SCIENCE NEWS

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ELECTRON SPEED

A METHOD used by astronomers to determine the velocity of stars has been applied in a slightly modified form to the atom to furnish the first direct evidence that electrons, negatively charged electrical portions of atoms, move about at high speeds in solid bodies. The experiment, conducted at the California Institute of Technology by Dr. Jesse W. M. DuMond, research fellow, and Dr. Harry A. Kirkpatrick, teaching fellow in physics, was the second crucial test of activities of the electrons within the atom. The first test was reported last January.

In explaining the application of the Doppler effect to the experiment, Dr. DuMond declared that if the source of the light or sound is in motion the successive vibrating waves or ripples are crowded together on the forward side of the motion's direction, and spaced farther apart on the rearward side. A similar phenomenon explains the fact that the sound from a train whistle approaching a stationary listener is of higher pitch than the sound of the same whistle when the train is receding from the listener. In the same way, stars approaching an observer emit spectral lines shifted toward the violet end of the spectrum, whereas receding stars emit lines shifted toward the red.

When the electron scatters X-radiation a similar effect occurs. If that part of the radiation which is scattered at a definite angle to the incoming beam is observed with a spectroscope, the spectral line which was in the original radiation is found to be shifted toward longer wavelengths and the spectral line is found to be broadened. The shift may be regarded analogically as a Doppler effect caused by the velocity of the electron recoiling away from the light under the impact that the light has given it. The increased breadth of the line may be regarded as a composite Doppler effect of the chaotic motion of all the electrons in the myriads of atoms scattering the X-radiation.

Dr. DuMond set the average speed of the invisible electrons which make up solid matter at 1,500 miles per second for the case of carbon. The experiment, which required months of work on the part of Drs. DuMond and Kirkpatrick, not only throws more light upon the internal activities of an atom, but proves two predictions made by Dr. DuMond in 1929: First, that in the spectrum of X-rays scattered by solids of low atomic number, the breadth of the Compton shifted line would be proportional to the sine of one half of the scattering angle; and, second, that it would be proportional to the primary wave-length.

The latest experiment testing the second of the above predictions was conducted with the multi-crystal spectrograph developed at the California Institute of Technology. Measurements were made of characteristic X-rays from molybdenum, silver and tungsten scattered by carbon at an angle of 156 degrees. Spectrum photographs were made of the radiation from each element. Each exposure lasted 1,000 hours.

Dr. DuMond based his predictions two years ago upon the hypothesis that the breadth of the shifted line in the spectrum of scattered X-rays is caused by the movement of electrons in atoms. The fulfilment of the two predictions is therefore confirmatory evidence for the hypothesis on which they were based. Details of the experiment will be published soon in the *Physical Review*. The first prediction was experimentally tested and reported upon last January. The present work refers to tests of the second prediction.

The story of this latest scientific contribution to the world of physics was revealed to a Science Service representative in the DuMond-Kirkpatrick laboratory, where 50,000- and 110,000-volt X-rays were used to find out that electrons really move about.

WEIGHT REDUCTION

RESEARCHES on the internal chemistry of fat folks, reported to the American Chemical Society, at its recent meeting at Buffalo, by Dr. L. H. Newburgh, of the University of Michigan Hospital, have not shown any metabolic abnormality. Dr. Newburgh's investigation included a careful check-up on the intake of energy-producing foods, the exchange of energy within the body and the amount of water absorbed and lost by the stout subjects of his research. He found them normal in all respects. The discomforting conclusion therefore remains that the only way to get too fat is to eat and drink too much.

Another investigation of the chemistry of getting fat was reported by Dr. William E. Anderson, of Yale University. He was particularly concerned with the problem of where the fat comes from, and traced the story of the upbuilding of body fat out of the fragments of sugars and starches. He also hinted at the probability that even proteins, those lean-meat and whole-wheat constituents that are supposed to be the dieter's stand-bys, can be at least to some extent split apart and reassembled into fats.

The smallest visible living things, bacteria, are storers of fat—more notably so, indeed, than humans or hippopotami or whales. Some of them build up a fat content of from 20 to 40 per cent. of their total body weight, according to Professor R. J. Anderson, also of Yale. But bacterial fat is not like the fats of the higher plants and animals. The latter consist of combinations of glycerin with one or more acids. The fatty acids of bacteria are peculiar substances with very large molecules. Injected into normal animals, these bacterial fats stimulate the formation of certain types of cells in excessive amount, leading to the building-up of tubercular tissue. Professor Anderson credited this peculiar physiological activity on the part of bacterial fatty substances to the big-moleculed acids they contain.

The much-maligned prune has found a defender in Dr. E. F. Kohman, of Washington, D. C. With his associates, W. H. Eddy and Miss Colia Z. Gurin, he made comparative vitamin studies with prunes and grapefruit. They used the prunes both dried and fresh, the grapefruit both fresh and canned. Prunes proved to be much better than grapefruit as sources of the growth-promoting vitamin A. It took 140 times as much grapefruit as it did of prune to induce normal growth in the young white rats that served as test animals. Grapefruit, however, scored over prunes in a test for Vitamin C, which prevents scurvy; and neither of the two fruits proved particularly good as sources for the anti-neuritic vitamin B complex.

OBSERVATIONS ON THE SUN

ORGANIZATION of a world-wide scientific agency for gathering facts on activities in the solar atmosphere is being perfected in Pasadena, California, under the direction of Dr. George E. Hale, director emeritus of the Mount Wilson Observatory. When the organization becomes active throughout the world, the sun will never set on workers who study the activities of sun-spots and prominences. Somewhere on the earth, at every hour of the twenty-four, an astronomer will have his eye upon the solar body.

Twenty-five coelostat telescope and spectrohelioscope stations have been established in widely separated parts of the world for making observations of the sun's actions and reporting to Dr. Hale, who devised the instruments to be used. Dr. Hale has revealed, in an article published by the *Astrophysical Journal*, that 25 instruments have been built or ordered for use at the various stations.

Stations are located at Cambridge, England; Zurich, Switzerland; Florence, Italy; Beirut, Syria; Kodaikanal, South India; Watheroo and Canberra, Australia; Nanking, China; Wellington, New Zealand; Apia, Samoa; Mount Wilson, California; Vermillion, South Dakota; Williams Bay, Wisconsin; Chicago; Columbus; Poughkeepsie, New York; New York City; Cambridge, Massachusetts, and Philadelphia.

"A general scheme of cooperation for the detection of eruptions on the sun's disk in which spectroheliographs may also take part, will be organized in harmony with present cooperative work of the International Astronomical Union," Dr. Hale stated in his paper. "A simple device for transforming a spectrohelioscope into a spectroheliograph has been built and tested at my Solar Observatory," Dr. Hale added. "The design is very inexpensive. The instrument can be employed as a useful auxiliary of standard spectrohelioscopes, especially when it is desired to photograph quickly the forms of rapidly changing eruptive phenomena."

MAGGOT TREATMENT OF WOUNDS

THE "maggot treatment" of bone injuries, in which larvae of blowflies are placed in the wound to clear up the decayed tissue and hasten healing, does not seem to be new. Dr. Hyman I. Goldstein, of Camden, New Jersey, has made a search into medical literature of the past and has found that the beneficial effect of these larvae was suggested by a French surgeon, Baron D. J. Larrey, shortly after the Napoleonic campaign in Egypt.

The baron states that in Syria the wounded were annoyed and often terrified by the appearance of "the larvae of the blue fly" in their injuries. "Nothing short of experience could convince them that these insects, so far from being injurious to their wounds, promoted rather their cicatrization, by cutting short the process of nature and by causing the separation of the cellular eschars which they devoured. These larvae are, indeed, greedy for putrefying substances only, and never touch the parts which are endowed with life."

Even earlier than this, in the sixteenth century, another French surgeon, Ambroise Paré, had observed the frequent presence of fly larvae in wounds, and had some idea of their possible beneficial work. The presence of larvae in wounds is noted in at least one place in the Bible: the terrible death of the Greek ruler Antiochus who persecuted the Jews (II Maccabees 9: 9). But this is recorded as part of the punishment sent upon him for his evil deeds. This ancient instance is not cited by Dr. Goldstein in his article.

The modern use of maggots to clear up wounds, especially bone wounds, dates from observations made in the field during the World War. The well-known Cleveland surgeon, Dr. George W. Crile, called attention in 1917 to the more rapid healing of wounds containing maggots. But it was the late Dr. W. S. Baer, of the Johns Hopkins University, who made the most extensive clinical tests, developed a technique and most vigorously advocated the general adoption of the method.

THE EXPLOSION OF STARS

INHABITANTS of the earth can be glad that the sun is not a star of the B E type, if a theory proposed to the American Astronomical Society by Dr. Dean B. McLaughlin, of the University of Michigan, is correct. Speaking before the society's meeting at the Perkins Observatory of Ohio Wesleyan University, at Delaware, Ohio, Dr. McLaughlin suggested that these stars explode every few years. Thus he explained the peculiar behavior of bright and dark lines in their spectra, obtained when their light is analyzed by the prisms of a spectroscope.

Most stars, like the sun, show a colored spectrum which is crossed by numerous dark lines. But about 1 per cent. of all the stars whose spectra have been observed show bright lines instead. In the B E stars, the bright lines are bisected by dark lines, and the two halves are continually changing in intensity. At times they are of equal brightness; then one may become several times as bright as the other. In explanation of this behavior, Dr. McLaughlin suggested that the star is surrounded by a very extensive atmosphere. The light that causes the bright line comes from the inner part of this atmosphere, but part of it is absorbed in the outer layer, causing the dark line in the center.

"The shifting of the lines and their changes in brightness are interpreted as being due to the gas being blown away from the star by the pressure of the star's radiation, and later falling back to the star again," Dr. McLaughlin explained. "This process takes several months or years for completion, and is repeated indefinitely. The observed shifting of the line represents the actual motions of the gases in the star's atmosphere."

Their behavior is similar to that of the "new" stars, or novae, that suddenly flash out in various parts of the sky, according to Dr. McLaughlin. Such novae are known to be surrounded by a rapidly expanding shell of gas. The difference is that the novae only explode once every million years or so, and then with very great violence, while the B E stars do it every few years or even every few months, in some cases.

Mountains and depressions as high as a mile or as deep as two miles above or below the average surface have been measured on the edge of the moon by H. R. Morgan and Jesse Pawling, of the U. S. Naval Observatory. Mr. Morgan reported that these measurements have been made from 4,000 observations of the time that the moon passed across the meridian. The measurements are made on the edge of the moon and are sometimes too early or too late, depending upon the height of the surface at the point that happens to be on the edge. From these studies it is expected that more accurate observations can be made of the occultations of stars, as the moon passes in front of them. Thus, one of the most difficult problems of astronomy can be solved more accurately.

TEST FOR PREGNANCY

THE fact that the pituitary gland empties an excessive amount of its hormone into the blood within a few days after conception is the basis for a test for pregnancy which has recently been proved accurate by the following investigators: Dr. M. H. Friedman, of the University of Pennsylvania; Dr. H. L. Reinhart and Dr. Ernest Scott, of Ohio State University; Dr. P. F. Schneider, of Northwestern University, and Dr. T. B. Magath and Dr. L. M. Randall, of the Mayo Clinic.

The test, known as the Aschheim-Zondek test because it was devised by Dr. S. Aschheim and Dr. B. Zondek, of Germany, is of extreme medical importance and may be a life-saving measure for the patient. With the overproduction that is characteristic of natural processes having to do with reproduction, more of the pituitary gland's hormone is made at this time than the body needs. All of it is carried about the body in the blood stream and as the blood passes through the kidneys the excess amount of the hormone is filtered out and passes from the body in the secretion of the kidneys. If some of this secretion is injected into non-pregnant female experimental animals, a detectable change in the ovaries of the animals takes place.

There are some diseases which may make women incapable of standing the added strain of pregnancy. If in such a case there is a possibility that conception has taken place, it is of first importance that the fact be known as soon as possible. The Aschheim-Zondek test gives this information earlier than any other method. The test is also valuable for distinguishing at an early stage between pregnancy and tumors or growths which may be dangerous and require immediate removal.

There are a number of other uses of the test which, conscientiously applied, rob the function of reproduction, which occupies so essential a place in our lives, of some of its dangers.

ITEMS

BLUE molds that the housewife knows on bread, oranges, mildewed clothing, jellies and other things also grow in the cracks of "crazed" crockery, the microscope has revealed. Fungi also have tastes for India ink, paste, cork, egg shells, sugar, tulip bulbs, rubber and even paper, Miss Marjory E. Swift reports in the *Journal* of the New York Botanical Garden. Certain similar fungi are the cause of human ailments.

A SACRED spring, timbered and cribbed with cedar logs in ancient times, and at the bottom of which were ten pottery pieces and more than forty prayer-sticks, was found by Dr. Paul S. Martin, leader of the Field Museum Archeological Expedition to the Southwest, at Ackman, Colorado. The prayer-sticks were very similar to those used by Hopi Indians, and pottery types were unlike anything in the neighborhood, belonging apparently to the Chaco style hundreds of miles away in New Mexico. A trench made through a kiva or temple shows walls and floors whose character is very puzzling.

CRANBERRY sauce has vitamin C like citrus fruits, when it is not cooked too long. It loses nothing when cooked two minutes; but if screened or pulped while hot, it loses 75 per cent. of its vitamin value, due to the oxygen of the air which then destroys it. Screening while cold has practically no such effect. Paul D. Isham and Professor Carl R. Fellers, of the Massachusetts Agricultural College, reported these results to the American Chemical Society which met at Buffalo recently.

A NEW electrical musical instrument, using a keyboard and giving musical effects of either piano or organ type, is the invention of Benjamin F. Miessner, radio engineer of Short Hills, New Jersey. It has been demonstrated before several leading pianists, who have expressed satisfaction over its performance. As described by the inventor, the new instrument looks much like a small grand piano. It produces its sounds as a piano does, by striking on strings. But instead of having a sounding-board like a piano, it puts the notes through an electrical translating, amplifying and reproducing apparatus. It may be played as a piano or as an organ, Mr. Miessner states. A wide range of quality may be obtained in either of these, and in addition there are a number of other interesting musical effects, such as tone-swell after key depression. The new instrument gives dynamic control of tone by the weight of the key touch in its organ performance as well as in its piano performance, differing therein from regular organs.