ASTRONOMY

Solving of Sun's Riddles

FUTURE SPACE PROBES may skim as "close" as two million miles from the sun's visible surface, a report to the National Academy of Sciences suggests.

Before this can be done, however, greatly improved materials must be developed since temperatures at that distance would be about 5,000 degrees Fahrenheit, roughly the melting point of the toughest materials now known.

A near-sun space probe is one of the several kinds of solar studies from high-flying balloons, satellites and probes recommended by the Academy's Space Science Board. The suggested experiments could yield answers to most of the still unsolved problems of the sun and its mighty outpouring of radiation.

Board members urged continued emphasis in the national space effort on studies of the sun's visible surface, and of the radiations that come indirectly from its core where temperatures are some 27 million degrees Fahrenheit.

In a report on "The Sun," one chapter in a nine-part survey of space science, the Board outlines specific applications of space research to solar physics. The report was written by Dr. Leo Goldberg, chairman of the University of Michigan's astronomy department.

Dr. Goldberg notes that the sun is an average star—average in brightness, surface temperature, size, mass, and perhaps even relative age. Because it is average, astronomers can apply knowledge gained from solar studies to the two extremes of bigger, brighter stars and smaller, fainter ones that are too far away for detailed observations of their surfaces.

The next nearest star, Alpha Centauri, is some 300,000 times as far as the sun.

However, despite the fact that the sun is only some 93 million miles from the earth, the amounts and kinds of information about it detected by earthbound instruments have proved inadequate for solving many basic solar problems. This is because the earth's atmosphere absorbs, deflects or alters most of the solar radiation.

Although the radiation from the sun as a whole is only very slightly variable, radiation from localized regions or in limited frequency ranges is extremely variable. This variability is associated with activity in the solar atmosphere in the form of sunspots, flares and prominences. Sunspot activity rises and falls in an 11 year cycle.

Dr. Goldberg suggests that observations made possible by balloons, satellites and space probes will answer many puzzling questions about the sun that are now understood only partially or not at all.

Among them are questions concerning the mechanism of the sudden onset and development of solar flares; the structure of the chromosphere, which is the unstable transition region above the sun's visible surface, in which the temperature rises from about 10,000 degrees Fahrenheit to about two million degrees in the corona; and the nature of the corona, the sun's tenuous outer atmosphere usually seen only at times of a solar eclipse. (See p. 364.)

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ASTRONOMY

Solar Theory Proposed

A THEORY for the birth of the solar system's sun and planets has been proposed by a Hungarian scientist.

Prof. L. Egyed of Eotvos University in Budapest suggests that when the universe was very young, all matter in the solar system was concentrated in the sun. Because of this, the acceleration due to gravity in the sun was very great, and the sun's matter was highly concentrated. Its radius therefore was very small.

Since then, centrifugal force that would force material out from the center of the spinning sun and gravitational acceleration have been decreasing. This would result in an increase in the sun's diameter.

At some time far in the past, centrifugal force became equal to the attraction of gravity at the solar equator, allowing part of the sun's mass to escape. This is how Prof. Egyed suggests that the various planets were formed—thrown out one at a time from the sun, with the outermost first.

The currently accepted view of solar system birth is that the planets resulted from gravitational attraction caused by eddies left by the original material forming the sun.

Prof. Egyed reported in Nature, 186:617, 1960, that his theory could also be applied to the formation of satellites circling the planets, such as those found around Jupiter.

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ASTRONOMY

Scale for Universe Wrong

ASTRONOMERS may be using a faulty "yardstick" to measure the vast distances of the universe.

Dr. Paul W. Hodge of Harvard College Observatory reports recent studies have shown that the methods now used for determining distances to galaxies far beyond the Milky Way galaxy, in which the sun and its planets are located, are incorrect.

These methods are based on comparing the apparent brightness of stars in the astronomically "close" galaxies with the brightness of the same kind of stars in the Milky Way.

Distances in the universe are then determined from measurements of distances of these nearby galaxies. However, Dr. Hodge reports in Nature, 186:618, 1960, detailed examination of the light from certain objects in the Magellanic Clouds shows that brightness comparisons should not be used as an index of distance.

Distances to galaxies beyond the Milky Way are measured in many thousands or millions of light years, which is the distance covered in one year by light traveling 186,000 miles a second.

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