

space sciences

Tracking the sun's magnetic field lines

The sun emits energetic electrons that stimulate electromagnetic waves of certain frequencies in the solar wind (called plasma frequencies). The frequency of the burst tells how rapidly the plasma is moving and how dense it is at a given point. Interplanetary Monitoring Platform 6 (now called Explorer 43) has been able to track the magnetic field lines of the sun by picking up this radio signal. IMP has followed the lines from within 30 radii of the sun to close to the orbit of earth. It has found that inside the orbit of Mercury, where the sun's magnetic field is very strong, the field lines move radially (as in the spokes of a wheel) out from the sun. As the field lines move past Mercury they curve into spiral arms. "If these preliminary data are confirmed," says Lawrence Kavanagh of NASA, "it will confirm the theory of Hannes Alfvén." Alfvén predicted that at 30 solar radii the plasma density rather than the field strength would begin to dominate the motion of the material, and thus the spiral curvature would begin.

IMP also confirmed another theory that the electric field outside of the earth's bow shock is zero, but as the plasma moves across the bow shock, the particles become accelerated inside the magnetosheath. Principal investigators on IMP are Robert Stone and Thomas Aggson, both of NASA's Goddard Space Flight Center.

Establishing a baseline for lunar magnetism

That lunar rocks have remanent magnetization has been one of the greatest surprises of the Apollo program. The origin of this magnetism is difficult to explain if one assumes the moon never had a molten core (SN: 1/22/72, p. 53).

This month the Apollo 16 astronauts will conduct an experiment to help determine the source of the magnetization. The test should resolve how much, if any, of the magnetism is acquired in the rocks en route back to earth or in laboratories.

There are actually two types of remanent magnetism in the rocks. One is quite soft and can be removed by exposing the rock to alternating fields of about 50 to 100 oersteds.

The second is quite stable and is hardly affected by fields up to 500 oersteds. It is this component that is most likely to represent ancient lunar magnetic fields.

The astronauts will use a portable magnetometer to take readings of rocks on the surface and readings of the local field at the site. Those readings will then be compared to the laboratory findings later to see if any magnetization was subsequently acquired. They will also take a "clean" lunar rock from earth laboratories back to the moon and return it to earth, to determine if magnetism is acquired en route.

Pioneering to Jupiter

Last week engineers performed a second maneuver with the Pioneer 10 spacecraft. The engine burns were designed to delay the arrival time at Jupiter by two and one-half hours and place the arrival point some 6,400 kilometers closer to the planet. The burns were also intended to steer Pioneer 10 behind Io, one of Jupiter's moons. This would allow determination of the density of Io's atmosphere. As of March 31, Pioneer 10 was some 20 million kilometers from earth.

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medical sciences

Regenerating brain nerves

In the past year or two, scientists have obtained glimmers of evidence that it may some day be possible to restore destroyed nerve cells of the brain and central nervous system. Such a capability might have possible application with accident and stroke victims, paraplegics, multiple sclerosis patients and other persons afflicted with destruction of central nervous system nerves. Reasons for hope are slowly building. Two Swedish scientists report in the March 17 *SCIENCE* that they have successfully stimulated regenerative neuron growth in rat brains.

They transplanted peripheral nerve tissue into the hypothalami of rat brains so that the peripheral tissue nerves contacted central nervous system neurons in the hypothalami. They then injected nerve growth factor (NGF), a known stimulator of some peripheral, non-central nervous system nerve cells, into the rats' hypothalami. Saline solution was injected into the hypothalami of some control rats. NGF, they found, stimulated regenerative growth of the central nervous system neurons in the hypothalami. The saline had no effect.

"This is, to our knowledge," Anders Björklund and Ulf Stenevi of the Department of History, University of Lund, say, "the first demonstration of an effect of NGF on central neurons."

Effects of alcohol by gender

Acetaldehyde (AcH) is the intermediate product in the breakdown of ethanol to acetate. There is evidence that AcH may contribute to either the pleasant or unpleasant effects of drinking. In spite of claims that both sexes are equal, apparently that is not so when it comes to metabolizing alcohol. Two investigators at the Columbia College of Physicians and Surgeons have found that male mice accumulate five times as much AcH in their blood as female mice over the same period of time. Thus, if mice metabolism can be extrapolated to human metabolism, differences in AcH accumulation suggest that men are affected by alcohol more quickly than women.

Reporting their work in the March 17 *NATURE*, Geoffrey P. Redmond and Gerald Cohen suggest the differences in alcohol metabolism between the sexes may be due either to increased production or to slower removal of AcH in males, or both. Drug metabolizing enzymes are known to differ between male and female rats.

When the eye clouds

The loss of transparency of the eye's cornea has not been well understood. Now two scientists in the Applied Physics Laboratory of Johns Hopkins University, R. L. McCally and R. A. Farrell, have found that corneal swelling disrupts the protein rods in the cornea. This disruption in turn distorts light passing through the cornea, and hence obscures the cornea's transparency.

Cataracts, transplant surgery, wearing contact lenses, wound healing and other conditions are known to make corneas swell. McCally and Farrell believe that the especially designed apparatus they used in their research might also be used clinically to predict the onset of corneal clouding in patients who might be particularly susceptible to it.

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