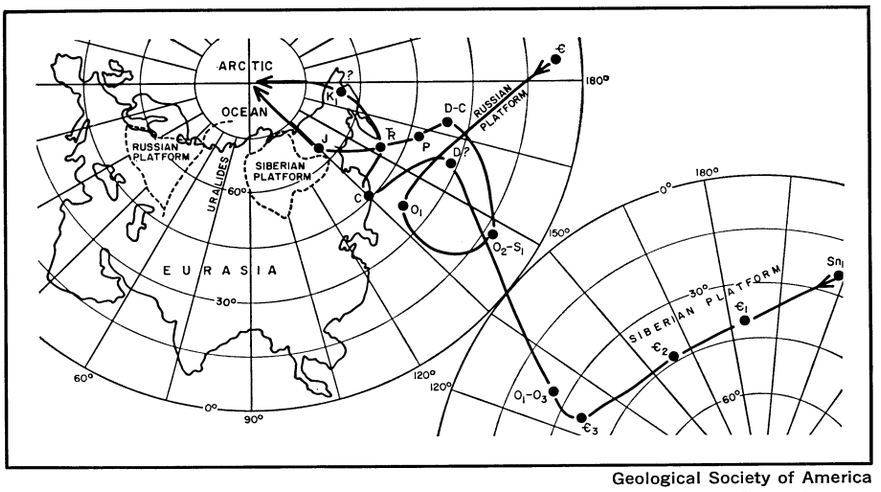

Geological Society of America

Changes in apparent magnetic pole positions help trace paths of subcontinents.

URALS

Piecing together the past

The course of continental drift, from the breakup of Pangaea (see p. 293) 200 million years ago to the present, has been the subject of much study and ferment in the earth sciences in the past few years. But many geologists now believe that continental drift predated the rifting and dispersion of Pangaea; the giant mother continent was itself an aggregate of an older set of subcontinents that had drifted together only to break up again into new patterns.

"Continental drift goes as far back in geological time as we can see," says Dr. Warren Hamilton of the U.S. Geological Survey in Denver. He feels that this has received too little attention, for only by looking back before the splitting of Pangaea can scientists find explanations for many present terrestrial features.

One such feature is the Uralides, a geological terrain lying beneath the Soviet Union's West Siberian Lowlands and exposed in its western edge in the Ural Mountains. Russian geophysicists still resist the concepts of continental drift and plate tectonics (SN: 7/11, p. 29), but their paleomagnetic and geological data enable Dr. Hamilton to conclude that the Uralides are a collision zone where two subcontinents, Russia and Siberia, came together as an intervening oceanic plate slid beneath them. His work thus adds the west-central Soviet Union to the list of areas (SN: 8/15, p. 143) where geologists have explained the formation of major continental features in terms of interactions of slowly shifting slabs, or plates, of the earth's crust and upper mantle.

The paleomagnetic orientations of dated rocks from the two platforms suggest, writes Dr. Hamilton in the September GEOLOGICAL SOCIETY OF AMERICA BULLETIN, that the Russian and Siberian continents were widely separated 550 million years ago in the Cambrian period. They came much closer in the Devonian and Carboniferous and collided in the Permian or early Triassic periods, about 225 million years ago—before the breakup of Pangaea. In fact, similar data on other areas of Eurasia suggest that the continent is an accretion of the Russian, Siberian and at least five other crustal plates.

Dr. Hamilton believes that during a 100-million-year span ending 400 million years ago, the Russian subcontinent had a stable continental margin, separated by an ocean basin from an arc of islands. However a subduction zone—a trench through which crustal plates slide downward into the mantle—beneath the islands eventually consumed the ocean floor between them, and island arc and continent collided to form the Ural Mountains. Another subduction zone opened up at the new continental margin, and some oceanic material from the plate that slid down it scraped off on the edge of the continent. As the continental margin grew outward, the subduction zone moved with it.

A similar process was taking place at the Siberian plate, and the two platforms finally grew together. The intervening accumulated oceanic material is now mostly hidden by the sediments of the West Siberian Lowlands. The relative motions of the plates continued after they collided, causing severe deformation of the terrain.

This model of formation would apply to all geological structures similar to the Uralides, says Dr. Hamilton. It has been accepted for some time that the Himalayas were created by such a process. □

HEALTH PROGRAM

Isolating the astronauts

The long, muted struggle between space physicians and astronauts has surfaced again, with the medics winning another round—this time for an Apollo prelaunch isolation and health program.

Spurred both by the need in April to ground Apollo 13 Astronaut Thomas Ken Mattingly only a week before liftoff because of his exposure and nonimmunity to measles (SN: 4/18, p. 387) and by the National Academy of Sciences' recommendations for preflight quarantine (SN: 6/13, p. 580), the National Aeronautics and Space Administration will put the crews of Apollo 14 through a period of semi-isolation before the launch, in addition to the continued quarantine after the flight (SN: 3/7, p. 243).

Coupled with the semi-isolation is a program of rigorous medical observations, tests and controls and immunizations against communicable diseases. Prime and backup crews will be immunized against diptheria, tetanus, typhoid, influenza, adenovirus, polio, small pox and yellow fever. (They will be immunized against rubella, rubeolla and mumps only if biochemical tests show no immunity.)

"This program is not designed as a health model for society in general," says one space physician. "But rather it is tailored for this particular situation."

Although the health program, as it is called, is not what the Academy recommended, it could be a forerunner to their proposal: to use the space capsule environment (preceded by a month's quarantine) to study disease-causing microorganisms, such as occur in crowded city dwellings. If the crew were kept in strict quarantine before launch, a state of microbiological equilibrium among the astronauts could be achieved.

The current program is more preventive in nature. Most of the Apollo crews have had some kind of minor ailment during flight, such as sinus or viral problems. "We haven't even been able to keep the astronauts free of the measles," moaned former NASA Administrator Dr. Thomas O. Paine when reviewing the space biomedicine program.

The health program will control whom the astronauts see, where they go and what they do beginning three weeks prior to launch. The men will be limited to crew quarters and air-filtered training areas at the Kennedy Space Center and to their homes or the crew quarters in the Lunar Receiving Laboratory at NASA's Manned Spacecraft Center in Houston.