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THE VELOCITY OF LIGHT

VARIATIONS in the speed of light are not accepted by Carnegie Institution scientists, on the basis of recently announced results. The discrepancies in the instrumental readings must find their explanations elsewhere. Dr. Walter S. Adams, director of the Mount Wilson Observatory, where the late Professor A. A. Michelson prepared the latest light-velocity experiments, indicated this in an exclusive statement to Science Service.

"The last hypothesis to be adopted is that the velocity of light varies," said Dr. Adams. "If a man knows accurately when the sun should set but observes that according to his watch it sets five minutes ahead of time, a logical person does not assume that the motion of the sun varies, but that his watch is wrong."

Dr. Adams' statement, copyright, 1933, by Science Service, follows:

The latest average value of the velocity of light, which will doubtless be accepted as the world standard, is announced by the scientists of the Mount Wilson Obvervatory of the Carnegie Institution of Washington as 299,774 kilometers (186,780 miles) per second. Further analysis of the observations may change the last figure by one or two units. This value compares with the Michelson 1926 result of 299,796 kilometers per second obtained as the result of observing the passage of light between two mountain peaks in California. The new value is 22 kilometers per second, or seven thousandths of one per cent., lower than the old value.

Certain unexplained variations which exceed considerably the experimental error of measurement have been found in the course of the observations. One of these had for a time a period of 14¾ days and another a long period of about one year, but neither period persisted throughout the entire series. The range of variation in each case was about 20 kilometers (12 miles) per second.

The cause of such apparent variations is first of all to be sought in instrumental sources, in possible changes in the apparatus, the length of the light-path, ground disturbances, errors in the timing mechanism or a possible effect of refractive index in the path of light. The precision required in this difficult experiment is extraordinarily high. It is only as a last resort that we should have recourse to the hypothesis that the velocity of light actually varies. We have long believed this to be a fundamental constant of nature and although a variation is conceivable it is not established by these results.

The present investigation was carried on by Dr. Francis G. Pease, of the Mount Wilson Observatory, and Fred Pearson, of the University of Chicago, working with the mile-long vacuum pipe line at the Irvine Ranch, Santa Ana, California. The apparatus was designed and first used by the late Professor A. A. Michelson. Although yielding a value for the velocity of light of extraordinarily high accuracy, it can hardly settle questions involving quantities of such a minute order as those here considered. For such an investigation it would be desirable to have quartz mirrors, a much more stable pipe-line and elaborate timing devices.

Recent determinations of the velocity of light have shown a tendency toward slightly smaller values. It does not seem necessary, however, to ascribe this to other than coincidence, especially since many of the individual values in the different series of observations frequently overlap another widely.

ASTRONOMICAL EVENTS OF 1934

FOUR eclipses, two of the moon and two of the sun, the almost certain reappearance of one comet and the possible return of another, are among the most interesting events on the astronomical program for 1934.

But the most important of astronomical events have a habit of happening without any warning. The year might, for example, bring the appearance of an unheralded comet, rivaling in brilliance the famous ones of the past. It might bring a nova, or "new star," which, flashing out of previous obscurity, would exceed in brightness most of the other objects in the sky.

Perhaps the astronomers who are constantly studying the heavens will find a new member of the sun's family of planets, that, including the earth, revolve around the sun. The last such discovery came unexpectedly in 1930 when astronomers at the Lowell Observatory in Arizona found Pluto, now the most distant of the known planets.

Such things as eclipses and periodic comets can be predicted with more certainty, and astronomers do know that on February 14 the moon's shadow will pass across Borneo and the Pacific Ocean, producing a total eclipse of the sun in those regions. Only two small islands are at all well placed where astronomers can observe this eclipse. These are under Japanese mandate, and it is expected that a party of astronomers from Tokyo will set up their instruments to make those observations which are possible only at eclipse time.

There are three other eclipses scheduled for the year. On January 30 the moon will enter partly the earth's shadow, producing a partial lunar eclipse, but this will not be seen from any part of the United States. Another partial eclipse of the moon will come on July 26, which will be seen from the western states. Then, on August 10, an annular eclipse of the sun will happen. At this time the moon will come directly between the earth and sun, but the moon will then be a little farther away than normally, so that it will fail to cover the sun completely, leaving a ring of sunlight visible around it. This will be observed from South Africa, but such an eclipse is of little scientific interest, because even the narrow ring of the sun which remains visible prevents any of the usual eclipse observations.

One of the most dependable of periodic comets is confidently expected to return this year. This is Encke's comet, which comes back to the vicinity of the earth once in 3.3 years. It has been observed on every return since it was first discovered about a century ago. The

Tuttle-Giacobini comet may also reappear, though there is some uncertainty as to its exact orbit. If it should fail to appear during 1934, astronomers will not expect it until 1937.

Meteors are perhaps the least dependable of astronomical objects, as those who watched in vain for a great shower last November will be able to testify. However, it is still hoped that this November may bring a fairly decent shower, though there seems to be no possible hope that there will be a great display like the famous ones of the past. Apparently the great cluster of these meteors has passed the earth, but this year we may run into the tail end of it, as we seem to have done in 1901, after having missed the great shower the previous year.

Twice during the year the innermost of the planets, the seldom seen Mercury, will come into the evening sky. Around February 18, and again about June 14, it will remain in the western sky for a while after sunset. Venus will be in the morning sky during most of the year. At the very beginning of January, however, it will be at its greatest brilliance, and will be seen, as it has been for several months, in the western sky after sunset. Then it will pass between the sun and the earth, and on March 11 it will again be extremely bright, as a morning star. Mars will be visible during the latter part of the year as a morning star. Jupiter will be seen in the evening sky for many months. On April 8 it will be directly opposite to the sun, at opposition, and will rise at sunset, remaining visible all night. Saturn will similarly be at opposition on August 18, so that it will be conspicuous in the summer evening sky.

EPILEPSY AND TAPEWORM LARVAE

CONVINCING proof that many cases diagnosed as true epilepsy are actually cases of infestation with tapeworm larvae was presented to the Royal Society of Tropical Medicine in London by Colonel W. P. MacArthur, professor of tropical medicine at the Royal Army Medical College and consulting physician to the British Army.

The epileptic seizures are due to invasion of the brain by the eggs of the tapeworm, which form small, cyst-like masses called cysticerci, and particularly to the degeneration of these parasites after they have died. Colonel MacArthur has found as many as two hundred cysticerci in some brains.

Investigating the occurrence of epilepsy among soldiers, he found over sixty definite cases of infestation with cysticerci. Twenty such cases have been diagnosed in hospitals during the current year. Six of eight soldiers recently invalided from India and victims of cysticercosis had been certified as cases of "true epilepsy." These cases of cysticercosis, which is the medical name for the condition, have no symptoms to distinguish them from ordinary epilepsy.

Cases of cysticercosis had been wrongly diagnosed as acute mania, melancholia, delusional insanity, dementia, brain tumors, and the nervous disease, disseminated sclerosis.

Colonel MacArthur believes that in England many persons in civil life who have been stigmatized as hereditarily insane are suffering from cysticercosis acquired during residence abroad.

SENSORY COMPENSATION IN THE BLIND

THE belief that the blind are endowed with greater keenness in their other senses is as unfounded in fact as it is comforting to the sensibilities of a pitying public.

Professor S. P. Hayes, of Mt. Holyoke College, who acts as consulting psychologist for the American Foundation for the Blind, has collected new evidence that leaves little to support the unwarranted assertions often made in regard to the superior hearing of the blind and the greater sensitivity of their hands.

At the Pennsylvania Institution for the Instruction of the Blind an auditory survey was made by the resident psychologist with a very finely adjusted instrument. Groups of blind boys, blind girls and seeing women teachers were tested.

A comparison of results showed that the blind groups were inferior to the seeing group in the hearing of pitches at all levels from very low to very high. Indeed, while all the seeing subjects heard all the pitches given, some of the blind pupils failed to hear both the lowest and the highest pitches.

Even setting aside the records of those blind subjects who were judged to be at all defective in either hearing or mentality, the experimenters found the same superiority of the seeing.

A test for the recognition of objects by touch and hearing was given to the pupils and blind teachers of two schools for the blind, and then repeated with groups of Mt. Holyoke College students. The objects for recognition were presented in identical cardboard boxes and were to be distinguished by the sound and the "feel" as the boxes were handled. The experiment was originally planned for blindfolded college students and calls for learning through the use of auditory and muscular cues.

The seeing subjects again made better records. There were individuals in each group who had great difficulty with the test, but a number of the blind subjects gave it up entirely because it was too hard for them.

When asked what methods were used to distinguish the objects the blind and the seeing gave similar replies. Some depended upon the quality of the sound while others mentioned the force of the objects as they hit the sides of the box.

These two experiments failed to furnish any evidence for a sensory compensation on the part of the blind, although, as Professor Hayes says, many blind people do take advantage of sensory cues which are neglected as unimportant by the seeing.

AERIAL MAPPING AND UNEMPLOYED ENGINEERS

PUTTING a large number of unemployed engineers and assistants quickly to work on an aerial mapping project that promises to be highly valuable to many governmental agencies is the goal of a new Civil Works Administration program.

Airplanes will soon be flying over selected agricultural agencies in ten southern states, while cameras take overhead views of farms and fields. On the ground below, groups of workers will chain off individual properties and plot to scale the results shown on the air pic-

tures. Fitted together, the air photographs will then form a great mosaic picture map of the land.

During 70 days an allotment of $650,000 is to be expended for this purpose. Mapping of 40,000 square miles will proceed as far as possible, with 500 engineers and some 1,500 assistants taking part. The states engaging in the project are Alabama, Arizona, Arkansas, California, Georgia, Louisiana, Mississippi, New Mexico, South Carolina, Texas and the District of Columbia.

The U. S. Geological Survey has charge of the project. Advising and conferring with the survey are representatives from governmental agencies which expect to find the maps useful. These include the Bureau of Census, Agricultural Adjustment Administration, Coast and Geodetic Survey, corps of engineers of the U. S. Army, and the Army Air Corps.

It is believed that many additional uses for the maps will occur, once they become permanent government records. They will be employed, perhaps as the first demonstration of their usefulness, in connection with the census of agriculture proposed for next November. Consulting the mosaic strips, enumerators can find obscure farms and buildings that might be otherwise overlooked. Facts about vacant farms, one of the hard problems of the census, can be recorded. Waste land not under cultivation because of gullies, stumps and rocks can be more completely accounted for. This information becomes of great importance in the study of soil erosion. The study of crops can be more effectively determined with the aid of the air maps.

The maps are expected to provide a more accurate record of the land area within townships and counties. The curvature of the earth causes a slight discrepancy in surveying records in a county, unless this has been taken into account. In one county where this discrepancy has not been allowed for, there is a record of more land in farms than the official area of the whole county.

The maps also may become property and real estate evidence. In one county where the aerial mapping system was tried, the untaxed land discovered within the county amounted to a tax fund sufficient to pay for the initial photographic mapping work.

The project of proceeding with mapping of 40,000 square miles may later be extended to an area of a million square miles if additional funds are made available.

ITEMS

COTTON was used as a reinforcing material in making asphalt paving blocks exhibited at a lecture before a Washington audience of the Negro chemist, Professor George W. Carver, who has worked for many years to discover new uses for the agricultural products of the South. About 3½ per cent. of the blocks, by weight, consisted of cotton; the reinforcement increases their strength and resistance to wear. Roads made of these blocks would use up forty bales of cotton to the mile.

CANNIBALISM was a practise among the natives of Britain about the time the Romans came, is the discovery reported by G. C. Dunning, of the Society of Antiquaries. Mr. Dunning found the evidence of human bones split for their marrow while he was excavating at Salmonsbury Camp near Bourton-on-the-Water, in Gloucestershire. About thirty of the split human bones, believed to be female bones, were unearthed. Aside from their cannibalism, the Britons who lived at the site were considerably civilized, Mr. Dunning reported. The surprising feature is that the cannibalistic practises occurred within the Christian era, near the time when the Romans extended their conquest over the island. A pike's head found near the junction of two well-known trout streams was also described. It shows that ancient fishermen used the stream long before its modern era of popularity.

RESISTANCE to disease or susceptibility to it may be inherited. Proof of this appears in a study, made public recently, by Dr. Charles B. Davenport, director of the department of genetics of the Carnegie Institution of Washington, Cold Spring Harbor, New York. Inefficient thyroid glands, for instance, tend to run in families, Dr. Davenport found in a study of goiter in a mountain valley of Western Maryland. While all the population there ate essentially the same food and drank essentially the same water, which was poor in iodine, the majority of the population did not have goiters, although lack of iodine is a factor causing goiter. However, many of the people do have goiters and studies of their relationship showed that the goiters appeared only in certain families. In these all the brothers, sisters and parents might have the condition.

A PHENOMENAL increase in ptarmigan in Mount McKinley National Park, Alaska, in the past four years is reported by Superintendent Harry J. Liek. When Superintendent Liek first went to the park, in the winter of 1929, these interesting birds were rarely even sighted. For two years little increase was noted. Then, in the winter of 1931, small coveys were seen traveling through the park. Now they are everywhere by the thousands, and Mr. Liek reports that flocks of several hundred at headquarters are a common sight. During the winter the ptarmigan in McKinley Park live entirely upon the buds of willows and birch trees.

How did the terns of Bird Key find their way home from the strange skies off Cape Hatteras? Carnegie Institution investigators, after considering all current theories of homing instinct in birds, are still at a loss for a conclusive answer to one of their own experiments. Five terns were taken from the bird rookery off the tip of the Florida peninsula and carried by a roundabout steamer route to a position off Cape Hatteras, where they were given their freedom. Five days from the date of capture, three of them were back on the nesting grounds, where they were identified by the metal bands with which their legs had been encircled before they were taken on their long voyage. The straight-line distance from Cape Hatteras to Bird Key is about 850 miles; by coast-line flight the distance is 1,081 miles. This latter is greater than the record flight for trained pigeons, 1,010 miles.