

## ASTRONOMY

# Star's Size Measured

A new astronomical instrument has enabled scientists to measure directly the size and temperature of Vega, the fifth brightest star in the sky, for the first time—By Ann Ewing

► A UNIQUE ASTRONOMICAL instrument has directly measured for the first time the size and temperature of the fifth brightest star in the sky, Vega, in the constellation of Lyra, the lyre.

Vega has a diameter three and a half times that of the sun and its temperature is 17,000 degrees Fahrenheit. These values were found by three Australian scientists and an English scientist now working in Australia.

The scientists measured them using a "stellar interferometer," the first of its kind in the world. It has two mirrors, each 22 feet in diameter, that move on a circular railway track having a diameter of 618 feet.

The mirrors weigh about 12 tons each. They do not, however, have a continuous glass surface as does the usual telescope mirror. Instead, they are made from more than 250 hexagonal mirrors that focus the star's light onto a photomultiplier tube in each telescope.

Since the star's light does not have to form a photographic image, the individual mirrors can be made cheaply by astronomical standards.

The world's largest reflecting mirror, in the Hale telescope atop Mt. Palomar, meas-

ures 200 inches, or 16.67 feet, and cost \$6.5 million to build.

By comparing the changes in the electrical currents produced by the two photomultiplier tubes when the mirrors of the Australian telescope are in different positions, the size and temperature of bright stars can be measured directly. The way in which the star's light varies over its surface also can be measured directly.

Knowing these values is "extremely important" to scientists, Dr. H. Messel, head of the University of Sydney's School of Physics, told SCIENCE SERVICE while attending a conference in Washington, D. C.

The Vega measurements are preliminary, having been made to test the equipment during final installation at the University's Narrabi Observatory.

Dr. R. Hanbury Brown, formerly of the University of Manchester, England, and Drs. C. Hazard, J. Davis and L. R. Allen of the Chatterton department of astronomy reported the first direct measurement of the angular diameter of Vega in *Nature*, 201:1111, 1964.

Vega and the constellation of Lyra are visible very low on the northern horizon in the late evening.

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National Bureau of Standards

**NEW CHEMICAL COMPOUND—**Dr. T. D. Boyle, chemist, submerges a trap in liquid nitrogen while purifying difluoroborane, a new compound discovered at the National Bureau of Standards. In the large vessel in the foreground are difluoroborane and other reaction products. It is the first time fluorine derivatives of this type have been prepared.

## PHYSICS

## Plan New Way to Spot Neutrinos From Sun

► A NEW WAY to detect neutrinos coming from the sun is being planned. The tiny neutrino is nature's most elusive particle, difficult to spot because it has no electrical charge and no observable mass.

A tank containing 100,000 gallons of pure perchlorethylene, better known as a dry-cleaning fluid, would serve as a "trap" for the neutrinos. It would be placed 4,500 feet deep in a mine.

Although neutrinos react with matter so infrequently that they can, on the average, penetrate 100 trillion miles of lead, the perchlorethylene tank should catch 4 to 11 interactions each day.

Neutrinos are shot out of an atomic nucleus at the speed of light when atoms break up due to their radioactivity. The sun and other stars make billions of them in their nuclear furnaces.

The neutrinos would react with the chlorine in the cleaning fluid to produce radioactive argon-37, the amount of that element being easy to determine.

A test with two 500 gallon tanks of perchlorethylene in a mine 2,300 feet deep has shown this method should work, Dr. Raymond Davis, Jr. of Brookhaven National Laboratory, Upton, N. Y., reported in *Physical Review Letters*, 12:303, 1964.

Dr. John N. Bahcall of California Institute of Technology, Pasadena, in the same journal, 12:300, 1964, reported the theoretical limits of neutrino production by the sun.

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## GEOPHYSICS

# Moon's Magnetic Teardrop

► THE MOON HAS a magnetic effect that extends like a giant teardrop at least 68,000 miles into interplanetary space away from the sun.

This lunar magnetic effect was detected for the first time by an Interplanetary Monitoring Platform, called IMP. Details of the structure of the moon's magnetosphere were reported at a scientific symposium at the National Aeronautics and Space Administration's Goddard Space Flight Center, Bethesda, Md.

The discovery does not necessarily mean that the moon has its own magnetic field, as the Russians reported finding with one of their space probes. The lunar magnetic effect, extending deep into space away from the sun, could result when the solar wind is trapped by electrified particles on the moon.

The solar wind is a steady stream of very low energy charged particles constantly spewed into space by the sun. Both the earth and the moon intercept the solar wind as they circle the sun.

The IMP satellite data also showed for the first time that the solar wind forms a shock wave, enclosing the earth, Dr. N. F.

Ness of Goddard Space Flight Center reported.

This shock wave in the space around earth can be likened to the shock wave that builds up in front of fast flying airplanes and causes the increasingly familiar sonic boom.

The IMP satellite, also known as Explorer 18, was launched last November.

The satellite is surveying space from the most stretched-out orbit yet achieved by a U.S. satellite, reaching from 120 to 122,800 miles into space once nearly every four days.

The shock wave around earth has a nearly hyperbolic structure, with the open end of the hyperbola extending away from the sun, Dr. Ness reported. The "tail" trails out into interplanetary space at an increasing rate and very possibly extends as far as the moon.

On the sunlit side of the earth the shock wave is located at 53,600 miles, some 13,600 miles in front of the magnetic shell surrounding earth, which is compressed on the sunward side by the solar wind.

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