astronomy

Gathered at the annual meeting of the American Astronomical Society in Austin, Texas

ASTROPHYSICS

Numerical studies of stellar collisions

The probable importance of stellar collisions in dense galactic cores in developing models of quasars and Seyfert galaxies has been stressed by Dr. Stirling A. Colgate of the New Mexico Institute of Mining and Technology (SN: 4/6/68, p. 330).

He finds the collisions begin at relatively low velocities, leading eventually to stellar amalgamation and an enhanced rate of supernovas within such active galaxies.

Drs. F. G. P. Seidl of Computer Applications, Inc., and A. G. W. Cameron of Yeshiva University and the NASA Goddard Institute for Space Studies in New York, have started using a computer to simulate such collisions.

Studies have so far been made only of two stars of the same mass in head-on collisions at various velocities. During the collision, there is first a squirting out of mass in the mid-plane between the stellar centers. Following that, after maximum compression, there is a stronger shock ejection of matter mainly along the directions of approach to the collision.

When the initial relative collision velocity is some 1,500 kilometers per second, more than half the total material remains in the coalesced remnant. Dr. Cameron intends to continue the work using numerical models for stars of different masses and varying angles of collision, including glancing incidents.

ASTROMETRY

New binary object

A new, very small object that could very well be an extremely cool star has been discovered by Dr. Sarah Lee Lippincott of Swarthmore College's Sproul Observatory.

The unseen companion of PGC-588, the astronomical designation of the binary system, was detected by measuring its motions on 240 photographic plates taken during the period from 1937 through 1968.

The basic component, photographed with the 24-inch Sproul telescope, appears to be a normal star with a mass equal to six-tenths of the sun. The invisible object accompanying PGC-588 in its travels through space has a mass only five-hundredths that of the sun.

This is on the borderline of the mass required for objects to be self-luminous, that is, to radiate by their own nuclear reactions rather than by reflected light.

INFRARED

Milky Way center observed

The discovery of an intense, far infrared source in the direction of the center of the Milky Way galaxy is reported by Drs. William F. Hoffman and C. L. Frederick of the National Aeronautics and Space Administration Institute for Space Studies in New York.

The source was detected during a balloon flight last summer, using a germanium bolometer at the focus of a one-inch aperture crystal quartz lens.

If the source is confirmed as being at the distance of the galactic center, its infrared radiation is comparable to the total visible luminosity associated with the nucleus. The luminosity is equivalent to that radiated by some 700 million suns.

If future observations prove this to be true, it could mean that astrophysicists will have to modify their theories of energy generation in galaxies, since such intense radiation from that distance is unexpected.

SOLAR

Sun's brightness temperature

Observations made from a jet aircraft at an altitude of 44,000 feet to reduce the effects of atmospheric water vapor have shown the brightness temperature of the sun, measured at a wavelength of one millimeter, is 5,400 degrees K., with a probable error of plus or minus 350 degrees.

This, Drs. Frank J. Low of the University of Arizona and Carl M. Gillespie of Rice University report, is "in satisfactory agreement with the value of 5,900 plus or minus 500 degrees obtained on the basis of ground-based observations, using the moon as a standard."

The measurements were made on six high altitude flights. The radiometer, with a field of view of two degrees, was pointed alternatively at the sun and the sky by telescope.

COSMOLOGY

Background radiation and the steady state

The microwave background radiation believed to be the remnants of the primordial fireball in which the universe was born can also be explained on the basis of the superposition of discrete sources, which would be compatible with a steady-state universe.

Drs. Geoffrey R. Burbidge and A. M. Wolfe of the University of California at San Diego have attempted mathematically to determine whether this measured radiation can be linked up with the observable universe.

They investigated the numbers of discrete sources that would be necessary to generate the microwave radiation, which is very energetic, having a density of at least 10^{-13} (one ten-trillionth) ergs per cubic centimeter.

They found that the required sources must be luminous in the millimeter and sub-millimeter region, radiating some 10^{46} ergs per second, to account for the observed background. These sources must also constitute at least one percent of the density of normal galaxies and radiate relatively weakly in the radio range.

Quasars that do not emit detectable energy at radio wavelengths are the most suitable objects, they suggest. Only observations at wavelengths of about 350 microns will be able to distinguish between the discrete source model, and the primeval fireball model. No such observation has yet been made.

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