SCIENCE NEWS

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CORONAL LINES CAUSED BY OXYGEN

THE mysterious and hypothetical element coronium, to which for years the major part of the radiation from the sun's halo or corona has been attributed, turns out to be the common element oxygen.

In 1869, when a solar eclipse path crossed the United States, green lines in the spectrum of the sun's outer envelope caused astronomers to assume an unknown element and name it after the sun's corona. The corona is visible only during the few minutes of total solar eclipse.

Now Dr. D. H. Menzel, of Harvard Observatory, and Dr. J. C. Boyce, of the Massachusetts Institute of Technology, have made the first important step in unraveling this astronomical mystery that has existed since the first observations of the coronal spectrum more than sixty years ago. Their analysis identifies three of the five strongest coronal lines with neutral oxygen atoms in the high solar atmosphere. These atoms are in very peculiar states of excitation. Thus the life-supporting gas in the earth's atmosphere promises to explain another of the mysteries of the heavens. For oxygen has heretofore been shown to be the cause of light from far-off nebulae and from the aurora or northern lights of the earth's atmosphere.

"The light of the gaseous nebulae was long attributed to the hypothetical element nebulium," Dr. Harlow Shapley, director of the Harvard Observatory, explained in commenting on the coronium-oxygen identification. "A few years ago the nebulium mystery was solved by finding that highly ionized oxygen and nitrogen were largely responsible for the radiation. Also in recent years the mysterious light of the aurora has been assigned to oxygen."

Careful checking of the "flags" that are flown by the elements in spectrum photographs made possible this latest discovery. These "flags" are lines that appear when light is dispersed by a prism. Bright lines or bands of light, beautifully colored, are caused by the radiation given off by various chemical elements heated to incandescence. Sunlight, which forms the rainbow of a showery day or the rainbow of the physicist's spectroscope, contains a wide array of light from numerous elements. By matching the spectral lines of light from the sun, stars and other otherwise inaccessible sources with those from known elements, scientists have been able to prove the existence of various earthly substances in other parts of the universe. Helium, which is now rated as a useful and fairly available elemental gas, was discovered in the sun's chromosphere during the eclipse of 1868 as a bright yellow line. Not until 1895 was it discovered here on earth chemically.

In a similar way the hypothetical element coronium came into existence because coronal spectral lines were found that could not be linked to any known element. As more and more of the ninety-odd chemical elements were discovered and studied without being proved to be coronium, scientists began to feel confident that coronium was a common element in masquerade. Drs. Menzel and Boyce have now produced the first definite evidence. The solution of the mystery of coronal radiation was assisted greatly by the recent discovery at Mount Wilson Observatory that the new star Nova Ophiuchi also shows coronal lines at one stage of its explosive outburst. The investigators used corona spectrum photographs obtained at the 1932 eclipse, which was successfully observed by the Harvard Observatory party. It is probable that after this important start made by Drs. Menzel and Boyce the other coronal lines will soon be interpreted.

The Harvard Observatory announcement states that Drs. Menzel and Boyce find that the frequency difference between two coronal lines (wave-length 6374 and wave-length 3454) agrees with the difference between two known high energy states of the neutral oxygen atom. This suggests that the lines are produced by combinations with a higher energy state. Calculation shows, the announcement states, that the oxygen atom should possess energy states of about this value. A theoretical extension of the data predicts that a line should be found at approximately the wave-length of a third prominent coronal line (wave-length 3987).

ATOM DISINTEGRATION BY HIGH-SPEED DEUTONS

ATOM smashing has revealed new secrets about the hidden energy of the building blocks of matter that may some day serve as power in a super-machine age civilization.

These new advances were reported on by Dr. Ernest O. Lawrence, professor of physics at the University of California, at the meetings of the Solvay International Institute of Physics held in Brussels. Dr. Lawrence, with his colleagues Drs. M. Stanley Livingston and Malcolm C. Henderson, has also communicated his research results to *The Physical Review*.

The whirligig atom-gun invented by these modern alchemists has fired the most energetic atomic projectiles ever produced by artificial means. Dr. Lawrence and his collaborators forced the hearts or nuclei of heavy or double weight hydrogen, called deutons, to whirl about in a vacuum. Twice during each circular trip these deutons are fed more electrical energy. Finally they are stepped up to the almost unbelievable speed of 3,000,000 volts, the most energetic particles ever controlled by man.

Then these atomic bullets bombard targets of platinum, brass, wax and many other chemicals. Atomic disaster is the result of these collisions between the deuton bullets and the target atom hearts. The fragments of these atomic explosions flying out are caught and measured. These measurements tell the physicists the story of the atomic disaster.

One kind of fragments fly out with a speed of 5,400,000 volts. As this is 2,400,000 volts more than the deuton bullet speed, small amounts of highly concentrated energy must have been released. These fragments, called protons, are the hearts of ordinary hydrogen atoms. The

companion fragment to the proton is called the neutron and has the same weight but no electrical charge. This particle also flies out with an energy of 2,400,000 volts.

The results of the collisions are interpreted from the disintegration fragments. It is concluded that the deuton bullet itself has been broken up and 4,800,000 volts of energy have been released as a result of this disaster. The deuton has to be very close to the target atom's heart before this disintegration will occur.

Very seldom do the right conditions exist for the release of this enormous amount of energy. So seldom, in fact, that Dr. Lawrence states that the best targets gave only two disintegration protons for every 10,000,000 deuton bullets bombarding the target. The process is so inefficient that it is only detected by very delicate scientific instruments and as yet can not be thought of as a commercial source of powerful energy.

STREAMLINED AUTOMOBILES AND POWER CONSUMPTION

THE automobile of 1933 consumes 30 per cent. less power in overcoming air resistance than its predecessor of 1928, wind-tunnel measurements on models by R. H. Heald, of the U. S. Bureau of Standards, show. This improved performance comes as a result of the modern trend toward streamline form. The tests showed, however, that the air resistance of the 1933 car is more than twice that of a completely streamlined car of the same frontal area.

The aerodynamic characteristics of six small-scale replicas, ranging from one quarter to one fifteenth natural size, were studied in the wind-tunnel at air speeds from thirteen to seventy miles per hour. These six models were a 1922 sedan, a 1922 touring car, a light sedan of 1928 and of 1933, and two models of the autos of tomorrow. The 1933 model was a composite model and not an exact duplicate of any actual make. It was equipped with disk wheels, exposed bumpers, fenders, headlights and spare tire. One model of the auto of the future differed from it in having the windshield inclined at a 45 degree angle, the top rounded front and rear, and a general smoothing of lines. The other model of the future presents a radical departure in design; the whole upper is rounded, blunt in front and tapered to the rear so that it resembles a section from a thick airplane wing. The wheels of this car are enclosed in the body.

Mr. Heald measured the resistance offered by these models to air currents of known velocity and from these data he obtains the so-called drag coefficients which express the aerodynamic efficiency of the model. These coefficients ranged from 0.0017 for the 1922 sedan, 0.0018 for the 1928 sedan, 0.0014 for the 1933 sedan to 0.0005 for the ultramodern car of the future.

The significance of these figures can be more readily appreciated when these drag coefficients are converted into horse-power consumption for an actual automobile. At a speed of 60 miles per hour air resistance uses 27 horse-power for the 1922 sedan, 33 horse-power for the touring car of the same period, 26 horse-power for the 1928 sedan, 18 horse-power for the 1933 sedan and 8 and 6 horse-power for the two streamlined models. The slight improvement of the 1928 model over those for 1922 is due, not to any improvement in aerodynamic design, but to a reduction in frontal area, and to a lesser extent this is true also of the 1933 car as compared to the 1928 model. At 48 miles per hour the power consumption due to air resistance is only one half of that at 60 miles per hour, while at 76 miles per hour it is doubled.

A striking feature of Mr. Heald's results is the prediction that the 1933 automobile, shorn of its projecting bumpers, headlights and spare tire, fitted with a sloping windshield and a rounded top, would consume 10 horsepower less at 60 miles per hour, and about 20 horse-power less at 70 miles per hour. This would effect a considerable saving in gasoline.

The completely streamlined, aerofoil type, as represented in the most advanced of Mr. Heald's models, offers a further slight improvement in performance, but this would only be of practical significance at considerably higher speeds. However, Mr. Heald points out that an automobile body of this shape would act like an airplane wing and at high speeds would produce a lifting force. The effect of this lifting force on performance has not yet been investigated.

A REPORTED ANCESTOR OF THE HUMAN SPECIES

DISCOVERY of a jaw belonging to an ancestor of the present-day human species was reported at a session of the Anthropological Institute, London, by Dr. L. S. B. Leakey.

The discovery, if accepted according to Dr. Leakey's interpretation, would mean that human history and evolution are pushed back into a much more distant past than anthropologists have assigned to man.

Dr. Leakey, whose excavations in East Africa have been a subject of much scientific discussion, announced that the new-found jaw represents a new species, which he called *Homo kanamensis*, in honor of Kanam in East Africa where the jaw was unearthed. The evidence of a new species is based on radiological examination of the jaw. This x-ray test, it was said, showed distinguishing features in the roots of the teeth, marking an evolutionary trend towards *Homo sapiens*, the species to which all modern races of men belong.

It was stated that the man represented by these skeletal remains lived in the Lower Pleistocene age, which would give this early species an antiquity of about half a million years. He would thus be a contemporary of *Pithecanthropus erectus*. Pithecanthropus, so-called apeman of Java, is a far more primitive type, and has long been rated as the most venerable proto-man ever found on earth. The new discovery would imply that a much higher type of man, and a direct ancestor of the species of man that survived into modern times, lived on earth at an ancient date. The jaw found at Kanam shows a development of chin and arrangement of teeth that are similar to *Homo sapiens*.

Another skull from East Africa, the Kanjera skull, was stated by Dr. Leakey to be Middle Pleistocene in antiquity and to represent a generalized primitive type o

Homo sapiens. The shape of the femur or thigh bone shows that this man walked erect. Development of a culture using hand axes of stone can be traced in East Africa.

ENCEPHALITIS AND MOSQUITOES

TEN Mississippi convicts who risked their lives to aid science left the state prison at Parchman on November 1.

Their liberty is being restored as a reward for their heroic service to the society against which they committed their crimes. They furnished proof that encephalitis, sometimes called sleeping sickness, is not carried by mosquitoes.

This enables investigators, seeking to protect society from the disease, to narrow the range of investigation and to come closer to knowledge of how the disease is transmitted.

Another group of convicts, volunteers from the Virginia state prison, are giving further proof that mosquitoes do not spread the disease. These men served as subjects later than the Mississippi group. The remainder of their sentence, which runs to the middle of November, will be cheered by the knowledge that their release from danger of illness and from imprisonment is now almost certain.

One month ago the Mississippi convicts volunteered to act as subjects in the experiments that Dr. J. P. Leake and his associates of the U. S. Public Health Service were conducting during the epidemic of encephalitis that struck St. Louis early this fall. The epidemic ran out its course by the middle of October, but the experiments were continued in the hope of finding means of preventing another such outbreak.

Mosquitoes were suspected of spreading the disease in St. Louis. So that the experiment was made of trying to transmit the disease to healthy men by the bite of mosquitoes that had previously fed on encephalitis patients. The investigators first tried the experiments on themselves. But since they had been in the thick of the fight all along, visiting patients and handling their infected blood, they might have developed resistance to the disease which would protect them against even the bite of an infected mosquito. The convicts had not been so exposed. However, mosquitoes also failed to infect them, although more than twice the usual time necessary for the disease to develop after infection has elapsed.

ITEMS

THE Whipple comet has been found on a photograph taken with the 16-inch Metcalf telescope at the Oak Ridge, Massachusetts, station of the Harvard Observatory on October 15 and also on several plates taken on October 20. Professor George Van Biesbroeck, of the Yerkes Observatory, has confirmed the discovery of the comet by Dr. Fred L. Whipple, of Harvard, by reporting a position determined on Sunday. Dr. Whipple's finding of the comet was bulletined to astronomers throughout the world last Saturday. It is of 13 or 14 magnitude and therefore visible only in larger telescopes.

A SURVEY of recent weather conditions by the U. S. Weather Bureau shows that the continuation of last summer's long drought in the southwestern winter wheat areas is hampering the fall planting program in parts of Oklahoma and Kansas. The lack of rain is also felt in the Great Plains region from Nebraska on northwards. Farther east, conditions are more favorable, and fall-planted grains are already pretty well in. Autumn rains, regionally at least, have caused some interference with harvesting, as in the eastern Iowa corn area and in the northwestern part of the Cotton Belt.

SHARP earthquake disturbance in the interior of Bolivia was indicated by a study of data collected telegraphically by Science Service and interpreted by seismologists of the U. S. Coast and Geodetic Survey. The quake began at 6:28 P. M., eastern standard time, on Wednesday, October 26. Its epicenter was in approximately 22 degrees south latitude, 67 degrees west longitude. This point lies in the Bolivian state of Potosi, about 350 miles northeast of Antofagasta, Chile. It is an interior mountain region, without good communications to the outside, so that if property damage or loss of life have resulted there may be a lapse of several days before a direct report reaches the world. The present report is based on instrumental data alone.

IF you were to travel over all the shoreline of the United States and its possessions, you would cover a distance greater than four times the circumference of the earth at the equator. The task of mapping all the territory, more than 103,000 miles in length, is one performed by the U. S. Coast and Geodetic Survey. Captain R. S. Patton, director of the survey, reports that 21 new charts and 152 new revisions of existing charts were issued by this bureau during the past fiscal year. The total number of nautical charts now issued by the survey is 752, and these are supplemented by 5,515 coast and intracoastal pilots, 31,609 tide and current tables, and 958 tidal current charts.

NOT only the height of a building or of a tree, but also the nature of the ground on which it rests, is of prime importance in determining whether it will be struck by lightning. That lightning chooses the path of least electrical resistance is the contention of L. N. Bogoiavlensky, of Soviet Russia, in a letter to *Nature.* The resistance of the air, he explains, is influenced by the radioactivity of the rocks below it, since radioactive materials constantly give off radiation which increases the ionization and the electrical conductivity of the air. From the frequency with which the supports of an electrical power line have been damaged by thunderstorms, Dr. Bogoiavlensky shows the parallelism between the number of lightning flashes that strike the ground, the electrical conductivity of the air and the distribution of radioactive rocks below the surface of the ground. These rocks lie sometimes at considerable depths, more than one hundred feet, but their radiation seems to be effective. The measurements which led to these findings, used in choosing the location of power lines, radio transmitting stations, etc., were carried out in the outskirts of Leningrad, Moscow and Cheljabinsk in the Ural, by the Radiological Department of the Central Chamber of Weights and Measures, Leningrad.