space science

Amino acids in third meteorite

Scientists at NASA's Ames Research Center announced last week the finding of six amino acids of apparent extraterrestrial origin in a third meteorite, the Orgueil. The six are among the identical sets of 18 different amino acids found in each of two other meteorites, the Murchison and the Murray (SN: 6/26/71, p. 435). This new evidence strengthens the theory that there is a basic pattern for the chemical evolution process, possibly leading to the origin of life. The six are alpha amino-isobutyric acid, N-methylglycine, beta aminosol, beta amino-N-butyric acid, beta alanine and gamma amino-butyric acid.

Drs. Cyril Ponnamperuma, Keith Kvenvolden, James Lawless, Clair Folsome and Gene Jarosewich (the latter of the Smithsonian Institution) also have found eight types of pyrimidine molecules—hydroxypyrimidines, three tetra-hydroxypyrimidines and two carboxy hydro-pyrimidines in all three of the meteorites. All eight are similar to the life pyrimidine molecule which is one of the principal building block molecules of the DNA genetic code chain.

The amino acids were structurally almost identical to protein-forming amino acids, but they have no functional role in living organisms. However, says Dr. Ponnamperuma, these molecules could be conceived to be constituents of non-earthly life forms. They were of both D and L types (right- and left-handed structures). Biological amino acids are all of the left-handed variety.

The meteorites—all three class II carbonaceous chrondrites—are believed to come from the asteroid belt and date from the time of the formation of the solar system.

Oxygen from water vapor

Scientists and astronauts on long-duration space flights of the future will require far more oxygen than is now provided in the Apollo spacecraft. How to do this within the constraints of weight and space has long been a problem.

Dr. Theodore Wydeven of the National Aeronautics and Space Administration's Ames Research Center believes he has the solution: an electrolysis system which converts moisture in the air directly into hydrogen and oxygen and releases the reclaimed oxygen back into the air. The moisture comes from human breath and perspiration.

Dr. Wydeven's prototype system has successfully completed more than 2,000 hours of testing—equivalent to an 80-day space mission. The average person breathes about two pounds of oxygen daily, puts back into the air about three pounds by expiration and perspiration. The extra pound comes from water taken into the digestive system.

Martian hurricane winds

The planet Mars exhibits puzzling seasonal changes such as the wave of darkening, apparent dust storms and color variations. Scientists at Cornell University believe they may now have a partial solution: a new category of super-hurricane-force winds on Mars.

Data from Mariners 6 and 7 and from ground-based radar studies show that the elevation and depressions on Mars are continent-size: the total elevation differences are greater than 10 kilometers. While ground temperatures tend to be the same regardless of the elevation of the terrain, the temperatures get colder with height in the atmosphere. This leads to horizontal temperature differences in the atmosphere which cause winds.

Previous theoretical estimates for the motion of wind on Mars, calculated for flat land, had indicated that the winds were not strong enough to create the huge dust storms. The new evidence, however, has led Carl Sagan, director of Cornell's Laboratory for Planetary Studies, and Peter Gierasch of Florida State University to a new conclusion: "The winds which blow along the slopes of the elevations sometimes add to the usual winds [due to the general atmospheric circulation] and produce a total wind velocity of 200 to 300 miles per hour," says Sagan. "These super hurricanes are, even in the extremely thin Martian atmosphere, very good at lifting dust off the surface."

Martian glaciers and dunes

Three Cornell University scientists—Donald J. Belcher, Carl Sagan and Joseph F. Veverka—have found indications of glacial action and the presence of huge sand dunes from studies of spacecraft photographs of Mars.

The chaotic terrain found in the Chyrse section of Mars near the planet's equator is similar to thermokarsts—rugged areas produced in the polar regions of earth by the thawing of perennially frozen ground. Since the terrain irregularity does not appear to have been caused by huge impacts, the scientists believe that geothermal heating inducing permafrost collapse could be the cause of the rugged terrain.

In addition Belcher identified a set of long curving parallel ridges as part of a glacial moraine, a pattern like those in the Great Lakes area left by the motion of glaciers. These were located at the south pole of Mars, covered by extensive frost—a place, notes Sagan, where one might expect glaciation to occur. The glaciers would be made of frozen carbon dioxide rather than frozen water.

The sand dunes are in a Martian bright area, thought to be desert-like. The dunes are calculated to be as large as 180 miles long and 60 miles wide. Their orientation coincides with the direction of the observed cloud motion on Mars.

The findings will be published in ICARUS.

Airport noise reduction

One way to reduce airport noise, says NASA, is to institute a two-segment landing approach instead of the current one-segment approach on the instrument landing system (ILS) path to a runway. Recent tests were conducted at Stockton, Calif., with American Airlines and the Federal Aviation Administration. Pilots used area navigation displays to establish a steep six-degree approach segment, starting at 3,000 feet and 6.4 miles from the runway. The second segment started at 400 feet and consisted of the conventional 2.5-degree ILS flight path. By keeping the aircraft higher above the ground and reducing engine power requirements, the steeper two-segment landing approach pattern lessens community noise near airports.