SCIENCE NEWS

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COSMIC RADIATION

DR. FRITZ ZWICKY, of the California Institute of Technology, points out in the *Proceedings* of the National Academy of Sciences that cosmic rays may be responsible for some of the light received from giant stars and that the rays also produce forces sufficiently great to cause—in the course of time—astronomical changes. So far, Dr. Zwicky intimates, only the terrestrial aspects of cosmic rays have been studied.

Cosmic rays may be expected to be scattering continually the clouds of gas molecules which are thought to be the first step in the formation of a new galaxy of stars. Gravity is the force which tends to build up these clouds of molecules. Thus, contends Dr. Zwicky, astronomers may some day need to consider cosmic rays as an additional force acting when they construct their astronomical hypotheses. No corner of interstellar space escapes these tiny bullets. Wherever they hit matter they break up atoms, and wherever atoms are dismembered light is emitted when the pieces come together again.

The faint glow of the sky on clear moonless nights is partly due to this unceasing rain of high-speed particles. Likewise the luminosity of comet tails, certain interstellar gas clouds and outer atmospheres of giant stars may be due in some measure to this cosmic bombardment.

No one knows, as yet, just where cosmic rays come from or how they acquire their enormous energy. Some kind of super-thunderstorm in stars may create them. In any case they form a sort of contact between different stars and galaxies. Light is not the only messenger which one star sends to another. Actual material substance in the form of speeding atoms, ions and electrons, are shot out from one stellar body and absorbed by another. Professor Zwicky points out that this dissemination of matter and energy throughout the universe "may play an essential rôle in the evolution of stars and galaxies."

A 1,200,000-VOLT X-RAY TUBE

PRODUCTION of medical radiation greater than all the refined radium in the world is one of the advantages claimed for the super-x-ray machine being constructed by the Kelley-Koett Company at Covington, Ky. It is estimated that it would cost $100,000,000 to produce sufficient radium to equal the quantity of radiation available in the super-x-ray.

The machine, the largest in the world, will be used in the treatment of cancer. Four patients can be treated at one time by use of the 1,200,000-volt apparatus now being built for the Miller Hospital, St. Paul, Minn. The cost is approximately $75,000.

The 27-foot tube, in which electrons will bombard a gold electrode to create the radiation necessary for cancer treatment, has already been completed. Tubes in ordinary x-ray machines are dwarfed when placed beside the gigantic "medical battlefield."

When complete the machine will be 35 feet high, 24 feet wide, 33 feet long. Ordinary x-ray machines are 100,000-volt equipments. A few 800,000-volt and 400,000-volt machines are in use.

Not only will the radiation of this new giant of the medical world be greater than that of the world's supply of refined radium, but the machine's radiation will have greater penetrating power. The tube itself is protected with four inches of lead to prevent the radiation except where it is desired. Three feet of concrete will separate the tube from the operator, when it is installed, to protect him from radiation.

The object of the super-ray is to penetrate into the body to treat cancers which can not be treated at the present time because of burns which would result. The great penetrating power makes treatment possible where serious x-ray burns would result on the skin with less penetrative machines.

The target of the tube, or the x-ray producing electrode, will be of gold, five inches in diameter and one sixteenth of an inch thick. Gold is used because of its high atomic weight. The electron streams bombarding it will produce a more penetrating radiation than with metal of less atomic weight. Ordinarily, tungsten is used for such targets. Another reason for the use of gold is that the electrons strike it with such speed and hit so hard that the target would be melted if a metal of less heat conductivity were used. Even the gold is backed up with a water-cooling jacket.

The tube itself is of indestructible porcelain and metal. Oil will be used to cool the target and water for cooling the oil. A two-way microphone loud-speaker communication system will be provided to permit conversation between operator and his patient. A periscope will permit the operator to see into the treatment room and observe the patient at any time during treatment.

The machine will be ready for installation in the Miller Hospital, St. Paul, on about August 1.

SUBMARINE CANYONS

DISCOVERY of three hitherto unknown submarine canyons is reported by Professor Francis P. Shepard, who has just returned from a cruise on the U. S. Coast Survey ship *Oceanographer*. Professor Shepard's participation in the survey was assisted by a grant from the Geological Society of America.

The canyons are cut deep into the sea bottom off the Middle Atlantic region of the United States. They lie to the southwest of the great submarine Hudson Canyon, which continues the Hudson Valley far under the ocean from the mouth of the present Hudson River.

The greatest depth of the floors of the three new-found canyons is 7,000 feet below sea-level. Their walls rise above this level 1,000, 1,500 and 2,000 feet respectively. The deepest of the three is the southernmost. This canyon is located approximately off Toms River, N. J., and cuts back into the continental shelf for about three miles. The other two terminate headward below the shelf margin.

All these canyons extend directly down the continental shelf slope in the direction which would be expected of streams if the sea-level were lowered, and their shapes are decidedly those of stream-cut canyons.

Professor Shepard has plotted the 4,700 soundings of the recent Hudson Canyon survey on a large scale. He states: "This is the most complete deep-water survey ever made and probably the most successful of the surveys to date. The canyon is much straighter than previously supposed, being practically identical in character with the canyons off Georges Bank in having a maximum wall height of 4,000 feet; but the hundred-fathom curve is bent shoreward sixteen miles as compared to thirteen for the largest of the Georges Canyons. The walls are not quite as deep in the case of the Hudson Canyon. The bottom declivity is fairly uniform, but shows an increase between 3,500 and 4,500 feet, which is probably due to the outcrop of a harder layer along the canyon course.

"Inside the canyon, as was known previously, a valley only about sixty feet deep extends almost into New York. This shallow valley is only a few feet deep where it joins the head of the canyon. It was probably caused by a small lowering of sea-level rather than by the great emergence which is implied by the deep canyon, which cuts the continental slope of the world."

HELIUM AS A PREVENTIVE OF CAISSON DISEASE

HELIUM, now used to lift men into the air, may find a new use in treating those who go underground or under the sea and who, working under compressed air, contract caisson disease, it appears from recent investigations on its solubility in the blood, reported by Drs. J. A. Hawkins and C. W. Shilling, of the Experimental Diving Unit at the U. S. Navy Yard.

The "bends," an exquisitely painful malady which affects workers who are exposed to air at high pressure, is caused by the blood's taking up a great deal of nitrogen from the air. When the workers come into normal air pressures, this forms bubbles in their veins, and may result in permanent crippling or death. Even the most modern methods of bringing men from high pressures to those of the atmosphere slowly do not entirely obviate the danger of the bends.

Helium, like nitrogen in that it is an inactive gas and plays no part in the actual requirements of the body, is less soluble in water than is nitrogen. Under pressure, less would dissolve in the blood, and what did dissolve would be more rapidly dissipated if helium were substituted for nitrogen in the compressed air supplied to divers. This would cut down on the danger from caisson disease.

However, Dr. P. A. VanSlyke has found that the solubility of other gases, like hydrogen and nitrogen, is different in the blood than in water. To check up on this Drs. Hawkins and Shilling have investigated the gas' solubility in dogs' blood. They used the standard method for this kind of work, mixing air containing known amounts of helium with dog blood, treated to prevent its clotting, in special bottles known as tonometers. When the mixing has gone on for a definite time, the remaining air is analyzed to find out how much of the helium was dissolved and so removed from the air.

Their results show that helium is just about as soluble in blood as in water, and that its use in preventing the bends is feasible. Helium has also recently been found a valuable aid in the treatment of asthma.

THE YELLOWSTONE BISON

THE American bison—buffalo to most people—which staged such a spectacular come-back in Yellowstone National Park when conservationists and the public generally thought it was about ready to join the dodo, now has a new home in the park. The main herd, since its establishment in 1902, has kept in the vicinity of the Lamar River Valley in the northeast section of the park. Now a small herd has been transplanted to Hayden Valley, one of the ancestral ranges of the buffalo of the gay nineties. Hayden Valley is in about the center of the park, near Yellowstone Lake.

In all, 36 buffaloes have been moved to Hayden Valley, including 16 bulls, 13 cows and 7 of this year's calves. They made the journey by truck. It is expected that they will stay in the vicinity of Hayden Valley and Mary Mountain, where grass is abundant, and that they will have no difficulty in wintering there, since it was a natural buffalo range at the close of the nineteenth century.

The transplanting of this herd of buffalo serves three primary purposes, according to Joseph Joffe, assistant to the superintendent of Yellowstone National Park. It will help alleviate conditions on the over-grazed Lamar River range, will by its success or failure indicate the wisdom of making similar experiments elsewhere in the park in the future, and, most important of all from the standpoint of the visiting public, probably will make it possible for motorists along the Lake-Canyon road to catch an occasional glimpse of a buffalo in his wild state.

For several years a show herd of buffalo has been kept in a corral on Antelope Creek, being moved there each spring and returned to the buffalo ranch in the fall. This show herd is easily accessible to park visitors and very popular with them.

SHADE AND SUNLIGHT

WHETHER a stand of timber is "ripe" enough for cutting can be judged by measuring the degree of shade the treetops cast, W. G. Morris, of the Society of American Foresters, indicated in an address before the meeting of the Ecological Society of America at Seattle on June 17.

The method is very simple. The forester walks through the forest, carrying in his hand a pocket-size electric photometer, of the type used by photographers to gauge the light they have to work by. This shows the amount of sky light passing through the forest canopy, in terms of figures on a dial. From time to time he notes down the readings, and at the end of his trip he averages them up. The density of the forest canopy thus measured is

an expression of the maturity and harvest-readiness of the forest.

Desert-dwelling reptiles are no fonder of the hot sun than are any other cold-blooded animals. The old-time notion that rattlesnakes and Gila monsters like to bask on a hot rock—the hotter the better—was dispelled at the meeting of the Ecological Society of America by Dr. Walter Mosauer, of the University of Southern California.

"Diurnal lizards and nocturnal snakes alike are killed by a short exposure to desert sunlight," he said, "especially if they are placed on the sand which reaches temperatures of 70 degrees Centigrade and over, around noon during the spring months. But even if they are suspended freely five feet above the ground, the direct isolation alone is lethal."

Forests of the states of Oregon and Washington, among the most important of surviving American timber stands, have been accurately mapped by the U. S. Forest Service and the maps are now being lithographed by the U. S. Geological Survey. This work, important both scientifically and economically, was outlined before the meeting of the society by T. T. Munger, of the U. S. Forest Service.

Twenty-six distinct types of forest are to be represented on the finished map, each type shown in a distinctive color. Logged-over and burned-over areas will also be shown.

ITEMS

PRODUCTION of a film—chemical, not cinematic—one hundred times thicker than most chemists thought could exist was announced by Professor William D. Harkins and Dr. Robert J. Myers, of the University of Chicago, at the opening of the Thirteenth Colloid Symposium of the American Chemical Society at St. Louis. Films possible in surface chemistry have been thought to be not more than one molecule thick. These films are from two to 100 molecules thick. Significance of the discovery is that science hopes to find more facts about the films which cover many parts of the human body and brain. "Without these films and related membranes life would be non-existent," said Dr. Harkins. "The motion of the muscles, the behavior of the nerves and the brain itself, and the characteristics of the blood and all the cells of the body are dependent upon the action of such films."

"NO TRESPASSING" signs are written in some kind of unexplored chemical language by growing roots, to keep other roots from invading territory which they have taken for their own. Indications of this are graphically shown in a device invented by Professor M. A. Raines, of Howard University. Professor Raines's method makes the root systems of plants visible throughout their entire growth. Against a slightly sloping sheet of glass he lays a sheet of dark paper or other absorbent material, kept moist by a series of wicks dipped into a supply of water. The roots sprouting from seeds placed at the top edge of the sheet grow down the moist paper and can be studied in detail. One of the things shown by roots of two young plants grown side by side on the same sheet is that when two young tips approach, they do not actually make contact, but when they are still a little distance apart, each bends aside a little and they then grow parallel. When the tip of a young root approaches the trunk of an older root running athwart its path, it also bends aside before actually touching it and runs down parallel with the older one. What the influence is, that thus deflects roots before they actually touch the solid substance of another root, Professor Raines does not yet know, but he regards the secretion of some repellent chemical compound as the most likely hypothesis.

A MAN-MADE sponge that may prove to be superior in many ways to the natural product is a new achievement to be added to those of the chemist. The sponge is manufactured of highly purified wood and cotton cellulose, its spongelike appearance being due to chemical reactions and can be employed for all purposes to which sponges are ordinarily put. The new synthetic sponge is tough and durable but becomes quite soft and pliable when wet, thus precluding any possibility of scratching the most highly polished surface. It will outlive the natural product, according to a report in *Industrial and Engineering Chemistry*. This man-made sponge is resistant to cleaning compounds, soaps, greasy matter and grit; is uniform in quality, size, shape and texture; is free from odor and, since it floats, does not pick up grit and other foreign matter. It can be trimmed to any desired size without damage to its texture or durability, and can be used for washing, polishing and drying almost any surface without the aid of towels or chamois.

FIREPROOF fabric knitted out of spun threads of asbestos is the invention of a Leningrad inventor, M. Semenovich. Garments made of the new material are stated to be quite unlike the heavy, armor-like safety suits heretofore made of asbestos; they weigh only about four pounds to the suit, and are as comfortable and well ventilated as wool. Tests made by workers wearing suits and gloves of asbestos fabric sound like tales of almost demon-like immunity to fire. The wearers picked up red-hot rods of metal and bent them as if they were soft wax. With suitable respirators, firemen walked right through flames to the very heart of the fire they were seeking to conquer. Large-scale manufacture of the new stuff has been undertaken in the USSR.

JUST as the carbon dioxide gas in the seltzer bottle forces the soda out of the spout, so it could quickly discharge the gasoline from the fuel tanks of airplanes in flight. Thus in an emergency landing the plane would hit the ground with no gasoline in the tanks to catch fire or explode. Instead tanks would be filled with non-inflammable carbon dioxide gas and danger of fire would be eliminated. This is essentially the principle upon which a patent has recently been granted here to John Hays Hammond, Jr., son of the famous engineer. According to the invention, each plane would carry a cylinder of compressed carbon dioxide or some other non-inflammable gas under pressure. By pipes, the cylinder would be connected to the fuel tanks and to piston-operated valves, one of which would cut off the supply of gasoline to the carburetor and the other of which would simultaneously dump the gasoline into space.