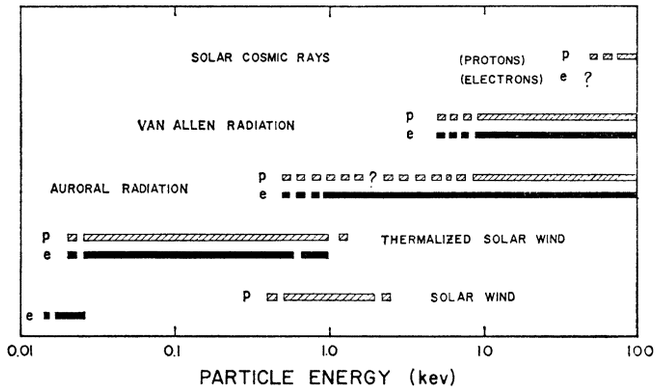
Physical Sciences Notes

INSTRUMENTATION

Versatile Detector for Particles

Since the launch of Explorer I in 1958, the most active discipline in space research has been that of fields and particles, with several hundred instruments having been flown on scores of satellites and space probes.

However, there has been a largely unfilled need for a single instrument that can measure particles of all the energies found in space near earth. Scientists at Rice



University in Houston have now developed an instrument to fill that need.

The Switched Proton Electron Channeltron Spectrometer, SPECS for short, sorts both electrons and protons into 18 different energy spectra over the range between 50 electron volts to 100,000 electron volts. The device can make this spectral analysis in a period that may be varied from less than one second to tens of seconds.

Different versions of the device have been built for numerous rockets and satellite applications, Dr. Brian J. O'Brien and his co-workers report in the current REVIEW OF SCIENTIFIC INSTRUMENTS (Aug.). Total weight of the instruments is either 900 or 1,600 grams with a power dissipation of about one watt and a size of less than 1,600 cubic centimeters.

SOLAR SYSTEM ASTRONOMY

Radar Map of Venus

Scientists at Massachusetts Institute of Technology's Lincoln Laboratory are using two antennas linked as an interferometer to make the first radar map of the surface of Venus. Admittedly the map will be "crude, but it will be better than no map at all." The surface of Venus, planet closest to earth, is hidden by clouds.

The studies are being made before, during and after the time of inferior conjunction, which occurred on Aug. 29, when the earth's twin planet was 26.6 million miles away and in line with the earth and sun.

Although the cloud veil prevents optical observations of the planet's surface, radar waves can penetrate it, and have done so in the past. However, previous observations were made with only one antenna, sufficient to pin down the planet's rotation rate as 242 days, 14 hours and 24 minutes.

The two antennas being used for the mapping are 120-foot Haystack dish and the 60-foot Westford dish. The radar map is expected to be about the quality of photographs of Mars taken with the average optical telescope.

The project is under the direction of Dr. Tors Hagfors. Dr. Alan E. E. Rogers is coordinating in the experiment because of his experience using radio telescopes as interferometers.

RELATIVISTIC PHYSICS

Faster-Than-Light Particles

Most physicists, although not all, believe that Einstein's theory of special relativity precludes the possibility of transmitting energy from point to point at velocities greater than the speed of light in a vacuum, as postulated by Einstein in his first paper on the special theory.

The possibility that there are particles whose velocities are always greater than the speed of light is not in contradiction with special relativity. Such particles might be created in pairs, thus eliminating the necessity of accelerating ordinary particles through the "light barrier."

Dr. Gerald Feinberg of Columbia University, now on leave at the Rockefeller University in New York, reports his reasons for believing that the limiting velocity of light is a limit with "two sides" in the current PHYSICAL REVIEW (July 25).

Dr. Feinberg explains that he meant the statement to be "poetic," but pointed out that a limit is reached by taking a series of values, which can be either above or below that limit. He cited zero as a limit for either positive or negative numbers depending upon which way one goes.

Dr. Feinberg calls particles moving faster than light tachyons, from the Greek word "tachys," meaning swift. Tachyons would have no spin, and would increase in velocity as their energy decreased.

They could be detected, if they carry an electric charge, by the Cerenkov radiation they would emit in a vacuum. Normal particles emit Cerenkov radiation only in matter.

"The objections generally raised to the existence of such particles are not valid in relativistic quantum theory." Dr. Feinberg concludes. He says experiments are now in progress at Princeton University to search for tachyons.

SOLAR SYSTEM ASTRONOMY

Enhanced Luminescence of the Moon

During the past 20 years numerous visual and photographic observations of lunar luminosity have been reported, but many of these provided doubtful evidence due to inadequate techniques. Recent intensity measurements of selected regions, however, demonstrate convincingly the existence of short periods during which portions of the moon shine more brightly than would be explained by simple reflection of solar light.

Two indirect processes—enhancement of normal reflectivity and photoluminescence—contributed simultaneously to observed increases in brightness, Dr. Ann Palm of the Southwest Center for Advanced Studies in Dallas believes.

She reports in ICARUS (Sept.) that solar radiation emitted during periods of solar disturbance can create lunar color centers that enhance normal reflectivity by their actions as photoabsorbers. The newly formed color centers may also be bleached by ordinary sunlight, resulting in spontaneous emission of light.