ASTRONOMY

Universe's Outposts May Be Forever Beyond Reach of Man

Famous Astronomer Believes That Even Larger Telescopes Will Not be Able to See Beyond a Definite Distance

"THE largest part of the universe is forever out of our reach." This is the opinion of the Abbé G. Lemaitre, famous Belgian astronomer, whose ideas of an expanding universe have been one of the recent sensations of astronomy.

In a report to the Royal Astronomical Society, of London, his first paper on the subject to be published in English, he makes this statement, which indicates that even if telescopes are made many times larger than any in existence or projected at present, they would not see beyond a definite limit, even though there might be plenty of stars and nebulae beyond.

Our present-day telescopes are not very far from this limit. The 100-inch reflector at Mt. Wilson, largest in the world, can detect objects as far away as 50,000,000 parsecs, the parsec being the astronomer's unit of distance, and equal to 18 million million miles. About seventeen times this distance is the limit beyond which we cannot see, according to the Abbé.

The reason for the invisibility of very distant objects is that all their visible light is increased to wavelengths so great that they cannot be detected. This shift in the wavelength of light as it is moving towards or away from the earth is well marked for the nearer objects, and is called the Doppler effect. The eye, and the photographic plate, are sensitive only to a limited band of wavelengths.

Spectrum Displaced

An object at a distance of 870,000,000 parsecs would have even its shortest waves so greatly lengthened as to make them invisible. That is, its "whole visible spectrum would be displaced into the infra-red," quoting the Belgian scientist.

It has been suggested in the past that, if our universe is curved in some higher dimension, as the earth itself is curved in three, a beam of light could travel completely around, and return to its starting point. Thus it might seem that we could see ghost images of the nebulae, or even our own Galaxy, by light that has gone around the other way. The Abbé Lemaitre points out, however, that the great Doppler shift would make this impossible.

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ABBE G. LEMAITRE

Whose ideas of an expanding universe have set the astronomical world agog. The Belgian cleric says that the wave lengths of very distant light become too great to be detected, and that the great Doppler shift makes impossible the passage of a light wave around the universe.

PHYSICS

Radio Reflecting Layer Measured by New Method

A NEW and simpler method of measuring the height of the Kennelly-Heaviside layer of the atmosphere which reflects radio waves, has been worked out by Dr. E. V. Appleton and G. Builder, of King's College, London.

Rather complicated apparatus has been necessary for this purpose in the past. In the new method only a common triode oscillator with a large grid leak is used. This produces the intermittent pulses of radio waves necessary for this work.

The sending and arrival of the pulse were recorded photographically on a high-speed oscillograph which was placed at a distance of three miles from the transmitting station. On the record the direct impulses and those which had traveled 70 miles up in the air and back again were clearly recorded.

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PSYCHOLOGY

Children Know Lindbergh and Andy Gump; but Not Hoover

A HOT political campaign may get grown-ups terribly excited, but it leaves no impression on children of kindergarten age. When the question "Who is Herbert Hoover?" was put to 100 youngsters between five and six years old, not one could answer. Only one knew who Al Smith is. Yet 87 knew what Lindbergh did and Andy Gump was familiar to 74.

These questions were asked in the course of an investigation conducted by Cathryn A. Probst, at the Institute of Child Welfare of the University of Minnesota to find out how much information, and what kind, is the equipment of the child when he enters the first grade of the public school. The results of her study are published in the current issue of *Child Development.*

Despite the rarity of the horse, every one of the children knew that this animal has four legs. The only other questions which no one missed were "What do we use to cut cloth?" "What do you use to cut meat?" and "What do you use a saw for?" Among the other easy questions were those dealing with the seasons of the year, the functions of the dentist and barber, the colors of the flag, and a few of the simplest natural history questions. (*Please Turn Page.*)

Some of the errors were amusing. According to some of the children, a carpenter fixes carpet sweepers; buttermilk is made by butterflies; baking powder is used by ladies on their faces; a plumber pulls out plums, and a man who raises corn or wheat is a bachelor.

It was rather surprising that only 11 knew what Cinderella's coach was made of, and only 9 knew how many wings a butterfly has.

Occupation of Parents Important

The occupation of the parents made a great difference in the range of information of the children. On only 7 out of the total of 132 questions did the children of semi-skilled and unskilled laborers excell the children of the more trained occupational groups. These questions included "How many eggs in half a dozen?" "What time it is at noon?" "Who is Dempsey?" "How many horns has a cow?" "How many wings has a butterfly?" "What must you not do in tin-tin? (a game)" and "What must you have to play anty-over?"

Boys were better than girls on all types of questions except those dealing with weather and other natural phenomena. When it came to football, baseball, hockey, and even croquet the girls were left way behind. However, the girls knew more about skiis and the game of bridge.

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METALLURGY

Better Source Found For Newly Discovered Metal

A NEW SOURCE of the recently discovered metal, rhenium, which contains up to one per cent. of rhenium has been announced at Berlin by its discoverers, Dr. Walter Noddack and his wife, Dr. Ida Noddack.

Previously the best ore from which the new metal could be obtained contained only one part of the metal in 660,000 of the ore. Dr. Walter Noddack has been seeking a more plentiful source of the metal for several years.

Rhenium, number 75 in the order of the elements, which was discovered a few years ago, is chemically similar to the common element manganese with which it often occurs in minerals.

Several thousands of tons of rhenium and rhenium compounds have been distributed among scientists throughout the world. They will study the properties of the new element on a larger scale.

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ARCHAEOLOGY

Damaged Sun Temple in West Rebuilt From Photographs

SUN TEMPLE, believed to be one of the last structures built in Mesa Verde National Park by the prehistoric race that once inhabited this region, has been the object of careful maintenance and repair work during the past few weeks, according to Superintendent Marshall Finnan, government representative in charge of the area.

Owing to the location of the old ruin on top of the mesa, it is exposed to destructive climatic influences and during the past winter considerable damage was caused to its walls through storms, freezing, and thawing. A section of the front wall 22 feet in length, facing the south, suffered particular damage. Moisture had penetrated this core and freezing had caused expansion which bulged the walls.

The method of repair was interesting. First, photographs were made of this section of wall. Then the top layer of rocks was removed and placed face downward on the ground, the same space being allowed between the rocks as their actual spacing in place in the wall. The succeeding layers of wall were handled in this fashion until the damaged section had been removed. The stones were then relaid in their actual positions. In replacing the wall the photographs and the actual spacing measurements were used as a guide.

A new capping of reenforced concrete with expansion joints at correct intervals is now being laid on the walls to prevent further deterioration.

Sun Temple, a ruin of mystery, is believed to have been contemporary with the largest and latest of the great communal dwellings which the prehistoric people of the region built deep in enormous caves. Probably it dates from 1200 or 1300 A. D. Its purpose is unknown and has long been a matter of speculation.

Many theories have been advanced concerning it, including the possibility of its having been intended to serve as a fortification against hostile invaders. The most appealing idea, according to the late Dr. J. Walter Fewkes, who made the original excavations, is that it was intended for a ceremonial building. Whatever the use for which it was destined, it apparently never was finished.

The ruin takes its name from a peculiar impression found on the upper surface of a large rock protruding from the base of the southwest corner of the building and inclosed by low wing walls on the north and south sides. The ancient cliff dwellers were sun worshippers, and it is believed that the old impression was inclosed as a shrine because of its resemblance to their sun emblem.

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