

PHYSICS

X-Rays From Sun Found To Create Radio "Roofs"

Unlike Light and Heat, Roentgen Radiation Does Not Reach Earth's Crust But Is Absorbed in Upper Air

X-RAYS generated in the sun bombard the earth incessantly, Dr. Ernst A. W. Müller of the Siemens and Halske Company has discovered as the result of a study of the electrified radio "roofs" of the earth's atmosphere.

Unlike the sun's light and heat, the solar X-rays or Roentgen radiations do not reach the solid crust of the earth. They are absorbed by the upper atmosphere down to a height of about 65 miles where they electrify the air and create what is known as the Kennelly-Heaviside layer. This E layer, as it is also called, is the lowest of a number of the earth's electrified roofs which keep radio waves from being lost in interplanetary space. It reflects the longer radio waves. (*Nature*, Feb. 2)

The solar X-rays are thought by Dr. Müller to be more penetrating or softer than the ultraviolet radiations known also to come from the sun. They are "soft" X-rays, having a wavelength around one hundred millionth or one billionth of an inch.

Based on Many Experiments

Dr. Müller's discovery is based on deductions from many experimental results from England, America and elsewhere. Radio observations during the 1932 solar eclipse and at other times indicated that the agent causing the electrification of radio roof E comes from the sun. At first it was thought that the radiation responsible might be great streams of sun-born neutrons or electrically neutral particles, and later ultraviolet sun light was blamed. Dr. Müller's calculations show that ultraviolet radiation is easily absorbed by the air and that an amount sufficient to create the radio layer would not plumb the depths of the earth's enveloping ocean of air.

How the sun acts as an immense X-ray generator is explained by Dr. Müller. Following the suggestion of Dr. W. F. G. Swann of the Franklin Institute, Philadelphia, that fast electrons are produced in sunspots, most of them, Dr.

Müller holds, must lose their energy in the outer layers of the sun and in so doing generate X-rays. This generation also takes place in the unspotted part of the sun, in Dr. Müller's opinion.

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PHYSICS

Million Volt Generator For Atom Research

See Front Cover

A NEW type of atom "gun," hurling electrified particle "bullets" at atoms, which should speed vital research on how matter is put together has just been completed, it has been announced by the department of physics of Ohio State University.

Creation of Dr. Willard H. Bennett, the new atom gun is a compact doughnut-shaped edition of the high-voltage generator first proposed by Prof. Robert T. Van de Graaff of Massachusetts Institute of Technology.

So huge is the M. I. T. generator that it is housed in an airplane hangar in

Massachusetts. The Ohio State device, capable of reaching voltages of a million volts, is small enough to go into a normal science laboratory. The trick is to mount the apparatus horizontally, on its side, instead of having it towering high in the air.

The million and more volts created with the device are being used to drive electric particles against matter and break it apart. In the debris of destruction science learns how the basic units of all matter—the atoms and electrons—are joined and studies the forces which hold them together.

The photograph on the front cover of this week's SCIENCE NEWS LETTER shows the flashing sparks from the generator. The picture is a double exposure; the man moved from beside the device before the "lightning" flashed.

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PHYSICS—ASTRONOMY

Electronic Tides In Air Also Caused by Moon

MYSTERIOUS electronic tides high in the upper atmosphere, 200 miles above the earth, are being investigated by Dr. Harlan T. Stetson, visiting research associate in astronomy at Harvard University.

Discovered by Dr. Stetson through their effects on radio transmission, the tides are believed to be caused by the moon.

Using the same data with which he found a marked correlation between



ELECTRICAL DOUGHNUT

Like a giant doughnut cooked to a golden copper hue is the new high voltage generator of Ohio State University. It is capable of creating a million volts to be used in experiments on bombarding the atom. Dr. Willard H. Bennett, professor of physics, designed the device.

radio reception and sunspots, Dr. Stetson has found that radio signals are much more strongly received when the moon is below the horizon. Furthermore, this effect is modified at different times of the month, depending upon whether the moon is more nearly over the northern or the southern hemisphere.

"The curves of radio reception which we have obtained," he says, "are very suggestive of a tidal effect in an ionized atmosphere far above the stratosphere. If this should be substantiated by further measurements now in progress, we shall have the problem of electronic tides in

the ionosphere, rising and falling in response to the moon's motion, like ocean tides."

Just how the moon produces these tides is difficult to say, Dr. Stetson admits. "But were we to speculate that the moon is an electrically charged body with a different potential from that of the earth, or that it were capable of emitting some mysterious radiation similar to gamma rays, we might have a hypothesis for finding the source of the moon's effect in producing these mysterious ionic tides."

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MEDICINE

C.C.C. Workers Prove Value Of New Pneumonia Vaccine

Thousands of Young Men Completely Free of Disease As Result of Preventive Vaccination This Winter

THOUSANDS of young men at C.C.C. camps who have been completely free of pneumonia this winter are the living proof of the success of a new pneumonia vaccine discussed with Johns Hopkins Medical School physicians by Dr. Lloyd D. Felton of Harvard Medical School.

After proving its safety by trying it on himself nearly two years ago, Dr. Felton has given the vaccine to some three thousand men. None of these developed pneumonia. In a control group of fourteen thousand who did not receive the vaccine, about forty cases of pneumonia developed.

Chemical Treatment

The vaccine is made by chemical treatment of the pneumonia germ, *Pneumococcus*. A remarkable feature of the new vaccine, fellow scientists point out, is that it protects against any of the four types of pneumonia germs which may cause the disease. Serums developed for treating pneumonia are only successful against specific types of the germ and before they can be used, the physician must make a test to find which type of germ has caused the disease in his patient.

Dr. Felton has devoted himself for years to the problem of pneumonia and developed one of the serums used in treatment. He says that the vaccine for preventing the disease will not be ready

for public use until many more tests have been made, but he is very encouraged over the results so far obtained.

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TOMBS IN "WORLD'S OLDEST CITY"

Older by several centuries than the famous royal burials of Ur of the Chaldees, these unrisfled tombs have been unearthed at Tepe Gawra, by Charles Bache (inset). The tombs show that early funerals in Mesopotamia, 3750 B.C., called for wooden coffins and the placing of valuable possessions with the dead. Thousands of beads, and beautiful ornaments of gold and electrum—a natural alloy of gold and silver—were among the objects found.

ARCHAEOLOGY

City 5,700 Years Old Under "Oldest City"

TEPE GAWRA in Mesopotamia, already famous as the oldest known city in the world, has had more centuries added to its hoary pre-history by new discoveries reported to the University Museum by the joint expedition of the American School of Oriental Research and the Museum. The expedition has just added to this already ten-layered archaeological "cake" an eleventh layer representing the oldest settlement thus far explored at this now classic site. Its estimated date is about 3750 B.C., according to Charles Bache, field director.

Ten Earlier Cities

But even this eleventh Tepe Gawra is not the end. Exploratory trenchings already made indicate the existence of at least ten still earlier cities on that site, dating back beyond 4000 B.C., and eventually in all likelihood to a thousand years earlier still.

For all its antiquity, the newly-explored eleventh Tepe Gawra had a complete civilization. Discoveries there include carefully arranged graves, indicat-