PHYSICS

Law May Be Universal

Gravitational law is still on trial but winning out, 299 years after birth of Newton. Distribution of galaxies obeys law. Theory of expanding universe questioned.

➤ IN THIS 299th year since the birth of Sir Isaac Newton on Christmas day, 1642, according to the Old Style Calendar then in use in England, his law of gravitation is still on trial but winning, according to Dr. Fritz Zwicky, professor of theoretical physics at the California Institute of Technology, in a report to the Astronomical Society of the Pacific.

The question is not whether the precise form of the law is Newton's or Einstein's, but the extent of its application whatever its form. Newton believed his law to be universal. "Every particle of matter in the universe attracts every other particle . . ." was Newton's formulation.

But it was a small universe in Newton's time. The extension of the force of gravity to the moon, and its action in producing the tides, were demonstrated by Newton himself. Its application to the planets and their satellites was readily verified in his time. Its application to comets was firmly established by the return of Halley's comet as predicted, 77 years after the calculations were made.

But all this concerns only our immediate solar system, a small speck in a vast universe of stars. Do the stars also obey this law? To answer this question took more time. Double stars revolve about each other but often require many years to complete a revolution, and are so far distant that the changes of position as seen in the telescope are of microscopic dimensions. It was not until 1830, more than a century and a half after the publication of Newton's law, that the astronomer, Savary, was able to show that the motions of these bodies are elliptical and the law of gravitation therefore applies.

But these stars belong to our own galactic or milky way system, a huge conglomeration of stars, clusters and gaseous bodies, 100,000 light years in diameter and about 20,000 light years thick at the center. It is only one among billions of others like it scattered about in a great universe of galaxies that extends at least 100,000,000 light years in every direction. Do the same laws apply in these distant galaxies or spiral nebulae?

This is a much harder question to answer than any of the others, and the answer cannot yet be regarded as complete. We believe that our own nebula or galaxy is revolving, but it takes 200,000 years to make one turn. Motions have been observed in our neighboring galaxy, Andromeda, only 870,000 light years away, which might be part of such a revolution, but it is too early to say.

Strangely enough, Dr. Zwicky finds the best evidence for the operation of gravity over inter-galactic distances, measured in millions of light years instead of millions of miles as in our solar system, in certain clusters of nebulae that occur. Imagine, a cluster of a universes each one like our great milky way! One of these in the constellation of Coma is 45,000,000 light years distant and about 5,000,000 light years in diameter. It contains, Dr. Zwicky estimates, over 2,000 galaxies; 650 have been counted.

The distribution of these galaxies within the sphere they occupy can be calculated on the basis of Newton's law of gravitation, and Dr. Zwicky finds that the actual distribution corresponds very nearly with that predicted by the law.

Incidentally, Dr. Zwicky says that these clusters of nebulae could not have settled down to their present state in the short time of less than 10,000,000,000 years allowed by the advocates of the expanding universe. Besides supporting the general validity of Newton's law of gravitation, he says they also suggest that the universe is not expanding.

Science News Letter, November 7, 1942

WORLD'S LARGEST—Remember when the huge tires were made for Admiral Richard E. Byrd's Antarctica "Snow-Cruiser"? Well this one of the set of six, which was on display for more than a year at the Chicago Museum of Science and Industry, has now been returned to the Goodyear Tire and Rubber Company to be made into about 120 retreads for the tires of war workers. The other five are still in Antarctica. This one is 10 feet in diameter and weighs between 1200 and 1300 pounds with its rim.