SCIENCE NEWS

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COSMIC RAY RESEARCH

COSMIC RAYS, already a potent means of learning new things about the nuclei or "hearts" of atoms, will next have the task of helping scientists discover new facts about distant nebulae. This new rôle of cosmic ray research in the future was suggested at the Sigma Xi lecture at Louisiana State University by Professor Carl D. Anderson, of the California Institute of Technology.

Dr. Anderson, Nobel Prize Laureate in Physics in 1936, when he was only 31 years old, is known for his researches on cosmic rays and for his discovery of the positron, fundamental atomic particle. In his lecture he said: "Cosmic ray researches have told us new facts about the smallest things in the universe, the elementary particles. They give rich promise of telling us in the near future equally important facts about the largest things in the universe, about the far-away nebulae and other astronomical bodies. Cosmic ray investigations will support and be supported by astronomical investigations. The electroscope, Geiger counter and cloud chamber will work hand in hand with the 200-inch telescope, each doing an important job in translating into knowledge those messages which come to us from outer space."

The energies of some cosmic ray particles are enormous, he continued. They are more than 1,000 times as energetic as any other particles known in the science of physics. In studying cosmic rays in the laboratory scientists are in effect "sitting in" at the death and birth of matter. A certain electron, for example, which may have been playing its prosaic rôle as a part of an atom for hundreds or thousands of years, will be struck a blow so hard that it will be projected through space at a speed greater than a hundred thousand miles a second; it will in turn strike several million other electrons and pass through several million atoms before it is finally brought to rest and again attaches itself to another atom, where it may carry out its normal duties with very little disturbance for perhaps another million years.

Other electrons, however, may be annihilated by the cosmic ray impact. After several million years' existence, perhaps, suddenly this electron disappears. But out of this annihilation a new electron appears which is one of a set of atomic "twins." These twins are alike except that they have opposite electrical charges.

Such positive and negative electrons, created in pairs, follow a greatly different "life" pattern. The negative electron joins other similar electrons and takes up a normal existence in some other atom.

The positive electron, however, survives only for about a billionth of a second. In this brief fraction of time the positron electron finds a negative electron and the two combine and neutralize their electrical charges. By this union they are annihilated and in their stead appear "two bits of radiant energy whose ultimate fate will be to interact with other electrons in the surrounding material."

This was the first of fourteen lectures which Dr. Anderson will give in universities through the country during the next three weeks. The lectureship is sponsored by Sigma Xi, national honorary society for the promotion of research in science. Election to membership in Sigma Xi is equivalent—among scientists—to membership in Phi Beta Kappa in general academic life.

NEW 82-INCH TELESCOPE OF THE McDONALD OBSERVATORY

THE new giant among telescopes, the 82-inch mirror of new McDonald Observatory, has been given its baptism of starlight and proved to be practically perfect in mirror quality and operation. For a number of nights the new telescope has been in use.

"Every new observation will mean an addition to our knowledge of the universe," said Dr. Otto Struve, director of both Yerkes and McDonald Observatories, after the preliminary observations.

The telescope was first pointed at a star on March 2. When brought to a focus the star image was steady and sharp, showing that the mirror was practically perfect. Photographs of brighter stars and of the moon were then obtained at the Cassegrain focus of the instrument. The first star of which the spectrum was photographed was the fifth magnitude object, 17 Lepocis, located south of Orion. This spectrum shows many features never before recorded with any instrument.

The McMath type electric drive controls the telescope so accurately that once adjusted for an observation the astronomer does not need to stay at the eyepiece to guide the telescope. The astronomer at the telescope moves it into position by push-button controls.

Since all mirrors of the 82-inch telescope are coated with aluminum, observations in the ultra-violet region of the light spectrum will be particularly efficient. Most of the old telescopes are designed in such a way that the ultra-violet light is lost, even when the conventional silver mirror coating is replaced by aluminum with its superior reflecting power in the ultra-violet.

The group of astronomers who made the tests included Dr. Struve, Professor George Van Biesbroeck, Professor Gerard P. Kuiper and Professor C. T. Elvey, of the joint Yerkes-McDonald Observatory staffs, as well as Dr. J. S. Plaskett, of the Dominion Astrophysical Observatory at Victoria.

McDonald Observatory was built by the University of Texas and is operated jointly by that university and Yerkes Observatory of the University of Chicago.

MEASUREMENTS OF THE TEMPERATURE OF TREES

TREES have thermostatic methods of their own for resisting both freezing in winter and overheating in summer, Professor E. S. Reynolds, plant physiologist of Washington University and of the Missouri Botanical Garden, has discovered in measurements of tree-trunk and air temperatures over a period of four years.

Professor Reynolds inserted automatic, recording, elec-

trical resistance thermometers in the heart of a tree-trunk and in the cambium or growth layer just under the bark. He also used a similar, shaded instrument to record the air temperatures alongside of those of the trees.

In the winter period the tree temperatures changed more slowly than the air temperatures. The lag became especially pronounced just when the temperature reached the freezing point. Often for a period of 24 to 60 hours after the air temperature had dropped several degrees below the freezing point the tree temperatures remained steadily at about the freezing point.

Likewise when the air temperature rose well above the freezing point the tree temperature would not pass about this point for a long time.

However, once this point was passed in either direction the temperature of the trunk followed that of the air rather closely. Dr. Reynolds regards this more or less extended period of steady temperature at the freezing point as dependent upon the release of heat during the freezing of the water in the tree and the equivalent absorption of heat later in the process of melting the ice.

Resistance to extreme temperatures in summer followed a different pattern. Thus under these conditions the temperature at the center of the tree dropped to 60 to 63 degrees and the cambium was less than 90, when the air temperature was above 105. The tree's ability to keep its trunk cooler than the torrid surrounding air seems to be tied up with two factors. The air spaces in the wood can hold larger quantities of water vapor as the temperature rises and more spaces are developed in the finely tubular tissues of the wood. This latter occurs because of the breaking of the slender sap columns due to the severe pull exercised on them by the rapidly transpiring leaves. From the near-by wet tissues water is evaporated rapidly into these nearly empty spaces until they are saturated with water vapor. The great amount of heat that is required to evaporate water is one of the best known physical phenomena. The tree thus keeps itself cool, at all times when it is in good foliage, by the absorption of heat from the tissues by this evaporation as if from a kind of internal sweat.

When it is remembered that the tender, growing cambium zone is not far beneath the surface of the bark, which is often heated to high temperatures by direct sunshine, the value of this cooling process is more evident.

Professor Reynolds also points out that his studies raise anew the old question of the possible rise of water in trees in the form of vapor. This was once one of the most-discussed of plant physiological theories, but has been more or less in abeyance lately. However, if water vapor is a regular part of the tree's temperature regulating mechanism, there is at least a possibility that it is also transported upwards, to be condensed back into liquid in leaves or twigs.

ALUMINUM DUST INHALATIONS AND SILICOSIS REMEDY

THE possibility that aluminum dust inhalations may serve both as preventive and remedy in silicosis appears in the report to the *Journal* of the Canadian Medical Association of J. J. Denny, metallurgical engineer, Dr. W. D. Robson, chief surgeon of the McIntyre Porcupine Mine, Schumacher, Ont., and Dr. D. A. Irwin, of the University of Toronto.

Silicosis is the lung disease resulting from inhalation of silica or quartz dust. The silicosis-preventive action of aluminum dust inhalations was first suggested in research on rabbits reported by the Canadian investigators to the academy two years ago. In this latest report their findings of two years ago are substantiated. The manner in which aluminum powder prevents quartz dust from damaging the lungs is explained, and it is shown that some quartz dust already inhaled may be gradually removed from the lungs under treatment with aluminum powder.

The development of the fibrosis of the tissues in the lungs, which is characteristic of silicosis and is produced by the inhalation of extremely fine quartz dust, is known to be due to the poisoning of the phagocytic (scavenger) tissue cells by the silica dust which they engulf. Because they are poisoned and killed, they are unable to eliminate this dust through the usual channels by which inert dusts are eliminated. The present experiments show that the action of the aluminum is to prevent the silica from poisoning and killing the lung phagocytes, and thus allow them to carry away the silica just as they would an inert dust.

It seems that the fine aluminum powder is gradually dissolved by the body fluids in the form of a colloidal or jelly-like aluminum hydroxide, which is then adsorbed and firmly held upon the surfaces of the quartz particles, and seals these surfaces so firmly that the quartz can no longer go into solution and poison the body tissues. Since the aluminum and its hydroxide are themselves harmless and non-irritating, the result is that the quartz particles are also rendered harmless, and therefore placed in the way of being eliminated by natural processes.

Experiments showed that it was not necessary that the aluminum dust should be inhaled at the same time as the quartz dust. Rabbits that inhaled aluminum dust for 40 minutes each morning were completely protected, although they inhaled quartz for the next 12 hours. The only condition seems to be that the amount of aluminum dust deposited in the lungs should be at least about one per cent. of the weight of the quartz dust, and that this aluminum dust should be distributed fairly uniformly with the quartz dust, so that it can get at it and act upon it.

Perhaps the most interesting experiments, from the standpoint of the treatment of silicosis, were those which indicated that if rabbits which had already developed silicosis and whose lungs contained considerable quartz dust were allowed to inhale a little aluminum dust each day, the quartz dust was not only rendered inactive but was steadily removed by the lung phagocytes, so that it was carried out of the body, and the further progress of the disease might be expected to be prevented. One of the most characteristic and serious things about silicosis has been the fact that when the quartz dust has once been deposited in the lungs the irritating and poisoning action continues for years, and the patient gradually gets worse. These experiments give hope that by the inhala-

tion of aluminum much of this quartz dust may be removed, and the progress of the disease retarded or even stopped.

MARKETS FOR NEW ENGLAND'S HURRICANE-FELLED TIMBER

USES and markets for New England's timber blown down by last fall's hurricane will be at least partly determined in Wisconsin. Scientists and engineers at the U. S. Forest Products Laboratory are seeking outlets for logs salvaged from the wind-felled trees, now in government-leased storage ponds in the devastated area. Some of their conclusions are set forth by Carlile P. Winslow, director of the laboratory, in the new issue of *American Forests*.

Present rough estimates figure salvageable logs of six inches diameter and up at about two billion board feet. Of this, 300 million board feet is in hardwoods, the rest in softwoods, principally spruce and white pine. Hitherto, New England's timber needs have amounted to between 800 million and one billion board feet a year. Local sources have supplied only half of that amount; the rest was shipped in. Furthermore, near-by New York, New Jersey and Pennsylvania have an annual timber requirement of some four billion board feet. New England, however, has had practically no share in that great market, and would have to meet competition of lumber from other sources if an effort were made now to enter it.

In New England, itself, the normal hardwood demand, for furniture, millwork, spools and bobbins, woodenware, etc., can use up the 300 million board feet of hurricane hardwood lumber in about three years. This will mean, of course, that the region's usual purchases of outside hardwood will be somewhat diminished during that time, though they will by no means stop altogether.

Disposal of the huge quantities of white pine will not be so simple. A great deal of this used to be consumed in lumber for boxes and crates, but the depression has cut into this demand very severely, and substitute materials have also captured a considerable part of the market.

It is a long time since New England white pine was sawed into the sizes of lumber needed for house construction. Much of the white pine now available can be used for this purpose, although its knottiness will necessitate shaping into the old full-sized "two-by-fours" and other dimension timbers, instead of the skimped measurements now prevalent in the construction lumber trade.

Pulp for paper and rayon will be the outlet of a good deal of the down spruce and fir in the northern part of the hurricane's path. There is even a chance that some of it may be exported to Europe. Mr. Winslow states that favorable prices have been paid for American pulpwood by Central European purchasers.

Possible pulp uses for white pine and some of the hardwoods are being investigated at the Forest Products Laboratory. Special treatments will be necessary to pulp these woods successfully, but the effort is considered worth making.

ITEMS

A SUBSTITUTE for blood for transfusion to revive patients suffering from shock has been discovered by Drs. H. A. Davis and J. F. Blalock, Jr., of the University of Tennessee. Instead of blood, they have found, the fluid removed from patients suffering from abdominal dropsy or from pleurisy can be used. This fluid, called ascitic fluid, must be typed just as blood must be before use in transfusions. It is useful in cases of shock in which there is a concentration of red blood cells but a deficiency of the fluid portion of the blood. Storing the fluid in a refrigerator does not affect its usefulness. Technical details of investigations of this substance as a substitute for blood when the latter is not available have been reported to the *Journal of Clinical Investigation*.

A NEW motion-picture technique has enabled Harvard educational psychologists in eight weeks to improve by 50 per cent. the reading speed of a group of 16 college freshmen. The group increase in speed, averaged, was from 251 to 382 words per minute. In the short period the students improved fundamentally their habits of eye-movement in reading, for the first time exercising conscious control. The number of eye-fixations per line of reading was reduced from 10.8 to 6.5, and the average number of regressions in reading from two every three lines to one every two. The students also gained in reading accuracy.

TWO National Advisory Committee for Aeronautics scientists at the National Advisory Committee for Aeronautics' Langley Memorial Aeronautical Laboratory have determined that injection of fuel directly into the cylinders of an aircraft engine produces the greatest output of power. Tests conducted on a single-cylinder experimental engine proved that the greatest amount of air and fuel can be put inside a cylinder by this means, as compared with manifold injection and carburetion.

LIGHT BLUE eggs are being laid by hens of a new hybrid type, produced in the poultry department of Cornell University. The hens are a cross between the ordinary white Leghorn and a South American fowl known as the Araucana hen, which lays deep blue eggs. When crossed with fowl that normally lay brown-shelled eggs, a hybrid is produced that lays eggs with olive-colored shells.

STRAWBERRY clover, a forage plant that loves wet soil and can tolerate relatively high concentrations of alkali, is recommended for use in seepy and alkaline fields by the Bureau of Reclamation, U. S. Department of the Interior. Tests during the past few years in the West have proved the plant to be of such merit that its general adoption is now encouraged. Strawberry clover is so named because it propagates itself, after it once gets a start from seed, by throwing out long runners that root at the tips, after the manner of a strawberry plant. Its botanical name, *Trifolium fragiferum*, is a reference to this resemblance: Frageria is the scientific name of the strawberry. This relatively new clover apparently came to the United States from Australia, in lots of mixed seed intended for pasture sowing. In some of the earlier plantings it has not only persisted after the grasses with which it was mixed, but has even driven out salt grass, foxtail and other weeds notorious for their aggressiveness.