SCIENCE NEWS

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THE SOURCE OF COSMIC RAYS

JUSTIFICATION for cosmic ray investigations must be found in their value as aids in our better understanding of the universe, rather than sources of industrial power. This was the basic philosophic theme of an address on cosmic rays given by Dr. Thomas H. Johnson, research worker 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. 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."

THE STUDY OF AIRPLANE PROPELLERS

NEW knowledge of propeller vibration and the possible causes of why propellers break in midair is reported by Dr. Walter Ramberg, Paul S. Ballif and Mack J. West, of the National Bureau of Standards.

Such propeller failures, while rare compared with the number of propellers in service, usually have serious consequences. Often the flying broken parts rip through the wings of a plane, cause a wreck and sometimes loss of life.

Because it was almost hopeless to try and measure the size of propeller vibrations and the forces in blades while they were whirling rapidly, the government scientists produced a comparable effect by working backward.

Instead of the propeller receiving its vibrations during actual flight the experimental test was performed with a fixed propeller made to undergo the vibrations by having its propeller shaft twisted back and forth mechanically. Thus strains and stresses were experienced in the propeller blade similar to those encountered during normal operation. Most important, they could be measured.

It was found the vibrations were those of resonance wherein tiny forces, timed at just the right period, built up and amplified one another until the total effect was enough to snap the blade.

It is such resonance vibrations which are feared when a column of troops is ordered to break step when marching across a bridge. If all the foot beats happened to be timed near the natural vibration period of the bridge, the latter might collapse from the built-up stresses created.

For the experimental propellers two vibration periods were found; one at the frequency of 35 times a second and the other 130 times a second. For the lower frequency of vibration it was found that the greatest stresses occurred at the middle of the propeller blade. Stresses experienced were determined by measurements on a special strain gage invented by Dr. L. B. Tuckerman, also of the Bureau. In the laboratory the scientists made eight propellers break artificially while vibrating with their fundamental frequency. All the blades broke at the mid-point where the stresses were within a few per cent. of the maxima measured.

The results of the research are reported in the forthcoming issue of the *Journal of Research* of the National Bureau of Standards.

THE DETECTION OF ULTRA-VIOLET RAYS

AN old tin can, a bit of old rubber sheeting, a water jet and a spark gap are essential parts of a new ultra-violet detecting apparatus developed by Dr. R. D. Summers, of the department of physics of the University of Pennsylvania.

With the simple and inexpensive equipment it is possible to hear the presence of the soundless and invisible rays which cause sunburn and likewise prove the presence of the still more piercing radiation from radium.

Dr. Summers took an old tin can, cut out the top and bottom and mounted a piece of rubber sheeting across one end. Placing the can on its side he directed a fine stream of water against it. When no vibrations were present the water jet hit the rubber and flowed silently to a collecting trough. Vibrations, however, make the water stream strike with less smoothness and—like the string and can telephone systems of boyhood—the sound comes out as a rattle and chatter. The same sounds issue from the can when a source of ultra-violet light or radium rays is brought into the vicinity of the apparatus. So sensi-

tive is the device that the ultra-violet light from a match held several yards away can be detected.

The frequency of the clicks issuing from the apparatus, Dr. Summers finds, is a measure of the intensity of the ultra-violet light or of the radium rays.

Immediately adjacent to the water jet is a spark gap connected to a 2,000 volt source obtained from a small transformer like those used in lighting neon advertising signs and passed through a rectifying radio tube to convert it into direct current. The spark gap is adjusted to a distance where the spark is just unable to jump the gap. Attached to one spark gap terminal is an electrode set close to the stream of water issuing from the jet. Being charged to 2,000 volts it attracts the water stream slightly.

As ultra-violet light or radium rays fall on the copper terminals of the gap electrons are emitted and the conductivity of the gap cut down. At the same time the electrical voltage on the gap is decreased. Hence the attraction of the terminal for the water jet is varied and the stream falls on a different place on the rubber sheet of the tin can.

It is the minute varied spraying of the water stream on the rubber—like a gardener watering a lawn—which creates the tell-tale sounds and thus detects ultra-violet light.

AN INSTRUMENT TO INDICATE TEMPERATURE AND HUMIDITY

A NEW instrument invented by Athelstan F. Spilhaus, of the Massachusetts Institute of Technology, has been called an "air mass indicator," but for every-day purposes it might well be christened a "comfortometer." It combines a thermometer to measure the temperature with a hygrometer to measure the humidity of the air, in such a way that a single pointer can tell you whether you have a right to be uncomfortable or not.

The new instrument was designed to face the universally known fact that humidity does have a lot to do with how hot or how cold it feels. As everybody has experienced many times, a hot, dry day is more tolerable than a hot, muggy one, because if there is little moisture in the air, perspiration evaporates readily, producing a cooling effect. A straight thermometer reading therefore means little, but combined properly with a humidity reading it has significance.

Mr. Spilhaus has succeeded in doing this by having a pointer, which indicates humidity, move over a dial which itself moves to indicate temperature. The dial is of a rather thick crescent shape, and is pivoted at one end. Attached to it is a strip made of two metals that expand unequally when heated, and must therefore bend, thus causing the dial to move up and down. The humidity-indicating pointer is attached to hairs that lengthen in moist air and shorten in dry, causing it to travel back and forth over the dial.

There are two kinds of dials. One, for scientists, is marked with symbols understood by initiates in the mysteries of meteorology. The other, for everybody's use, bears such every-day terms as raw, keen, damp, dry, muggy, scorching, heat prostration. There is also a blessed "island of comfort" in the middle—though it looks discouragingly small as compared with the "sea of troubles" with which it is surrounded. However, at least for indoor use in really modern buildings, the air-conditioning engineer can see to it that the pointer does not stray off that "island."

The instrument can also be used as an ice warning indicator for aircraft. Ice formation on the wings and other surfaces of airplanes is a serious problem, but hitherto pilots have had no instrument to check by, other than a thermometer. But subfreeing temperatures are not dangerous unless the accompanying relative humidity is nearly 100 per cent. With an air mass indicator substituted for the thermometer, the pilot can tell at a glance whether it is time to begin worrying about ice on the wings.

Mr. Spilhaus emphasizes the fact that his instrument is not intended for use in forecasting weather. It is designed solely to give a more accurate and significant reading of the weather of right now.

THE ANTIQUITY OF MODERN MAN

THE cradle of modern man is again in doubt, as British scientists renewed their controversy over the age of African skeletons heretofore hailed as the oldest of modern humans and said to be some 60,000 years old.

A Scotch verdict of "not proven" is the set-back given to the antiquity of the African remains famous throughout the scientific world as "Kanjera Man." Professor P. G. H. Boswell, geologist of the Imperial College of Science, announced in a letter to *Nature* that he visited the region in Kenya, East Africa, where the skeletal remains were unearthed, and that he failed to find the site. It had been his intention to establish the geological age of the earth layer where the bones were deposited, geological evidence being one of the most convincing clues to the antiquity of such human remains.

The ancient human type called Kanjera Man, discovered by Dr. J. S. B. Leakey in 1932, consists of three skulls and skeletal fragments. These long-ago Africans walked erect and had other traits of modern human beings. Dr. Leakey has maintained that the site is of the Middle Pleistocene period of geologic history. This would indicate that Africa had humans of modern racial type so early that Europeans were still of the shambling, stooped Neanderthal race, a type which became obsolete and vanished from the earth.

A conference of the Royal Anthropological Institute was called in 1933 to hear Dr. Leakey report on his discoveries, and the conference gave a verdict that he had not exaggerated the age of the African remains. This opinion was based partly on the types of animal bones associated with the bones of man. Meanwhile, American anthropologists have remained cautiously skeptical, awaiting such confirmation as Professor Boswell sought to obtain, and failed to find.

Professor Boswell records that his failure in identifying the site was due partly to errors connected with the exhibited photographs of the earth beds, and to the fact that deposits in the area had frequently been disturbed by slipping.

THE TREATMENT OF MYASTHENIA GRAVIS

CONQUEST of a rare and usually fatal disease of muscle weakness seems a little closer, with the announcement by physicians in London of a new method of treating it. The remedy, a complex chemical having the trade name of Prostigmin, is not a cure and provides only temporary relief. It is important, medical scientists point out, not only because it gives greater relief of symptoms than anything so far tried, but because it attacks the seat of the disorder. Apparently it repairs the mechanism damaged by the disease and consequently should lead to an understanding of its cause and possibly eventually to its cure.

Results of Prostigmin treatment in seven cases of the disease have just been reported by Dr. E. A. Blake Pritchard, of University College Hospital, London, to the *Lancet*. Dr. Pritchard used this treatment following the report by Dr. M. B. Walker, of St. Alfege's Hospital, of unmistakable improvement she observed in three patients treated with Prostigmin.

Myasthenia gravis is characterized by gradual weakness of the muscles, although they do not waste away. The patient first notices that he is getting very tired. He sees double. Then he may have trouble in walking, or in lifting his arms or in grasping things. His jaw muscles become weaker, finally they may be so weak that he can not chew. Various remedies have been tried, none, according to Dr. Pritchard, so successful as Prostigmin.

Dr. Pritchard found that his patients showed some improvement within the first five minutes after injection of Prostigmin and atropine. The latter drug is given to counteract the effects of Prostigmin on the heart. Within thirty minutes the patients improved to a degree far greater than when treated by any other method.

The cause of this strange disease is not known, but it seems to be due to interference or blocking of the messages from nerves to muscles. According to the theory, stimuli to muscles, the orders to go into action, are conveyed by the liberation at the nerve endings of a substance called acetylcholine. In myasthenia gravis the order for action is not delivered to the muscles, either because not enough acetylcholine is formed or else because it is destroyed too rapidly.

The ultimate usefulness of Prostigmin as a remedy for myasthenia gravis is somewhat doubtful, since this same medical authority points out that "it has yet to be learned whether frequent injection of the drug does more good than harm to sufferers from this disorder." But because its effect is more than palliative in that it affects directly the mechanism that is out of order, Prostigmin may prove a most significant clue to final solution of the problem of what causes this disease and how it may be cured.

ITEMS

A NEW high figure for scarlet fever cases has been reached in the present wide-spread outbreak. Almost 8,000 new cases were reported by state health officers to the U. S. Public Health Service during the week of March 2, the latest for which figures are available. More new cases are being reported than at any time in the past seven years. The present increase throughout the nation coincides with the usual seasonal rise and will therefore probably continue to the end of the month, as the peak of the seasonal rise in scarlet fever cases usually is reached by the end of March or the first week in April.

INFRA-RED radiation, the "dark invisible light" that lies just below the lower end of the visible spectrum, has been found useful in the study of fossil leaves found in layers of coal, by Professor John Walton, paleobotanist of Glasgow University. Fern-like leaves in coal are usually studied by lifting them off, carefully spread out on some adhesive substance on a glass slide, which permits them to be handled under the microscope. Frequently they are so dark as to be quite opaque to both eye and camera, with ordinary light. But to infra-red radiation many of them are transparent, permitting fine details of structure to be photographed. Professor Walton has reported on his new technique to *Nature*.

WHETHER the brightness of a meteor is due to the size of the shooting star as it plunges through our atmosphere or to the speed with which it is traveling should be known shortly as a result of investigations now in progress at the Harvard College Astronomical Observatory. Observations are to be made under the direction of Fletcher Watson, assistant in astronomy, of each of the meteor showers that occur at intervals throughout the year. The principal ones occur approximately on April 22, May 25, July 29, August 12, November 17 and December 12.

THOUSANDS of young men at CCC camps who have been completely free of pneumonia this winter are the living proof of the success of a new pneumonia vaccine discussed with physicians of the Johns Hopkins Medical School by Dr. Lloyd D. Felton, of the 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 whom developed pneumonia. In a control group of fourteen thousand who did not receive the vaccine, about forty cases of pneumonia developed. The vaccine is made by chemical treatment of the pneumonia germ, which bears the scientific name Pneumococcus. A remarkable feature of the new vaccine is that it protects against any of the four types of pneumonia germs which may cause the disease. The vaccine for preventing the disease will not be ready for public use until many more tests have been made.

THE latest aid to infanthood is a tablet called cevitamic acid. The name is coined and means an acid containing vitamin C. Its successful use in treating babies with scurvy is reported by Dr. Arthur F. Abt and Dr. I. M. Epstein, of the Northwestern University Medical School. Most babies are given orange juice or tomato juice, both of which contain vitamin C, to protect them from scurvy. For babies who cannot retain either of these juices or who have been deprived of it by circumstances until scurvy has developed, these physicians have successfully used cevitamic acid in treating the disease. The acid is commercially prepared from vegetable sources, such as cabbage, paprika, orange or lemon juice, and comes in tablet form.