ASTRONOMY

Pin-Point Distance to Sun

For the first time scientists will know accurately the "astronomical unit," as the distance from the earth to the sun is called. This knowledge will aid space probes.

WITHIN TWO years, man will know accurately for the first time the distance to the sun. This distance, some 93,000,000 miles, must be known with much greater reliability than now before space vehicles can be sent on trips to planets with any assurance of a successful orbit or landing.

To make the most accurate determination to date of the sun's distance, a radio telescope with especially designed receiving equipment will tune in on the radio waves absorbed by neutral hydrogen in interstellar clouds. The experiment, proposed by astronomers at Yale University, will be made using the Naval Research Laboratory's 84-foot radio telescope located at Maryland Point Observatory, some 50 miles south of Washington, D. C.

Astronomers call the distance to the sun the astronomical unit. It establishes the basic scale of the solar system and is fundamental to space technology as well as astronomy.

The initial velocity of a rocket departing from earth must be changed from conventional units into a velocity in astronomical units per second in order to permit calculation of the gravitational orbit beyond the immediate vicinity of the earth. Thus an exact distance for the astronomical unit is not needed for lunar probes.

This change from terrestrial to astronomical units is now in error by the same percentage amount as the error in the present value of the astronomical unit, one part in 20,000. Using the radio telescope information, astronomers expect to find the sun's distance to one part in 280,000, or an accuracy of about 300 miles in the distance between the earth and sun.

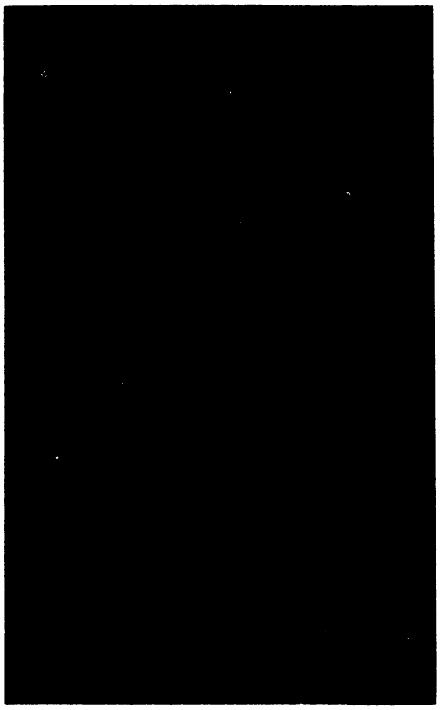
At present, the two most important determinations of the sun's distance both depend on observations of the asteroid, Eros, but use different methods. The values obtained by the two methods differ by 89,000 miles, an "alarming" amount.

The radio telescope method involves obtaining a precise measurement of the earth's speed in its orbit around the sun. Using this newly determined value and standard equations, the astronomical unit can be found directly.

The telescope's receiving equipment will record the radio waves of hydrogen atoms in clouds in the space between the stars that are absorbing the radiation emitted by so-called radio "stars" at even farther distances. At one time during a year, the earth's orbital velocity will be directed toward the star. Six months later in the earth's journey around the sun, the earth's velocity will be directed exactly opposite.

The faraway interstellar cloud of atomic hydrogen gas will have a velocity with respect to the solar system that will remain constant for both measurements. By taking the difference between the amount of the red shift in the hydrogen lines taken at six-month intervals, the cloud's effect is eliminated and a precise value for the earth's speed obtained. When combined with the time taken for the earth to make one orbit around the sun, the sun's distance is known.

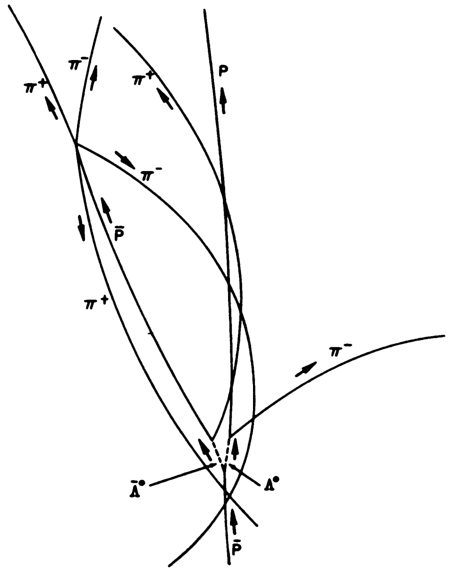
The radio telescope measurements of interstellar absorption may also give a better determination of the lunar mass in the future, Dr. Dirk Brouwer, director of the Yale University Observatory, and Dr. A. E. Lilley, also of the Observatory, reported to the National Aeronautics and Space Administration.



ANTI-MATTER—The creation and decay of an antilambda is shown in this photograph taken in the six-foot bubble chamber at the University of California's Lawrence Radiation Laboratory. An antiproton from the Bevatron enters at the bottom of the picture, its track ends, and after a gap two V-shaped tracks occur. The V on the right is the product of the decay of an ordinary lambda particle. The V on the left is product of the decay of an antilambda. The particle on the left side of the V is an antiproton, which in the upper left hand corner, creates a four-pronged pi meson star.

NASA has allocated $110,000 to support the research, which is also supported by grants from the Research Corporation and the Alfred P. Sloan Foundation. The Naval Research Laboratory's cooperation is directed by Edward F. McClain.

Science News Letter, August 8, 1959



ANTI-MATTER DIAGRAMED—This diagram shows the pattern of particle decay and formation.

PHYSICS

Physics Conference Sees Anti-Lambda Photograph

THE NINTH Annual International Conference on High Energy Physics drew some 60 scientists from the United States to Kiev, one of the largest cities in the U.S.S.R. It was the first time this yearly gathering of top level physicists had been held in Russia.

The specialists spent ten days exchanging the latest information on what makes up the nucleus of an atom and how it behaves when smashed apart by atomic particles. They were trying to bring some sense of order to the crazy, mixed-up particles having unpredictable behavior patterns found in atomic cores.

Some 25 of these odd particles are now known, and most of them have left their tracks in photographic emulsions so that their characteristics can be studied in detail. One of the newest to be so studied is known as an anti-lambda, a chunk of anti-matter that annihilates in an encounter with normal matter, both disappearing to release tremendous amounts of energy.

The anti-lambda photograph was taken in the six-foot bubble chamber at the University of California's Lawrence Radiation Laboratory, which is supported by the Atomic Energy Commission. The experiment producing this new "strange" particle was run by Drs. Lynn Stevenson, assistant physics professor, and Philippe Eberhard, on leave from the Centre National de la Recherche Scientifique de France, under the direction of Dr. Luis W. Alvarez.

Science News Letter, August 8, 1959