

physical sciences

GEOPHYSICS

Earthquakes linked to Chandler's wobble

To earthbound observers, the 14-month motion of the earth's axis of rotation known as Chandler's wobble (SN: 1/27, p. 88) represents a variation of the astronomically determined latitude. Viewed from space, however, it represents a wobble of the earth about its rotation axis, and can be conveniently displayed as the path of the north pole.

In the Sept. 13 *SCIENCE*, Drs. Ialatencha Mansinha and D. E. Smylie of the University of Western Ontario in London, Canada, report observational evidence to support the previously suggested theory that large earthquakes excite this natural wobble of earth.

On the basis of their theoretical model, Drs. Mansinha and Smylie checked on the effects of large earthquakes between 1957 and 1968 on the earth's pole path. Changes in that path were found to correlate closely with the occurrence of 15 out of 22 of these temblors.

They suggest that if these indications are confirmed by future observations, "a change in the pole path might be a valuable signal that a very large scale strain release is about to occur." In combination with instruments along active fault zones, this could provide information concerning an upcoming quake.

LIQUID CRYSTALS

Spherical gas detection

Specialists in liquid crystals have known for several years that cholesteric-type compounds react to gas vapors. They react to the vapor by changing color in the same way they do to temperature variations (see p. 321), although the two effects are usually unrelated.

The theory is that the gas vapors alter the molecular arrangement of the liquid crystals, thus changing their reflective properties. This reaction is so sensitive that it can be used to detect a few parts per million of the introduced vapor. This test has previously been conducted only on a flat surface, as far as is known.

Now, Dr. James L. Ferguson of Kent State University's Liquid Crystal Institute in Kent, Ohio, is readying a spherical detector that will do the same job but be much more sensitive. The sensitivity is the result of the globe's larger surface. He plans to start taking color pictures of liquid crystal reactions in a sphere within the next three months.

Dr. Ferguson says another use suggested for liquid crystals is to paint them on the wings of gliders. There the temperature differences produced by thermal updrafts would cause color changes easily visible to the glider pilot helping him fly.

GEOPHYSICS

Earth has polar wind

Blowing gently from earth's northern and southern polar regions is a polar wind, part of the ionosphere that has expanded sufficiently into space to be blown down earth's geomagnetic tail. It is so called because it has many similarities to the solar wind (SN: 8/31, p. 216).

The polar wind was found to be necessary to explain the balance of helium in the earth's atmosphere; its existence is confirmed by satellite observations. It flows upwards out of the atmosphere along open geomagnetic field lines. It is probably most intense on the sunlit portion of the polar cap where there is continuous replenishment of the plasma by ionization from sunlight.

The polar wind, which starts at about 200 kilometers out, is much less energetic than the solar wind. It moves at 10 to 20 kilometers per second; the solar wind from 500 to several thousand kilometers per second.

Dr. W. Ian Axford will outline the principle ideas in a report in a forthcoming *JOURNAL OF GEOPHYSICAL RESEARCH*; Drs. Peter M. Banks and Thomas E. Holzer will report the actual theory of the wind, together with extensive mathematical treatment. The three scientists are at the University of California, San Diego.

HIGH ENERGY PHYSICS

Germany will help with CERN accelerator

European plans to build a high energy accelerator have been boosted by an announcement by West German Minister for Scientific Research Dr. Gerhard Stoltenberg that his country is prepared to participate.

Germany joins Austria, Belgium, France and Italy in supporting the new laboratory being planned by CERN, the European physics consortium. Great Britain earlier shook the foundations of the project by withdrawing support (SN: 7/13, p. 30).

Original plans called for an accelerator of 300 billion electron volts, ten times larger than the present CERN machine but less than the 400 GeV planned eventually for the accelerator being built at Weston, Ill.

A CERN study group is presently working on the best way to scale down the project to the level of available funds.

CRYSTALLOGRAPHY

Predictions tally with results

The major constituents of human bile are conjugated bile salt, the phospholipid lecithin and free cholesterol, which combine with water to form a system that is liquid crystalline (see p. 321) when in the right proportions.

Dr. Donald M. Small of Boston University School of Medicine has devised theoretical diagrams of these four components that represent accurately what is found in normal bile and that of patients with gallstones.

Bile from normal humans is a clear, one-phase solution; that from afflicted persons is cloudy and obviously consists of two phases, the liquid bile and the cholesterol stones.

Dr. Small bases his theoretical predictions on the assumption that the physical state of bile is predictable from slices made across one corner of a tetrahedron. The right side of the tetrahedron represents lecithin, the left cholesterol, the front water and the base bile salt.

The corner slice shows which compositions will separate into liquid crystals, and the results tally for both gall bladder patients and normal humans.