SCIENCE NEWS

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EFFECTS OF POLARIZED LIGHT ON VITAL PROCESSES

A NEW and hitherto unsuspected influence of the quality of light upon vital processes was announced to the American Chemical Society in session at Richmond, Va., this week, by Dr. David I. Macht, of the Johns Hopkins University. It is well known that a difference in the wave length of light, that is, the frequency of vibration, makes a marked difference in its action on plants and animals; that, for instance, rickets may be cured by light of high frequency, such as the ultra-violet rays. Now Dr. Macht has found that the direction of the vibrations also makes a difference in its effects. If the vibrations all lie in the same plane, like a wavy line on a sheet of paper, the action is different than if the vibrations occur in all directions promiscuously as in ordinary light. This peculiar form of light is called "polarized" because the vibrations have a single direction. But it can not be distinguished by the eye from ordinary light. Ordinary light, such as sunlight, can be polarized by reflecting from a plate of glass or sheet of tin set at a certain angle.

An Englishwoman, Miss Elizabeth Semmens, reported in 1923 that polarized light would promote the conversion of starch into sugar. Dr. Macht has confirmed this and gone much farther. Rays of polarized light are found by him to stimulate the growth of yeast and bacteria. Sprouting beans and sunflower seeds grow more rapidly under polarized light than under common light of the same brightness. Certain drugs, such as digitalis, cocaine and quinine, lose in their medicinal power on exposure to polarized light.

Still more interesting is the discovery that polarized light causes sick and poisoned rats to succumb more quickly. Injections of santonin or cocaine caused rats exposed to polarized light to be seized with convulsions, and usually die, sooner than those similarly dosed but living in common light. Rats which had been reduced to poor health, by feeding them on a diet deficient in vitamins, were taken with convulsions and suddenly died when exposed for several hours to ultra-violet rays.

These discoveries may aid to explain the irregular and uncertain action of drugs and course of diseases which now perplex the doctors. Daylight is often partially polarized by reflection from sea, snow and sky. Moonlight is largely polarized by the reflection of the sunlight from the surface of our satellite. This may suggest to the reader the possibility that some day science may find some grain of truth in the old folklore theories of the influence of moonlight on plant growth and decay.

CATHODE RAYS FOR DRYING PAINT

CATHODE rays, which aroused great expectations of practical applications a few months ago when Dr. W. D. Coolidge, of the General Electric Co., exhibited a more powerful machine for producing them, are already fulfilling their hopes. At the meeting of the American Chemical Society their effect in speeding up the drying of paint materials was discussed by Professor J. S. Long, of the chemistry department of Lehigh University.

In collaboration with a group of his associates, Professor Long exposed a number of glass plates coated with linseed oil, perilla oil and China wood oil, all standard paint materials, to the action of rays from the Coolidge tube, and also exposed similar samples to blasts of warm air and to beams of ultra-violet rays to obtain comparisons of the speed of drying and hardening produced by these methods.

"The time required for the oil, without drier, to become dry to the touch or to dry hard, was found to decrease in a regular manner as the time of exposure to cathode rays increased up to 10 minutes. Perilla oil, without driers, rayed for 10 minutes was dry to the touch in 2 hours and hard in 5 hours. Linseed oil rayed for 10 minutes was dry to the touch in 3 hours and hard in 6 hours at 60 degrees Fahrenheit. Raw perilla and linseed oils, without driers, flowed on the same glass plates at the same time, were wet and not much changed when the progressively thicker films from rayed samples were all dry."

In a second paper, Professor Long discussed the properties of a synthetic compound resembling linseed oil in its quick-drying effects. It bears the descriptive chemical name "linolenic monoglyceride," and was artificially made with acids derived from linseed oil and perilla oil as a basis. It is the hope of Professor Long and his coworkers eventually to obtain a series of such synthetic oils that will free the paint and allied industries of their present dependence on vegetable oils that can never be produced in sufficient quantity to satisfy the demand and hence are always expensive.

MANGANESE AND COPPER FOR PLANTS AND ANIMALS

MANGANESE, best known through its use in alloy steels, and the common element copper are needed in microscopic quantity to maintain good health in plants and animals, according to Professor J. S. McHargue, of the Kentucky Agricultural Experiment Station, who spoke before the meeting, at Richmond, Va., of the American Chemical Society. Dr. McHargue said, in part:

"Carefully controlled experiments show that plants will not grow in sand cultures containing adequate amounts of purified compounds of the so-called ten essential elements after the plant food material contained in the parent seeds has been exhausted. The addition of a small amount of a manganese compound causes a very marked increase in the growth of the plant and a small amount of copper in addition to manganese makes larger and more nearly normal plants.

"Small amounts of manganese and copper are normal constituents in the tissues of animals. Marine and fresh water mollusks are quite rich in manganese, copper and

zinc. Birds apparently contain more manganese than some of the higher types of domestic quadrupeds. The liver, kidneys, spleen, pancreas, heart and brain contain more of these elements than the lean muscular tissues or the blood.

"The Bluegrass region of central Kentucky is underlain with phosphatic limestones which produce a soil relatively rich in manganese, copper, zinc, nickel and cobalt, and the presence of these elements can be detected in the forage crops produced from the soils of this region. It is therefore assumed that the presence of these elements in the herbage is a contributing factor in the development of the superior specimens of livestock for which the Bluegrass country has long since attained a world-wide fame."

A NEW INSULATOR TO REDUCE THE COSTS OF POWER TRANSMISSION

CHEAPER electric lights and less expensive electrical heating are possible outcomes of recent work on electrical insulations by a group of Russian scientists under the leadership of Dr. Abram Joffe, head of the Physical-Technical Institute of Leningrad.

Dr. Joffe will describe his researches on a new type of insulating material, which scientists believe may revolutionize the whole aspect of high-power transmission problems, in a forthcoming issue of *The Journal of Mathematics and Physics* of the Massachustts Institute of Technology. As a result of this work entirely new ways of manufacturing electrical insulators may be opened up.

He has found that a very thin layer of a comparatively cheap and readily available varnish-like material substitutes for the large bulky porcelain insulators now used. Investigation of the dependence of dielectric strength, that is, the resistance to electrical puncture or breakdown, on the thickness of a sample has shown that considerable potentials can be insulated by very thin films, their dielectric strength approaching the tremendous figure of 100,000,000 volts per centimeter of insulator thickness.

In addition to giving the electrical industry a new insulating material, Dr. Joffe's work gives the experimental physicist a new method of subjecting materials to immense pressures. When the electrical current is in a wire it creates pressure at the wire's surface in trying to get out. Since Dr. Joffe's new insulating material resists the electricity's efforts for freedom more strenuously than other materials, greater pressures are created at the surface of the conductor than ever before obtained. He has obtained the extraordinary pressure of 300,000 atmospheres, some 4,500,000 pounds per square inch. The highest pressure previously obtained in scientific work has been 40,000 atmospheres, secured by Professor P. W. Bridgman, of the department of physics at Harvard University. Since such high pressures squeeze the atoms of the metal tighter together than ever before, it is predicted that new knowledge about the properties of matter, especially the spacing of the atoms, will result.

In high-voltage power transmission, high potential currents are likely to flash from pole to pole, to other wires and sometimes to the ground. To prevent this, there are used high towers equipped with cross arms that hold the wires a considerable distance apart, suspended from costly porcelain insulators. With the new methods it may be possible to reduce the size of insulators so that the wires can be laid in conduits, thus doing away altogether with the expensive pole construction in use at present.

Dr. Joffe has been studying the problem of electrical insulation for many years and is at present engaged in giving a course of lectures on the electrical and elastic properties of solids in the department of physics at the University of California. American physicists are of the opinion that Dr. Joffe's new discoveries, when more completely developed, will have not only the highly desirable practical results of making electrical heating and lighting cheaper, but will be invaluable in the branches of engineering and physics that employ high voltages.

FAST-GROWING TREES FOR PAPER

FAST-GROWING hybrid poplar trees, grown as a farm crop, may before long compete with corn and cotton for a place in the farmer's fields. To meet the ever-increasing demand for wood pulp for the paper-making, rayon and other industries, three scientists, representing an alliance between botany and chemistry, and also between pure research and applied science in industry, have undertaken to see what can be done about getting new varieties of trees big enough to use in less time than it takes the natural species to grow in the forest. These three men, Dr. A. B. Stout, of the New York Botanical Garden; Dr. Ralph H. McKee, of Columbia University, and E. J. Schreiner, of the Oxford Paper Company, now announce that they have succeeded in obtaining new hybrid varieties of poplar that will reach a trunk diameter of eighteen inches in eighteen years, giving a total yield of 100 cords to the acre. Part of the crop can be harvested at the end of ten years, to thin out the stand, and the balance when the trees have matured.

The unusually rapid growth of the new varieties, the investigators explain, is due to a phenomenon long known to breeders, called "hybrid vigor." It is not at all well understood, but in plant and animal husbandry it is much used to obtain thriftier crops and stronger and larger livestock than can be got by sticking to unmixed species. The superior strength and endurance of the mule, a hybrid between the horse and the donkey, are credited to this hybrid vigor, and many of our best field and garden crops have been obtained in the same way. A few tentative experiments have been made in the past with hybrid forest trees, but the present work is the first endeavor to apply the principle to the development of a tree needed for a group of major industrial operations.

DEATHS FROM ALCOHOLISM

STATISTICIANS of the Metropolitan Life Insurance Co. have made a comparative study of the death rate from alcoholism among their policy holders for the several years succeeding the enforcement of the eighteenth amendment and for an equal number of years before.

Their results show that the increase of such deaths since 1920 has been very general throughout the country and is many times greater than the prevailing rate in Canada. Under alcoholism have been included all records of deaths known to be due to acute alcoholic poisoning from post-war bootleg liquor. All together they constituted in 1926 4.1 per hundred thousand deaths among the policy holders of the company or exactly the same percentage as prevailed in 1911, the first year of the period studied. This was the highest death rate since 1917, and shows an increase of 24 per cent. over 1925.

The condition is pretty much the same throughout the whole United States, but Maryland and New York appear to have suffered the most, for the rate of the former, 10.1 deaths per hundred thousand, is the highest ever recorded from that state. New York was a runner-up with 6.3, surpassed only in 1913, 1914 and 1916. These figures, which are for a representative slice of the industrial population, are in close agreement with those for the general population up to 1925, the latest year on which statistics are available. They show, the statisticians say, that alcoholism is not restricted to any economic class or to any limited area of the country, but tends to be even higher among the general population than among the wage-earning groups.

Though the deaths from straight alcoholism have been increasing, the ones from acute alcoholic poisoning have been progressively falling off, indicating that on the whole the bootlegger and home brewer are gradually perfecting their product so that it constitutes less of a menace to life.

The alleged increase of drinking among young people has not yet succeeded in materially lowering the average age of those dead from alcoholism, at least men. The average for women has decreased in the last two years, but only slightly.

ITEMS

A DRUG that makes an individual see yellow is the subject of experiments by a Scottish scientist, Wilfred Marshall, of the University of Aberdeen. The drug is known as santonin and is prepared from the dried flower heads of the European wormwood. In his experiments, reported in *The Journal of Pharmacology and Experimental Therapeutics*, Mr. Marshall administered doses of santonin to an elderly man experienced in discriminating colors. Doses of a half gram or more caused objects to appear yellow to him within half an hour after the dose was taken. The yellow vision was most noticeable on coming from a darkened room into daylight and was best seen through the windows viewed from a dimly lighted room. In diffuse daylight its intensity quickly diminished to a greenish-yellow veil. Artificial lights viewed in the evening seem a deep yellow in hue. It has not yet been determined just how the drug accomplishes its peculiar effect.

SCARLET fever and measles together caused only 176 more children's deaths than automobiles throughout 41 states during the year 1925, according to figures recently compiled by the Metropolitan Life Insurance Co. In that year automobiles killed four children to every seven killed by diphtheria. Nearly 40 per cent. of automobile fatalities happen to children under fifteen, while the mortality is particularly heavy between the ages of five and ten. Approximately 11 out of every 20 lives lost in accidents to pedestrians were those of children. Though the automobile deaths of little children run into thousands annually the statistical survey indicates that it tends to become higher rather than to decrease. Safer streets through stricter traffic regulation, more playgrounds to keep children off the streets, and home training to instruct the young idea in the hazard of street play to life and limb, are suggested as possible lines of attack to preserve America's children from the menace of the automobile.

DR. BELA DORNER, head of the laboratories of the Royal Hungarian Railways, has recently come to this country with a process which he states is commercially practicable for the utilization of corn stalks in the manufacture of paper, rayon, auto finishes, and many other products for which wood pulp at present is the only satisfactory basis. A number of New York capitalists have become interested in the possibilities of Dr. Dorner's method, and a prominent consulting chemist retained by them has reported favorably on it, after a series of large-scale tests. It has long been known that cornstalk substance is chemically and physically suited for the needs now met only by wood pulp, but certain practical difficulties prevented the development of a stalk-pulp industry. One of the chief obstacles in processes hitherto tried has been the necessity for cutting out the hard cross-plates at the joints, which made too great an expense for commercial development. In the Dorner process, however, the whole stalk is ground up, and it is claimed that the hard parts make no trouble in the later manufacturing stages.

LIME, familiar in building operations, is also of use to the dairyman, O. R. Overman, assistant professor of dairy chemistry at the University of Illinois, told members of the American Chemical Society meeting at Richmond, Va., in a symposium on lime and its chemical aspects. This use of lime has come with the development of dairying as an industry with a scientific basis. It has been found that when lime is added to cream used in butter-making, it neutralizes the acids formed, resulting in a greater yield of butter and increased keeping properties. Other members of the society told of the use of lime in the beet sugar, tanning and paper industries. The chief need of the industry itself is to make suitable lime at a profit, according to Professor J. R. Withrow, of the Ohio State University. The lime manufacturers give the best of their product to the building trades, and what is left to the chemists. As the building use of lime varies with the seasons, the result is a variable quality of lime reaching the chemists, and this damages the manufacturer in the eyes of the chemist.