SCIENCE NEWS

Science Service, Washington, D. C.

COSMIC RAY MEASUREMENTS FROM LITTLE AMERICA

FIRST observations to determine the effect latitude has on a recently discovered characteristic of cosmic rays that bombard the earth from outer space will be made soon when the U.S.M.S. *North Star* sails from Seattle on a round trip to Little America to bring back the last of the United States Antarctic Expedition.

According to Dr. Serge A. Korff, of the Bartol Research Foundation of the Franklin Institute, Dana Bailey, of the Harvard College Observatory, will make the observations. These will be of the neutrons, electrically neutral particles, that are produced by the cosmic rays. Discovered in 1932, as produced in the laboratory, their connection with cosmic rays has only lately been noticed.

Dr. Korff has designed a new form of counter to measure them, as distinct from the measurements of the other types of cosmic radiation. This consists of a tube containing a gas, boron trifluoride. The neutrons break up the nuclei of the boron atoms, and alpha particles, atomic bullets of another kind, are formed. These are detected in the counter.

Mr. Bailey, whose studies at Oxford University as a Rhodes Scholar were interrupted last spring by the war, will sail from Seattle on December 1 and will be back about the end of April, 1941. He will also bring back two cosmic ray meters of the type devised by Dr. R. A. Millikan, which have been in use at Little America since January, 1940. These he will continue to operate on the return voyage.

Dr. Korff expressed the opinion that the year's work at Little America will yield important data on cosmic rays. The meters were installed by Dr. Eric Clarke, now of the Massachusetts Institute of Technology, and have been operated by Dr. F. Alton Wade, senior scienstist of the Antarctic Expedition. He took the meters on one flight over Antarctica, which reached an altitude of 22,000 feet.

From the results obtained, especially during the Antarctic night, it may be possible to learn whether cosmic ray fluctuations near the South Pole can be correlated with those here, and whether they have any relation to changes in the earth's magnetic field and magnetic storms.

On Commander Byrd's last expedition, cosmic ray meters were used, but these were of a less sensitive type than those now employed.

SUPER-SPEED EARTHQUAKE WAVES

THE present picture of conditions deep beneath the surface of the earth will need to be revised, according to Dr. L. Don Leet, director of Harvard's Seismograph Station. He has just completed new measurements of the speed at which earthquake waves travel underground and has found that some of them go about 1,500 miles an hour faster than experts had thought. The new figure, the highest ever recorded, can not be explained in terms of any familiar geological material or present theories about conditions of heat and pressure twenty-one miles below the earth's surface. Obviously, these new measurements indicate that the physical laws and conditions applying deep underground are still imperfectly known.

Dr. Leet made his clockings from the records of some fifty earthquakes which have visited New England and vicinity during the past six years as tabulated on the first good-sized network of seismograph stations to employ a new type of extremely sensitive quake-detector.

Special attention was paid to the waves traveling in the upper layer of the so-called mantle of the earth, about twenty-one miles underground, and Dr. Leet found that the "push" waves in this layer, that is, those which give a back-and-forth motion, scud along at 5.2 miles a second. The previously accepted velocity was 4.8 miles a second.

The instruments used in the study were Benioff seismographs, the most sensitive yet devised, which were developed by Professor Hugo Benioff, of the California Institute of Technology. Harvard has six of these quake-recorders and others are at the Dominion Observatory, Ottawa, Williams College, Weston College, Fordham and the Massachusetts Institute of Technology, all of which participated in the study.

The investigation involved the determination of the location and exact time of occurrence of the earthquake and of the time of the arrival of the various wave forms at these observing stations, from which data the speed of the waves could be derived.

The research also enabled Dr. Leet to map for the first time the surface layers of the earth in New England down to the mantle. The top layer, he found, is dominantly granitic and extends down about nine miles. Then comes a second layer of heavier minerals which is six miles thick and probably basaltic. A third layer, also about six miles thick, is of undetermined composition.

A RADIUM SUBSTITUTE

X-RAY photographs of parts of airplanes and other machines important for defense, to discover any hidden defects and now made with radium, may soon be made with an artificially produced radium substitute, radioactive yttrium, prepared in the laboratory by bombarding strontium with atomic bullets from a cyclotron.

Dr. Charles Pecher, Belgian physicist, now working in the William H. Crocker Radiation Laboratory of the University of California, announces the separation of this material in a communication to the last issue of the *Physical Review*.

Dr. Pecher was interested in making the element strontium radioactive for biological investigations. This was done by bombarding strontium samples with 16-million-volt deuterons from the cyclotron. Some of the strontium atoms are converted into a form of another element, yttrium, which also has properties like radium, and which lasts for about 100 days, much longer than most of the artificially radioactive substances. Already, he says, enough has been obtained to be equivalent to about 25 milligrams of radium.

Photographs made through two inches of iron show that the yttrium can be used industrially for photographs of the inside of machinery.

"Because of its long life and penetrating gamma-radiation," writes Dr. Pecher, "this radioactive yttrium is, among the artificial radioactive elements known at the present time, the most likely to be substituted for radium, but it must be considered at the present time merely as a by-product of the radio-strontium preparation as it is, as yet, appreciably more expensive than radium for a like dose of gamma-radiation."

HEALTH HAZARDS CAUSED BY WAR

INFLUENZA, measles and pneumonia will be the major health hazards to the English people under simultaneous siege from war and cold weather this winter, according to a prediction by Dr. John E. Gordon, director of the American Red Cross-Harvard Hospital shortly to be erected in southwest England.

Protection of America from the same war-borne health hazard, should war come to this country, is the objective of the studies Dr. Gordon and associates will make in a hospital of twenty-two buildings now being pre-fabricated for shipment abroad next month.

When epidemics strike a nation at war, doctors and health authorities are too busy trying to check the epidemic and care for the sick to have any time for investigating where and how the epidemic started and traveled. Such investigations, however, could give valuable information for prevention of wide-spread sickness and death in the future, Dr. Gordon explained.

To gather such information on the ground, for the benefit of the U. S. Army, Navy and Public Health Service, Dr. Gordon and some of his associates will study patients in the 100-bed hospital. At the same time, field units, consisting of two physicians and three nurses, will go out with laboratory trucks to investigate epidemics at the point of their outbreak, using the hospital and its laboratory animals as a base.

Each of the 22 buildings of the hospital will be an almost completely self-contained unit. This is partly to minimize damage in case of air attacks and partly to provide more complete isolation of patients suffering from different contagious diseases, such as measles, scarlet fever, influenza and the like. The latest shatter-proof and blackout-features and bomb shelters will be provided for all the units as protection against air raids.

Dr. Gordon is now organizing the staff of the hospital, which will consist of some 75 doctors, medical technologists and Red Cross nurses. They will leave for England about January 1. Dr. Paul B. Beeson, Boston specialist in chemical treatment of infections, will be physician-in-chief of the hospital. Dr. Gerald F. Houser, also of Boston, will be administrative superintendent. Miss Patience L. Clark, of Detroit, will be at the head of the staff of 50 Red Cross nurses. More than three applications have been received for each post available on the hospital staff, Dr. Gordon said. Physicians, nurses, medical technicians, ambulance drivers from all over the nation have sought appointment.

COLOR MOVIES OF DISEASE IN CIRCULATING BLOOD

NEW aid to national defense on the medical side may come from color movies shown at the Southern Medical Association meeting at Louisville, Ky. They are the first motion pictures ever taken of disease in the circulating blood of a living animal.

The disease is malaria, the old "chills and fever" which scourged American troops during the Spanish American War. With the supply of quinine, chief anti-malaria chemical, threatened by present war conditions, medical authorities planning for national defense have been worrying over the problem of protecting American troops from malaria if they should be sent to Central or South American tropics on hemisphere defense duty.

The color movies were taken by Dr. Melvin H. Knisely, of the University of Chicago, now working at the University of Tennessee, Dr. Warren K. Stratman-Thomas, malaria expert of the Tennessee Valley Authority, and Dr. Theodore S. Eliot, associate professor of histology at the University of Tennessee. They show that malaria kills by turning the fluid blood into a thick sludge which plugs up the tiny arteries and veins. Then, contrary to popular conception, the heart is literally worked to death trying futilely to push more blood against the blockade of this malarial sludge in the veins and arteries.

As the disease progresses, the color movies show, the power of the blood's scavenger cells to engulf the clumps of sludge-sticky red blood cells lessens or vanishes. Gradually much of the life-sustaining blood passages are blocked off. This stage in the progress of the disease is known as the crisis. In some cases, the crisis is successfully passed but the ensuing oxygen starvation, caused by exhaustion of the red blood cells, brings death.

Heparin, the newly purified anti-blood-clotting chemical, prevents the formation of the dangerous malarial sludge in the blood. When heparin is used, however, the malaria parasites, or germs, multiply and kill by devouring the oxygen-carrying hemoglobin in the blood. Heparin makes it possible, however, to differentiate the mechanical and chemical effects of the disease and to study them separately.

New knowledge of the scavenger cells of the blood, as well as of malaria, was obtained from these color motion pictures, made possible by Dr. Knisely's adaptation of the quartz rod light for observing and photographing blood in the veins and arteries of living animals. These cells, it now is seen, "know" which material in the blood stream to grasp and which to leave alone as being harmless by a sticky substance which coats injurious substances such as germs or particles of carbon.

BONE MARROW TRANSFUSIONS

A NEW kind of transfusion, using bone marrow instead of blood, is reported by Dr. Maurice Morrison and Dr. A. A. Samwick, of the Jewish Hospital of Brooklyn, N. Y., in the current issue of the *Journal* of the American Medical Association.

Leukemia, the fatal disease in which there are too many white cells in the blood, and other rare and unconquered

blood disorders may yield to this new type of transfusion. Bone marrow transfusions have already been used, apparently successfully, in treating a 42-year-old salesman suffering from aplastic anemia. In this rare condition, unlike more familiar anemias, the blood contains too few white cells. The bone marrow stops producing white cells in sufficient numbers to make up for those destroyed.

Healthy bone marrow might stimulate the maturing of blood-forming constituents already present in the diseased bone marrow. So Drs. Morrison and Samwick drew a little less than a teaspoonful of bone marrow from the breastbone of the patient's brother and injected it into the patient's breastbone. Slightly larger doses were given in two subsequent transfusions. The patient recovered from symptoms of his illness and his blood condition also improved. But it is considered not justifiable to credit the results solely to the bone marrow transfusions until further studies have been made. Two other patients with rare blood disorders are now being treated with bone marrow transfusions.

Transfusions of healthy bone marrow, it is hoped, will help many patients suffering from various blood disorders, in the way that liver or liver extract helps patients with pernicious anemia. The latter patients lack a factor essential to the formation of red blood. This factor is supplied by liver. Leukemia patients and others with blood disorders may lack some other blood-forming factor which might be supplied by healthy bone marrow.

FOSSIL WORMHOLES

FOSSIL wormholes, chewed into the petrified wood that was part of living forest growth far back in the days of the dinosaurs, have been found in a petrified forest in the wild parts of northern China by an American missionary, the Rev. G. B. Mathews, with headquarters at the Catholic University of Peking. Father Mathews discovered the petrified forest in the course of his mission travels. Once hundreds of square miles in extent, there are to-day only scattered and isolated fragments. The rest has been eroded away in the course of many tens of centuries.

The petrified tree stumps still stand on their own roots, which itself is a rarity in fossil forests. Breaking off specimens disclosed the wormholes, as much as three inches beneath the bark. They are from a sixteenth to a quarter of an inch in diameter, and some of them contain pellets of "frass" or food waste, from the meals of the unknown larvae that chewed the wood.

No trace of the hole-borers themselves has been found, but Father Mathews is hopeful that the frass pellets can give some idea of their makers, if examined by entomologists with sufficient experience in the study of wood-boring larvae. There is, of course, the possibility that larvae or pupae of the ancient hole-makers themselves may yet be found.

Geologically, the fossil wormholes belong to the Upper Jurassic period, of an age estimated in excess of 150,000,000 years. Fossil wormholes have previously been reported in petrified wood from Egypt and South Dakota, but in both these instances the material had been poorly preserved, so that close study was not possible.

ITEMS

AN effect of total solar eclipse upon the powerful cosmic rays that incessantly bombard the earth from outer space has been discovered by investigators at the University of Sao Paulo, Brazil. This effect, hitherto sought without success, was reported by Professor G. Wataghin in a cable to Professor Arthur H. Compton, of the University of Chicago, who relayed the information to the *Physical Review*. Observations of the penetrating cosmic rays made underground show that their behavior was different from that of the total radiation.

MORE than a dozen earthquake observatories, scattered all the way from the Philippines to Alaska to New England and Ontario, have confirmed the location of the Rumanian earthquake's epicenter as being near Focsani, about 100 miles north of Bucharest. Their data, as wired to Science Service and calculated by at the U. S. Coast and Geodetic Survey, give the site of greatest disturbance as in 45 degrees north latitude, 26.2 degrees east longitude. The shocks began at 1: 38: 52 P.M., London time (November 10). The earthquake that shook Bucharest on October 22, 1802, was by no means an exclusively Rumanian affair, according to Captain N. H. Heck. This disturbance is reported as having been strongly felt all the way from Hungary to the Dardanelles. Effects on Rumanian oil fields are as yet only sketchily reported. It is improbable that any great shifts in oil pools would be made with any suddenness, but it is not at all unlikely that some, perhaps many, of the wells may have been pinched shut, necessitating costly and time-consuming redrilling.

THE bad weather that swept over the country on the Armistice week end was anything but bad for agriculture, according to reports coming in at the U. S. Weather Bureau. Heavy snows in the northern and northwestern winter wheat regions, and moderate rains farther south, benefited this important crop greatly. The precipitation was everywhere welcome and nowhere excessive; in a few places more rain is still needed. Fall pastures also show the benefits of the moisture. Late harvested crops, especially corn and cotton, are rapidly approaching completion, except where heavy snow (as in Iowa) interfered with corn picking, and heavy rains (in Texas) kept workers out of the last cotton fields. The week brought first heavy frosts to large parts of the country, reaching as far south as Arkansas and Oklahoma. In many localities these were the latest dates on record for first killing frosts.

MOUNT RAINIER'S family of glaciers will soon number only twenty-seven members instead of twenty-eight. Stevens Glacier, near Paradise Glacier, has diminished to a thin piece of ice about a quarter of a mile long, separated by about 200 yards from the main ice body of the mountain's cap. The perishing of Stevens Glacier is laid to two principal factors: less than two thirds of a normal snowfall last winter and mean temperatures averaging 18 per cent. above average during the past year. Other glaciers on Mount Rainier have shown quite irregular behavior during the current season, some of them receding more than their normal average, others considerably less.