PHYSICS

Air a Hundred Miles Up May Be Warm as a Summer Day

World-Wide Investigation of Radio Signal Reflection Also Shows Wave Action in Upper Ionized Region

FURTHER proof that the layers of ionized atmosphere of the earth from 62 to 124 miles above sea level have a fairly constant temperature regardless of the time of day, night or season is presented in a report (*Physical Review, Nov.* 1) prepared by Dr. E. O. Hulburt of the Naval Research Laboratory.

Moreover, new data taken by many investigators scattered all over the world indicate that the temperature of the high altitude layer may be as great as that of an average summer's day at the earth's surface, about 80 degrees Fahrenheit.

"Best agreement between the radio facts and the theoretical calculations is found," Dr. Hulburt reports, "if the temperatures of these levels is taken to be rather warm, above 300 degrees Kelvin."

A degree Kelvin is the unit of the absolute temperature scale. A figure of 300 degrees Kelvin corresponds to 80.6 degrees Fahrenheit.

Dr. Hulburt's preliminary report was prepared from data forwarded to him by scientists working at the Department of Terrestrial Magnetism of the Carnegie Institution and the National Bureau of Standards, both of Washington.

Observations were obtained in such widely scattered places as Watheroo, Western Australia; Huancayo, Peru; Washington; Fairbanks, Alaska; and in New England and Nova Scotia during the solar eclipse.

145 Miles Up

Taking advantage of the reflection of radio signals from the ionized layers scientists have further investigated the characteristics of the layer known as F2. This layer of the ionosphere begins about 145 miles above sea level and continues up to 220 miles. Layer F2 is above the layers E and F1 whose temperature varies within 86 degrees Fahrenheit no matter what the time of day or season.

Radio studies of the ionization in the F2 regions for different times of day, Dr. Hulburt indicates, fit in with the belief that great waves of ionized atmosphere move about in this region. As the ionized air spreads out from a point directly below the sun in all directions, part of it moves with the rotation of the earth and part against the rotation. Eastward the ionized wave moves with the earth and should resemble water waves, having a smooth form, perhaps like ground swells.

The part of the wave going westward moves against the earth's rotation and, Dr. Hulbert postulates, "is checked and is caused to whitecap, as in a tide rip." That is, the top spills over the bottom of the wave.

Observations made on the magnetic equator substantiate this view and record a greatly disturbed and erratic layer of ionization in the morning hours, with a maximum at 10 a. m. A minimum occurs at noon and then there is a smoother, less disturbed ionization in the afternoon, with a broad maximum at from 6 to 8 p. m.

Science News Letter, November 17, 1934

ASTRONOMY

Astronomer Explains Star Going Two Ways at Once

THE mystery of stars which go two ways at once, the outer part expanding and the inner part contracting, is cleared up by the South African astronomer A. E. H. Bleksley of the University of Witwatersrand (*Nature, Oct.* 27).

The two-way stars are the pulsating stars known as the "Cepheid variables." They are relatively common. Their paradoxical action of expanding and contracting at the same time in different places was explained by Mr. Bleksley as the result of his calculations on the temperatures and luminosities of several of the stars, particularly the one known technically as RS Boötis.

It was assumed by scientists that such stars ought to be the hottest and brightest when they reached the greatest contraction. Astrophysicists were therefore puzzled to find that when the star was getting brighter and brighter its outer atmosphere was moving toward them, or away from the center.

The finding of this kind of star action threw doubts on the whole "pulsation" theory of the Cepheid variable type of star.

Astronomers will probably be glad Mr. Bleksley has explained away the paradox by showing that while the oscillations of stellar atmosphere exist, they differ in phase or time by approximately one quarter of the total period for one complete "pulsation" of the star. Taking this phase difference into account the time of maximum brightness, maximum temperature and minimum radius (most contraction) still coincide just as they should in a world that follows the laboratory findings of the physicist.

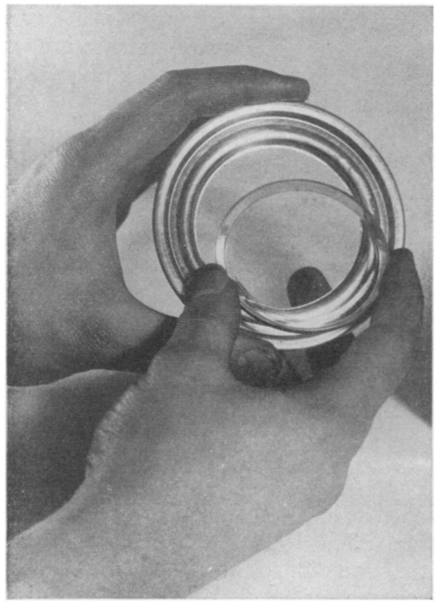
Science News Letter, November 17, 1934

TECHNOLOGY

Glass Tops on Tin Cans Made of Telescope Material

A NEW type glass top for tin cans enabling purchasers to see the contents has been developed by the Corning Glass Works. The glass is the same kind used in making great telescope mirrors such as the new 200-inch diameter instrument of the California Institute of Technology.

Because of the low expansion of the



FOR TIN AND TELESCOPE

The same material that allows the astronomer to gaze at the stars is now being placed in can tops to allow the housewife to see her vegetables.

glass when heated it is possible to solder the tin can onto the glass without need for a close-fitting gasket. So strong is the glass-to-tin joint that in tests the glass breaks before the tin-glass union.

The development makes it possible to ship cans with glass ends to the cannery and pack in the contents just as is done now for all metal cans. In the food processing it is often necessary to place the filled can in a steam autoclave and then suddenly cool it with water to prevent over-cooking. The special glass resists, satisfactorily, this drastic treatment.

Science News Letter, November 17, 1934

MEDICINE

Artificial Radioactivity Seen As Aid in Cancer Fight

Man-Made Radioactivity May Prove To Be Effective Substitute For Expensive Radium in Medicine

THE STRUGGLE of medical science to combat cancer has been materially aided by the recent discovery of ways to make many common elements radioactive by artificial means, Dr. G. Failla, head of the physical laboratories of Memorial Hospital, New York City, has informed Science Service.

Dr. Failla's encouraging statement was made in reply to a request for interpretation of the announcement by Prof. E. O. Lawrence of the University of California that a way had been found to make sodium radioactive and have it give off penetrating gamma rays and beta rays. (*See SNL, Oct. 27 p. 259*). Gamma rays from man-made radioactive sodium are over twice as piercing as those from the most powerful natural sources, thorium C".

The main difficulty in the treatment of cancerous tissue by radiation, Dr. Failla declares, has been to find some carrier which will distribute itself fairly uniformly throughout the tumor without diffusing into the surrounding normal tissue and through the blood stream. No such selective carrier is available at present although chemists the world over have been searching for it for decades.

Opens New Fields

"The advent of artificial radioactivity opens new fields of cancer research," Dr. Failla declares. "In their search in the past for chemical agents suitable for the treatment of cancer, chemists have concentrated their attention on agents which damage the living cell hoping to find something which would kill cancer cells without harming irreparably normal cells and the patient as a whole.

"With the coming of radioactivity induced by artificial means it is only necessary to look for something which is selectively or even differentially absorbed or temporarily retained by cancer tissue.

"When and if such a substance is found it will then be possible to make one or more of its constituents artificially radioactive. By virtue of its greater concentration in cancer tissue such tissues would be destroyed readily by the radioactive rays while normal tissue would survive.

Need Not Be Gamma

"In this connection," Dr. Failla continued, "it should be noted that radiation emitted by artificially produced radioactive material need not be of the gamma ray type. Any radiation which either directly or indirectly produces ionization is satisfactory for this purpose since the source of the rays would actually permeate the cancer tissue and ionize it intensely."

Prof. Lawrence's discovery of a way to make artificially radioactive sodium, giving off gamma rays with a half life of fifteen hours, has an important bearing, Dr. Failla reports, on the field of cancer therapy for it may develop that it is possible to use it as a substitute for radium and the radioactive gas radon obtained from radium, for the external treatment.

The life of radioactive sodium—based on its half life of fifteen hours—is too short, Dr. Failla believes, to allow its insertion directly into a tumor. Unless very large quantities are available constant replacement would be necessary.

While one immediately thinks of making up a solution or suspension of radioactive sodium, perhaps as salt, and injecting this directly into tumors the problem is fraught with difficulties known for many years, Dr. Failla declares (See *Archives of Radiology and Electrotherapy, June*, 1920).

Fifteen years ago scientists at Memorial Hospital prepared radioactive salt by exposing it to radon for three hours so that the disintegration products—radium A, B and C—were deposited on the salt. By dissolving this special salt in water a radioactive solution was obtained which could be injected directly into tumors, or into the blood stream for special cases where there was a general neoplasmic condition throughout the body.

The method was tried extensively on animals and human patients but was finally abandoned. Radioactive oils and suspensions of charcoal containing radon, or its disintegration products, were also tried at Memorial Hospital with little success, Dr. Failla indicated.

Science News Letter, November 17, 1934

BIOCHEMISTRY

Study Concentration of Viruses as Clue to Nature

TOO SMALL to be seen; too many to count. It sounds like an old riddle but it is merely a rough way of describing the innumerable tiny particles which make up the viruses that cause diseases like infantile paralysis in humans and tobacco mosaic in plants.

For these infective particles are so small they can not be seen even with powerful microscopes. As to counting them, 10 with fourteen ciphers written after it, may represent the number of infective particles in about 20 drops of juice squeezed from a plant infected with tobacco mosaic, Dr. William J. Robbins of the University of Missouri estimates.

These figures are highly speculative, Dr. Robbins pointed out (*Science, Sept. 21.*) They are based on the assumption that one-tenth of a gram or about two grains of infective material having a molecular weight of 100,000 exists in a little over six quarts of plant juice.

Here again the scientist is assuming: first, that one molecule of infective material weighs 100,000 times as much as one molecule of hydrogen; and second, that the yield of infective principle from the plant juice is 100 per cent.

Dr. Robbins' calculations are based on