PHYSICS

All Atomic Particles Equal

With the increasing number of new particles being discovered, the theory that no particle is more elementary than another is gaining strength according to Dr. Geoffrey Chew.

➤ THE PROTON, the neutron and other "aristocrats" of matter are losing their status among the growing population of atomic particles.

The "notion of democracy"—that no particle is more elementary than another—is gaining strength among modern physicists, Dr. Geoffrey Chew said at the centennial celebration of the National Academy of Science in Washington, D. C.

Dr. Chew, a theoretical physicist of the University of California, Berkeley, has been a leader in efforts to give meaning to the great number of new particles being discovered with high-energy research equipment.

Not long ago physicists believed all matter could be built up out of certain elementary particles, such as the electron, proton, neutron and mesons. The list of such particles kept growing until there are now from 30 to 100 entries, depending on which physicist you talk to.

The particles fall into two groups. One group, called the leptons, contains only the electron, the mu meson and the two neutrinos. They do not interact strongly with other particles.

All other particles are called strongly interacting particles. It is in this second group that the need for democratic thinking is most urgent, Dr. Chew said.

He protested the second-class citizenship assigned to particles like the deuteron, simply because it is thought to be a composite.

By stripping the particles of their ranks, he said, the proton could be considered a combination of a neutron and a positive pi meson.

On the other hand, the neutron could be considered as a composite of a proton and a negative pi meson.

Testing the theory that one elementary particle is just as elementary as the next would require a particle accelerator five times as powerful as the biggest one existing.

He said the secrets of the strongly interacting particles are being unlocked faster than those concerning the leptons.

Dr. Chew has proposed a system called "bootstrap dynamics" to explain the large number of strongly interacting particles. Each particle is thought of as a combination of other particles held together by forces arising from the exchange of still other particles.

Another speaker at the Academy's centennial celebration, Dr. Eugene P. Wigner, mathematical physicist at Princeton University, said that physicists also are giving up, at least temporarily, the hope of finding a single basic interaction.

Early in this century, he said, the electromagnetic interactions were considered to be the source of all others.

Fremont Davis

NAS CENTENNIAL—Shown at the centennial celebration of the National Academy of Sciences are from left to right, Dr. Frederick Seitz, president of NAS, Dr. Detlev W. Bronk, past president of the Academy and chairman of the centennial committee, and Dr. Paul A. Weiss of Rockefeller Institute.

Four or five distinct types of interactions are now recognized, Dr. Wigner said—the gravitational, the electromagnetic, one or two types of strong nuclear interactions and the weak interaction responsible for such phenomena as beta decay.

At present, Dr. Wigner said, there is no way of telling how many interactions there are.

• Science News Letter, 84:275 Nov. 2, 1963

ASTRONOMY

Comet Belt Predicted Near Farthest Planet

➤ A BELT of yet-to-be-seen comets lies near the pathway of the farthest planet, Pluto, predicted Dr. Fred L. Whipple, director of Smithsonian Astrophysical Observatory, Cambridge, Mass.

Dr. Whipple, who is also an astronomy professor at Harvard University, said the belt extends out to an undefined distance.

The belt is distinct from the great cloud of comets that is more than twice as far off and that accounts for the occasional comets we see.

Speaking at the National Academy of Science's centennial celebration, Dr. Whipple said rocket-borne space probes soon should confirm whether or not such a belt exists and also answer a number of major questions concerning the history of the solar system.

Comets are like flying dust bowls. Surrounding the dust particles are basic gases locked in ice. When they come near the sun, the gases are released, forming long, spectacular tails in contrast to the comet's head.

Dr. Whipple said the gravitational pull of the comet belt probably is responsible for disturbances in the planet Neptune's orbit. This would mean that the belt would be ten times heavier than the earth.

Neptune's eccentric path had been attributed to the gravitational pull of Pluto, but Dr. Whipple said that is unlikely. Pluto appears far too small to be as heavy as a single earth.

Dr. Whipple said pieces of comet clouds probably were the building blocks of Neptune and the planet Uranus, while the giant planets were formed from condensing gases, mostly hydrogen and helium.

The belief that our entire galaxy was formed from helium as well as hydrogen was supported by another speaker at the centennial celebration, Dr. William A. Fowler of California Institute of Technology, Pasadena.

He outlined the current theory that 12 to 15 billion years ago the galaxy was a rotating mass of turbulent hydrogen gas. The gas in regions of relatively low turbulence and high density began condensing into stars.

As the stellar material contracted, he said, the interior became very hot and dense, triggering nuclear reactions. The first such reactions were fusions of hydrogen into helium. More complicated reactions followed, forming the other elements.

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