

# earth sciences

## Glomar Challenger dates Antarctic breakup

Tens of millions of years ago, vast chunks of the Antarctic continent broke off and moved away to form the largest free land masses in the southern Pacific Ocean. A timetable for these titanic schisms has been suggested by research from just-completed Leg 29 of the voyage of the research ship Glomar Challenger. It was the second of five planned excursions by the deep-sea drilling ship into Antarctic waters (SN: 3/31/73, p. 204).

Some time between 60 million and 80 million years ago, judging by studies of sediment drawn from just above the ocean-floor basalt, a huge section that would later become New Zealand broke away from its parent landmass, now known as Gondwanaland. About 50 million years ago, the area from which New Zealand had separated broke off itself to become Australia. Then, some 23 million years later, a piece of the now-isolated Australia came loose to become Tasmania.

The signs in the ancient sediments were interpreted by James P. Kennett of the University of Rhode Island and Robert E. Houtz of Columbia University's Lamont Doherty Geological Observatory, chief scientists for Leg 29.

These great land movements also gave birth to the circumpolar current, the strong, continuous flow that girdles Antarctica. The Challenger investigators found that the powerful current has made itself felt at the very depths of the ocean, digging away vast areas on the sea floor south of Australia and New Zealand. In one place they even discovered the imprint of the current on the ocean bottom, in the form of vast ripple marks like those on riverbeds.

## An undersea mountain two miles high

Nine more undersea mountains or seamounts have been discovered in the eastern Pacific Ocean, including one more than two miles high.

The seamounts range from 4,626 feet to 10,689 feet high, and were found between 900 and 2,500 miles west of northern Chile by the National Oceanic and Atmospheric Administration's research ship Oceanographer. All nine peaks are completely submerged, rising up from ocean depths of from 1.5 to 2.5 miles, although one of the seamounts extends upward to within only 1,368 feet of the surface.

## Nitrates and groundwater

Concentrations of nitrates from repeated applications of animal wastes and fertilizers can cause irreparable damage to groundwater supplies, warn two researchers from the University of Minnesota Agricultural Experiment Station in St. Paul.

This should be of particular concern to farm and feedlot operators, according to Robert Gast and Philip Goodrich, who maintain that "after such a buildup is allowed to occur, there may be a slow but irreversible movement of nitrates through the soil into the groundwater for years in the future."

The problem is not universal, however, they point out. The technique of "chopping" (trimming back crops to increase growth rates) in the last 100 years in the United States has "continuously removed more plant nutrients, especially nitrogen, than have been returned to the soil by fertilizers, plant residues, legume crops, rainwater and animal wastes." In such cases, in fact, the researchers say, increased use of nitrate-rich fertilizers is often the only way of keeping up crop production levels.

# natural sciences

## Primitive life triggered its own evolution

The sudden spurt of evolution and population growth of multi-celled organisms, after 2.5 billion years of domination by primitive plants and bacteria in the Precambrian period, has been one of the mysteries of early life on earth. A paleobiologist from Johns Hopkins University now proposes that the surge began when the new life forms themselves replaced the availability of natural resources as the limiting factor in their development.

A pasture well sown with grass will prevent the appearance of weeds, points out Steven M. Stanley. But when a grazing sheep pulls up some of the grass by its roots, some weeds can then grow and a diversification of the species in the pasture begins. In the same way, he says, primitive algae and bacteria saturated their environment and flourished for billions of years with very slow development of new species that would feed on the existing ones. "But once they started appearing," says Stanley, "once this barrier was crossed, herbivorous and carnivorous organisms arose almost simultaneously, and the whole self-limiting character of the system changed." The new animals reduced the algae population, which was then able to diversify, which in turn hastened the diversification of the animals. "The whole system," Stanley says, "suddenly took off."

## Earliest fossil of iguana family

Two paleontologists working in Brazil have found the earliest fossil record of the family of primitive lizards known as iguanas. The partial skeleton was found near Pierópolis, Brazil, in rocks of Upper Cretaceous age (older than 65 million years).

"The specimen . . . is of particular interest because it is the first Mesozoic record of the Iguanidae and the earliest record of the family," report Richard Estes of Boston University and Llewellyn I. Price of Brazil's National Department of Mineral Production in the May 18 SCIENCE. The specimen is a new genus and species, which the discoverers have named *Pristiguana brasiliensis*.

This discovery and other related evidence previously reported by Estes lead the researchers to conclude that iguanids are probably of southern continental (Gondwanan) origin, contrary to the often suggested northern origin of the group. They believe the iguanids must have reached Madagascar by dispersal through Africa, which did not separate from South America until the mid-Cretaceous.

## Rare bird gets a grant

One of the few known nesting sites of the California black rail, a bird now on the California rare and endangered species list, is included in an area to be protected as public land, under a matching grant just awarded by the Department of the Interior. The grant, to be matched by the California Wildlife Conservation Board, is to acquire a 516.7-acre tidal marshland about 30 miles north of San Francisco at the southern end of Tomales Bay.

The current population of the black rail in California is not precisely known but is being studied, along with the bird's ecology and distribution, by the California Wildlife Conservation Board. Apparently, reports the U.S. Fish and Wildlife Service, the rail's sparse numbers are "due to a reduction in tidal marsh habitat by filling, draining and/or pollution, channelization and phreatophyte control along the Colorado River." The birds are both elusive and secretive, which makes them difficult to observe.