

## GEOPHYSICS

## Effect of Solar Wind Seen

► THE EARTH'S TAIL stretches out millions of miles away from the sun in two streams that occasionally join one another.

Immediately after the highly elongated tail closes, earth's high atmosphere blazes forth with auroras. This is but one result of the complex interaction of the solar wind, earth's magnetic field and the interplanetary magnetic field.

Evidence that the sun's magnetic field frequently joins forces with the earth's field to cause ionospheric storms and auroral activity was reported to the International Scientific Radio Union meeting in Washington, D.C.

The evidence recorded by Explorer XII and 12 ground stations circling the north magnetic pole, was presented to the meeting by Donald H. Fairfield of Pennsylvania State University, University Park, Pa.

Satellite experiments have shown that the one million tons of matter the sun throws spaceward every second form what is called the solar wind, creating weather in space. This constantly blowing wind pushes gently against the earth's magnetic field, squeezing down the sunward side.

When the interplanetary magnetic field is directed northward, the solar wind and earth's magnetosphere are very little affected.

However, when the interplanetary magnetic field is directed southward, these field lines can join with lines of the earth's magnetic field at high latitudes. The solar wind streaming around the edge of the magnetosphere pulls it into a long tail, possibly four million miles in length.

When this tail closes, sometimes very suddenly, a surge of electrical particles from

the stretched-out tail of the magnetosphere shoots down the lines of force to the polar regions above earth.

The particles pour tremendous amounts of energy into the ionosphere, stripping electrons from atoms, and setting up colorful auroras. Auroral displays occur on the average of two or three times a day, usually over the polar regions just after midnight, local time.

The observations made by Mr. Fairfield, a graduate student working under the guidance of Dr. James W. Dungey, showed that auroral activity is considerably stronger when the interplanetary field is pointed southward than when it is northward. The peak in activity is believed to occur when the field lines in the tail join suddenly. Dr. Dungey developed this theory of auroral activity prior to the satellite observations.

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## ASTROPHYSICS

## Annihilation of Matter Seen Source of 'Quasars'

► THE ANNIHILATION of matter when matter and antimatter clash was suggested as the cause of the puzzling, extraordinarily bright celestial objects called quasars.

G. K. Gray of Manchester, England, believes the universe contains regions of space, or "pockets," made up only of matter as found in the solar system and others consisting of antimatter. If this is so, then occasional annihilations of stars and anti-stars would occur, providing the energy source of quasars.

Such annihilations would have occurred more frequently when the amount of antimatter was more approximately the same as the amount of matter than is the case now.

This imbalance, Mr. Gray points out in *Nature*, 206:175, 1965, appears to have evolved from a small-scale and chance lack of symmetry. There is also a lack of balance in the number of naturally occurring biological compounds that rotate a light beam to the left compared with those that rotate light to the right.

Mr. Gray concludes that:

1. The matter of the universe has evolved as have living species.

2. The absence of equivalence between left-handedness and right-handedness in the world of the atomic nucleus is connected with the lack of symmetry between matter and antimatter.

3. Since atomic particles are produced in equal numbers of particles and antiparticles, matter must have evolved from a chance disproportion in the distribution of particles.

P. F. Browne of Heald Green, Cheshire, calls the similarity between evolution of matter and of species a "remarkable parallel." He suggests, however, that quasars "must be what they appear to be—stars within the galaxy."

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## TECHNOLOGY

## Aerial Photos Scanned In About Six Seconds

► AIR RECONNAISSANCE crews will be able to scan their photographs six seconds after exposure as a result of a new process.

The process consists of inserting an inactive developer into the film's sensitized surface before exposure. Then the image is developed in one second when a high energy activator solution is applied.

Processing time also includes three seconds for stabilization of the image and two seconds for rinsing. The technique was developed by the Good Year Aerospace Corporation.

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## PHYSICS

## Two-Mile Laser Beam Reduced Through Mirrors

► A TWO-MILE-LONG laser beam has been reduced to a ten-foot-long space by reflecting it over a thousand times between two mirrors.

Donald Herriott and Harry Schulte of Bell Telephone Laboratories, New York, bent two spherical mirrors into slightly cylindrical shapes to eliminate interference between reflections of the beam. Several beams, in fact, can be reflected at the same time if they enter at different angles or at different frequencies.

A laser beam could be made to retain information in a manner similar to radio waves. The beam would be detained in the space between the two mirrors, thereby storing the information.

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Bell Telephone Laboratories

**FOLDED LASER BEAM**—A two-mile laser beam has been folded into a 10-foot space by Donald Herriott and Harry Schulte (above) of Bell Telephone Laboratories. The area of the reflecting mirrors and the scattering loss of the mirrors limit the number of reflections.