SCIENCE NEWS

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THE ENERGY OF COSMIC RAYS

WHERE do the enormous energies observed in cosmic rays come from? Newest of all problems in atomic science is to figure out how the ray energy is released.

Cosmic rays have been observed, for example, so energetic and piercing that they pass through nearly 2,000 feet (600 meters) of sea-water.

Professor A. H. Compton, of the University of Chicago, now of the University of Oxford, England, has estimated in *Nature* that some of the most piercing cosmic rays have energies of 600,000,000,000 electron volts. Such great evidences of energy, Dr. Compton points out, can not come from the release of the energy equivalent to the mass of most atoms known on earth. It would require atoms from 100 to 1,000 times as heavy as those of hydrogen to produce such rays by exploding. Heaviest of all atoms on earth are those of uranium weighing only about 238 times as much as hydrogen.

Dr. Compton pictures such rays as primary ones coming in from outer space and not as secondary ones created in the earth's atmosphere. They can not, definitely, be photons of radiations.

Photons are the little so-called packets of radiation, of which ordinary light is only one kind, which have been suggested as the cause of cosmic rays. Dr. Compton's 600,000,000,000-volt cosmic rays, by contrast, are thought to be electrified particles.

Those investigators who like to retain the idea of cosmic rays being photonic in nature have speculated on complex chain reactions within matter as cosmic rays pierce it. Such chain mechanisms seek to explain how super-penetrating power of the rays is possible with photons far less energetic than observations would indicate.

Just before Dr. Compton's report, and also in *Nature*, H. J. Bhabha, Indian physicist now at Cambridge, England, described such a hypothetical chain mechanism. He pictures an incoming cosmic ray photon striking atoms of matter and turning into a neutron with little loss of energy. The neutron, like a microscopic billiard ball, flies forward with great energy and with little ionizing power. In traveling through a yard of lead, Mr. Bhabha estimates, some 25 such interchanges between photons and neutrons would occur; the one turning into the other alternately.

This scheme would lower materially the loss of energy as a cosmic ray goes through matter, for about half the time it spent in the material it would be in the form of neutrons and lose little energy. Thus the final power of the ray, as measured by its ionization, would be much more than its real energy if such a mechanism were not acting.

Dr. Compton, in discussing such chain mechanisms, points out that "The apparent absence of any possible mechanism whereby such a chain reaction might be effected seems sufficient to rule out such suggestions."

PHYSIOLOGICAL EFFECTS OF RADIATION

NEW scientific tools for investigating how well radium rays and x-rays act on the human body have been developed by the National Bureau of Standards. The apparatus, using blocks of wax instead of the human body to scatter the rays, and a mixture of three fluids having atomic patterns similar to the body tissues to absorb the radiation, may prove useful in helping to decide the old question of when to use and when not to use radium in treating deep-seated cancerous tissue.

Often radium rays work better than x-rays, but frequently the opposite is true. Physicians, in the past, have only been able to determine this fact by actual body therapy. Now, it is hoped, a laboratory test can decide the problem in advance of treatment.

Lauriston S. Taylor, head of the section of x-rays standardization, and Dr. F. L. Mohler, head of the section of atomic physics of the bureau, are the developers of the new ray-measuring equipment.

"While it has been possible," Mr. Taylor said, "to measure separately the ionization of radium and x-rays it has not been possible to compare accurately the results of two such tests and decide definitely when and where each may be most efficiently utilized. Any suitable method of measuring these rays must be carried out under conditions which physically are the same as those encountered by the radiation when it enters the body. To accomplish this we have constructed apparatus which measures the radiation in liquids instead of gases. These liquids have the same atomic properties as the body tissues." The fluids, he added, are carbon bisulphide, tetrahydronapthalene and a fluid obtained from oil refineries, known as ligroin.

A fine, screen-like mesh of wires properly insulated is immersed in this combination liquid and the ability of the rays to ionize atoms by knocking off electrons is measured. It is a similar ionization of atoms in the body which makes radium and x-rays effective in treating cancer.

Below the ionization screen, Mr. Taylor explained, are a series of wax blocks which scatter the rays backward after the fashion of the human body in radiation therapy. These wax blocks are known as "phantom" bodies and take the place of a real body in the actual tests.

"STALLED AIR"

"STALLED AIR," a persistent stagnation in the atmosphere, with the country largely blanketed with a great warm air mass, was the cause of the fog that has grounded airplanes, slowed rail schedules and caused auto wrecks for several days, according to C. L. Mitchell, of the U. S. Weather Bureau.

A long drift of warmed air from the southwest brought about a condition of general cloudiness and thin rains. This, in itself, is not an abnormal or unusual occurrence in winter, Mr. Mitchell explained. What brought the fog

was the apparent inability of this sluggish air mass to move.

The fog came because the heated moist air condensed over the cooler land and water of the Northeast. Such condensation occurs because of the presence of microscopic particles in the air which serve as nuclei. Atoms in the atmosphere from which one electron has been removed so that they become electrical ions are a common type of nuclei. Dust and soot particles from many chimneys also form convenient places at which moisture in the air can condense.

The dense fogs found in industrial cities known as "smoggy" weather—a combination of the words smoke and foggy—occur for this last reason. Much of the fog in the East may have been due to this "smog" for during the winter the air is especially filled with ash and unburned coal particles.

The foggy condition has been general over practically the whole of the Appalachian mountain region and the Atlantic seaboard. Fog has also been reported from as far west as Omaha; but the trans-Appalachian region has not been under a continuous shadowy blanket.

THE FEDERAL FOOD AND DRUG ACT

TIGHTENING up of the Federal Food and Drugs Act on thirty-six specific points is urged by the American Medical Association through its board of trustees, the council on pharmacy and chemistry and the committee on foods.

Clamping down on extravagant claims made over the radio and in printed advertisements for foods, cosmetics, drugs and certain devices is necessary to protect the health and pocketbooks of the American people, the *Journal* of the American Medical Association states in its current issue. Within the thirty years that have passed since the food and drugs laws was enacted, there have developed advertising agencies, the radio, and many other new forms of approach which make new legislation desirable.

It is believed the doctors would not place on publishers or owners of broadcasting stations the responsibility for exaggerated or untruthful claims. Responsibility should rest with the individual or firm issuing the products.

A few of the important changes advocated are:

1. Extend the provisions of the law to include cosmetics and cosmetic advertising.

2. Ban the use of testimonials of a health, medicinal or therapeutic character in food advertising by persons unqualified to express a scientific opinion.

3. Require all drug testimonials to be accompanied by the name and address of the writer and consider such testimonials the claims of the advertiser.

4. Prohibit the mention of the names of diseases on the labels of drug preparations unless the drug is a cure.

5. Extend the scope of the word "drug" to include devices, substances and preparations intended to "affect" the structure or any function of the body or the treatment of disease.

6. Require declaration and warning on the labels of habit-forming drugs.

7. Prevent the use of resinous glaze or shellac to cover candy.

8. Prohibit the use of artificial colors in food other than those certified by the Department of Agriculture.

9. Class as adulterated food prepared under unsanitary conditions.

10. Authorize the fixing of tolerances for any added or natural poison in or on food, and if dangerous ban the food whether the constituent was added by man or exists there naturally.

GENERAL HEALTH AND THE DEPRESSION

THE economic depression of the past few years has not lowered the general health of the people of the United States, according to the report made to the Congress by Dr. Hugh S. Cumming, Surgeon-General of the U. S. Public Health Service.

The two chief factors which have kept the country healthy are "the vast work of the relief agencies and the fortunate absence of wide-spread epidemics," he said.

The lowest death rate ever recorded in the United States was for the calendar year 1933, the last half of which is covered by the Surgeon-General's report. Health conditions remained comparatively good for the first half of 1934 but the death rates for many localities were higher than in the preceding year.

Those whose health was most affected by the depression were members of the families which had been in comfortable economic circumstances before 1929 but which since then have been reduced to the lower economic class. This was learned from a series of studies by the U. S. Public Health Service in ten localities where the depression was most severe.

Death rates for tuberculosis, typhoid fever and diphtheria reached new low marks for the calendar year 1933.

"The participation of the Public Health Service in the Civil Works program was an outstanding activity during the year," the Surgeon-General reported. "Through the use of work relief labor, assistance was given to 14 states in malaria-control drainage work, in which 6,000 miles of ditching was carried out. In these states there are approximately 2,000,000 cases of malaria each year and the annual loss therefrom is estimated at half a billion dollars. Under the Civil Works program and aid, more than 225,000 sanitary outdoor toilets for rural homes were constructed in 22 states, the material being furnished by the home owners.

"In the field of public health, new problems constantly arise and new dangers appear, such as those illustrated by the unusual type of encephalitis appearing in St. Louis in 1933, the extensive outbreak of amoebic dysentery in Chicago, and the necessity for the control of distillery wastes which are now being emptied into already heavily overtaxed and polluted streams, thus seriously affecting the water supplies of the country. Constant vigilance is required for the early detection and study of these new continually arising dangers to the public health in order successfully to combat them."

THE USE OF RUBBER IN THE AUTOMOBILE INDUSTRY

CURT SAURER, of the Firestone Tire & Rubber Co., speaking at the recent meeting of the Society of Auto-

motive Engineers, told what uses rubber finds in modern automobiles; and what the future holds.

The best recognized use of rubber—in tires—is only one of about twenty important places where rubber enters the construction of an automobile.

Drive along a road, hit a bump and the tires absorb the first shock. Helping the tire take up the impact is the spring between the axle and body. And between the axle and spring many cars have a layer of rubber to help absorb the shock. In the future, Mr. Saurer reports, it may be possible to remove the spring entirely and ride on rubber. The future may also bring a rubber mounting between the motor and the running gears of the car and between the gear box and the wheels. Such installation would further aid in silencing a motor car.

As you guide the car with a hard rubber steering wheel, step on the brakes if the emergency arises. More often than not, your foot will come down on a rubber-covered brake or clutch pedal. And the pressure moves an intricate system of rods and levers made silent and rattle-proof with rubber. Even in the brakes themselves is rubber, for the brake linings of to-day use rubber as the binding material within them.

Well known, Mr. Saurer points out, is the sound insulation provided by rubber sheeting which takes rattles and squeaks out of the joints between the separate parts of a car body. In front of the car is the radiator and with it the cooling system of the automobile. Rubber goes into the radiator hose. Newest change in this part of the car is hose with an outlet valve used as a drain or for installing hose leading to the hot water heater system for winter driving. Familiar are the uses of rubber as electrical insulator in the ignition system of all cars. Known too are rubber windshield wipers and rubber coating on the running board.

Cars of the future, Mr. Saurer believes, will also have a rubber covering on the under side of the mud guards to protect the metal from the impact of stones and to reduce the noise of such impacts.

Rubber seat cushions have not yet come for automobiles but the problem is being investigated. Perhaps such seats will come as some form of the familiar sponge rubber, perhaps as rubber threads. One may someday ride while sitting on a pile of rubber bands.

ITEMS

A CABLE from Copenhagen reports that a comet, just discovered at Union Observatory at Johannesburg, South Africa, by Astronomer E. L. Johnson, is the first of the new year. But it is not visible from the northern hemisphere, and even south of the equator a telescope of some size is necessary. It will be called Johnson's comet. The astronomical location of the presumably new comet is right ascension one hour and south declination 51 degrees three minutes, which means that it is in the southern constellation of the Phoenix. Its brightness is reported as 10.4 magnitude, whereas an object in the sky must be sixth magnitude in order to be seen by keen, unaided eyes. News of the discovery, made late on Tuesday night (January 8), was reported to the central bureau for astronomical information at Copenhagen, whence astronomical news is cabled to the observatories of the world. The comet is moving about a degree a day southward, but more observations and extensive computations will be necessary before astronomers can say whether it will grow brighter, when it is likely to return, or how long it will remain with us at this time.

A SECOND cable from Copenhagen states that a new object in the heavens, discovered by a British amateur astronomer, has been reported through the International Astronomical Union Bureau. It may be an asteroid or a comet. Although it is tenth magnitude and too faint to be seen with the unaided eye, it is located in the constellation of Taurus, the bull, somewhat west of the bright star Aldebaran in the evening sky. Discovered on January 6 by Geoffrey Francis Kellaway who lives in the Somerset County of England, the new object was confirmed by Dr. A. C. C. Crommelin before being reported. It will be known as the Kellaway object. The object has no tail but does have a bright center or nucleus. The astronomical coordinates at discovery were right ascension 4 hours 17 minutes 24 seconds and declination north 16 degrees 11 minutes and the daily motion is in right ascension plus two minutes 8 seconds and in declination plus one minute.

INFLUENZA cases throughout the country increased from 2,889 to 4,965 during the first week of the new year, according to reports of 38 state health officers to the U. S. Public Health Service. These official reports do not give a true picture of the influenza situation. Actually there may be 49,000 or more cases of the disease. The reported number of cases must be multiplied by five or ten or more in order to get anything like a true idea of the amount of influenza present in the country, since so very many cases of this disease never get reported, even during epidemics. Confusion of influenza with colds and grippe adds to the difficulty of determining the amount of influenza in the country. Influenza is a much more severe ailment than grippe, while the latter is more severe than the common cold.

UNUSUALLY warm weather for early January, prevailing over most of the country, has helped distressed livestock in the West and at the same time has encouraged the seeding of Southern vegetable crops for the early spring market in the East. These are outstanding points in the week's summary of weather and crop conditions, as compiled by J. B. Kincer, of the U. S. Weather Bureau. The benefits to Western range cattle came partly through added respite from winter cold, but mainly through the melting away of the snow cover from pastures which had been blanketed down, permitting the animals to graze again. Considering the distressed conditions of the past several seasons in the West, the present winter has so far been rather favorable for cattle. The drought condition on the Great Plains, however, is not yet at all adequately relieved, and conditions in the anomalous dry area from the upper Ohio Valley southward are also still serious.