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LIGHT FROM DISTANT NEBULAE

DR. GUSTAV STROMBERG, of the Mount Wilson Observatory, reported to the Pasadena meeting of the Astronomical Society of the Pacific the results of his measurements of the velocity of light from distant nebulae that has been on its way some 70 million years.

Dr. Stromberg has been endeavoring to get a clue to one of the great mysteries of modern astronomy: Is the universe exploding? Measurements of the light from the very distant nebulae show that they are rushing away from us with terrific speeds up to 10,000 miles a second, the more distant ones moving faster.

It is possible, thought Dr. Stromberg, that the light from these great distances may not be the same as the light from less remote neighbors. To answer this he has measured its speed and found it to tally with the results of measurements on the earth.

Thus the very aged light beams have lost none of their youthful fire, still speeding along after millions of years at 186,000 miles a second. The result of his experiments checks with the requirements of the theory of relativity.

Dr. Stromberg's method depends on the fact that when one observes a star the telescope is not pointed directly at it, but makes a slight allowance for the 18-mile-a-second motion of the earth. To receive the light beam from the nebula straight along the axis of the telescope, the telescope has to be tilted through a small angle corresponding to the ratio of the velocity of the earth to the velocity of light. As the light passes along the telescope the latter is moved forward on account of the motion of the earth and hence the point where the beam of light strikes the photographic plate depends on the motion of the telescope.

If the velocity of light from a nebula differs from that from a neighboring star the nebula would appear shifted a small amount in the course of the year as the observer's own motion varied.

Dr. Stromber's measurements at the Mount Wilson Observatory show that the velocities are alike within one tenth of one per cent. which is less than the errors involved in the experiment.

A NEW TYPE OF SEISMOGRAPH

How seismograph instruments of a new type, cheaply constructed and starting automatically to register only when an earthquake rocks the actual spot where they are standing, are being planted at various points in California to "trap" earthquakes when they happen, was told before the meeting of the Seismological Society of America by Professor R. R. Martel, of the California Institute of Technology. Professor Martel read a report from Captain N. H. Heck, of the U. S. Coast and Geodetic Survey, who has immediate charge of the work.

Although earthquakes have engaged the attention of scientific men for many years and delicate instruments have been devised to detect them at a distance and tell how far away and how violent they are, strangely enough there has not been until the present time any instrument that could make a record of an earthquake occurring in the immediate neighborhood. They are so delicately built that a strong earthquake directly under them would wreck them. The new instruments are more ruggedly built, record only relatively large earth movements near by, and turn themselves on automatically when a quake begins.

The distribution of these instruments has been undertaken by the Federal Government largely as a practical aid to engineers and architects in designing and placing buildings so as to avoid earthquake damage as far as possible. California was not chosen as the first area to be investigated by means of the new instruments because it is the most probable scene of great earthquakes. Violent quakes have visited other parts of the continent, such as the Midwest, the Southeast and the sea-bottom off the northeastern coast. But California is a satisfactorily active seismic region, and if observers wait with patience they are likely to get the data they are looking for. Moreover, California people are more interested in earthquakes and are more ready to give the necessary local support to the research program.

THE CLIMATE OF DEATH VALLEY

THE climate of Death Valley was described in detail before the meeting of the American Meteorological Society by Ernest E. Eklund, of the San Francisco office of the U. S. Weather Bureau. Since 1911 there has been an observatory at Greenland Ranch, better known as Furnace Creek Ranch, 178 feet below sea-level and 98 feet above the lowest part of the valley.

On July 10, 1913, a maximum temperature of 134 degrees Fahrenheit was recorded at Greenland Ranch and was accepted as the highest natural-air shade temperature that had ever been recorded anywhere under approved conditions of equipment and exposure. This record was exceeded by a temperature of 136 degrees recorded at Azizia, Tripoli, in 1922. Extreme maximum temperatures of 120 degrees or higher have occurred at Greenland Ranch in every month from May to September, inclusive, and of 100 degrees in every month from March to October, inclusive. In July and August, 1917, maximum temperatures of 120 degrees were recorded on 43 consecutive days.

Though high temperatures occur in summer, freezing weather occurs frequently in winter. Temperatures of 32 degrees or lower have been recorded from October to March, inclusive, and in December, January and February, 1928–29, there were 72 consecutive days on which the temperature fell to the freezing point. An extreme minimum temperature of 15 degrees has occurred.

The nights are comfortably cool from October to April, inclusive, but in summer minimum temperatures

of 90 degrees or higher are not unusual and minimum temperatures of 100 degrees are not unknown. The hottest month is July with the mean temperature of 102 degrees and the coolest is January with a mean temperature of 51.4 degrees. The mean daily range in temperature is about 30 degrees, but daily ranges of 50 degrees or more have occurred in practically all months.

The average annual precipitation is only 1.38 inches, and sometimes a whole year is rainless. In the period from December, 1928, to February, 1930, there were 401 consecutive days on which no measurable precipitation occurred. There are on an average only seven rainy days a year. A daily rainfall of one inch or more in 24 hours has been recorded at Greenland Ranch only four times in twenty years, and the heaviest monthly rainfall ever recorded was 1.9 inches in February, 1913.

Heavy precipitation occurs in the mountains on each side of Death Valley, generally as the result of thunder-storms, although thunder-storms are infrequent within the valley. Eighty per cent. of the days are clear. Relative humidity is often very low and high winds, sometimes accompanied by sand-storms, are not infrequent.

EVAPORATION IN PLANTS

WIRES of water running through plants from root-tips to leaf-surfaces, lifting the endless supply necessary to replace the constant losses due to evaporation. This is the picture of the internal sap transportation systems of plants most commonly accepted by students of plant life, according to Dr. E. D. Woodhouse, of Stanford University, speaking before the Botanical Society of America at its meeting in Pasadena. Water is not weak when it is confined in very narrow columns such as the sap vessels of plants; it is as strong as fine wire then, so that the water supply of a plant can literally pull itself upstairs.

But sometimes the tension becomes too great and the water wire breaks. Then the slender sap vessel becomes filled with air, and if this happens in too many of the vessels there is nothing left for the plant to do but wilt and die.

Here is where an emergency repair system, automatic in the plants, may step in, Mr. Woodhouse thinks. He suggested the possibility that "metabolic water," produced in the process of food use by the plant itself, may be introduced into these air-plugged vessels, refilling them with liquid and patching the broken ends of the column together again.

Mr. Woodhouse also offered a theory to explain the occurrence of water traveling upward in rings. Frequently, he said, the woody water-conducting tissue of trees will contain layers of water-filled vessels alternating with layers of empty ones. He suggested that the plant tends to pull its water up through the larger vessels, which offer less friction to oppose its passage. But these larger vessels also make it easier for the water wires to be broken, for their strength is greatest when they are thinnest. So that in times of drought the rings of big tubes will be empty while the finer ones will still contain unbroken columns of water.

INFANTILE PARALYSIS

INFANTILE paralysis which attacks children and young adults, leaving them crippled with wasted and paralyzed limbs, can not be controlled by ordinary methods found successful in controlling other communicable diseases, according to Dr. W. Lloyd Aycock, associate professor of preventive medicine at the Harvard University Medical School.

Dr. Aycock's paper was given at a special symposium on immunity at the Philadelphia meeting of the American Medical Association. At this session were discussed the various ways in which individuals develop the ability to withstand exposure to disease without becoming ill. Immunity to the germ diseases and also to the poison-ivy, hay-fever type of disease which is due to hypersensitiveness to specific protein substances, was discussed. Whether or not a person develops infantile paralysis when exposed to the disease for the first time depends on certain factors of individual susceptibility. This is true for other diseases which, like infantile paralysis, are caused by viruses; such as smallpox, rabies, chickenpox, yellow fever and some animal diseases like foot-and-mouth disease.

Dr. Aycock said his investigations suggested that persons who are susceptible to infantile paralysis may be persons whose physiological mechanism for adapting to changes in climate and season is faulty. The body changes normally with the seasons and in response to changes in climate; some people, however, have a faulty bodily adjustment in this regard and fail to make these changes. The seasonal and geographical occurrence of infantile paralysis suggests that these people whose response to climatic changes is not normal are susceptible to the disease. Dr. Aycock is investigating this phase of the problem by studying the physiology of infantile paralysis patients and by studying the effect of artificially induced physiologic changes on the susceptibility of certain animals to the disease. The virus of infantile paralysis is rather wide-spread, yet relatively few persons develop the disease in spite of the fact that they must come in contact with the virus frequently. Some scientists believe immunity to the disease develops spontaneously as people grow older. Dr. Aycock disagrees with this view. He believes that there is wide-spread immunity to the disease. The development of this immunity in adults who have not had the disease is associated with the presence of the disease virus.

ELECTROSURGERY AND CANCER

"THE value of controllable heat as a substitute for the surgeon's scalpel can not easily be overestimated," in the opinion of Dr. A. C. Scott, of Temple, Texas, who took part in a discussion of electrosurgical treatment of cancer at the closing session of the American Medical Association.

The combination of surgery and heat are the two most potent agents known for the eradication of disease, he said. While the radio knife and electrosurgery and diathermy are modern developments, Dr. Scott reminded his hearers that the use of heat in surgery was prac-

ticed by the Chinese in a crude way four thousand years ago.

The value of electrosurgery is that it cuts down the chance of recurrence of cancer. Cancer cells become sterile at a temperature of 120 degrees Fahrenheit. If one cancer cell, or perhaps a group of a dozen cancer cells, is left behind by the knife in the ordinary operation, it might cause a recurrence. But disease can not be spread with a hot scalpel, he said. The chief value of electrosurgery is therefore its heat. Dr. Scott prefers the loop cautery knife to the radio knife because with the loop the electric current is confined to the knife. With the radio knife the current passes into the body from the knife and there is no control over it. Some tissues are better conductors of electricity than others.

BLOOD VOLUME MEASUREMENTS AND THE HEART

THE finding of a method of determining the volume of the circulating blood in man was stated by Professor Yandell Henderson, of Yale University, to be a needed step in the treatment of diseases of the heart and circulatory system, the leading causes of death to-day. Professor Henderson spoke before the American Medical Association.

"Such measurements would probably be as significant and instructive regarding conditions of health and disease as are our present determinations of arterial (blood) pressure and the electrocardiogram," he said. The measure of the volume of the circulation will unlock many secrets. Investigators are now working on this problem and a method of such measurement will be found. When it is, physicians will be able to determine the relative efficiency of the circulation in health and in heart and other diseases.

Professor Henderson described the circulation as a balance of three factors, like a tripod. One leg of this tripod is the heart pumping the blood onward; the second leg is the vasomotor nervous system which determines the resistance and pressure in the arteries. The third and chief leg, according to Professor Henderson, is the mechanism which pushes the blood back through the veins to the right side of the heart. If any one of these legs fails, the tripod, or circulation, collapses.

ITEMS

THE mechanism by which a nerve impulse can be converted into a chemical stimulus was indicated in studies reported by Professor Walter B. Cannon, of the Harvard Medical School, to the Association for the Study of Internal Secretion meeting at Philadelphia. Professor Cannon described his newly discovered hormone, sympathin, which is found very generally in smooth muscle tissue. It is probably the same as adrenalin, the stimulating secretion of part of the adrenal glands. The action of the two substances is apparently very similar. The discovery of sympathin is expected to have great practical importance. Secretion of sympathin from a muscle cell upon stimulation by a nervous impulse may be the way in which the nerve impulse can cause activity of tissues.

REMARKABLE results from high frequency electric currents in the treatment of the hopeless condition known as multiple sclerosis, or creeping paralysis, were described by Dr. William H. Schmidt, of Jefferson Medical College, at the Philadelphia meeting of the American Physical Therapy Association. Dr. Schmidt and his associate, Dr. Benjamin Weiss, of Jefferson Medical College, said that they could not call their method a cure for creeping paralysis, but that they are hopeful. Every case treated has improved and some have recovered completely. This disabling disease, for which no cure has yet been found, is characterized by remissions of symptoms, and Dr. Schmidt said that they could not be sure whether their patients had really recovered or were only having natural remissions. An encouraging feature is that the improvement has continued after the treatment has been stopped. The treatment, which is the same that has been successful in treating cases of paresis, produces a high fever in the patient. The theory is that this fever stimulates the natural defensive mechanism of the body to overcome the disease.

THE great nebula in the constellation of Orion is three times farther away than was formerly supposed, according to announcement made by Dr. Robert J. Trumpler, of the Lick Observatory, Mount Hamilton, California. He reported his measurements to the meeting at Pasadena of the Astronomical Society of the Pacific. Three different methods lead to the conclusion that this brilliant nebula is distant from the earth some 1,800 light-years, a light-year being the distance traveled in a year by a beam of light which covers 186,000 miles a second. Knowing the distance it is easy to calculate the size of the nebula. It is so big that light takes 26 years to cross it. Compared with other diffuse nebulae of the Milky Way, however, the Orion nebula ranks among the smaller. Although the matter of the nebula is highly rarefied it has an appreciable effect on the light passing through it, rendering it slightly reddish. The stars in the midst of the nebula are found to be somewhat more reddish than astronomers expected.

AN instrument that will measure the force of an earthquake that shakes it was described by Professor J. A. Anderson, of the Mount Wilson Observatory, before the meeting of the Seismological Society of America. It consists essentially of a pendulum free to swing in a given plane, but normally resisting against a stop. It can be adjusted to indicate a given force of movement by the angle of its swing. When an earthquake strikes it, the pendulum swings away from its stop. This opens an electric circuit and causes a semaphore on top of the instrument to drop. It is planned to use seven such pendulums on each installation, each set to indicate a different earthquake force. Then the operator, looking at the set-up after a quake, can tell by the number of semaphores which have dropped how severe the earthquake was. Then, simply by resetting the semaphores, he leaves the instrument ready to register the force of the next earthquake.