SCIENCE NEWS

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THE DISTANCE OF THE STARS

MORE than 5,000 stars nearest to the earth are only a half or a third as far away as astronomers have previously believed, is announced by Professor Jan Schilt, head of the department of astronomy of Columbia University. By analyzing thousands of determinations of distances of the "nearer" stars, made by the method of parallaxes, Professor Schilt has found a small systematic error which changes the calculated distances by a factor of from two to three.

Parallax is the method by which the distances of the nearer stars are computed, particularly those of the earth's galaxy. The parallax method is based on sighting the angle of the star in the sky at intervals six months apart and then computing its distance by trigonometry.

By examining the stellar parallaxes obtained through many years by many astronomers, Professor Schilt has determined small correction factors which occur systematically. Although it is only a working hypothesis, Professor Schilt suggests that the tides in the earth's atmosphere, caused by the pull of the moon, change the bending ability of the air for the light from the star and make the determinations of position slightly in error.

It is also suggested that the effect of sunlight passing through the air about the earth would warm it slightly and hence create "waves" that might change its bending ability. A combination of the moon and sun effect is believed to produce the errors. For any individual measurement the systematic error thus introduced is much smaller than the error of observation. Only by taking large numbers of observations and analyzing them statistically can the systematic error be detected.

While the new findings tend to shrink the known limits of the galaxy of stars containing the sun and earth, the discovery does not mean that the limits of the universe are likewise decreased. This is because the distances of remote stars are not determined by the parallax method but by means of the luminosity law which relates their brightness with their distance.

The new knowledge is expected to take the galaxy of stars to which the sun belongs out of the special category in which it has been placed. Because the new findings "move in" the stars, the number of them to be found in a cubic volume of the galaxy is increased. Previously it has been supposed that the sun's galaxy was "thinner" and had fewer stars per unit volume than other island universes out in space. The new discovery brings the sun's galaxy more in line with the characteristics of other galaxies.

It will be necessary to recompute the distances of all stars for which the method of parallaxes has been employed since the method was first introduced by the German astronomer, Friedrich W. Bessel, in 1838. Because of the systematic nature of the new correction, only recalculation will be needed without taking new observations on each star.

A NEW KIND OF EARTHQUAKE WAVE DISCOVERED

A NEW type of earthquake wave, which is expected to alter radically now-accepted seismological theories and the allied concepts of building quake-proof structures, has been discovered by Dr. L. Don Leet, director of the Seismograph Station of Harvard University. The find is also expected to be of special military importance, since it will probably vitally affect the use of the seismograph in army artillery observation, which employs earth tremors as guides to the sites of heavy enemy guns. They are also used to check the accuracy of the army's own firing. Both the discharge of a cannon and explosion of a shell start underground vibrations which can be traced on earthquake recording instruments.

The new wave-form was detected after a ten-year study of man-made earthquakes, touched off by high-power dynamite explosions. Dr. Leet said that the new type vibration, entirely unpredicted in earthquake theory, is the fifth fundamental type known to science.

The four forms previously known have been recognized for about forty years and it was surprising to find a new type, especially since in many types of explosion-shocks the new form is dominant, registering strongly on the instruments while the other four forms hardly leave their marks. The new form is a sort of surface wave which travels through the upper 200 miles of the earth's crust, in contrast to the deeper waves which travel directly through the earth's core. It is the third fastest of known earthquake waves. Those through the earth's center are the speediest, and they impart a push-and-pull motion to particles in the path. Another internal wave, which shakes the particles from side to side of the wave-path, is second-fastest.

Then comes the new wave, which drives particles at a diagonal to its path, followed by another surface wave, with a side-to-side motion, and finally, the slowest wave of all, a surface wave which drives the particles in a curious sort of elliptical rotation. Dr. Leet has timed the new wave going about 2,500 feet a second when set off by dynamite in sandy ground, but he pointed out that this speed might be considerably different under other conditions. Thus far the new wave form has been observed only on dynamite-explosion records, not on natural quake-charts, but Dr. Leet said it is "almost certain" that it will eventually be found among natural tremors. In all other respects, he pointed out, natural and artificial quakes are similar.

An important problem arising from discovery of the new wave, and one which Dr. Leet is now investigating, is how much damage this new type of wave does. If it is mingled with the waves close to the sources of earthquakes, which cause heaviest damage, it may be necessary to change the design of quake-proof structures to withstand the ground conditions set up by the new wave.

The discovery may also have important implications for the science of geology, for many of the assumptions which

geologists have made concerning conditions deep in the interior of the earth are based on studies of earthquake waves. The fact that certain waves travel faster under the Pacific Ocean than under a continent, for example, has been interpreted to indicate differences in rock structure under oceans and continents. With a new concept of quake-waves, however, many of these conclusions may have to be reexamined.

PAPERS READ BEFORE THE AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

AT the Chicago meeting of the American Academy of Ophthalmology and Otolaryngology held on October 9, 10 and 11 the rare case of a patient whose eyesight was affected by a waterlogged condition of his cornea, relieved by a draining operation, was reported by Drs. R. O. Rychener, of Memphis, and D. B. Kirby, of New York. The cornea is the transparent tissue in front of the eye through which we see. Sometimes it is pushed forward into a cone shape instead of its usual flattened curve under the eyelids. The condition is caused by abnormal stretching of and high pressure within the eye. Vision in such cases is usually very poor. In this case of waterlogging the inside of the cornea was stretched so that the water fluid within the eye worked its way into the layers of the cornea, causing a diffuse cloudiness. By cutting the cornea and draining off some of the excess fluid, thus reducing the pressure, the condition was relieved and the patient had better vision than before the waterlogging complication set in. Only eight other cases of this condition have been reported in medical literature.

THAT diabetic patients whose vision has been impaired by bleeding into the retina of the eye have been helped by large doses of vitamins B and C, was reported by Dr. Jonas S. Friedenwald, of the Johns Hopkins University and Hospital. In these patients the tiny veins and arteries of the retina have very fragile walls and consequently bleed easily. Ordinarily, vitamin C, the scurvy-preventing vitamin of citrus fruits and tomatoes, makes these fragile blood vessel walls sturdier, thus controlling the bleeding tendency. Tendency to bleeding from tiny blood vessels because of deficiency of vitamin C is one characteristic of scurvy itself. Diabetic patients, however, apparently do not always utilize vitamin C normally, so even when given large doses of it, their eye condition does not improve. But when vitamin B, the vitamin found abundantly in yeast and liver, is given with vitamin C, the resistance of the small blood vessels in the eyes of diabetics is restored to normal. Dr. Friedenwald reported "marked improvement" in the eye condition of a small group of diabetic patients who were given the double vitamin treatment. Vitamin B is made up of a number of different vitamins which scientists have recently been separating. Which part of the B complex is responsible for the improvement in the eye condition is being investigated.

VITAMINS, or at least a diet with plenty of vitamins to build up the patient's general health, are a necessary eyesight-saving addition to treatment of syphilis of the brain and nervous system, it appears from the report of Dr. William M. Muncy, of Providence, R. I. High degrees of artificial fever plus powerful arsenical drugs are used in treating this kind of syphilis, but the combined treatment was found to cause inflammation of the optic nerve in a number of patients who had no previous eye trouble. Vitamin deficiency was believed responsible. Dietary building-up restored to normal the vision of a number of these patients, after which they were able to stand repeated doses of the necessary arsenical treatment for the syphilitic condition without further symptoms of visual disorder.

TWO surgical hole-drilling operations, one of them brand-new, for relief of deafness were reported by Dr. O. Jason Dixon, of Kansas City. The new operation is for relief of deafness due to abnormal inward pressure of the ear-drum on the chain of tiny bones in the middle ear. To relieve this pressure, Dr. Dixon makes a hole behind the ear through the mastoid, connecting with the ear-drum from behind. The hole is lined with grafted skin and remains permanently open. Dr. Dixon reported that several patients who had this operation showed considerable improvement of hearing. The other operation for deafness discussed was described by Dr. Edward H. Campbell, of Philadelphia. It is applicable only to one type of chronic progressive deafness, characterized by a roaring in the ears. In this operation a hole is drilled into the outermost semicircular canal back of the ear, making a tiny window into the ear. Successful results depend on the window remaining permanently open. There is a tendency for the surrounding bone to grow rapidly and to close the window. The operation can not be performed if the patient is extremely deaf, or if he can not hear through the bones of the skull, or if he is dizzy or has other signs of imperfect balancing mechanism.

A NEW kind of sinusitis was reported by Lieutenant Colonel J. E. Ash, curator of the Army Medical Museum in Washington. The condition may feel like the same old sinus trouble to the patient, but Colonel Ash discovered that the lining of the sinus in one case showed a type of inflammation like that seen in chronic bladder inflammation. This, apparently, is the first time the condition has been reported. Sinus disease is due either to germs, to an allergy like hay-fever or to a combination of the two.

THE recently discovered danger of serious lung trouble from nose drops can be avoided if the drops are made with vegetable oils instead of mineral oils, according to Dr. Frank J. Novak, Jr., of Chicago. The danger arises when the nose drops or spray accidentally get into the bronchial tubes, which is especially likely to happen in babies and small children. Vegetable oils, unlike mineral oils, can be absorbed by the body tissues and disposed of without harm, whereas non-absorbable mineral oils accumulate and sometimes cause damage.

A RARE kind of eye trouble, in which the eye protrudes from its socket and beats or throbs in time with the heart beat, was reported by Drs. S. J. Meyer and H. Saul Sugar,

of Chicago. Skull fractures from automobile accident injuries or other hard blows on the temple may cause the condition, but it is most often due to rupture of the carotid artery, the big artery running up the side of the neck, at the place where it passes through the large venous channel behind the eye. Besides the severe deformity of the eye, the patient hears the disagreeable noise of the blood rushing from the artery into the vein. The physician can hear this by listening through his stethoscope applied at the temple, and a whirring sensation is felt through the eyelid. For relief of the condition it may be necessary to tie the internal carotid artery.

WARNING that glaucoma with loss of vision may follow the use of large doses of x-rays or radium in treatment of cancer of the cheek or tumors of the eye was sounded by Dr. Louis Bothman, of Chicago. In glaucoma the eye hardens because of changes that interfere with the normal escape of fluid from the eye. The condition is fortunately a rare complication of the life-saving cancer treatment and can be guarded against in most cases by careful screening of the eye against the rays.

DR. WILLIAM T. DAVIS, of Washington, reported that children with the kind of squint in which one eye turns in may be helped to overcome the condition by careful training plus the use of strong-lensed eye glasses. These children, Dr. Davis said, should be trained to use the squinting eye by covering up the good one. Such children squint when they see sharply, he explained, but the eyes become straight when the vision is blurred, either by strong lenses or by training. When the child learns to relax the muscles, glasses may be discarded. This type of squint is entirely different from that arising from muscular weakness or paralysis, which may require both glasses and operation for correction.

ITEMS

A MAJOR epidemic of influenza is predicted for February, 1941, with a "Phase 2 outbreak of some severity" likely to occur in February, 1940. The two-phase theory of influenza occurrence on which these predictions are based has been developed by an English physician, Dr. J. H. D. Webster. It is brought to the attention of American physicians and health authorities through an editorial in the *Journal* of the American Medical Association. Analyzing 'flu epidemic history for the past 49 years, Dr. Webster finds that Phase 1, accounting for influenza outbreaks every 33 weeks, is the major phase in the influenza cycle. Phase 2, the intermediate, covers outbreaks occurring about 16 weeks after Phase 1. This phase has led to a number of serious outbreaks such as those in February-March, 1924, January-March, 1932, and the first and third world-wide epidemics of 1918–1919.

VERY great solar activity is now speckling the sun's face, it is shown on photographic plates taken at the U. S. Naval Observatory. The rise in solar activity coincides with increase in magnetic disturbance which is forecast by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. On September 29, the U. S. Naval Observatory photographed 273 spots on the sun's disk. On the next day the number was substantially the same.

A NEW water-repelling chemical which becomes part of the fiber on which it is applied and which can not be removed by any known solvent was announced at the meeting in Boston of the American Association of Textile Chemists and Colorists. The new material, a long-chain quarternary ammonium compound, known as Zelan, gives a permanent water-repellent finish to clothing which laundering and dry cleaning will not remove. Use of the chemical for coating the clothing of armies is seen as one potential use, for the clothing will not become heavy with rain or perspiration. Yet at the same time the chemical does not close the pores of the clothing and allows the evaporation of perspiration which helps keep the body cool. George A. Slowinske, du Pont chemist, said that for flags, pennants and sailcloth the chemical was already showing excellent service. There is no need to dry out the sails to prevent mildew (the time-honored chore of yachtsmen).

AT thirty-eight miles above the earth's surface the temperature is 100 degrees Centigrade, the boiling point of water, Dr. Fred L. Whipple, astronomer of Harvard University, told the meeting of the International Union of Geodesy and Geophysics. Dr. Whipple's discovery was accomplished with a new type of "meteor speedometer" which uses the appearance of shooting star tracks in the sky to tell temperatures in the stratosphere far beyond the reach of man. With his new apparatus Dr. Whipple obtains very accurate measurements of the height, brightness, velocity and deceleration of meteors which flash briefly in the area about 30 to 60 miles above the earth. At heights of 70 miles above the earth the temperature is found to be 20 degrees Centigrade, ordinary room temperature. The basic principle of Dr. Whipple's apparatus is to revolve a fan blade in front of a telescope-camera lens in such a way that if a meteor flashes down across the field of view, its fiery path is broken at measured intervals. This gives an indication of speed and deceleration. There is one such thermometer at Harvard Observatory in Cambridge, while the other is at Harvard's Oak Ridge station, 24 miles away.

BEAMS of piercing neutron particles are now being produced at the department of physics at Cornell University in an experimental advance which will be of great aid to the study of the transmutation of matter, artificial disintegration, etc. Professor R. F. Bacher, of Cornell, and Dr. D. C. Swanson, now at the University of Florida, report in *The Physical Review* that by placing a thick wall of water around a source of neutrons and then putting a "hole" through the water by means of a tube they have achieved a distinct collimation of their neutrons into a beam. Neutrons, because they lack electrical charge, easily penetrate into any atoms with which they come in contact. Previous attempts to produce a beam of them have only been partially successful. And yet such beams have been greatly needed to improve the geometry of many nuclear experiments in which scattering occurs, and cross sections of atoms for neutrons of different energies can be determined.