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THE NOBEL PRIZE AWARDS IN PHYSICS AND CHEMISTRY

A DECADE ago two physicists, one an American, Dr. C. J. Davisson, of the Bell Telephone Laboratories, the other Professor G. P. Thomson, of the Imperial College, London, discovered that electrons, the basic and smallest particles of matter, act like waves of light or x-rays. They showed that crystals scatter them. They confirmed experimentally the theory of wave mechanics that won for Prince Louis Victor de Broglie the Nobel laureate in physics in 1929. This year's Noble prize in physics is shared by Davisson and Thomson, a world acclaimed honor worth to each of them about $20,000 and much more in prestige.

To-day this diffraction of electrons is being put to practical use. As a tool of science it compares, in its field, with x-ray analysis. X-ray diffractions by crystals are powerful tools to probe the depths of metals and other crystals. The special merit of electron diffraction is the analysis of the surface of crystals and the structure of very thin films of materials. X-rays are useless for such surface and thin film studies. They are so piercing that they go through the sample without disclosing sought-for information. Electrons—far less piercing—are stopped, scattered and reflected by crystal surfaces and thin films and thus are vitally useful for this type of research. Only a few weeks ago it was suggested that the methods of electron diffraction might well be used as a tool for biological research in studying the very thin films which separate cells of the animal and human body.

Quite independently the two men made the same discovery in 1927. Dr. Davisson, who worked jointly with Dr. L. H. Germer, found high-speed electrons were scattered by a crystal of nickel. Professor Thomson, then at the University of Aberdeen, shot low-speed electrons through a screen composed of a film of pure gold, far thinner than the sheerest gold leaf. Drs. Davisson and Germer published first.

Professor Thomson is a son of Sir J. J. Thomson, famous dean of British physicists who in 1906 won the Nobel prize in physics, and who in 1897, just thirty years before his son showed that the electron was wave-like, discovered the electron itself, one of the greatest discoveries of all time. Professor Thomson was only thirty-five years old and Dr. Davisson was forty-six when they made their discoveries in 1927.

Interviewed over long-distance telephone, Dr. Davisson said that he should "wait until official notification" before commenting on his honor. He hoped the press would make mention of Dr. Germer's participation in the discovery. And he emphasized the practical application to-day of what a decade ago was just the demonstration of an interesting phenomenon.

The 1937 Nobel award in chemistry is shared by Professor Paul Karrer, of the University of Zurich, Switzerland, and Professor W. N. Haworth, of Birmingham University, in England. Professor Karrer worked out the chemical formula for vitamin A, the growth vitamin found in cod-liver oil, butter, carrots and other yellow foods. This vitamin he subsequently discovered is closely related to ionone, the basic material of all violet perfumes. Turning his attention to the next vitamin in the alphabet, Professor Karrer worked out the formula for vitamin B_2, sometimes called the appetite vitamin because of its appetite-stimulating quality. Under his direction a pharmaceutical supply house was able to make synthetic vitamin B_2. American physicians had a chance to see the sixty grains of brownish crystals which then constituted the entire world's supply of this synthetic vitamin at the 1935 meeting of the American Medical Association.

Research on vitamin C, the scurvy-preventive, and on the class of chemicals known as carbohydrates, which comprise sugars and starches, was the basis for Professor Haworth's sharing the Nobel Prize award. A chain of glucose units, arranged as rings, he discovered, make up the cellulose molecule. Cellulose is the principal constituent of wood, cotton, flax and other textiles.—WATSON DAVIS.

ICE SHEETS IN THE SOUTHERN HEMISPHERE

A GEOLOGICAL riddle of the first order, and still without satisfactory solution, is the evidence for a major glacial epoch in South America, Africa and Australia. Evidence for the existence of continental ice sheets in the Southern Hemisphere during the carboniferous or coal age is discussed in the new annual report of the Smithsonian Institution by a British geologist, Dr. W. W. Watts.

Masses of typical glacial boulders, scratched like those carried by glaciers of the present day, are found in all three regions, solidified into conglomerate rock. Other glacial deposits corroborate the evidence of the boulder conglomerates. The evidence shows, too, that the land where the ice lay was at that time fairly level and not very high above the sea, so that the ice could not have been in mountain glaciers. It was a true ice age.

Even more puzzling is the fact that the movement of the ice was southward, from the Equator toward the South Pole, instead of from Pole to Equator as one might expect it to be. Alternative attempted explanations include the suggestion that the position of the earth's axis shifted, and various types of continental drift. Dr. Watts considers the polar shift theory as highly improbable. The idea that the continents drift about on a highly viscous subcrustal layer of the earth is more attractive and would answer some of the questions fairly well. But in doing so the drift hypothesis would raise other questions just about as hard to answer, so that in the end geologists might only find themselves trading one riddle for another.

A STAIN FOR THE VIRUS OF MEASLES

A BLACK, ink-like stain or dye may be the means of conquering measles, dreaded childhood disease, it appears

from the discovery of Professor Jean Broadhurst, of Teachers College, Columbia University.

The dye enables workers for the first time to see under the microscope the hitherto invisible virus bodies which cause measles. As a result, the disease can be diagnosed 2 or 3 days earlier than has been possible heretofore, before the typical rash and fever appear, and the child can be isolated and kept from spreading the disease to others. Not only that, but healthy carriers of the virus can be detected and kept from spreading the disease which periodically sweeps the country in epidemics. Important also is the fact that the early diagnosis means that treatment can be started early and this may save the child from mastoiditis, ear infections, pneumonia and other serious ails that may follow measles.

The discovery, according to an official statement from the university, also opens the way to control measles by vaccines, since "researchists will now be able to see and study the virus bodies, something that has been impossible heretofore."

The dye is called nigrosin. Its advantage over other dyes is that it colors the virus bodies but not the other germs that lurk in noses and throats.

Professor Broadhurst's discovery was made with the assistance of Dr. Margaret Estelle McLean, of the college, and Vincent Saurino, a student. The experiments, aided by a grant from the Milbank Memorial Fund, included examination of mucus from the throats and noses of over 160 patients with measles. Details are reported in the current issue of *The Journal of Infectious Diseases.*

MOLECULAR STUDIES OF IRON AND NEW TYPES OF STEEL

AMERICAN industry is entering a new era in the manufacture and use of steels adapted to a wide variety of purposes and made possible by investigators studying iron molecule by molecule, according to a report made by Dr. John Johnston, director of research for the United States Steel Corporation to the Franklin Institute. Control of the heating and cooling of iron and steel during its manufacture so as to change the point at which iron changes from its alpha" form to its gamma phase is making possible new types of material that can be fitted to new needs, he said. "A generation ago," he stated, "the technical problems facing the steel industry were related mainly to increased production of a few kinds of steel, but to-day the object is to improve the fitness of steel at no greater over-all cost to the public."

Iron is now known to exist in two forms, the alpha and gamma types. These two types, which differ in physical properties sufficiently to enable engineers to adapt them to practical use, owe their existence to different arrangements of iron atoms in the iron molecule. And the change from one type to the other can be controlled by the processing which the iron receives. The emphasis on the iron and steel business to-day is on producing corrosion-proof metals. Stainless steel, most prominent member of the corrosion-resistant family, is valuable, among other things, because it does not rust and thin sheets can be used without the fear that they will be damaged by long exposure.

LIGNIN IN METAL PLATING

LIGNIN, called by chemists the "Dark Continent of Chemistry" because they know so little about it and what to do with the millions of tons of it that go to waste each year, has a new use that may become a major by-product industry.

Shiny metal platings that do not chip or break off can be made at less expense by adding it to electroplating baths, according to a patent granted to Wilhelm Sailer, of Germany.

The patent, which is assigned to the Mead Research Engineering Company of Dayton, Ohio, states that good platings can in certain cases be obtained without the use of an electric current in a lignin and metal salt plating bath. Even alloys, mixtures of two or more metals like copper and zinc, can be readily plated on articles, something heretofore difficult to do, by using lignin.

Zinc, tin, nickel, copper and cadmium are some of the metals that are readily plated with the substance, millions of tons of which are poured each year into streams by paper factories in the waste liquor that results from the cooking or digestion of wood chips with chemicals to liberate the wood fibers out of which paper is made. The chemicals dissolve the lignin, which is in effect used by nature to bind plant fibers together, giving the plant the rigidity that enables it to stand up.

It is this waste lignin liquor dumped by the paper mills that has been found so useful in electroplating.

Before using it, however, it is treated with hydrogen peroxide and chlorine. This oxidizes the lignin. Now if the electroplater wants to plate an article with zinc he adds zinc chloride to a solution of this oxidized lignin liquor. In the resulting solution he submerges the article to be plated and next passes an electric current through the bath. Soon a coating of zinc is deposited on the object to be plated.

The inventor claims that with lignin in the plating bath, less electric current is consumed. The plating metal more readily covers all nooks, crannies and cracks in the article. So tenaciously does the plating stick that it does not break or chip off even after continuous bending of the article.

TELEVISION AND THE COAXIAL CABLE

TELEVISION advanced one step nearer to becoming a commercial service as 240-line images were transmitted from New York to Philadelphia over the American Telephone and Telegraph Company's new million-cycle coaxial cable, which can carry at one time one 240-line television image, 240 wirephoto signals or telephone conversations, or 2,880 telegrams.

Using an eight-inch-square cathode-ray receiver in place of the older disk scanning receptors, animated diagrams describing the equipment were transmitted from New York City and received in Philadelphia with no important loss of detail. Flicker was notably decreased, and the images were only slightly colored. Newsreels were transmitted from New York and could be watched from a distance of ten feet without severe eye strain. Details such as a tennis ball in motion could be followed in the received image.

Present at the demonstration were Dr. Frank B. Jewett, president of the Bell Telephone Laboratories, where engineers have developed the coaxial cable from a theory to a working system, and Dr. Herbert E. Ives, director of electro-optical research, engineer in charge of television investigations.

Intended for use as a communication channel for any service—code, voice, or image—the coaxial cable is limited in carrying power only by the nature of the terminal equipment. New terminals are now planned to increase the band of a million cycles carried by the cable to a still greater figure. Television images transmitted are far superior to those sent by the same engineers from Washington to New York in 1927, and somewhat better than those sent over the two-way system demonstrated in New York recently.

Employing single side band transmission, which doubles the possible number of lines that can be sent over a given channel, and utilizing the entire spectrum of frequencies, this million-cycle cable is capable of carrying only the 240-line images shown. A projected two-million-cycle system, capable of carrying 480-line images, would permit twice as much detail or double the size of images with the same detail.

Starting in New York, the signals are "multiplied," or amplified, every ten miles, each multiplier containing about as much equipment as an average radio receiver. Power for the multipliers is transmitted through the cable along with the signals, making the system independent of any local power source. Special delay equalizers were designed by Bell Laboratories engineers to prevent distortion that would be caused by the different rate of travel of the different signal frequencies. While electrical signals theoretically travel with the speed of light, the cable and terminal mechanisms cause delays sufficient to distort an uncorrected image. The equalizers allow the various signals that start out together to arrive within a quarter of a millionth of a second of each other.

The coaxial cable, which made possible this demonstration and which will be one of the key factors making possible television when it becomes commercially practical, has been known in principle for several years but it was only recently that machinery for manufacturing the cable was perfected. Previously its cost was prohibitive. The machinery, designed by the Western Electric Company, has not yet been patented, it is so new, and its design is a closely guarded secret.

Cable transmission of picture images and automatic rebroadcasting every fifty miles appears to-day to be the most likely form television will take. The short waves which must be used for radioing pictures can not at present be broadcast more than 25 to 50 miles. Although neither company is believed to be planning at present a New York to Philadelphia broadcasting hookup, both the Columbia Broadcasting System and the National Broadcasting Company will begin regular television broadcasts from New York shortly after the first of next year. These experimental "telecasts," however, will be receivable only in the metropolitan area. Should they branch out, use of the new type cable demonstrated here for the first time will be required.—RONALD L. IVES.

ITEMS

THIRTY-FIVE million acres of farm land have been turned back to forest since 1930 to bring the total woodland area of the United States to nearly 190,000,000 acres, according to figures released by the National Lumber Manufacturers' Association. Depression between 1930 and 1935 were primarily responsible for the change. During those years farmers turned submarginal lands back to trees. Farm forest lands are holding their own to-day, however, because of the intensive soil conservation efforts on the part of the government and the growing realization that timber is also a crop.

THREE major insect pests are going to make trouble again next year, unless something happens to them while they are in winter quarters. Egg surveys by field workers of the U. S. Department of Agriculture indicate vast numbers of grasshopper eggs in the soil throughout the principal grain and grazing states, and also heavy egg-laying by Mormon crickets in their more limited range in the West. Chinch bugs, which live over winter as hibernating adults instead of eggs, are reported in great numbers from Illinois and Kansas.

HUMAN ECOLOGY, the organic adjustment of people to each other and to their environment, is a factor that must be considered in any national effort at planned land use, Secretary of Agriculture Wallace emphasized in his annual report to the President. "This is a problem with many aspects," Secretary Wallace says. "Specialists formerly attacked it mainly from the physical standpoint, and chiefly considered what different lands might best produce. Certain areas were designated for crops, others for grazing, and still others for forests, wildlife, or recreation. After the depression of 1929, however, the land-use problem came to be conceived much more broadly from the human as well as from the physical standpoint, and with far more in it than merely the determination of crop possibilities. The land is for the people. Natural resources should promote human welfare, now as well as in the future, and this requires social as well as physical engineering. There are important economic requirements. Production, conservation and the welfare of the land user go together. Separate them, and each breaks down. No single aspect of the land question can be dealt with independently. Soil conservation, for example, depends greatly on farm incomes, and tenure conditions influence both."

THAT carbon dioxide filled incandescent lamps, providing an artificial daylight claimed to be a wide improvement over any previous type of artificial daylight lamp, have been commercially perfected, was reported to the Optical Society of America at its recent meeting at Lake Placid. The lamp is suitable for matching colors, the test which has proved the undoing of most previous artificial lights, Dr. Thomas J. Killian, of the Barkon Tube Lighting Corporation, said. Previous attempts to use carbon dioxide in lamps, a long-sought goal because of its white spectrum, have failed because of the tendency of the gas to break down under the electric charge sent through it, with consequent changes in its pressure and behavior. A simple electronic control for the pressure is the new feature of the light, Mr. Killian stated.