physical sciences notes

PARTICLES

Neutron charge distribution

Although the neutron is electrically neutral as a whole, experiment has shown that within it is a distribution of negative and positive charge that adds to zero overall. The question now is whether that distribution is symmetrical.

If the distribution is not symmetrical, the neutron will have an electric dipole moment; in spite of its neutrality it will react very slightly to the attractive force of an electric field. The latest experiment seeking such an attraction was reported June 17 to the American Physical Society meeting at Los Alamos, N.M., by Dr. Victor W. Cohen of Brookhaven National Laboratory who worked with Drs. Robert Nathans, Henry Silsbee, Edgar Lipworth and Norman Ramsey.

The experiment sought to determine whether the magnetic resonance frequency of a beam of neutrons would be altered by a strong electric field. It found an alteration, but the experimenters are not yet sure the change might not be caused by other experimental effects.

If the change is caused by a dipole moment, however, the size of the moment has to be about ten times smaller than previous theoretical calculations suggest it might be.

COMPUTER SCIENCE

NAS names a board

Because of the rapid evolution of computers and their increasing influence on the life of the nation, the National Academy of Sciences has established a Computer Science and Engineering Board.

Composed of academic and industrial specialists in the field, the new board will assess the implications of the growth of information processing technology as it affects the public and private sectors of the nation.

The chairman of the new board is Prof. Anthony G. Oettinger of the Aiken Computation Laboratory of Harvard University.

CHEMICAL ANALYSIS

Cryogenic infrared technique

A method of gas analysis that uses infrared spectroscopy from frozen samples has been developed by M. M. Rochkind of Bell Telephone Laboratories. The technique, known as pseudo matrix isolation, is applicable to all gases that absorb infrared light—about 99 percent—and can be used on very small samples.

For analysis, a gas mixture is diluted with nitrogen and frozen by being blown against a piece of cesium iodide cooled to minus 253 degrees C. Freezing suppresses motions of the gas molecules that complicate the way the gas absorbs infrared light. Embedding the molecules in a matrix of inert nitrogen prevents chemical interactions among them, which also add complications.

The method is expected to be useful in air pollution control, in photochemical research, as a quality control tool in industry, and in chemical laboratory analysis.

THEORETICAL PHYSICS

Special relativity in close quarters

Of all the theories of modern physics special relativity probably has the most abundant collection of evidence in its favor; yet physicists still worry whether it will hold at distances shorter than they have yet tested it.

A way to find out, say Drs. L-E. Lundberg and L. B. Rédei of Umeå University in Sweden in the PHYSICAL REVIEW for May 25, is to assume that the theory does not hold below a certain limit—7×10^{-16} centimeter—and calculate the changes this would make in the activities of elementary particles.

One such result is a one percent change in the lifetimes of charged pions, and the Swedish physicists suggest searching for this.

Another experiment performed at Brookhaven National Laboratory confirmed that the constant speed of light, cornerstone of special relativity, holds down to 10^{-16} cm. (SN: 2/18/67, p. 163).

MAGNETISM

Nonmagnetic laboratory

An environment strictly free of magnetic materials is necessary for certain kinds of experiments in which weak magnetic fields are to be controlled precisely—including such things as exact determination of electrical units. At the National Bureau of Standards, a newly-completed nonmagnetic laboratory is now available for such experiments.

In the construction and operation of the laboratory iron-bearing rocks and soil, steel hardware and tools and even steel nails in the walls had to be avoided. A location was chosen at which the earth's magnetic field is as uniform as possible—such a site was found in an out-of-the-way part of the Bureau's Gaithersburg, Md., property. The only nearby source of magnetic disturbance is the linear accelerator about a quarter of a mile away. The accelerator will not be on constantly, so there will be quiet periods for the new laboratory's experimentation.

CELESTIAL MECHANICS

Icarus found

When the asteroid Icarus made its close approach to the earth June 14, the radar beam from the Lincoln Laboratory Haystack antenna found it as planned (SN: 11/18/67, p. 490). Predictions of the asteroid's motion derived from 71 optical observations since it was discovered in 1949 proved accurate enough for the radar to make contact.

The reflected signal, however, was very weak—too weak to gain information on surface roughness or possible rotation of the asteroid.

The observations do confirm and will probably refine previous predictions of Icarus' path. A more precise calculation may make it possible to determine whether the asteroid performs according to Einstein's general relativity, which predicts the amount its orbit shifts over time.