate that it may have represented some sort of ionization discharge, perhaps occurring at the top of a column of ionized air associated with the thunderhead.

PALEOMAGNETISM

Pliocene-Pleistocene boundary

The first significant cooling phase of the latter part of the present era is thought to have occurred at the boundary between the Pliocene and Pleistocene geological epochs, about a million years ago.

Drs. J. P. Kennett and N. D. Watkins of the University of Rhode Island and Dr. Paul Vella of the University of Wellington in New Zealand have used geomagnetic polarity reversals to date marine sediments now exposed on New Zealand. They then were able to correlate Pliocene-Pleistocene strata with climatic changes.

They found that there was a pronounced cold phase considerably before the stratigraphic boundary. If the beginning of the Pleistocene were placed at the first marked cooling, they conclude in the Jan. 22 SCIENCE, the Pliocene period would be eliminated.

They believe there may also be a relationship between paleoclimatic and geomagnetic polarity changes, since cooling trends seem to begin at or shortly after polarity changes.

PLATE TECTONICS

Evolution of western North America

The theories of sea-floor spreading and plate tectonics have been highly successful in explaining geophysical marine phenomena. The implications of these theories for continental features are less obvious.

Magnetic anomaly patterns in the northeastern Pacific Ocean indicate, according to Dr. Tanya Atwater of the Scripps Institution of Oceanography, that during the mid-Tertiary period (about 30 million years ago) there was a trench offshore from western North America, which eventually consumed a crustal plate that lay between the present Pacific and North American plates. Since the San Andreas Fault marks part of the present boundary, she points out, the fault would have been active for only the past 30 million years. This contradicts other data that suggest a longer period of activity for the fault.

In the December GEOLOGICAL SOCIETY OF AMERICA BULLETIN, Dr. Atwater proposes two probable models for plate motions for the period subsequent to 30 million years ago. One assumes a constant motion and the other suggests that the two plates were fixed with respect to one another until 5 million years ago, when they broke along the San Andreas. The models, she points out, make testable predictions.