physical sciences

Gathered at the meeting of the American Physical Society in New Orleans last week

ASTROPHYSICS

Gamma-ray pulsar

More than 40 pulsars have now been discovered. All of them give off pulsed radio signals at rates varying from once in three-thousandths of a second to once in three seconds. Only one, NP 0532 in the Crab nebula, has been observed to pulse in any other range of the electromagnetic spectrum than the radio. It pulses in both light and X-rays up to 100,000 electron-volts energy.

Now there is evidence that this pulsar also pulses in gamma rays with energies above 10 million electron-volts, reports Dr. Nathan Seeman of the Naval Research Laboratory.

On Oct. 25 a spark chamber and plastic detectors were sent aloft to record gamma rays from the Crab at an altitude where they would be undisturbed by collisions with elements of the atmosphere. So far only the spark chamber evidence has been analyzed, but it shows gamma-ray pulses at NP 0532's primary rate.

GRAVITY THEORY

Negative forces between electrons

The gravitational forces between large bodies are always attractive. Yet the modern theory of gravity predicts that when the bodies are spinning the effects of the spin make a contribution to the net force and this contribution may be repulsive. In most cases the spin contribution, if it is negative, is negligible compared to the basic attractive force.

This may not be the case for the gravitational force between two electrons, says Dr. R. F. O'Connell of Louisiana State University, who has been making theoretical calculations of the gravitational field generated by electrons.

The spins of the electrons are so large compared with their other properties that the spin contributions will dominate the gravitational forces between the electrons at close distances. Therefore, says Dr. O'Connell, the net force between electrons may be repulsive if the spins happen to be properly oriented to make it so.

ASTROPHYSICS

Variations of quasars and related objects

In attempts to understand the physical processes going on inside astronomical objects an important piece of information is whether their light output varies and, if so, how it varies. A program of photographic monitoring of quasars, N galaxies and Seyfert galaxies has been carried out over the last two years at the University of Florida by Drs. G. H. Folsom, A. G. Smith, R. L. Hackney and K. R. Hackney.

Some of the objects they studied were known optical variables; others were chosen because they had unusual radio spectra which led to the belief they might be optical variables. Of these objects 12 percent show violent activity (changes in brightness exceeding one magnitude in periods of days or weeks), 54 percent show some activity (changes of half a magnitude or less in weeks or months) and 12 percent have changed significantly since 1954 but are not now active. No evidence of change since 1954 was shown by 23 percent of the objects.

POLLUTION

Magnetic containment of oil slicks

A magnetic method for containing oil slicks spilled on water is under development at the University of South Florida, reports Dr. J. E. Turbeville. The idea consists of spreading a buoyant ferromagnetic material on the slick to convert it into a ferromagnetic film. When this has been done the proper magnetic devices may be able to capture and contain the slick and possibly even move it away from areas where there is a great chance of damage to property or ecology.

PLANETARY PHYSICS

Jupiter's decametric radiation

One of the persistent mysteries of the planet Jupiter is the radiation that emanates in the decametric wavelength range (10 to 100 meters). Unlike many other planetary radiations this cannot be ascribed simply to the heat of the planet. Some other source must be found for it.

A possible explanation is that Jupiter, like the earth, possesses a magnetosphere, an outer atmosphere of charged particles bound to its magnetic field, and that this magnetosphere is disturbed by the passage of Jupiter's nearest satellite, Io. The radiation would be caused by the disturbance.

To see whether Io does in fact influence the radiation, Drs. H. R. Miller and A. G. Smith of the University of Florida analyzed the radiation received over a frequency range between 15 and 27.6 megahertz—20 to 11 meters. There are three distinct sources in this range, called A, B and C. Drs. Miller and Smith found that the brightness of B and C appears to depend almost entirely on the position of Io, while A has two components, one related to Io's position and one not so related.

FLUID PHYSICS

Thermomagnetic force in gases

When a thin disk is suspended in a heated polyatomic gas and a magnetic field is applied, the disk will feel a force distinct from the ordinary pressure. In fact, this thermomagnetic force can be opposite to the pressure, Drs. Mark E. Larchez and T. W. Adair III of Texas A&M University reported earlier this year (SN: 7/25, p. 66).

Since discovering the thermomagnetic force they have studied its dependence on the temperature and the strength of the magnetic field. They find that the force depends on the ratio of magnetic field to pressure—it diminishes as the ratio increases.