

SCIENCE NEWS

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COSMIC RAYS

THE cosmic rays, penetrating radiations that come into our ken from somewhere outside the solar system, may not be radiated waves at all, results of the latest experiments indicate. In a communication to the German scientific journal *Forschungen und Fortschritte*, Dr. Walther Bothe, of Berlin, and Dr. Werner Kolhoerster, of Potsdam, state that they have evidence that they are really high-velocity particles like beta rays, which are free electrons moving at high speed, or possibly like alpha particles, which are the stripped nuclei of hydrogen or helium atoms.

The two German physicists obtained their results with a specially built adaptation of the physical instrument known as the electron counter. It consisted of a cylindrical chamber, within which was a very slender oxidized wire, connected to an electroscope. Whenever a charged particle—electron or alpha particle—made contact with the wire the electroscope registered the impact.

Using two of these instruments, one above the other, within a lead-armored vessel to keep out the earth-originated radiations, Dr. Bothe and Dr. Kolhoerster frequently obtained coincidental registrations of particle impacts on their electroscopes. These they regard as having been due, in most cases, to the same particle striking both wires in succession. This would indicate that the particle came from above, with sufficient velocity to carry it through the lead armor and both tubes.

The possibility that cosmic rays may consist of moving particles instead of mere waves of energy is admitted to have radical implications by the two experimenters. To carry such particles through the resistance offered by the earth's atmosphere would require a starting velocity imparted by a potential of at least a billion volts. On the other hand, the total energy of the bombardment that reaches the earth is small, for the measurements indicated only one impact per second for every square centimeter of exposed surface. Considering the almost infinite minuteness of beta or alpha particles, this sinks to almost immeasurably small quantities.

The possibility that cosmic rays may be penetrating particles rather than true radiations receives some support from work done at the U. S. Bureau of Standards by Dr. L. F. Curtiss. Dr. Curtiss has used a different method from that employed by Dr. Walther Bothe and Dr. Werner Kolhoerster, the German physicists who report their belief in the particulate nature of the rays. He states that his results lend some support to the opinion of his German colleagues, but he is not yet satisfied that either the German work or his own constitutes full and conclusive proof. The technical report of Dr. Curtiss' experiments will be published in a few weeks by the Bureau of Standards.

ARTIFICIAL LIGHTING FOR HEALTH

A NEW era of artificial lighting, in which the importance of illumination as an aid to health as well as to

vision will be considered, has now dawned, Dr. M. Luckiesh, director of the General Electric Company's lighting research laboratory at Cleveland, told the American Institute of Electrical Engineers meeting in New York City. The first great era came with the beginning of artificial lighting with the burning of crude materials, he explained, and the second with the use of electricity in arc and incandescent lamps.

"This dream of simulating sunlight," said Dr. Luckiesh, "and dispensing whatever health benefits there are in midsummer sunlight, while providing light for vision, has its beginning in the impressive logic of sunlight as a powerful environmental factor. It has been stimulated by some sound scientific facts which have been unearthed during the past forty years. It has not been influenced by the recent craze for ultra-violet radiation proclaimed as a cure-all by charlatans or others who profit blindly or blindly in the twilight zone of knowledge.

"No attempt will be made to marshal all the major scientific facts which emphasize the value of sunlight. Admittedly, these are far outnumbered by vague data and unsupported claims. Sunlight does cure and prevent rickets; therefore, it is important to the health of children. In some places the death-rate is highest in or shortly after the season when the sunlight is at its minimum. There is some evidence that fewer colds are experienced by a group of persons systematically exposed to artificial sunlight than by a group not exposed. Sunlight is closely related to one or two vitamins—possibly to all. The effect of a single exposure to powerful ultra-violet radiation for only a few minutes can be detected for two and sometimes three months after. The possible benefits of sunlight outdoors are intricately interwoven with those of exercise and fresh air. However, few intelligent persons would insist that sunlight is not beneficial.

"These are examples of facts having sound or only partial foundations. But beneath all this is the powerful logic of sunlight as an environmental factor upon which all life depends directly or indirectly. It has been bathing this earth since the most primitive life began. Plants have developed under its heat and light. Eyes have evolved to see by its energy of certain wave-lengths. Vitamin D at least is manufactured by it. Thousands of photochemical reactions selectively utilize its energy of various wave-lengths. Viewing the completed picture of which the foregoing is only fragmentary, is it possible to believe that sunlight—so interwoven into life-processes—is not directly beneficial to human beings? Is it not easy to suspect that its benefits extend far beyond present knowledge and even far beyond the ability of our imagination to encompass at the present time?"

Dr. Luckiesh described a new sunlight lamp that has been developed in his laboratory that closely simulates sunlight, both in color and health-giving powers. It gives light in three ways. At the bottom of the bulb is a little pool of mercury. When the lamp is turned on,

the tungsten filament glows, and the heat vaporizes the mercury, then a mercury arc is formed between two tungsten electrodes, so that about 68 per cent. of the light comes from the glowing electrodes, 25 per cent. from the arc and the remaining 7 per cent. from the filament. The lamp is simple to use, though it requires a transformer to step down the ordinary lighting current to the 11 volts on which it runs.

This lamp, declared Dr. Luckiesh, is 50 times as effective in producing tanning of the skin, known medically as erythema, as midday midsummer sunlight of equal intensity. The quartz tube mercury vapor arc, sometimes used for medical purposes, is 500 times as effective, he said, but has the disadvantage of requiring the user to wear goggles while using it, in order to prevent serious eye trouble. The new lamp, he said, requires no more caution than one would use with midsummer sunlight. Its bulb is of glass, which cuts out some of the shorter, and more harmful, ultra-violet rays, but passes those which have the most beneficial effect.

The intensity of midsummer sunlight is far greater than any amount of artificial light that can be reasonably used in the home, he said, and so it was necessary to make the new light more effective in producing physiological effects. However, he declared, it has yet to be proved that sunburn is a necessary forerunner of curative or health value of the rays. Experiments on animals have shown beneficial effects, in curing rickets, with an ordinary 50-watt tungsten lamp, without producing a trace of erythema. In general, however, the rays that produce sunburn seem to be of about the same wavelength as those of curative value.

MODELS AND PHOTOGRAPHS IN MOTION PICTURE STUDIOS

IMAGES of small models and photographic transparencies reflected in a mirror with part of the silvering scratched away are taking the place of huge and costly sets in European movie studios. At a meeting of the Kinematograph Group of the Royal Photographic Society of London Hans Nieter demonstrated the Schüfftan process of model photography. The method is also being applied in England.

Though models were used in the early days of the movies, it was not possible to photograph human actors easily at the same time. Then methods were tried of using small models in the foreground, close to the camera, while the actors were in the distance. To focus the nearby models and the distant actors at the same time, however, it was necessary to use a very small lens aperture, and this in turn required extra illumination. Somewhat similar was the method used in "Robin Hood," where the upper parts of the castle were painted on glass, and placed in front of the camera in such a way that they appeared to be a continuation of the lower parts, which were actually built.

In the Schüfftan process either transparencies, made from actual photographs, or models can be used. Instead of being in front of the camera, they are placed to the side. A large lens in front of them corrects for their

closeness, and a mirror at an angle of 45 degrees reflects their image into the camera lens.

When the directors and technicians have decided on the effect they want, a model or transparency is made, and the part in which the actors will appear is made in full size, to correspond with the model. This is erected in front of the camera, and enough of the silvering on the mirror is scratched away to show it. Final adjustments make the lines in the set appear as a continuation of those in the model. Then from the point of view of the camera, the set and model merge together imperceptibly. Because of the large correcting lens, everything is in focus, even with the largest aperture camera lenses, so that ordinary lighting can be employed.

In his demonstration Mr. Nieter showed one film of a train dashing over a wrecked bridge into a stream, with the escaping steam rising from the locomotive, and people actually swimming away from the wreck. All the parts of the train were in model form, while the people swam in a tank on the studio floor. Still other effects can be obtained with the use of several mirrors, to show, for instance, the workings of a man's mind, with various thoughts appearing for a time.

The method is particularly advantageous for the talkies, Mr. Nieter pointed out, because it permits the making of scenes in a small compass, and so avoiding the bugbear of echoes on a huge set.

AN AUTOMATIC COLOR-MATCHING MACHINE

A MACHINE that writes a permanent record of a color in ten seconds, and does it so accurately as to distinguish between colors so similar that they appear identical even to the trained eye, has been perfected by two young physicists at the University of Pennsylvania. Joseph Razek and Peter J. Mulder, both instructors in the department of physics, developed the machine as a by-product of a more abstruse research in which they were engaged while working for their doctors' degrees.

The heart of the machine is a spectroscope that analyzes the color to be studied, while its eye is the same magic lamp that has made possible both talking movies and television, the photoelectric cell.

Completely enclosed in a box the size of a large suitcase, there is a rectangular opening at the top over which the color is placed, which may be on paper, cloth, or any other material. A bright light shines on it, and is then reflected through prisms of the spectroscope, which spread it out into a rainbow-like spectrum, showing all the component colors.

As the operator turns a small crank, different colors shine on the photoelectric cell, and from it comes a minute electric current, varying according to the intensity of the color that illuminates it. This current is amplified, and oscillates a tiny mirror, which reflects a spot of light back and forth across a scale on the front of the instrument. The same light also records its motion on a moving strip of photographic film. The result is a curve, a permanent record of the color which would be preserved even if the color fades or is destroyed, for it

shows the percentage of each component color reflected by the sample under test.

REMAINS OF AN ICE AGE RHINOCEROS IN POLAND

THE complete body of an Ice Age rhinoceros, with muscles and skin complete and in place, has been dug out of the soil of Poland, in the district of Sarunia, Tytus Filipowicz, Polish Minister to the United States, has informed *Science Service*.

The finding of so complete a specimen of the Pleistocene rhinoceros is wholly unprecedented. Rhinoceros bones are fairly common fossils in Europe, for the great woolly animals ranged freely over the continent during intervals between glacial advances scores of thousands of years ago. Cro-Magnon artists sketched and sculptured its likeness on the walls of their caves. But of the non-bony parts nothing had been discovered before, except a few pieces of skin.

The present find was made as a result of renewed digging in a mine that had yielded the incomplete skeleton of a mammoth and the skull, foreleg and a large piece of skin from a rhinoceros, something over twenty years ago. Last year the Polish Academy of Science obtained funds for further excavation and went to work again, in spite of the fact that the old narrow pit had become dangerous due to the accumulation of oil on its sides and a tendency for poisonous gases to accumulate.

The digging revealed much new material of interest in the study of prehistoric plant and animal life of the region, and at last the sensational find was made of the complete rhinoceros. Premature and unauthorized reports gained currency that the find consisted of the skeleton of a mammoth, and the scientists in charge decided to let the rumors go on, thereby avoiding interruptions in the work by crowds of uninvited guests.

Confronted with the task of getting the giant animal out of the narrow pit, the committee called upon the Polish army for man-power. Soldiers enlarged the pit to four yards square by thirty-four yards deep, and through this new shaft the great carcass was raised to the surface.

It has been taken to the physiographic museum of the Polish Academy of Science in Krakow. It is planned to remove the hide and make a thorough anatomical study of the muscles and other organs, after which the skeleton will be mounted and placed on display. It will be the only complete Pleistocene rhinoceros skeleton in existence.

The Sarunia Research Committee, which brought the work to its successful conclusion, consisted of Professor K. Kostanecki, president of the Polish Academy of Science; Professor S. Kutrzeba, secretary of the academy; Professor H. Hoyer, Professor S. Kreutz, Professor J. Nowak, Professor W. Szafer, Professor J. Stach, Professor J. Morozewicz and Professor J. Tokarski. Immediate supervision of the work was entrusted to E. Panow, who cooperated with the present owner of the mine, Mr. Lautman, in clearing the rubbish away from the old diggings and in opening a new fifty-yard drift.

ITEMS

"It is no longer sufficient that our highways be wide and smooth, they must also be pleasing to the eye," according to the men who design and build the roads at the annual meeting of the American Society of Civil Engineers at New York recently. "The growing appreciation on the part of the highway engineer of the esthetic phase of his work and the definite improvement that may be made by choosing road locations so as to bring out the natural beauty of the locality" were pointed out as outstanding developments in highway engineering during the past year. Sweeping curves, short tunnels to preserve mountain beauty and bridges that harmonize with the landscape are some of the ways in which the highway engineer is building with more beauty.

THE Schwassman-Wachmann comet, discovered by two German astronomers on November 15, 1927, is still under observation. Dr. Walter Baade, at the Hamburg Observatory, detected the comet on the night of December 21, 1929. Then it was of the 15.5 magnitude, far too faint to be seen except with a large telescope, but only about a magnitude and a half fainter than when it was discovered. Since then the discoverers, at the University of Berlin Observatory at Berlin-Babelsberg, have discovered another comet, which is also still in sight.

MINERS can now recover for the first time practically pure copper directly from sulphide ores by a method just discovered after a year's research by the school of mines and geology at Washington State College at Pullman, Washington. The method requires cheap hydroelectric power. Present methods of recovering copper ore involve smelting and electrolysis is used only to refine the metal. Only one previous attempt, made some 15 years ago, at obtaining practically pure copper directly from the ore by electrolysis was found in the historical researches undertaken. The details of the method will be published by the college.

THE world's stock of Neanderthal remains has been increased by a skull, recently unearthed in a quarry on the northeastern outskirts of Rome. The find is reported by a young Italian scientist, Professor Sergio Sergi. The skull is that of a woman, very closely similar in type to the original Neanderthal skull found at Gibraltar many years ago. Its brain capacity is the same, 1,200 cubic centimeters. While many stone implements of the type produced by the Neanderthals have previously been found in Italy, this is the first find ever made of actual bones of this ancient, powerful, brutal-appearing but undoubtedly human species. In the same stratum of gravel with the new Rome skull were found the bones of an ancient elephant, a species of hippopotamus and the woolly rhinoceros, all of them animals that flourished in Europe during the warm period that intervened between the last two phases of the Pleistocene, or great Ice Age. The same formation has in other places yielded early stone age implements of characteristic Neanderthal workmanship.