

## ASTROPHYSICS

### Supernova remnant in Centaurus

An extended radio source in the constellation Centaurus was suspected of being a supernova remnant because of its size, location and relatively flat spectrum. Drs. J. B. Whiteoak and F. F. Gardner of the Commonwealth Scientific and Industrial Research Organization in Sydney, Australia, report in *THE ASTROPHYSICAL JOURNAL* for December that studies of its emission at three frequencies tend to confirm this. The emission agrees with a theory which says it would be caused by high-energy electrons injected into a region where the galactic magnetic field was compressed by the supernova explosion.

## COSMOLOGY

### Primordial gravitational radiation

The big bang theory of the origin of the universe predicts that observers now should be able to find electromagnetic radiation left over from the primordial explosion, and some radio astronomers believe they have found it (SN: 6/15, p. 577).

Analogously, the theory predicts that the big bang should also have produced a supply of gravitational radiation (SN: 4/27, p. 408). Some of this should still be around for observation, if observation of this sort of radiation is possible, and it should be much cooled down from the original 10 billion or so degrees.

Dr. Richard A. Matzner of the Nordisk Institute for Teoretisk Atomfysik in Copenhagen and the University of Maryland presents a calculation of the present temperature of this blackbody gravitational radiation, which he says is more accurate than previous estimates.

Starting from high-energy particle interactions likely to produce gravitons, the particles that make up gravitational waves, he presents an argument in *THE ASTROPHYSICAL JOURNAL* for December that the temperature of the gravitational radiation must now be approximately equal to or less than 1.6 degrees K.

## CELESTIAL MECHANICS

### The moon's libration clouds

In the 18th century the French mathematician Joseph Louis, Comte de Lagrange, calculated that a planet might be accompanied by companions that would precede and follow it by 60 degrees.

He came to this conclusion from a study of the gravitational forces of the sun and the planet. The forces are in equilibrium at the 60-degree points and an object that happened to fall into those libration points would stay and move around the sun with them.

Lagrange's theory works equally well for the earth and the moon as for the sun and a planet. In 1961 Dr. Kazimierz Kordylewski of the University of Krakow reported seeing faintly luminous clouds.

In the intervening years some trained observers have been able to see the moon's clouds, and others have not. Most recently a report in *NATURE* for Jan. 4 by Dr. Vladimir Vanysek of the University of Massachusetts considers them well-confirmed, reports new observations

and begins to try to determine what they are made of. Meanwhile in *ICARUS*, Vol. 9, page 429, Dr. Robert G. Roosen of the University of Texas reports his inability to find one of them at a level of detection 30 times fainter than the brightness reported by Dr. Kordylewski.

## PLANETARY ASTRONOMY

### The Great Red Spot

Jupiter's Great Red Spot has puzzled astronomers for centuries. Among the theories of what it might be, a persistent candidate has been the notion that it is some kind of cyclone in the Jovian atmosphere.

A report, in *ICARUS*, Vol. 9, page 474, of vortical motion in the Spot tends to support the theory.

Drs. E. J. Reese and B. A. Smith of New Mexico State University watched the interaction of the Great Red Spot with two series of small dark spots moving through the region where the Red Spot lies. They report that the edge of the Red Spot turns around with a circulation period of about 12 days.

## PLANETARY ASTRONOMY

### Search for Jovian auroras

The planet Jupiter is a strong source of 10-centimeter radio waves. These waves are in the wrong range to come from thermal vibrations; their sources must be driven by some other energizing mechanism, almost certainly a strong magnetic field.

Astronomers have thus concluded that the planet has a strong magnetic field and have been looking for phenomena analogous to those produced by the earth's magnetic field, especially auroras.

Past searches have shown nothing like them. But the sun is now entering a period of high activity, during which terrestrial auroras tend to increase. Reasoning that Jovian ones might also increase, Dr. Michael T. Schwitters of the University of Texas decided to look again. He reports in *ICARUS*, Vol. 9, page 570, that in 20 hours of exposure he found only one feature in the hydrogen-alpha spectrum that might be auroral.

## SOLAR ASTRONOMY

### Flare radiation

Observers of solar flares have had difficulty in attributing observed radiation at widely different wavelengths, both hard X rays and microwave radio, to a single source of electrons, although a model of that sort would be simpler and more satisfying than other possibilities.

Now, however, in studies of a flare that occurred on July 7, 1966, Drs. Stephen S. Holt and Thomas L. Cline of the Goddard Space Flight Center in Greenbelt, Md., have succeeded in determining both the number of electrons involved and their energy spectrum.

They conclude in *THE ASTROPHYSICAL JOURNAL* for December that "both the observed X radiation and synchrotron radiation [the microwaves] can be explained in terms of the same electron source if the source region is high in the chromosphere, where the maximum [magnetic] field may be as high as 1,000 gauss."