physical sciences

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

PARTICLES

Anti-omega-minus

To every subatomic particle there corresponds an antiparticle. So says physical theory. For the six years since the particle called omega-minus was discovered, physicists have looked for its antiparticle. Now Dr. Gerson Goldhaber of the Lawrence Radiation Laboratory at Berkeley, Calif., reports he and his colleagues have found it.

The anti-omega-minus, which has a positive electric charge, is the last antibaryon expected to live long enough to leave its own track in a bubble chamber. Antibaryons are antiparticles to the baryons, a class of heavy particles related to neutrons and protons. Other baryons and antibaryons exist, the so-called resonances, but these are too short-lived to leave their own tracks. Their presence has to be inferred secondarily from the particles into which they decay.

No one had expected that the anti-omega-minus could not be found, says Dr. Goldhaber, but its discovery was necessary to keep the theory intact.

ACCELERATORS

CERN storage rings operate

A storage ring is a device that takes accelerated particles from an accelerator, stores the beam in a circular track until it is built up to a proper density of protons or electrons and then collides it with a beam going in the opposite direction. This sort of collision makes a good deal more energy available for the creation of new particles than a beam of the same energy striking a stationary target.

At present the world's only colliding beam project for protons is the Intersecting Storage Rings at the CERN laboratory in Geneva. These are designed to take protons from the CERN Proton Synchrotron, which can deliver them at energies up to 30 billion electron-volts (GeV).

Dr. Bernard P. Gregory of CERN told the meeting that the first collisions in the ISR took place Jan. 27. This, he says, is really the test that everything is well built and working properly.

Protons at 15-GeV energy were used for the test instead of 30-GeV protons since they could be taken out of the Proton Synchrotron while it was accelerating without disturbing its experimental program. The next step, says Dr. Gregory, is achieving the full design intensity of the proton beam. The test was run at one-tenth the design intensity, which calls for the equivalent of a 20-ampere current.

PARTICLES

A_2 meson not split

A meson designated A_2, which comes in three varieties—positive, neutral and negative electric charges—has been causing a serious flap among particle physicists: Some experiments at the CERN laboratory in Geneva showed that the negative A_2, instead of being a single particle, is split into two apparently related particles. If that were so, it would require drastic revisions of the current theory that says subatomic particles are made of subentities called quarks. The ways in which quarks can be put together in the present theory cannot account for the properties of twin A_2's.

But an experiment reported to the meeting by Dr. K. J. Foley of Brookhaven National Laboratory seems to show that the negative A_2 is not split. Dr. Foley was joined in the work by Drs. W. A. Love, Satoshi Ozaki, E. D. Platner, A. C. Saulys and S. J. Lindenbaum.

The Brookhaven experiment convinces some observers that the A_2 is not split. But the two experiments were done by different techniques, and others warn that until the CERN method is repeated exactly, they will hold that A_2 is split under some conditions and not split under others.

PARTICLES

No monopoles

Magnetic monopoles are hypothetical bodies that would have a single magnetic pole, either north or south. All known magnets have at least one north and one south pole, but certain theories predict the existence of monopoles and there is a continuing search for them. A claim of tentative evidence for the existence of a monopole was reported at last month's Lunar Science Conference (SN: 1/23/71, p. 61).

According to theory energetic neutrinos might spontaneously produce pairs of monopoles, and Drs. R. A. Carrigan Jr. and F. A. Nezrick of the National Accelerator Laboratory made a search of bubble-chamber pictures taken during neutrino experiments at the CERN laboratory in Geneva to see if any monopoles appeared. But, they reported in New York, no tracks that could be attributed to monopoles appeared.

PARTICLES

More about partons

In the last two years experiments in which protons and neutrons were bombarded with high-energy electrons have given indications that protons and neutrons are not amorphous masses but composed of distinct subparticles. The subparticles have been named partons, and whether or not they correspond to the hypothetical quarks remains a moot question (SN: 10/24/70, p. 333).

The existence of partons can influence other interactions in which protons and neutrons participate. Dr. K. M. Terwilliger of the University of Michigan reports that experiments in which protons were bombarded by pi mesons also appear to be in harmony with the parton idea. If there are partons, the angular distribution of pi mesons scattered backward should approach a constant limit as energy goes up. Experiments done at Argonne National Laboratory at energies between 2 billion and 6 billion GeV show a trend toward such a limit, he says. Experiments with the 500-GeV accelerator at the National Accelerator Laboratory, which is expected to be in operation by midsummer, will extend the observations.