

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 lift-off because of his exposure and non-immunity 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 diphtheria, tetanus, typhoid, influenza, adenovirus, polio, small pox and yellow fever. (They will be immunized against rubella, rubella 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.

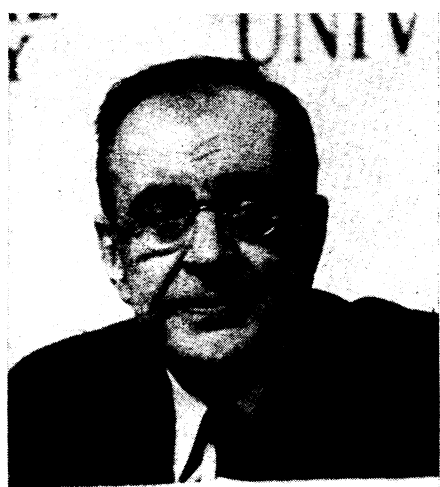
The health program will control whom the astronauts see, where they go and what they do beginning three weeks prior to launch. The men will be limited to crew quarters and air-filtered training areas at the Kennedy Space Center and to their homes or the crew quarters in the Lunar Receiving Laboratory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

Primary contacts—wives, backup crew members and personnel deemed essential for the mission—will also go through similar medical controls, including physical examinations and vaccinations, beginning two months before launch. In addition to family health, community health will be under medical surveillance, with the monitoring of all primary areas, food and water.

"The most important factors in making this plan to reduce the possibility of crew illness effective," says Dr. Charles A. Berry, director of medical research at MSC, "are awareness of, acceptance of, and emphasis on preventive medicine by all management levels and flight crews." □

## ANOMALOUS WATER

### Deryagin and the Russians



Lehigh Univ.

*Deryagin: Enough for 15 articles.*

Anomalous water, or polywater as some people call it, is an apparent form of water with strange properties that lead some scientists to believe it is a polymer, or macromolecule, built of ordinary water molecules. Other scientists believe that its unusual properties of density, viscosity and freezing behavior result merely from impurities dissolved in ordinary water (SN: 1/4, p. 17).

Anomalous water was brought to worldwide attention by Dr. Boris Vladimirovich Deryagin, chief of the laboratory for surface forces of the Institute of Physical Chemistry of the Soviet Academy of Sciences. Yet debate on the existence or nonexistence of the substance has raged most publicly in the West.

Now a transcript of a session of the Soviet Academy of Sciences indicates that Russian opinions are as varied as those in the West.

Anomalous water is made by condensing ordinary water vapor in minute capillary tubes. The amounts that come out are no more than a few

micrograms. Russian chemists, like their Western colleagues, are concerned about the validity of conclusions drawn from analysis of such minute amounts.

"How much modified water has been obtained in all?" asked Dr. Aleksandr N. Frumkin, director of the Institute of Physical Chemistry, at the session. "About enough for 15 reports," Dr. Deryagin replied.

Dr. Frumkin brushed aside the levity and asked why, since at least 1,000 experiments had been done, the anomalous water was not collected. That would have made at least a milligram, enough for a convincing analysis. Dr. Deryagin replied that he had been concerned with immediately establishing the properties of the new substance and could not wait for accumulation.

This procedure draws a strong objection from Dr. Boris V. Nekrasov of the Kalinin Moscow Institute of Non-Ferrous Metals and Gold: "Discoveries must be explained on the basis of materialism rather than on the basis of mysticism. . . . All these experiments will appear mystical until at least a milligram of modified water has been obtained and a thorough chemical analysis made."

Some Russians feel that organic impurities may account for anomalous water, and V. L. Tal'rose says he found impurities in some of Dr. Deryagin's samples. Dr. Deryagin counters that measurements of surface tension refute the contention that anomalous water is mostly organic impurities. As anomalous water is dissolved in ordinary water, the surface tension of the solution rises gradually. If the anomalous water were organic impurities, he says, the change would be sudden.

Tal'rose also points out that mass spectrometry of Dr. Deryagin's samples showed none of the heavy ions that would be expected as fragments of a polymer; only ions of ordinary water were evident. Dr. Deryagin replies that the bombardment with electrons that is necessary for the spectrometry may have broken up the heavy ions.

Dr. Deryagin maintains his belief in polymers and contends that the surface forces that extend into the water from the walls of the tubes force the water molecules to form polymers. Dr. Nekrasov asks how this can be: "Even at a pressure of 200,000 atmospheres water has a density of only 1.13, while here it suddenly acquires a density of 1.40 under the influence of incomparably weaker surface forces."

The sum of the available evidence leaves opinion as widely split in Moscow as it is in the West.

States Dr. Pyotr A. Rebinder of the University of Moscow and the Institute of Physical Chemistry: "Deryagin

actually has discovered an entirely new form of water, which is now being studied in many countries. This is the discovery of the century."

But Dr. Aleksandr N. Nesmeyanov, director of the Institute of Org-Elemental Compounds of the U.S.S.R. Academy, says: ". . . everything does not jibe properly here. . . . This is reminiscent of [psychic research]—a table knock—and this has to be explained somehow."

Dr. Valentin A. Kargin, director of the Institute of Macromolecules of the U.S.S.R. Academy, asks why anomalous water does not occur in nature since there are many instances of ground water in contact with quartz surfaces. "It appears to me that all these facts are based more on faith than on science," he says, "but if the facts are confirmed we will have to change all our current ideas on the physicochemistry of fluids, and this is not probable."

One of the participants sums up the sense of the meeting: "The opposition is all very convincing, but no one has said what it is that Deryagin has observed." □

## SCIENCE NEWSBRIEFS

### Apollo 15 site

The space agency was expected to announce this week its choice between Hadley/Apennines and Marius Hills for the landing site of Apollo 15 next summer (SN: 9/19, p. 247). Chances are that the decision will go to Hadley/Apennines.

The landing site itself is in a mare between two easily accessible geological features of high scientific priority—a rille (Hadley) and a mountain range. The lunar rilles appear to be erosional features, but how and when the erosion could have occurred is a mystery. Equipped with the lunar rover (SN: 9/12, p. 215), the astronauts could also explore the mountain range, the Apennines, which rims the southwestern part of Mare Umbrium. □

### Marine council

The House has approved and sent to the White House a bill to extend the life of the National Council on Marine Resources and Engineering Development for another year. The council is a Cabinet-level organization set up to assist the President in guiding national marine science activities until a permanent agency could be set up. Though such an agency, the National Oceanic and Atmospheric Administration (NOAA) (SN: 7/25, p. 59), officially came into being this week, it was decided that the council would be needed during the transition period while the NOAA assumes its responsibilities. □