

PHYSICS

Hydrogen Came First

Laboratory creation of miniature "galaxies" leads scientist to propose the universe first consisted entirely of hydrogen ions.

See Front Cover

► ALL MATTER first appeared in the universe as hydrogen ions, Dr. Winston H. Bostick, head of Stevens Institute of Technology's physics department, has proposed.

His explanation is based on the laboratory creation of miniature "galaxies" that bear a striking resemblance to the giant star systems making up the visible universe. The earth, the other planets and the sun are among the billions of heavenly objects composing one of these galactic systems, the Milky Way.

The laboratory "galaxies" are made by firing chunks of ionized matter at each other at speeds up to 140 miles per second, Dr. Bostick told the American Nuclear Society meeting in Washington.

His experiments also suggest that magnetism is the force repelling galaxies from each other, resulting in the expanding universe that astronomers observe. Dr. Bostick's work was started in June, 1954, at the Radiation Laboratory of the University of California in connection with Project Sherwood, code name for the Atomic Energy Commission's research program aimed at taming the H-bomb's fusion process for peaceful purposes.

After joining the Stevens faculty this fall, Dr. Bostick developed his galactic theories, in cooperation with Dr. David Finkelstein, also of Stevens.

If further experiments confirm their work, the knowledge of astronomers concerning the origin of the universe may be extended backward by a billion years, which Dr. Bostick estimates is the length of time required for forming a galaxy.

The miniature "galaxies" are formed using a "plasma gun" designed by Dr. Bostick. About the size of a pencil eraser, the gun consists of two tiny wires embedded in a ceramic base, with the ends flush with the face.

By forcing electric currents up to 10,000 amperes through the wires in one-half of a millionth of a second, an arc is formed between the two wire ends. The wires are made of titanium metal with deuterium gas absorbed or occluded in it. The current heats the tips to temperatures sufficiently high to ionize both the titanium and the deuterium.

Titanium and deuterium ions, particles of matter carrying positive charges, and electrons, tiny negative particles, are hurled from the plasma gun at speeds equivalent to 450,000 miles an hour.

This is the highest speed that matter of such density is known to have attained on earth. Atom smashers produce higher

speeds but, by comparison, accelerate only an infinitesimal quantity of particles.

If the energy were expressed as temperature, the titanium ions would reach 100,000,000 degrees centigrade and the deuterium ions 4,000,000 degrees centigrade. The former temperature is comparable to those generated in thermonuclear explosions or in stars.

When the ionized matter, known as plasma, is fired across a magnetic field, the ions take a curved path and form into tightly knit luminous pellets. Dr. Bostick has named these entities "plasmoids."

The plasmoids behave rather like elementary nuclear particles on a large scale.

When several plasmoids are fired simultaneously toward a center in a magnetic field, they trace spiral paths around the common center.

Sequential photographs of such spirals, created in a split second, have a marked geometric similarity to photographs of heavenly galaxies made by astronomers during various stages of formation and aging, Dr. Bostick reported.

One such set of photographs is shown in

the photograph on the cover of this week's SCIENCE NEWS LETTER. The figures in the lower left corner of each picture give the time in microseconds after the simultaneous discharge of eight "plasma guns."

The speed attained by the plasmoids, up to 450,000 miles per second, is approximately that of stars moving around in the spiral arms of galaxies.

He suggests that a heavenly galaxy is formed when the electrons and protons of the ionized hydrogen in space are attracted gravitationally toward a center across a magnetic field. Since this situation is believed unstable, jets of plasma, or ionized matter, would be formed and be attracted toward the center across the magnetic field.

"When they are," Dr. Bostick said, "it is anticipated that the centerward-traveling jets will behave like the plasmoids we have produced in the laboratory, that is, produce spiral arms which eventually wrap themselves up into a central structure."

The gravitational energy generated in the process of galactic evolution, Dr. Bostick believes, is transformed into magnetic energy. He suggests that the accumulation of such energy may lead to the formation of an ever-growing general magnetic field.

As the strength of this field increases, it may give rise to the forces that bring about the continuing expansion of the universe, since these magnetic fields repel the magnetic fields surrounding other galaxies.

"Thus, for the first time," Dr. Bostick concludes, "we can begin to understand the mechanism that brings on the expansion of the well-documented 'expanding universe.'"

Science News Letter, December 22, 1956



AERIAL RECONNAISSANCE CAMERA — Typical of the high-precision lenses used by the U. S. Air Force for aerial reconnaissance is this 36-inch lens built by the Perkin-Elmer Corporation, Norwalk, Conn. It is shown here on a test stand for final adjustments. Such cameras might be used if President Eisenhower's proposed "Open Skies" program were adopted.