PHYSICS

Relativity Fails Two Tests

Interpretation of old eclipse photographs and the Einstein gravitational red shift are being questioned as the result of new observations and calculations.

➤ TWO OF the critical verifications of the Einstein general theory of relativity are being called in question by new observations and calculations reported to the American scientists by Dr. Dirk ter Haar, theoretical physicist of St. Andrews University, Scotland, now visiting professor at Purdue University, Lafayette, Ind.

There is no upsetting revision of Einstein's great formulations as to the nature of the laws of the universe which have virtually revolutionized our way of viewing things. And the famous Einstein equivalence of mass and energy, basic to the atomic bomb, is not involved at all.

One of Prof. Albert Einstein's colleagues in the 1920's when they were at Berlin's Potsdam Observatory in Germany is Dr. Edwin Finlay-Freundlich, now at St. Andrews University Observatory.

He has been reinvestigating the experimental tests for the validity of Einstein's general relativity. Less than a year ago, he began to report divergences from what can be read in most textbooks; that is, that the three possible tests show agreement between predicted and observed effects.

The first test, the movement of the perihelion of the planet Mercury, is not questioned.

When it comes to the deflection of light by the sun, tested at total eclipses of the sun, the situation is different. The reported agreement at the eclipse of 1919 brought Einstein to world attention.

Eclipse photographs of 1922, 1929 and 1936 re-interpreted by Dr. Freundlich show that the deflection of star light toward the sun by its gravitational effect is 30% higher than predicted. Dr. Freundlich will make observations at the total eclipse of the sun on June 30 from Sweden that should tell definitely whether this disagreement is real.

The so-called Einstein gravitational red shift is also in trouble. Light coming from a heavy body with a strong gravitational field will be shifted toward the red end of the spectrum. The Einstein theory predicted the amount of the shift.

For the prodigiously heavy white dwarf stars, like the famous companion of Sirius, it turns out that this red shift is about a sixth that predicted from Einstein's formula. On the other hand, for extremely hot stars the red shift turns out to be much larger, ten or more times the one predicted.

Dr. Freundlich has worked out a new formula which gives the kind of red shifts that are actually observed. This new mathematical idea is used on the reddening of star light that astronomers believe may be due to a great expansion of the universe and a great blowing apart of the hundreds of thousands of galaxies of stars.

It works out, Dr. ter Haar reported, if it is assumed that astronomical space between the galaxies is very, very cold, a mere 1.5 degrees above absolute zero of temperature, as it is believed to be.

It looks as though the general theory of relativity is all right as long as it is dealing with purely gravitational effects as in the planet Mercury tests, but breaks down as soon as electromagnetic radiation effects come into play.

If particles of light, the photons, are assumed to act like material particles they will fall toward heavy bodies, like the sun. The job now, Dr. ter Haar explains, is to work out the proper theory that gives the correct values.

Dr. ter Haar, who was born in Holland and educated at Leyden, is about to return to his Scottish university post. On his way back he hopes to visit Einstein at Princeton, N. J., to discuss the new formulations of the Einstein theory.

Science News Letter, May 29, 1954

• RADIO

Saturday, June 5, 1954, 3:15-3:30 p.m. EDT

"Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio Network. Check your local CBS Station.

Dr. Selman A. Waksman, professor of microbiology and director of the Institute of Microbiology, Rutgers University, will discuss "Microbiology — Past and Future."

PHYSICS

High Neutron Source Available to Public

➤ A UNIQUE research tool, a high intensity neutron source, is now available to the public at the Atomic Energy Commission's Materials Testing Reactor, Idaho, the AEC has announced.

This reactor can produce isotopes of higher specific radioactivity than the Argonne, Brookhaven or Oak Ridge reactors, where irradiation services are also available to the public.

Portions of the area of the reactor's greatest neutron intensity, used primarily for AEC projects, may also be provided from time to time. The AEC's program will have first choice, however, and security will not be endangered since the actual experiments at the reactor will be done by cleared personnel.

Primary purpose of the MTR is to test materials for use in other reactors.

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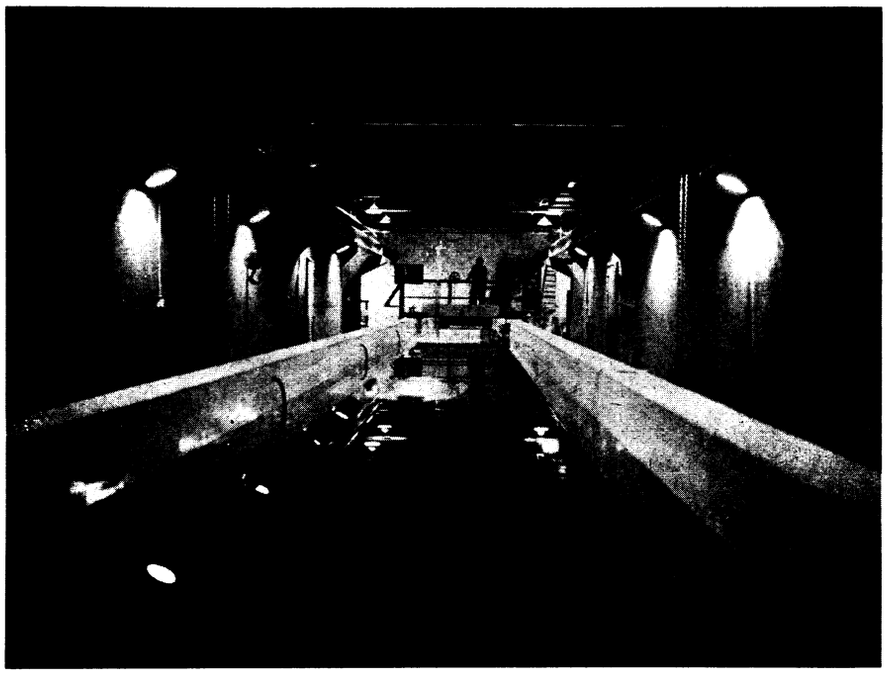

REACTOR TANK CANAL—Radioactive fuel of enriched uranium 235 for the Atomic Energy Commission's Materials Testing Reactor, Idaho, and other pieces for the pile, are lifted with grappling tools and lowered through a chute and valve mechanism in the bottom of the reactor tank into this canal, which holds 18 feet of water. The pile's high intensity neutron beam has just been made available to the public.