

PHYSICS

Cosmic Rays Not Likely To be Future Power Source

COSMIC rays, as sources of industrial power, must join split atoms in the limbo of impracticable dream-schemes. Justification for cosmic ray investigations must be found in their value as aids in our better understanding of the universe, and the eventual better conduct of life.

This was the basic philosophic theme of an address on cosmic rays delivered in Washington by Dr. Thomas H. Johnson, researcher at the Bartol Foundation, Swarthmore, Pa., under the auspices of the Carnegie Institution of Washington, of which he is also an associate.

"The total energy falling upon the earth's surface in the form of cosmic radiation is about one thousandth that of starlight, one billionth that of sunlight," said Dr. Johnson. "If the cosmic ray energy were equal to that of sunlight, the latter would still prove to be the better source of power, for the extreme penetrating ability of the cosmic radiation prevents its concentration for conversion into useful forms of work."

All evidence points to regions beyond the atmosphere as the source of the cosmic radiation, the speaker declared, mentioning that when the detecting instruments used by many investigators in widely separated regions of the earth are pointed horizontally the number of rays detected falls to a very small fraction of the normal vertical-ray count. Furthermore, the higher instruments are carried in balloons, the greater is the cosmic ray registration: on stratosphere flights a 300-fold increase has been recorded.

Intense electrical fields, somewhere in the universe, were suggested as the most likely sources of cosmic rays by Dr. Johnson. He said:

"Accustomed as we are to electrical displays during thunderstorms and volcanic eruptions it is easy to imagine similar processes taking place on stars. Negatively charged clouds of dust or vapor high above the surface of a star could draw from its atmosphere positively charged atomic ions and project them, like the beam of a cathode ray

oscillograph, into cosmic space. Nuclei of hydrogen and helium atoms, the principal constituents of stellar atmospheres, would thus become the cosmic rays.

"During their passage through interstellar space small quantities of matter would be encountered in which secondary positive and negative electrons would be generated. The electron component could thus acquire a new significance as an indication of the amount of matter through which the primary protons have traversed before reaching the earth."

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AVIATION

All-Metal Airplanes Not In Danger from Lightning

GLEAMING all-metal airplanes riding through storm areas are in little danger from direct lightning strokes. Should a bolt of lightning strike a metal plane its effects would be much less serious than in a plane of wood construction. Such are the conclusions just reported to the British Air Ministry by Dr. G. C. Simpson of the Meteorological Office.

Since 1925 ten cases of aircraft struck by lightning have been reported to the British Air Ministry but in each case no serious damage was reported. There is no authentic record of an airplane ever coming to disaster because of a lightning discharge.

That metal planes are safe in lightning storms, at least from damage by the lightning itself, has been checked by Dr. Simpson. He has found that the average bolt of lightning will not quite raise a round wire of one-half-inch diameter from its normal temperature to the boiling point of water.

Since a metal airplane is electrically conducting and bonded together by many metallic bands whose total cross section is usually more than that of one-half inch iron wire, there can be little danger of fire from the lightning strike, Dr. Simpson concludes.

Even a dirigible is much less vulner-

able to lightning than is popularly supposed. Its intricate and large metal framework provides an easy path for the passage of the electricity in a lightning stroke.

The danger from lightning is more serious when the object struck does not have such good conducting properties, as in the case of an airplane of wood construction. In this type the lightning bolt strikes one part and then has to jump through air to another. At each jump powerful sparks occur which have sufficiently high temperatures to ignite almost anything inflammable.

Lightning has a high voltage estimated at millions of volts. But passengers in an airplane struck by such a lightning bolt suffer no ill effects. It is possible to charge up the human body to very high electrical potentials if it is kept insulated.

In the great high voltage generator at Massachusetts Institute of Technology, for example, scientists sit atop tall insulating columns inside spheres charged to 5,000,000 volts. As long as they are safely insulated from the ground all is well. So far the insulation has held up. Persons in an airplane thousands of feet above the ground are much more safely insulated.

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PHYSIOLOGY

Carbon Dioxide May Help High Altitude Flyers

BY INHALING small amounts of carbon dioxide with the air they breathe passengers in transport planes, altitude flyers and mountaineers could be protected from the discomforts of high altitudes, concludes a group of Yale University physiologists from recent tests on Pike's Peak. The illness due to the lack of oxygen high above the earth is known as mountain sickness. The experiments are reported by Prof. Yandell Henderson, Samuel B. Childs, Jr., and Hannibal Hamlin. (*Nature*, March 23)

Mountain sickness is a form of suffocation due to the diminished partial pressure of oxygen at great altitudes. While deficiency of oxygen in the blood is the cause of the trouble, supplying more oxygen to the lungs will not correct it. Earlier studies of Prof. Henderson showed that carbon dioxide, thrown off from the lungs as waste, is a natural and necessary stimulus to the breathing process. New-born babies that fail to breathe and persons whose breathing

has been stopped by drowning, gas poisoning or other accident have been helped back to normal breathing by inhalations of carbon dioxide mixed with oxygen.

The lack of oxygen obtainable at high altitudes causes overbreathing and as a result, a deficiency of carbon dioxide, Prof. Henderson has long contended.

His point was proved by the recent tests on Pike's Peak.

These were made on five young men who had been at the summit long enough to be used to the altitude. Wear-

ing a mask open to the air and also connected with a small tank of carbon dioxide, these young men walked 250 yards up the cog railway, grade 1 in 5, in two minutes. The work amounted to lifting the body and the eight-pound apparatus 150 feet vertically. They made the test twice, once inhaling the carbon dioxide and once without these inhalations.

"None felt either the exertion or the respiratory strain to be at all increased by the inhalation, but rather the contrary," the Yale physiologists report.

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BACTERIOLOGY

Body Tissues Not Germ-Free; Bacteria in Dissociated State

WITHIN a few minutes after birth, the blood and every normal tissue of the body are invaded by the ordinary bacteria found on the skin and in the mouth and nose, Dr. Lars F. Gulbrandsen of the University of Illinois College of Medicine has found.

This discovery upsets the prevailing idea that the blood and tissues of the body are as a rule sterile, that is, free from micro-organisms. Dr. Gulbrandsen finds the bacteria present in a changed form and believes that this change constitutes one of the body's means of defense against disease.

So far there has not been time for other scientists to confirm Dr. Gulbrandsen's findings and theories, but his study is said to open a new field in the investigation of disease and resistance.

The bacteria come to the tissues through the wall of the intestinal tract from food that has been taken through the mouth, Dr. Gulbrandsen believes.

New-born guinea pigs, he found, did not have bacteria in their body tissues at birth. But within fifteen minutes after feeding them pure cultures of bacteria by mouth, the micro-organisms could be found in the animals' tissues.

The bacteria, however, had undergone decided changes of a type known to bacteriologists as dissociation changes. They had no power to produce disease in the healthy individual and would not grow under ordinary cultural conditions.

It is this dissociation change which Dr. Gulbrandsen believes constitutes one of the body's major mechanisms of defense against disease.

Further work is being done to learn whether the bacteria pass through the lining walls of the intestinal tract intact or whether they are changed in that passage and can then return to their original form in the body tissues.

For this research Dr. Gulbrandsen was recently awarded the \$500 Capps prize of the Institute of Medicine in Chicago. This prize is given each year for the most meritorious medical research by a graduate of a medical school in Chicago completed within two years after graduation.

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ASTRONOMY

Gaseous Nebulae May Be Ghosts of Exploded Stars

ARE THE great, misty nebulae seen by astronomers the ghost-shrouds of some prehistoric star which exploded as did now-famous Nova Hercules just before last Christmas? Scientists are asking themselves that question.

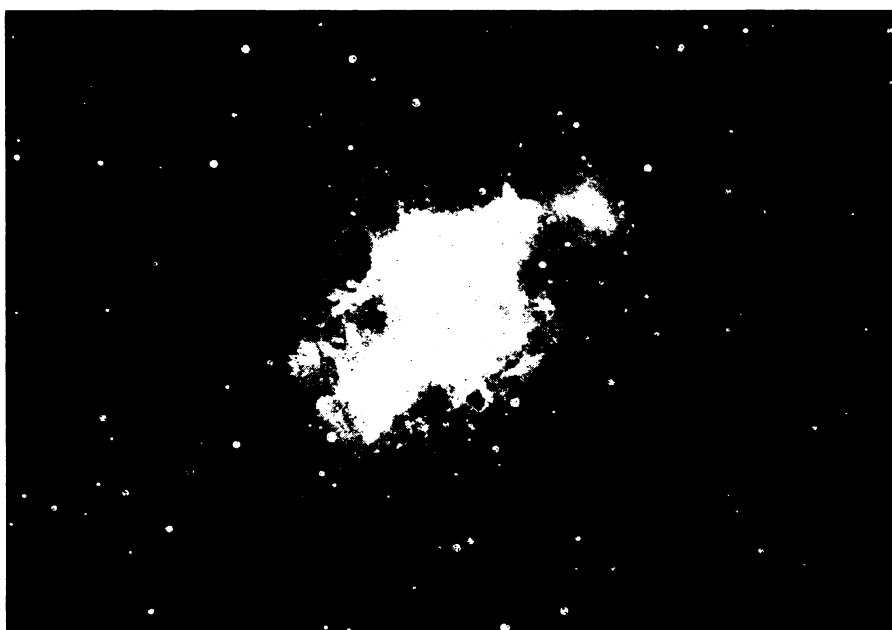
Dr. Gustaf Strömberg of Mt. Wilson Observatory, in a summary of exploding stars written for the Carnegie Institution of Washington, points out one case, at least, which links the appearance of nova stars with the great nebulae so prevalent in the heavens. Dr. Strömberg says:

"In the sky there are certain objects whose appearance and spectra are similar to those of the later stages of a nova. It is quite possible that all of these bodies have gone through a nova stage.

"A peculiar case is that of the so-called Crab Nebula in the constellation Taurus. By comparing photographs taken from time to time we have found that the nebula is gradually expanding. By calculating the time required to reach its present dimensions at a uniform rate we find that the hot gas must have left the star's surface about 900 years ago.

"In the records there is only one account of a nova star in that part of the sky in which the Crab Nebula is located. Chinese astronomers saw a nova there in the year 1054!"

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CRAB NEBULA OF TAURUS