ASTRONOMY

Query Newton's Theory

Comparisons between the observed and predicted positions of the planet Jupiter suggest there may be an error in Newton's fundamental theory.

➤ NEWTON'S theory of gravitation, used to predict the motion of planets, may be wrong.

Drs. R. H. Dicke and R. Krotkov of Princeton University told the American Physical Society meeting in Washington a comparison between the observed and predicted positions of the planet Jupiter shows they do not quite agree. It is possible, they suggest, that the fundamental theory of Newton may not be "quite right."

Jupiter sometimes appears to be ahead of where it should be, sometimes behind. The difference changes regularly with time and goes through a complete cycle once every 12.4 years. The magnitude of the effect is small: Jupiter never gets out of place in its orbit by more than 600 miles.

Jupiter is so far away that this 600-mile shift, when observed by astronomers here, puts the planet out of position by only 0.00007 degrees, an angle barely measurable. The sun makes an angle of one-half a degree in the sky.

No clear indication of a similar effect has been found in the other outer planets, Saturn, Uranus and Neptune, they reported.

The reason for studying how well the best theories account for Jupiter's observed motion is, fundamentally, to see if they are correct. Such discrepancies as the small one found in Jupiter's motion have occurred frequently in the past. So far they have been explained either by a previously unsuspected systematic error in the measurements, which can then be eliminated or corrected, or by inadequate calculations of the predicted position.

Although the Newtonian theory of gravitation used to predict planetary positions is very simple in principle, the calculations involved in using it are extremely complicated. Until electronic computers were developed astronomers could never be sure their calculations were sufficiently accurate.

The calculations used by Drs. Dicke and Krotkov in their comparison of theory and experiment were done on an electronic computer by Dr. W. J. Eckert of the Watson Computing Laboratory, New York, Dr. Dirk Brouwer of Yale University Observatory and Dr. G. M. Clemence of the U. S. Naval Observatory.

The calculations are believed to give very accurately the position of Jupiter, so the small discrepancy can be explained by either an error in the measurements or, possibly, in the fundamental theory.

The cycle in which Jupiter departs from its predicted position has repeated every 12.4 years for the past 160 years. This is slightly longer than the 11.9 years required by Jupiter to revolve once around the sun. Since these two time periods are nearly equal, the error may be considered due to a steady but gradual change in the shape and orientation of Jupiter's orbit.

However, there is at present no known reason for such a gradual change to occur, Drs. Dicke and Krotkov pointed out.

Since the Newtonian theory of gravitation has successfully explained the motions of planets, scientists are reluctant to change it.

Science News Letter, May 9, 1959

PHYSICS

Rays Photographed In Luminescent Chamber

➤ TRACKS OF some of the very weak cosmic rays that reach the earth's surface from space have been photographed in a luminescent chamber for the first time.

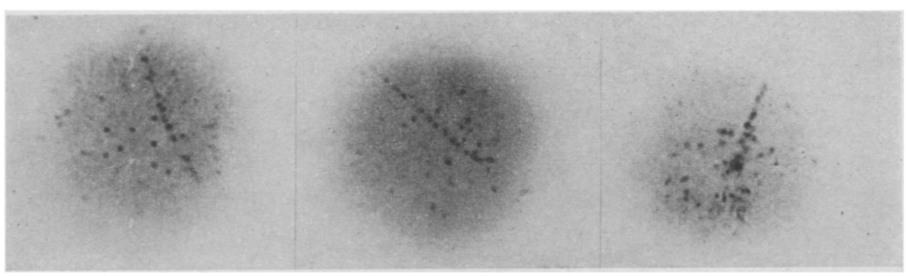
Dr. Lawrence W. Jones of the University of Michigan reported development of this new instrument for studying high energy nuclear reactions to the Physical Society meeting. With Dr. Martin L. Perl, also of Michigan, Dr. Jones found a way to record the light produced by charged particles as they pass through certain plastic and crystal materials.

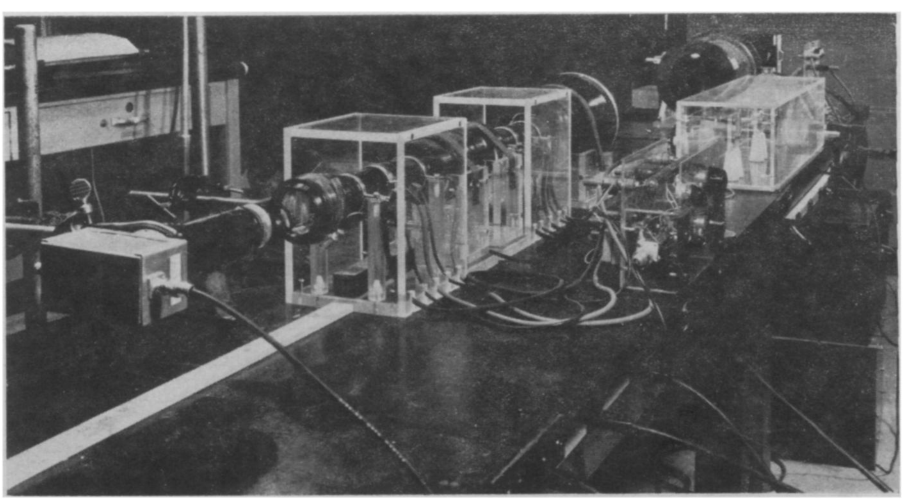
Although this light is "100,000 times too faint to be detected by the unaided eye or photographed directly," Dr. Jones said, special image intensifying electronic tubes can be used to amplify the fiant light to a level where it can be seen and recorded on photographs.

Scintillating crystals combined with image tubes thus join emulsions, cloud chambers and the more recent bubble chambers as a means of observing the tracks of charged particles.

Dr. Jones said the luminescent chamber had the added advantage of allowing an electronic "gate," or shutter, to record the reactions of particles to within intervals as short as a millionth of a second. With the large synchrotrons, or atom smashers, the device will allow scientists to do many nuclear experiments in which it is necessary not only to see where the reacting particles go in space but when the reactions occur in time.

Science News Letter, May 9, 1959





LUMINESCENT CHAMBER — Photographs of cosmic ray tracks taken with a cascade luminescent chamber made up of three image tubes coupled with refractive optics are shown (above). The dark spots are due to ion bombardment of the first cathode; gray streaks are tracks. The apparatus, viewed from the crystal end, is shown at the left. From left to right are: photomultiplier; thallium activated sodium iodide crystal; wide angle eyepiece lens; Radio Corporation of America two-stage image tube; American Optical Company special eyepiece lenses; two-stage image tube; lens; Westinghouse one-stage image tube; and photographic film.