SCIENCE NEWS

Science Service, Washington, D. C.

MESOTRONS

(Copyright, 1939, by Science Service)

MESOTRONS, the fiercely energetic particles generated by cosmic rays far up in the stratosphere, "commit suicide" on their way to earth.

They dash in uncountable hordes from their high birthplace toward sea-level, but on the way more than half of them disappear. That much was known. What was not known was whether they died from collisions with the atmosphere or from some other cause.

An elaborate series of experiments conducted all the way from Chicago to the top of 14,259-foot Mount Evans, where the world's highest laboratory is situated, has established that the mesotrons disintegrate according to a fixed schedule or life-span which seems largely independent of outside conditions.

Their suicidal impulse resembles that of the disintegration of radium, which is subject to no outside conditions possible for man to establish.

Dr. Bruno Rossi, the Italian physicist now a research fellow of the University of Chicago, and head of the party that made the experiments, computes the average life-span of a mesotron, dashing toward earth at a speed approaching that of light, as 27/10,000,000th of a second. He plans to return to the mountains with more equipment next summer, for further investigation into the nature of mesotrons and of cosmic rays. He and his party, which included Professors J. Barton Hoag, Winston Bostick and O. E. Polk, of the University of Chicago, and Professor Norman Hilberry, of New York University, brought an ordinary old school bus from Chicago to Mount Evans.

On its floor was installed a ton and a half of equipment. It included three cosmic-ray counters, with five inches of lead on top to insure that only the powerful mesotrons would get through. Boxes contained several hundred pounds of powdered graphite.

Observations were taken at Chicago, elevation 580 feet; Denver University campus, 5,200 feet; Echo Lake, west of Denver on the flanks of Mount Evans, 10,816 feet, and at the top of the mountain at the cosmic ray laboratory of Denver University, 14,259 feet. At Chicago, the counters clicked at the rate of 5 a minute; at Denver, 7; at Echo Lake between 9 and 10, and at the top of the mountain, 12. This only confirmed previous observations, which showed more mesotrons at high atmospheric levels.

When the last count had been checked and re-checked at the top of the mountains, the observers heaped graphite, in deep trays, on top of the counters until there was a layer 55 centimeters thick or obout 20 inches. This thickness was calculated to represent the same amount of mass as that contained in the air blanket, 3,641 feet thick, between the top of the peak and the altitude of Echo Lake.

Now, to reach the counters, the mesotrons would have to pass through the same mass, but they could pass in much less time. If the number of mesotrons now registered remained more numerous, it would show that many mesotrons passed successfully through the mass. But it would also show that many of them disintegrated in the greater time—short as it seems by ordinary measurements—that it takes them to travel through 3,641 feet of air rather than 20 inches of graphite.

The clicks at the mountain-top decreased to about 11 a minute, but there were still more than the 10 a minute registered at Echo Lake. Some mesotrons, therefore, "commit suicide" without outside impulsion, on the way down to earth.

THE CAUSE OF SPRUE

(Copyright, 1939, by Science Service)

A NEW theory of the cause of sprue, serious disease of the tropics which also occurs in the United States and other temperate regions, was announced by Dr. Edward B. Vedder, of the George Washington Medical School, at the opening session on November 21 of the American Society of Tropical Medicine, meeting at Memphis.

Sprue, Dr. Vedder believes, is caused by a failure of the tiny but powerful pituitary gland at the base of the brain. This little gland produces a number of hormones, among them one called prolactin, which stimulates milk secretion, and which also has an effect on the digestive tract. It is lack of this hormone which Dr. Vedder believes causes sprue, and he would like physicians to try the hormone as a remedy for their sprue patients. Most effective remedies for sprue at present are liver extract or some other source of the vitamin B_2 complex, but Dr. Vedder believes the gland hormone would prove a better remedy.

Sore mouth, anemia and digestive disorder are characteristic symptoms of sprue. The digestive disorders set up a vicious cycle, because the sprue patient, already unable to absorb enough of the B vitamins, has more and more trouble getting enough of these vitamins which he needs to remedy his illness. In severe cases they must be given by hypodermic injections. A number of investigators have concluded that the digestive disorder and vitamin deficiency were important parts of the picture, but no satisfactory explanation for what starts the vicious cycle has hitherto been forthcoming.

The start of the digestive disorder, Dr. Vedder believes, is the failure of the anterior pituitary gland to produce enough prolactin to keep the digestive tract functioning smoothly. Tropical service, he suggests, precipitates the pituitary gland failure in some persons, but such gland failure may occur without the precipitating effect of long periods of tropical heat, which may explain the nearly two hundred cases of non-tropical sprue in medical records.

GERM-FREE SURROUNDINGS FOR INFANTS

(Copyright, 1939, by Science Service)

PROTECTION for babies in maternity hospitals and infants' homes, from the germs they unwittingly give each other, is a leading topic in the two-day colloquium on newest progress in bacteriology now in progress at the University of Notre Dame.

Two principal systems to obtain this protection have been developed. In one, brought to its highest point by Professor James A. Reyniers, of Notre Dame, emphasis is placed on the complete isolation of all babies, brought about by keeping each one in a tiny room or cubicle, kept as germ-free as all imaginable precautions will insure.

The other system, developed by Professor William F. Wells, of the University of Pennsylvania, depends on floods of ultra-violet radiation across doorways and other critical areas in the hospital, which massacre the germs as they float through the air. Both systems are now under full-scale practical test at a well-known home for babies.

Animals and plants brought into the world without the contamination of germs, which is the fate of all ordinary living things, and kept germ-free throughout their lives, have been produced in Professor Reyniers' laboratory, and adaptations of his technique, as well as other methods, are now in use by a number of research workers. In his method, the young guinea pigs or other laboratory animals are born by Caesarian operation under completely aseptic conditions, within big tank-like cages where they are kept as long as necessary, receiving only sterile food, water and air. He has brought up guinea pigs, chickens and other animals from infancy to full growth, without their ever being invaded by a single discoverable germ.

Getting germ-free plants is usually a simpler job, according to Dr. Philip R. White, of the Rockefeller Institute laboratories at Princeton, N. J. The internal tissues of plants are usually naturally germ-free; it is a question simply of getting seeds out of a pod, or cutting tissues out of the inside of a stem or root, without their becoming contaminated. Many kinds of seeds have coats so resistant that they can be washed in effective antiseptic solutions without injuring the embryo plants which they contain. Dr. White described the method by which he obtains germ-free cuttings of roots, which he grows in flasks of nutrient fluid, maintaining them indefinitely without connection with any stems. In such cultures of non-green plant tissues he has proved that a little iron is as necessary to them as it is to the chlorophyll-containing leaves and green shoots. One part of iron in 10,000,000 of solution makes all the difference between life and death to simple tissues.

Other uses of germ-free techniques were set forth by Dr. R. W. Glaser, of the Rockefeller Institute, and by Dr. Oram Woolpert, of the Ohio State University. Also discussed at the colloquium were exceedingly delicate mechanical devices, which make it possible to insert a single germ, or a germ-size dose of a drug or virus, into a single living cell, to study results on this smallest of all experimental bases. Applications of these techniques have been made to many practical problems in diseased conditions of plant and animal cells, as well as to cells in normal states of life and growth.

RELATION OF QUARTZ DUST TO SILICOSIS

(*Copyright, 1939, by Science Service*)

MEDICAL men are now attacking the problem of silicosis by attaching a small transparent "window" to the ears of rabbits, it was reported to the meeting of the Air Hygiene Foundation by Dr. Eliot R. Clark, professor of anatomy of the University of Pennsylvania, and Darrow E. Haagensen.

A tiny sterile microscope viewing window, designed by Dr. R. G. Williams, associate professor of anatomy at the University of Pennsylvania, was attached last April to a rabbit's ear. Inside is a space only 1/333 of an inch thick in which the tissue of the ear could grow normally. Last June minute specks of silica ranging in size from one to seven microns (a micron is 1/25,000 of an inch) were placed on the tissue. A few particles up to 30 microns were also present. The cover was then placed over the microscope chamber, and the tissue cells as they sought to live in the same environment with the silica have been photographed daily.

While the important research must be continued much longer before final conclusions can be determined, it already appears that:

1. A relatively stationary grouping has developed among living cells called macrophages which have ingested, or taken in, the smaller particles of silica.

2. The silica laden cells tend to be very sluggish but seem to move slightly from day to day. They show grouping tendencies with occasional slow scattering and regrouping. Some of the larger particles from 15 microns and up in size appear to lie outside the cells and are not influenced by the tissue fluids.

3. Connective tissue has grown into the chamber and completely covered the observational area. As far as can be determined the lymphatic capillaries are normal as is the rich blood vessel plexus. Not even a mild inflammatory condition has appeared.

In a separate report Dr. Clark described the history of the use of observational "windows" placed over living tissues and showed that the tail of the tadpole, the bat's wing and the web of the frog's foot have all been used at one time or another for research.

Professor Philip Drinker, of Harvard University, chairman of the Foundation's Preventive Engineering Committee, describes studies seeking to learn what size of silica particles seem to have the most rapid effect in producing cell changes. Ground flint, consisting of 99.7 per cent. silica, was carefully separated into four sizes of 3.30, 1.65, 1.04 and 0.62 microns. Sterile suspensions of these fractions were injected into ear veins of rabbits twice at three-month intervals, and the animals were killed and autopsied periodically. Examination of the liver sections indicated that the fine particles were taken up more rapidly than the larger ones. There appears to be no striking effects for the larger size particles, while it seems, in these preliminary studies, that the smaller sizes produce the greatest changes.

The knowledge obtained will be useful to engineers in designing ventilation and filtering systems for mines and other places where silica dust is prevalent, and will also be of greatest use in the design of dust respirators.

PNEUMONIA CONTROL

THE latest aid in the fight to save lives threatened by pneumonia, especially among children, is a new, speedy diagnostic technic which can shorten to six hours or less the time before starting effective treatment. Details of

the new technic are reported by Dr. Franklin D. Poole and Miss Mildred D. Fousek, of the Orphan Asylum at New Haven and Yale University School of Medicine, in the *Journal* of the American Medical Association.

Rapid typing of pneumonia germs found in the patient's sputum, in order to determine which type of anti-pneumonia serum should be used in treatment, has already been accomplished, but often in children and sometimes in adults delay still occurs because of difficulty in obtaining sputum for the test. At Yale University the difficulty has been surmounted by applying the usual speedy typing technic to material obtained by swabbing the patient's nose. The method is valuable, it is pointed out, even though many pneumonia patients are now treated with the chemical, sulfapyridine, instead of with anti-pneumonia serum, because it is desirable for the doctor to know whether the pneumonia is caused by a pneumonia germ or by the streptococcus.

Small doses of sulfapyridine given for a short time in treatment of pneumonia in children are recommended by Drs. Charles Hendee Smith and Rosa Lee Nemir, of New York, in a report of their results with sulfapyridine treatment in 93 cases of pneumonia in children, which appears in the same issue of the *Journal*.

The value of sulfapyridine in saving lives, especially from Type III pneumonia for which serum treatment does not have as good a life-saving record as it does in other types, was stressed in another report to the *Journal* by Drs. Norman Plummer and Herbert K. Ensworth, of New York. Among 270 sulfapyridine-treated patients at New York and Bellevue Hospitals there were only 34 deaths. Of these, 11 died within 24 hours of the beginning of treatment, which reduces the death rate in this group to 8.5 per cent. Serum treatment was used in addition to sulfapyridine in 102 of the cases. In serum-treated pneumonia cases a death rate of about 18 per cent. to 20 per cent. has previously been reported from Bellevue Hospital. Besides reducing the death rate, sulfapyridine shortens the period of fever and sterilizes the blood stream.

ITEMS

THE earthquake that jarred several Eastern cities on November 14 had its epicenter in New Jersey, about 15 miles southeast of Wilmington, Del., according to a first approximation by the U. S. Coast and Geodetic Survey, based on data obtained telegraphically by Science Service. Time of origin was 9: 53.9 P.M., EST. Geographic coordinates were latitude 39.7 degrees north, longitude 75.4 degrees west. This is the fifth earthquake felt in New Jersey within a decade. Most recent was one on August 23, 1938, near Mt. Holly, followed by a couple of light aftershocks. Other New Jersey earthquakes were recorded on May 31, 1937, on the sea coast; January 24, 1933, near Trenton, and January 26, 1931, in the Moorestown-Rivertown neighborhood.

SEATTLE'S earthquake, that cracked windows and pavements on November 13, had its epicenter about 60 miles southwest of the city, according to a provisional determination by seismologists of the U. S. Coast and Geodetic Survey, based on data collected telegraphically by Science Service. The spot lies a little to the south of Mount Olympus National Monument, in a rugged, mountainous, almost uninhabited region. Geographical coordinates were given as 47.5 degrees north latitude, 123.5 degrees west longitude. Time of origin was a quarter of an hour before midnight, Pacific time, or 2:45.8 A.M., EST.

DUST storms may swirl again unless something happens to break the grip of the severe drought, which still continues unrelieved as autumn merges towards winter. The U. S. Weather Bureau states that "In the southwestern Plains, especially western Kansas, the soil is dry, loose, and subject to drifting by high winds." Light rains over parts of the northern central valley, particularly in the Great Lakes region, brought temporary relief, but the moisture is confined to the topsoil, for immediate benefit of fall-sown grains. Deep wells are being put down, seeking water for thirsty livestock. Over the greater part of the principal crop-producing regions, however, it is still too dry for fall seeding. Indeed, farmers in the Corn Belt are complaining that it is not only impossible to plow, but that they can't even mend their fences because the soil is so dry and hard that they can't dig post-holes.

BENJAMIN FRANKLIN wanted the turkey, not the eagle, to be the national bird of the United States. Yet not quite: for the turkey that graces our tables on Thanksgiving Day is not the native American bird that Franklin had in mind. The tame turkey of the barnyard is not the same species as the wild turkey that once roamed all the eastern woods. It is a tropical cousin, brought up by indirect route from below the Rio Grande.

WOUNDS incurred by persons working in the Russian Arctic are said to heal more rapidly than usual if they require stitching, but more slowly if they are left open. Paradoxically, both effects are credited to the relatively germ-free Arctic air. Germs in closed-up wounds cause inflammation and suppuration, but on minor, open wounds they stimulate the natural self-closing and healing processes.

THERE are lambs on the outskirts of Washington whose sires have never been east of Idaho; lambs in Idaho whose sires live in the pastures of the U. S. Department of Agriculture station at Beltsville, Md. Airplanes carried the prize rams' semen that made these long-distance breedings possible. This animal parentage at a range of a couple of thousand miles is only the most spectacular aspect of the rapid development of the technique of artificial breeding in this country. A little over a year ago, it was well established in only one state, New Jersey. Now there are artificial breeding associations in fifteen states, either actually operating or in process of formation. The territorial range covered is literally from Maine to California. Artificial breeding enables a farmer or rancher to have his new stock sired by the choicest animals available, regardless of distance, at fees so moderate that it becomes unnecessary for him to maintain sires on his own place or to patronize near-by owners of male animals of possibly less desirable qualities.