SCIENCE NEWS

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PROFESSOR WARBURG'S WORK

CANCER, biological physics and the respiratory function of the blood are the three chief subjects of research by Professor Otto Warburg, of the Kaiser Wilhelm Institute for Biology, Berlin, who has just been awarded the Nobel Prize in medicine for 1931. Professor Warburg has made very important contributions in all three of these fields.

His work on cancer has probably attracted most attention. He showed that cancer cells have quite a different metabolism from ordinary tissue cells. They can get all the energy they need to live and grow and reproduce from the breaking down of sugar. Unlike other cells, they do not need oxygen but can live without it, as some disease germs do. This does not mean that cancer is caused by germs, however. It is the suffocation of normal cells by lack of oxygen that gives the cancer cells a considerable advantage in the competition of growth, according to Professor Warburg.

Professor Warburg also investigated the photochemistry of plant cells, that mysterious process by which the cells turn carbon dioxide and water into food in the presence of light. He measured very exactly the light absorbed by these green cells and compared it with the amount of carbon dioxide they used. He was then able to show a certain quantum relation between the two. This research of Professor Warburg's was one of the first pieces of work in which biological physics was compared with the quantum theory.

Other work of Professor Warburg's has been in the field of blood chemistry. He demonstrated the constitution and action of the ferment in the blood which controls the conveyance of the oxygen of the air from the lungs to the muscles and other tissues of the body. This substance, called the respiration ferment, was subsequently made in the laboratory by Professor Hans Fischer, of Munich.

ORIGIN OF THE PLANETS

THAT the earth and its brother planets were born when the sun was struck a glancing blow by a passing star ages ago, was affirmed by Professor Willem de Sitter, Dutch astronomer and "universe maker," in an address before the Washington Academy of Sciences and the Society of Sigma Xi.

An actual collision between the wandering star and the sun instead of a near approach is favored by Professor de Sitter as the most plausible explanation of the way in which the sun obtained its whirling family of satellites. Dr. Harold Jeffreys, British scientist, suggested this collision theory of the planetary system's origin, in order to explain the way in which the sun and the planets rotate on their axes. The idea that the planets were thrown out of the body of the sun by the attraction of another celestial body passing at a very short distance dates back to 1861. Professor de Sitter declared that the Laplace nebular hypothesis, which held sway for over a century, has now yielded to the collision theory of the origin of the solar system.

"The first result of an encounter would be that a filament of matter was drawn out from the sun towards the passing star," Professor de Sitter said. "This filament, after the star had passed away, would break up into different fractions, some of which would be large and constitute the planets, while a considerable part of the mass of the filament would either fall back on to the sun or be dissolved into a medium of gaseous molecular constitution, which would in the course of time partly fall down on the sun and planets and partly be dissolved into space.

"The effect of this medium on the motion of the planets would be to make the orbits circular as the result of friction. Those parts which would fall back on the sun would impart to the sun the momentum acquired from the passing star and thus produce the rotation of the sun in the same direction as the revolution of all the planets. The orbits of the planets would be very elliptical in the beginning and would only be reduced to circles gradually, due to the effect of the resisting medium and only at first perihelion passage in the elliptical orbit, the satellites would be drawn out from the planet by the action of the sun in the same way as the planets were drawn out from the sun by the star."

Professor de Sitter contended that this theory explains all the major features of the solar system, leaving only one difficulty, which is cleared up by assuming that the star actually collides with the sun. The actual collision would produce the rotation of the sun and the planets.

THE EXPLORATION OF SPACE

A "PALEOZOIC picture," a photograph made with light which is supposed to have started toward the earth 300 million years ago, was shown during a lecture at Princeton University by Dr. Edwin P. Hubble, of the Mount Wilson Observatory. It was a photograph of the most distant nebula yet studied by astronomers, and it was made with light that left the "island universe" on the fringe of known space at about a time when coal was in the making here on earth.

The achievement of a giant telescope in amplifying our knowledge of the material universe was depicted by Dr. Hubble in the Vanuxem lectures on "The Exploration of Space." Observational astronomy, once concerned chiefly with the solar system, then with the stars in our Milky Way or galaxy, is now, he declared, entering upon a third phase—the accurate description of the extra-galactic nebulae.

Thirty million of these, he estimated, lie within 300 million light years of our own galaxy. These thirty million nebular "neighbors" are scattered through this vast space more or less at random; but on the whole their distribution is homogeneous and isotropic, according to the careful statistical study he has been conducting at Mount Wilson. The hundred-inch reflector

there can penetrate no farther into the depths of space, and speculative conjectures are our only guide at present when we consider what lies beyond the observational frontier, farther away than 300 million light years.

The principle of the uniformity of nature, when applied to this problem, may be interpreted in two ways, he suggested. The relativists usually assume that the homogeneity and isotropy of the observed region extend throughout the entire universe of space. But, as an alternative, it may be that, just as astronomers already have found a system of the planets and a system of the stars, so future observations with still larger telescopes may disclose a system of the nebulae. Long exposures with the greatest telescopes often bring out as many extra-galactic nebulae as stars.

MEASUREMENT OF THE INTENSITY OF X-RAYS

THE danger of burns during x-ray treatments has been greatly lessened, according to Dr. Lauriston Taylor, of the U. S. Bureau of Standards, by the completion and final testing of apparatus designed to measure the intensity of x-ray doses.

"Until now, no exact and uniform measurement of the strength of x-rays has been possible," it is explained by Dr. Taylor, who has just returned from Europe with the primary x-ray standard which he designed for the United States. "Now a doctor may calibrate his apparatus to learn the intensity of his x-ray doses without the necessity of guesswork. He will not burn his patient, nor will he commit the worse crime, in cases such as cancer, of undertreating him." There are two factors in x-ray treatment, the intensity and the penetrative power of the rays. The ray's penetrative power depends on the shortness of its wave-length, longer waves having a burning effect. The intensity of the x-ray dose is more important, and it is this intensity which he can now measure.

For three months Dr. Taylor experimented in European national standardizing laboratories, consulting foreign scientists and comparing his apparatus with theirs. Before that he labored at his instruments in the U. S. Bureau of Standards in Washington to construct a portable x-ray standard, finally building one which is so simple that he could take it with him, and so accurate and dependable that it is designated as the primary or final standard of the United States. This he compared with foreign instruments, drawing up with European scientists specifications for an international standard to remedy international confusion. This new apparatus is the only one in the world that completely satisfies these specifications, according to Dr. Taylor.

Uncle Sam's x-ray yardstick is in reality a small metal chamber into which x-rays are projected in a steady, uniform beam. When the rays pass through the air in this chamber they ionize the air, that is, set loose free electrons. This causes the air to become a partial conductor of electricity, which may be measured by an electric current and meters. The strength of this current depends on the strength of the x-rays.

France, Dr. Taylor reports, had been comparing x-rays with radium emission, but the x-ray intensity as thus measured varied with the ray's wave-length. The English laboratories did not guarantee steady and uniform transmission of the ray being gauged. The American apparatus does away with both difficulties, and furnishes as nearly as possible a means for transmitting, maintaining and measuring a ray of uniform and standard intensity, independent of all other conditions. For this reason France, Egypt and several other countries have adopted Dr. Taylor's specifications outright, and other countries have drawn up specifications which at present his apparatus alone fits. "It is now up to the bureau," Dr. Taylor affirms, "to find a means for gauging exactly the penetrative qualities of the various x-ray wave-lengths. The intensity of a ray used in medical treatment is but half the problem. Not until we have both standards can we call our standardization work complete."

THE USE OF DIESEL ENGINES

IS the time ripe for oil-burning Diesel engines to take the place of the gasoline power plants under the hoods of America's 27,000,000 automobiles? Even prominent automotive engineers give opposite answers to this question. Colonel George A. Green, vice-president in charge of engineering of the General Motors Truck Corporation, and Julius Kuttner, representing Oberhaensli Oil Engines of Austria, clashed on the subject before the national transportation meeting of the Society of Automotive Engineers in Washington, D. C.

Basing his conclusions on exhaustive comparative tests of one of the best heavy-duty Diesel engines now commercially available and on a gasoline engine having approximately the same displacement, Colonel Green declared that the Diesel has not been developed sufficiently to be applied with success to automobiles in this country. The chief operating disadvantages, he pointed out, are lack of rapid acceleration or pick-up and the giving off of a dense cloud of black smoke when running at full load, which precludes the operation of the engine in crowded areas. Other reasons why Diesel engines would not find a ready market were said to be higher first cost and maintenance, greater weight and size, roughness of operation and noise.

In the discussion which followed the presentation of Colonel Green's paper, Mr. Kuttner showed engineering curves made up from comparative tests on six Diesel engines and six gasoline engines which, he said, indicate that the Diesels have greater acceleration than the gasoline-burning engines. He suggested that Colonel Green might have reached different conclusions had he run tests on a number of different engines.

Colonel Green admitted that for heavy duty truck or coach operation Diesels will be satisfactory, except for smoking, and will result in marked fuel economy; but, he said, those who ride must be satisfied with less acceleration. Likewise the Diesel, with some other disadvantages, might be applied to passenger cars and trucks. But he contended that Americans have become so used to cars with a quick getaway that they will not tolerate those that are slower to speed up. "There is a splendid op-

portunity for Diesels in aircraft and marine work,'' Colonel Green said, ''but further development is necessary before the Diesel engine can be satisfactorily exploited in this country as an automotive power plant.'' In his opinion, if the use of the Diesel becomes widespread, the engine will lose one of its great advantages, namely, fuel economy, because the cost of the fuel would certainly increase.

USES OF PINE TAR OIL

A POISON spray that cuts both ways, killing insects and checking the fungi that cause plant disease, has been made possible by the improvement of pine tar oil distilled from ''fat'' stumps and old logs in the southern states. It has been made the subject of study by Dr. E. R. deOng, consulting entomologist of San Francisco.

The light oil that comes off after wood turpentine has been distilled out of these forest waste products has long been known to possess insecticidal value. But it has hitherto been unsuited for general use on plants because it contained acids that poisoned the foliage and penetrated into the deeper tissues, often causing death. New processes now eliminate the acids, making the oil harmless to plants. The process is practicable on a commercial scale, Dr. deOng states.

Pine tar oil can be used for carrying various insect poisons, and in itself has insecticidal properties. Furthermore, it dissolves the wax on leaf surfaces, penetrating to the leaf tissue itself and carrying the dissolved insect poisons into more intimate contact than can be achieved with the usual petroleum spray bases. And since it is more volatile than the petroleum derivatives, it evaporates before it does the foliage any harm. When used where slower evaporation is desired, it may then be combined with any petroleum fraction.

A decided advantage claimed for pine tar oil as a spray base is its ability to carry in solution copper resinate, which is a compound of copper and resin, highly toxic to disease-producing fungi. Here again the ability of pine tar oil to dissolve the waxy covering on leaves comes into play, making it possible for the fungicide to reach the tiny accidental cracks and the minute breathing pores through which fungi usually gain entrance to the leaf.

ITEMS

BY shooting high-speed electrons into vapors of various organic substances, some new substances with larger molecules than the original ones have been formed at the University of Toronto by Professor J. C. McLennan and Dr. W. L. Patrick. Grain alcohol, methyl alcohol, formaldehyde, acetaldehyde and acetone, simple organic substances, were used in these experiments. Gaseous hydrogen, methane and carbon dioxides were formed by the later decomposition of the yellow complex compounds formed under the direct action of the rays. The initial clumping process, called ''condensation'' by chemists, is expected to assist in solving new problems of the structure of chemical compounds. Similar complex substances have already been formed by exposing organic vapors to the bombardment of radium gamma rays.

THAT the lumpiness of energy may be explained on purely mathematical grounds was suggested to the meeting of the American Mathematical Society at Columbia University on October 31 by Professor Edward Kasner, of Columbia, as a result of his studies of curves. An imaginary or complex mathematical curve, Professor Kasner said, has a peculiarity that a piece of it can never be made like a straight line, no matter how short a piece is taken. Professor Kasner studied the ratio between the length of a straight line cutting such a curve when the length of the piece cut off is made smaller and smaller, and found some curious things. In ordinary curves this ratio is one, but in the special cases considered by him the ratio can have only discontinuous values less than one, such as 0.94, 0.86, 0.80, etc. These values become realized when electrons are assumed to shoot out with the velocity of light and measurements are made in the space of Minkowski and Einstein. Jerkiness of this kind reminds one of the things observed in the quantum theory. Professor Kasner suggested that there may be some relation between the mathematical fact and the physical quantum laws.

AN asteroid discovered by Dr. K. Reinmuth, of the Königstuhl Observatory at Heidelberg, has attracted the attention of astronomers because of its unusual motion. With an average of three such discoveries every week, one has to be unusual to attract more than a passing interest. The new body, designated as 1931RA, is moving at a very slow speed through the sky. It would take nearly five days to travel the diameter of the full moon. Astronomers at the Rechen-Institut at Berlin, which keeps track of the asteroids, believe that this slow motion is due either to the fact that the new body is among the most distant, or else that it is moving with almost the same speed as the earth. In either event, the body is interesting, so astronomers have been asked to observe it further.

THE case of a native child who developed rat-bite fever after being bitten by a rat has been reported by Ana Vazquez-Colet, of the Bureau of Science, Manila, to the *Philippine Journal of Science*. The disease has been known for a long time in China and Japan and a few cases have been reported in the Philippines, but this is the first time that the organism causing it, *Spirocheta morsus muris*, has been found in a case here. The patient, a girl four years old, was bitten on the forehead by a rat while in bed. The bite healed, but a week later she developed fever and the skin around the healed bite became swollen and red. The fever came and went, with periods of about two days in between when there was no fever. She was brought to the Bureau of Science for Pasteur treatment. A few drops of blood and some bits of tissue were obtained from the forehead near the bite, and the organism causing the disease was discovered in examination of these specimens. The child recovered after about six weeks.