

ASTRONOMY

Origin of Solar System

Objects accumulated in a dust cloud very early in the solar system's history played an important part in the formation of the planetary system and possibly the sun, theorizes Dr. Urey.

► A NEW THEORY for the origin of the solar system is proposed by the Nobel Prize winner, Dr. Harold C. Urey of the University of Chicago.

It accounts, Dr. Urey reports, for some characteristics of meteorites, including the diamonds found in them, and for the varying densities of the planets.

His theory is that objects about the size of asteroids or the moon accumulated in a dust cloud very early in the solar system's history, or about 4,500,000,000 years ago. These solid objects played an important part in the formation of the planetary system and possibly of the sun, Dr. Urey believes.

After clumping together, the solid objects were then heated to temperatures sufficiently high to melt silicates and iron, 1,500 degrees centigrade. Dr. Urey suggests that either chemical heating by free radical reactions or heating by the fall of objects through gases could produce the necessary high temperatures.

After some period of time, millions or tens of millions of years, during which the objects cooled to about 500 degrees centigrade, they fell rapidly toward a gravitation center. It was then that the sun was formed, with a gigantic disk composed of leftover gas and these solid objects.

During this process, melting of the iron and silicates that are the chief materials of meteorites could also have occurred.

These primary objects were then broken up by intense collisions that reduced the solid material to fragments varying from too small to be visible up to the size of meteorites, Dr. Urey proposes.

The gas and dust in the giant solar disk were dissipated by solar light pressure and turbulent gases, and some of the solid material was removed by spiraling toward the sun.

It was during this time, about 4,300,000,000 years ago Dr. Urey believes, that the planets and asteroids accumulated.

During the process of breakup and reaccumulation, separation of the silicates and metals occurred in varying degrees. This variable loss accounts for the different densities of the planets, Dr. Urey reports in the *Astrophysical Journal* (Nov., 1956).

Fragments resulting from the later breakup of the reaccumulated objects are the meteorites. The primary, or first-formed, solid objects must have clumped together before the formation of the solar system, Dr. Urey believes, in order to account for the known properties of meteorites.

He suggests that protoplanets, or planets in the making, in the sense of large masses of gas and dust of the same composition as the sun did not occur, or at least they did

not occur until after the separation of the metals and silicates in the primary solid objects.

Dr. Urey proposes that the moons circling the earth and other planets were formed by a similar process.

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ASTRONOMY

Two Generations of Stars Found in Orion Nebula

► A "FATHER" star that sired more than 100 stars in a brief but very intense "lifetime" is the source of one of the brightest regions in the sky, the Orion Nebula.

The first star lived and died within 1,800,000 years, which is a relatively short time on the astronomical time scale. When it burned out, it left behind a dense compressed shell of neutral hydrogen within which a second generation of stars were formed.

This life history of the Orion Nebula is drawn by Dr. Malcolm P. Savedoff of the University of Rochester, Rochester, N. Y. He believes the Orion region was a shapeless cloud of neutral hydrogen until about 2,000,000 years ago. Then the initial star, so bright it was completely burned out some 200,000 years ago, appeared.

Around the primary star was formed an ionized hydrogen region in which the gas pressure was several hundred times that in the neutral cloud. The ionized gas expanded into interstellar space, squeezing the material there to produce a compressed region of neutral hydrogen in which the 100 very bright and hot stars were formed nearly simultaneously.

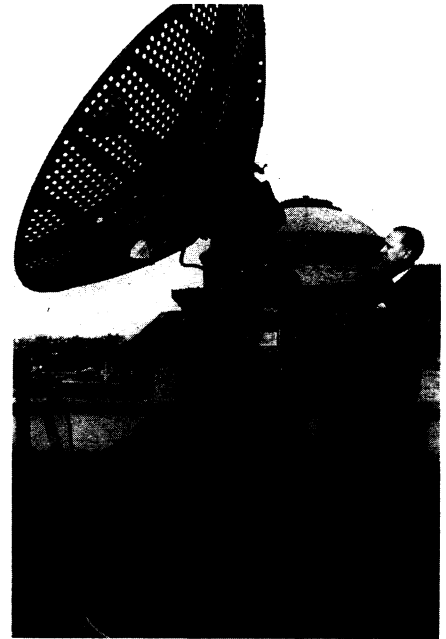
"In the second generation," Dr. Savedoff reports, "the Orion Nebula is the brightest emission nebula in the sky." Therefore, he concludes, in the *Astrophysical Journal* (Nov., 1956), "it should be the most ephemeral."

The constellation of Orion is visible high in the southern sky during the evening in January. The Great Nebula in Orion is marked by the middle star of the three in line in Orion's sword. Through the telescope it appears as a luminous greenish cloud.

Dr. Savedoff bases his theory on the observed mass, radius and expansion rate of the great arc in the Orion Nebula that appears as an elliptical ring, which is also the source of radio waves.

The shell surrounding the Orion Nebula has an observed velocity of about six miles per second and a mass five times that of the sun.

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FOR "CENSUS" OF NEUTRONS—
The antenna shown with Prof. Serge A. Korff will be used on Guam by two New York University physicists in counting neutrons produced by cosmic rays. They hope to find, among other things, a new scientific check for the measurement of historic time.

AGRICULTURE

Device Shocks Seeds Into Germination

► SHOCK-TREATMENT APPARATUS may soon be a standard piece of American farm equipment. With it, farmers will be able to improve germination, dry grain, process food and kill weed seeds.

The key to these future farm possibilities with shock treatment is a small electrical device invented by O. A. Brown of the U. S. Department of Agriculture's experiment station, Knoxville, Tenn. It is a low-frequency electrical energy machine that is simple in design and operation and inexpensive.

Experimentally, a working model of the device has successfully speeded up corn seed germination, helped prepare soybean seeds for dehydrated processing and inhibited the germination of other seeds.

The device consists of a glass tube, horizontally mounted, and fitted with electrical terminals at each end. The tube has two mouths on top. One, corked in operation, is the entrance for the seeds. The other is connected to a vacuum pump.

Seeds put into the tube are subjected to radiation from the glow discharge of the low-frequency current at less than atmospheric pressure. The device gives greater control than previously possible. Mr. Brown was aided in developing it by associates at the station.

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