

Stellar Distances Refined

A computer imitating the behavior of pulsating stars enables astronomers to measure stellar distances with new precision—By Ann Ewing

► THE DISTANCES to certain stars whose light output varies rhythmically in less than a day can now be determined more accurately.

The yardstick used to measure stellar distances to the class of stars known as RR Lyrae has been given new precision by Dr. Robert F. Christy, professor of theoretical physics at California Institute of Technology, Pasadena. Dr. Christy used a large computer to imitate the behavior of these pulsating stars, the type into which the sun is expected to evolve several million years from now.

His computer calculations have shown that these stars are all about 50 times brighter than and about half as heavy as the sun. The mathematical models also showed that the surface layers of RR Lyrae stars consist of about 30% helium, Dr. Christy reported in the *Astrophysical Journal*, 144:108, 1966.

RR Lyrae stars are important rods for measuring distances within the Milky Way galaxy. They are easy to distinguish from other stars because they dim and brighten so rapidly.

To use such stars as yardsticks, it is essential to know their intrinsic brightness, which astronomers figure on a scale using the luminosity of one com-

pared to the sun if both were placed side by side. Their distances are determined by comparing their apparent brightness and intrinsic brightness.

Dr. Christy's computation of a 30% helium content in the surface layers of RR Lyrae stars is considerably higher than expected. The high value lends support to the "big bang" theory of how the universe was born.

As stars evolve, their nuclear furnaces change hydrogen, by far the most abundant element in the universe, into helium. If the surface helium content of RR Lyrae stars represents the composition of the matter from which these stars were formed, then the Milky Way was already rich in helium when very young.

The high percentage of helium could have resulted from the cosmic explosion that some scientists believe triggered the birth of the universe some 10 billion to 20 billion years ago.

Astronomers have been using computers to calculate the process through which stars evolve since the machines became available shortly after World War II. Dr. Christy made his calculations using a new method of simulating the behavior of stars.

RR Lyrae stars are slowly evolving

objects that have burned up enough of their hydrogen so that they swell up and become cool giants with diameters about five times that of the sun.

Further evolution elevates their surface temperatures from 11,000 to 13,000 degrees F., close to the sun's visible surface temperature of 10,000 degrees.

Dr. Christy found that the pulsating stars' temperatures depend not only on the surface temperature but also on the amount of helium in the outer layers.

Some RR Lyrae stars vary their light output once every six hours, while others take up to one day.

The cause of the pulsations can be likened to that of percolating coffee periodically erupting as it is heated.

• *Science News*, 89:387 May 21, 1966

TECHNOLOGY

Ionic Calcium Measured By Selective Electrode

► A CALCIUM ION selective electrode which is expected to expand clinical and biological research has been developed by the Corning Glass Works, Corning, N.Y.

The electrode is believed to be the first calcium electrode on the market. To date there has been no practical technique to measure ionic calcium.

Calcium determinations are important in fields such as clinical and biological chemistry, soil and water analysis, food and dairy chemistry and geology and limnology.

The electrode embodies a new principle. It develops its electro-potential at a liquid-liquid interface rather than at a glass-liquid interface, as in the well-known glass pH electrode.

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TECHNOLOGY

Laser Can Be Beamed 100,000 Times a Second

► A SYSTEM combining a computer and the intensely bright light of a laser can direct a beam to any of 131,072 points within a space smaller than a match head at speeds of more than 100,000 selections per second.

Such a system could be used in lightning-fast devices to produce a printed page without type bars or keys, display sharper images on viewing screens or provide a highly flexible method of data handling for computers.

The combination method, developed by International Business Machines Corporation, is now in the exploratory stage at the Army Electronics Command, Fort Monmouth, N.J.

The central feature of the experimental equipment, designed for possible use in automatic data systems for Army combat forces, is the ultra-precise control of the laser beam.

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Credit—U.S. Army

LIGHT DEFLECTOR—A new digital light deflector system that can position a light beam to any of 131,072 points at speeds exceeding 100,000 selections per second is being tested by IBM physicist Dr. Millard A. Habegger. It was developed for the U.S. Army by the International Business Machines Corporation.