astronomy

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ASTROPHYSICS

Jet of M-87 a galactic flare

M-87 is one of the brightest galaxies known. It has an unusually large number of globular clusters, but its most intriguing feature is a peculiar jet that starts from the nucleus and can be traced for 1,500 parsecs, or about 4,890 light years.

This galaxy is also a source of intense radio emission. For all these reasons, M-87, or NGC-4486 as it is alternatively known, is extensively studied by scientists. Dr. Peter A. Sturrock, Stanford University astrophysicist, finds that the jet can be interpreted as a galactic flare, similar in mechanism but on a gigantic scale to a solar flare.

He bases this interpretation on photometric studies showing that the jet is comprised of six or seven small sources. The magnetic field configuration associated with M-87 is assumed to be that associated with a massive object that has condensed in the primeval magnetic field.

This interpretation leads to the prediction that the optical appearance of the jet should change within 30 years.

ASTROPHYSICS

Shells around white dwarf stars

Calculations of stellar evolution indicate that most stars with masses of one to two times that of the sun undergo carbon burning at their centers before ending up as white dwarfs. Such an evolution suggests that significant amounts of sodium 23 or other nuclei of odd mass number are likely to be present in the centers of massive white dwarf stars.

Drs. Sachiko Tsuruta of the Smithsonian Astrophysical Observatory in Cambridge, Mass., and A. G. W. Cameron of the Belfer Graduate School of Science in New York, have calculated the thermal and vibrational energy losses that can result when these stars form a shell. In this shell, the nuclei undergo successive electron captures and beta decays, with accompanying stellar energy loss through emission of neutrinos and antineutrinos.

Their calculations were made for a large number of nuclei that might contribute significantly to such energy losses. Based on these calculations, if carbon burning takes place first, blue-white dwarf stars having very faint intrinsic luminosities should be rare.

INSTRUMENTATION

Automatic spectrum line identification

The critical identification of features in stellar spectra is an important but tedious task that can be materially aided by computer procedures.

Drs. Walter K. Bonsack and J. D. Wilson of the University of Hawaii have devised a set of computer programs for spectrum line identification and used them to determine the spectra of the giant star epsilon Virginis, with good results.

The procedure consists of two stages. First a data tape is prepared that gives for each spectrum feature the wavelength, the line strength and two wavelength search intervals. The widths of these two intervals depend on the line strength.

The second stage involves reading the laboratory data into the computer in groups of lines of similar upper and lower excitation potential, then searching the stellar data in order of decreasing laboratory intensity for wavelength coincidences. The search is stopped at the intensity level at which no coincidences are found.

GALACTIC ASTRONOMY

Galaxy clusters cluster

That galaxies seem to concentrate in clusters has long been recognized; the local group of which the Milky Way and its neighbors are a part contains 17 galaxies.

Now Drs. William C. Saslaw of the University of California at Berkeley and T. Kiang of the University of Cambridge's Dunsink Observatory in Dublin have found that galactic clusters occur in clusters. They used a three-dimensional array of space in cubes 50 megaparsecs on a side to demonstrate the superclustering, estimating the distance to each cluster from the apparent magnitude of the tenth brightest galaxy within it. (One megaparsec is 3.26 million light years.)

Their scale of clustering is at least three times larger than found by previous analyses in two dimensions. This, they say, "is probably because apparent declustering can occur when a three-dimensional clustered distribution is projected onto two dimensions."

INTERSTELLAR ASTRONOMY

Simulating interstellar dust

To test the possibility that diffuse interstellar absorption lines may be due to organic compounds in interstellar space—a simple compound, formaldehyde, has been found (SN: 4/12, p. 351)—two scientists have carried out exploratory simulation experiments. They find that materials in space should show absorption lines that differ from those usually seen in the laboratory.

Drs. Fred M. Johnson of the EOS Division of Xerox Corporation and Gordon W. Hodgson of Stanford University measured effects on light transmission of suspensions of various stable aromatic compounds. Measurements were made under conditions of fine dispersion of solid particles, at low temperatures and in the presence of mineral substances.

Pyrene, perylene and other polycyclic aromatic hydrocarbons, as well as carbazole, porphyrins and other nitrogen-containing aromatics, "showed spectra in the visible range significantly different from the familiar corresponding spectra in solution." Lowering the temperature generally caused some of the lines to sharpen and to shift slightly to the red.

Mixtures of silicate and carbonate minerals usually weakened the absorption spectra.