astronomy

Recycling Titan's atmosphere

Saturn may possess an invisible ring of gas circling the planet at a distance about 10 times the radius of the visible rings. This is the suggestion of Thomas R. McDonough and Neil M. Brice of Cornell University, published in the October ICARUS. The ring would be composed of gas atoms at a density somewhere between one and 1,000 atoms per cubic centimeter and would consist of gases being recycled from the atmosphere of Saturn's satellite Titan.

Titan has the most extensively studied atmosphere of any satellite in the solar system. It seems strange that it should have one since its mass is only 1.87 times the moon's, so the loss rate from its atmosphere should be large. In fact over 5 billion years (roughly the age of the solar system), Titan might have lost many times the amount of atmosphere required to give the current estimated pressure of 0.1 times the earth's atmosphere.

McDonough and Brice suggest two mechanisms for the maintenance of Titan's atmosphere: recycling and supply from Saturn's magnetosphere. Atoms lost from Titan's atmosphere are unlikely to have the velocity to escape from Saturn. Therefore they would be deposited in a ring around Saturn. If Titan has a large exosphere it could sweep up and recapture about 97 percent of the lost atoms, decreasing the effective net loss rate by a factor of nearly 100. Also, if Saturn has a magnetic field comparable to Jupiter's (10 gauss at the surface) it would have a magnetosphere with a trapped plasma and this plasma could supply Titan with a continuous flow of hydrogen atoms.

Beta Lyrae: No need for a black hole

The binary star Beta Lyrae is one of the more unusual objects in the sky. A number of astronomers have suggested that one of its components is a black hole. But this need not be, says S. Kriz of the Astronomical Institute of the Czechoslovak Academy of Sciences. In the Sept. 17 NATURE PHYSICAL SCIENCE he argues instead that the secondary component (the supposed black hole) is a massive main-sequence star surrounded by a circulating flat gaseous disk.

The black hole suggestion was based on the observation that the secondary appeared much less luminous than it ought to be in this kind of binary. Kriz says it is probably as luminous as a main-sequence star of the sort he proposes it should be, but we are looking at it through the surrounding disk, which obscures it.

The real question, according to Kriz, is not that the secondary seems underluminous for its type, but that the primary is overluminous. The black-hole hypothesis cannot account for the overluminous primary, but Kriz says his can by postulating an exchange of matter between the two.

A strange new infrared object

A new infrared object with peculiar qualities has been found near the location of the X-ray source GX2+5. It was discovered by I. S. Glass of the South African Astronomical Observatory and the Royal Greenwich Observatory who was using an infrared photometer with the 74-inch telescope of the Radcliffe Observatory in Pretoria. Spectra taken by M. W. Feast of the Radcliffe Observatory indicate that the object's light is very red and heavily obscured by interstellar absorption. Because of its peculiar nature and its location near GX2+5, they suggest in the Sept. 17 NATURE PHYSICAL SCIENCE that it be considered a candidate for identification with the X-ray source.

earth sciences

Earthquake prediction in hindsight

As an article in last week's issue of SCIENCE NEWS pointed out (p. 200), the past year has been an exciting time for seismologists working on the problem of earthquake prediction. Observations in New York, California, the Soviet Union and elsewhere indicate that a decrease in the velocity of P-type seismic waves may herald the onset of an earthquake. This and evidence of other types of premonitory signals of quakes may speed the way toward an ability to predict them.

But many seismologists have been dubious of some of the new reports. Seismograms are difficult to read to the required accuracy, and there is always the possibility that scientists caught up in the recent excitement might subconsciously misinterpret the new data. A report in the Sept. 21 NATURE may help dispel some of those doubts. The readings, as an accompanying article in the journal notes, "were made not by participants in the frenzied activity of the past year but by Japanese technicians 10 years ago."

M. Wyss and D. J. Holcomb of the University of Colorado examined the Japanese data. They found that if seismologists had known then what they know now, the 6th-magnitude earthquake swarm at Matsushiro, Japan, in 1965 could have been predicted. The data indicate that the P-wave velocity in the source region of the Matsushiro swarm decreased 20 percent approximately three years before the swarm. "The entire pattern and magnitude of the anomaly is strikingly similar to premonitory velocity changes reported elsewhere," say Wyss and Holcomb. ". . . A very strong case could have been made for the prediction of an imminent shock with magnitude near 6."

Atmosphere, ocean and El Niño

Earlier this year, oceanographer Klaus Wyrtki showed that a chain of events starting in the western Pacific Ocean leads to El Niño, the annual warming of waters off Peru (SN: 4/7/73, p. 222). This past year's El Niño was catastrophic, leading to the severely depleted anchovy catch and contributing to the world rise of soybean prices. Wyrtki found that variations in the flow of the equatorial countercurrent, which brings the warmer water eastward across the Pacific, could be recorded by measuring the difference in sea level between islands in the Pacific situated north and south of the current. He found a time lag of three months between the increase in the current's transport of warm water in the western Pacific and the onset of El Niño off South America. The studies show that it may be possible to predict the severity of El Niño.

Now Jerome Namias of the Scripps Institution of Oceanography has extended the chain of events leading to El Niño back further in time and upward into the atmosphere. He has found that the strength of the countercurrent and the resulting temperature variations off South America are related to changes in wind flow in the remote subtropical atmosphere. There are lags of as much as eight months between wind and temperature.

When the subtropical upper westerlies are strong, he shows, the trade winds blowing from the northeast are weak, and the countercurrent starts to flow more strongly eastward bringing warm water about eight months later off Central America. When the subtropical upper westerlies are weak (the trades strong) the countercurrent is slowed.

"These findings, along with Wyrtki's, suggest that when more refined researches are completed the life history of El Niño may be predictable," concludes Namias in the Sept. 28 SCIENCE.