astronomy

Gathered at the meeting of the American Astronomical Society in New York last week

PULSARS

Starquakes and faster pulses

When pulsars were first discovered, it appeared that their pulse rates were unusually regular and constant. After some months of watching, however, astronomers found that the pulsars are all gradually slowing down.

The slowdown fits well with current pulsar theories, but in the last year two pulsars, the one in the constellation Vela and the one in the Crab nebula, have shown sudden increases in pulse rate (SN: 4/19, p. 377). This is not provided for in current theory.

Drs. David Pines, Gordon Baym and Christopher Pethick of the University of Illinois and Malvin Ruderman of Columbia University report that the speed-ups may be caused by what they call starquakes.

They see a pulsar as a star with a solid shell filled with a frictionless, nonviscous fluid composed of neutrons. Starquakes, in analogy to earthquakes, are violent readjustments of stresses in the solid shell. The shocks are transmitted to the fluid interior in such a way that they cause an increase in the star's rotation rate, and this shows up as an increase in pulse rate.

MOLECULES

Formaldehyde in dark nebulae

Formaldehyde is the most complicated chemical element yet found in interstellar space (SN: 5/12, p. 351) and the locations where it is seen keep increasing. Observations of formaldehyde in dark nebulae are reported by Drs. Lewis E. Snyder of the University of Virginia, Patrick Palmer of the University of Chicago, David Buhl of the National Radio Astronomy Observatory and Benjamin F. Zuckerman of the University of Maryland.

They report finding formaldehyde in 7 of 11 dark nebulae that they looked at. Formaldehyde has always previously appeared in company with the hydroxyl radical, but one of these sources shows formaldehyde without hydroxyl. This, says Dr. Snyder, probably represents the discovery of a new class of interstellar cloud, but it is too early to assess what astrophysical significance the new class may have.

PLANETS

Jupiter's periodic 10-meter waves

The planet Jupiter produces outbursts of 10-meter wavelength radio waves that fascinate astronomers. The waves are in the wrong frequency range to be produced by heating of the planet's surface as are those from other planets. Charged particles driven by magnetic fields, possibly in a Jovian magnetosphere, are suspected as the source.

This would be borne out by a report of Drs. T.D. Carr, A.G. Smith, F.F. Donivan and H.I. Register of the University of Florida. Twelve years of observation of the waves, they say, show a long-term periodicity in three important aspects of the radiation.

The probability that a radiating spot will appear at any time, the apparent Jovian longitude at which it appears and the width of the spot all vary in a cycle about a decade long, the astronomers say. They suggest that the length of the cycle is actually 11.86 earth years, the time it takes Jupiter to orbit the sun. The periodic fluctuations come about, they say, because different parts of the magnetosphere are carried in and out of view from the earth as the planet orbits the sun.

THE GALAXY

Animated radio maps

Radio astronomers customarily make contour maps of the flux of radio waves that permeates the Milky Way galaxy. Maps are made for each observing frequency. Contour lines represent levels of radio brightness, and the distinction between concentrated sources, radio stars and diffuse background can be read out of the way the lines curl together or spread apart.

The maps contain highly concentrated information, and it is difficult for astronomers to get a feel for how particular features of the radio background change from place to place. Dr. Gart Westerhout of the University of Maryland has therefore put a set of such maps into an animated movie. The film represents a scan across the galaxy, and the watcher can follow any particular feature as it changes from place to place.

X-RAYS

Supernova binaries as sources

X-rays have been observed to come from various sources in the universe, but the nature of these sources is not yet clear. One possibility is binary stars.

Binaries consist of two stars orbiting around each other. Members of binary systems are as susceptible to explosions as are single stars. If one member of a binary explodes as a supernova, say Drs. George E. McCluskey Jr., of Lehigh University and Yoji Kondo of the Manned Space Flight Center, there can be cases where the orbit is not disturbed by the explosion, and a neutron star is left orbiting with a normal one.

In such a case, matter can flow from the normal to the neutron star, and this passage should generate strong X-ray emission. Certain discrete X-ray sources, they say, could represent this kind of system.

MOLECULES

New hydroxyl sources

The hydroxyl radical (OH) was the first chemical substance that can be called a molecule to be discovered in interstellar clouds (SN: 1/23/63, p. 323). Dr. B. E. Turner of the National Radio Astronomy Observatory now reports 47 new hydroxyl clouds, 14 that emit radio frequencies characteristic of hydroxyl, and 33 that betray their presence by absorbing those frequencies.