SCIENCE NEWS

Science Service, Washington, D. C.

NIGHT VISION AND DAY VISION

YOUR eyes have two-way vision—one set of sense organs for daylight seeing and the other for darkness. Both operate at the same time only when the light is about as bright as full moonlight. Differences between the eye as a night-vision instrument and the daylight eye, important for night warfare and blackouts, were described by Professor Selig Hecht, of the Laboratory of Biophysics, Columbia University, at a meeting of the Physical Society of Pittsburgh.

Night eyes are thousands of times more sensitive than are day eyes. The night pilot who has been flying in the dark for an hour or more could see the light of a candle twelve miles away even if it were exposed only for a thousandth of a second. If it burned continuously, he could see it over 200 miles away, were it not for interference of fog and haze at night, or for smoke and the curvature of the earth. For this reason, Professor Hecht explained, it is dangerous in a blackout for any one to use a flashlight, or light a match or even a cigarette in an open space. The flame of a match can be seen by a pilot many miles away.

Night eyes can not see as sharply as day eyes. When it is necessary to recognize small forms and slight differences in shade and shape, you must have good lighting and use your daylight eyes. You need your day eyes to read an instrument or your watch. Night eyes are color-blind. Colored lights look colorless to your night vision. If you see them as red or green or blue, you are using your cone or day vision.

But the brightness of different colors is not the same when you see them at night as when you see them in the day time. This is particularly important when you want to use colored lights to see best during a blackout without giving aid to the enemy. Blue and green are easiest to see. Red and orange, which seem so conspicuous in the day, are hardest to see at night. Nothing could be more dangerous than the use of blue lights during blackouts.

Dr. Hecht said that "For reasons which are none too clear at present the notion has gained prevalence that blue lights should be used to illuminate objects, and that these would furnish less light to distant aviators because blue is supposed to be a dim light. Indeed, the Germans and the English, and at the beginning we ourselves, used blue lights during blackouts."

The reason why red lights are safer than blue was explained as follows: When we need a light during a blackout—to watch a dial, read a compass or a road sign—we must use our day vision for this purpose. The enemy aviator, however, needs only his night vision in order to spot that light. Your night eyes and your day eyes happen to be equally sensitive to red light. If you see the light at all, you can also see it with your color-sensitive day eyes and you have the day vision's advantage of ability to recognize shapes.

But for blue light, your night vision is 1,000 times more sensitive than is your day vision. In other words, if you have enough blue light so that you can see a road sign, the light will be 1,000 times as bright to the night-seeing pilot as would be a red light of equal effectiveness.

A NEW CHEMICAL REMEDY FOR TUBERCULOSIS

HOPE for a chemical conquest of tuberculosis is encouraged by successful results in the treatment of thirteen tuberculous patients with Promin.

Promin, a distant relative of the sulfa drugs, can not yet be called a cure for tuberculosis. But the thirteen patients showed definite signs of improvement within two months after getting this new treatment, and x-ray pictures showed the diseased areas of the lungs were nearly or entirely healed within four to six months. Dr. H. Corwin Hinshaw, Dr. Karl Pfuetze and Dr. William H. Feldman, of the Mayo Clinic and Foundation, reported these results at the Philadelphia meeting of the National Tuberculosis Association.

The thirteen patients were in the early stages of tuberculosis with sputum being coughed from the lungs, but no extensive destruction or degeneration of the lungs. They had the kind of lung condition which often heals spontaneously without chemical treatment. The number of patients is too small to be sure that Promin was responsible for the healing. It is concluded, however, that further trial on patients of Promin and related drugs of the sulfone series seems justified.

Altogether, 106 patients have been given Promin, following the successful use of this chemical in treatment of human tuberculous infection in guinea pigs. A special study was made of 36 patients with tuberculosis of the lungs whose lungs had not been collapsed and who had been under treatment for from four to twelve months. It was reported that most favorable results were observed on "exudative pulmonary lesions of recent origin without extensive destruction of tissue and without marked fibrosis." There were thirteen patients who showed such rapid signs of improvement. Cavities in the lungs closed in more than ten patients and tuberculosis germs apparently disappeared from the sputum of eleven patients. Fever declined significantly in ten of the eighteen patients. On the unfavorable side, the doctors reported one patient developed a new and progressive lesion and four patients in the group died, three being obviously in the last hopeless stage of the disease before the treatment was started. —JANE STAFFORD.

SOILLESS GARDENING

SUCCESSFUL growing of plants with their roots dangling in an atmosphere saturated with water vapor, instead of being embedded in soil, has recently been accomplished and is expected to become an important contribution to the science of soilless gardening.

Dr. Walter Carter, entomologist for the Pineapple Research Institute, Honolulu, Hawaii, tells of his adap-

tation of the method in *Phytopathology*. In his studies of root damage to pineapple plants caused by infestation with mealy bugs, Dr. Carter found that the necessary examination and sampling of roots during the experiment produced considerable mechanical injury. To overcome this difficulty, the water vapor method was developed.

This method consists of setting the plants in holes in the top of a fairly tight wooden box. Inside the box is an atomizer such as is used in air-conditioning apparatus and in keeping green vegetables from wilting in retail stores. In this device water from an ordinary main goes through a valve to form a fine jet which impinges on a flat plate. The resulting spray keeps the air in the box saturated with water vapor.

The pineapple cuttings soon begin to grow and develop roots which hang down inside the box. More vigorous growth is produced, Dr. Carter found, if a nutrient solution is added to the spray. To accomplish this, he connected an eight-quart tank in parallel with the water supply. A needle valve from the main line leads into the bottom of the tank and a pipe from the top makes a T-joint with the pipe leading to the atomizer. The fresh water gradually replaces the nutrient solution. One tankful lasts about three days. The liquid in the tank becomes progressively more dilute, but this does no harm to the plants. When the nutrient solution needs replacing, the needle valve is closed and the tank drained and refilled.

The water vapor method has several advantages over other soilless methods. Once set up it is almost automatic, requiring no adjustment of acidity or refilling of jars. Root aeration is better at all times, and no trouble is encountered with algae or other contaminating organisms.

RUBBER PRODUCTION IN HAITI

RICH, verdant Haiti, where once the tom-toms of Voodoo rites boomed, has settled down to hard work among her once-abandoned rubber trees, and in cooperation with this country is producing rubber at the rate of 350 pounds per month.

Some 2,500,000 new rubber plants have been set out, and estimates reveal at least 100,000 acres which could give the United States a large near-by supply. Haiti is tapping her old trees with newest, proved techniques, experimenting with splitting Hevea seeds to get two plants from one seed, growing rubber seedlings.

Behind this forward-looking enterprise is a unique organization, begun well before the war in the Pacific. It is called the Haiti-American Society for the Development of Agriculture. It was formed last year as the outcome of discussions with United States agriculture advisers. It is a cooperative venture between this country and the South American Republic which a few years ago faced economic disaster from wartime loss of trade.

Foreseeing the Pacific tragedy, the society began preparing itself to supply this country with rubber, fibers, drugs, now cut off from the Netherlands Indies, Philippines, Malaya and India. Now the rubber plantations have a head start on the big job of increasing rubber planting in the Americas; the rubber enterprise is surpassed only by the Ford plantations in the Amazon valley.

Major operations, as reported by the president and general manager, Thomas A. Fennell, are:

Bayeux Division—This plantation has nearly a million growing rubber plants and about 2,500,000 rubber seeds. Tapping of old rubber trees at Bayeux has started.

Forests Division—A sawmill at Morne de Commissaires has been turned over to the society for operation. In the last three months of 1941 the mill cut about 100,000 board feet of pine lumber. A second and larger mill is being installed.

Grand'Anse Division—A state-owned tract of approximately 30,000 acres under preparation. About 1,000,000 Hevea seeds planted in nurseries.

An attempt is being made to develop handicrafts for Haiti's large labor supply. Samples have been sent to New York importers.

THE MANUFACTURE OF NYLON IN JAPAN

THE author, K. Hosino, research man for the Oriental Rayon Company, Ltd., according to the *Journal* of the Chemical Society of Japan, has analyzed nylon, the synthetic plastic fiber that has made the United States independent of silk. After he had determined how the molecules were put together, he duplicated them and then made modifications which he claims are improvements over the American product.

This procedure, reminiscent of pre-war tales of how Japanese mechanics would build a duplicate of any machine that Occidental manufacturers would sell to their employers, might give Japanese textile factories the means to compete to great advantage with nylon mills in this country and Europe. Japan has persistently refused to enter into any patent treaty with any foreign country, so that the du Ponts, originators of nylon and owners of basic patents thereon, will have no protection against Japanese attacks on their business, especially in the export market.

Nylon, the Japanese chemist states as a result of his analysis, is a "polyamide of hexamethylenediamine combined with adipic acid."

If Japan goes into the nylon business, the silk industry, already hard hit first by rayon and then by the cessation of American silk purchases even before the outbreak of war, may never come to full revival. It is reported that hundreds of thousands of mulberry trees have already been felled in Japan, to make room for more food-crop production. Quite possibly these groves may never be replanted. Silk may again become what it was in the Middle Ages and early modern times—luxury for the rich.—WATSON DAVIS.

SYNTHETIC CELLULOSE

BASIC understanding of cellulose, the stuff that cotton, wood and a thousand other useful substances are made of, was materially advanced by a paper presented at the recent meeting of the American Chemical Society by Dr. W. T. Haskins, Dr. Raymond M. Hann and Dr. C. S. Hudson, of the National Institute of Health, U. S. Public Health Service, at Bethesda, Md.

For the first time in the history of chemistry, the fundamental building block of cellulose, a compound known as cellobiose, was made synthetically by the three investigators. This does not mean that cotton plants, trees and all other of cellulose will presently be out of a job, Dr. Hudson stated in discussing the paper. Man will probably never be able to make cellulose as easily and cheaply as plants. But it does mean that science will have a better knowledge of how cellulose is put together, that knowledge can be turned to advantage in making such things as explosives, rayon, plastics and transparent wrappings, of better quality and at lower cost.

When cellulose was first analyzed, more than a hundred years ago, it broke down into molecules of common glucose. Subsequently it was found that these were united in pairs to make double sized molecules of a more complex sugar which was named cellobiose. Now for the first time it has been possible to make cellobiose artificially and to demonstrate that in the synthetic molecules the glucoses are tied together in exactly the same way that they are in the natural molecules.

At the same session, what might be termed the engineering properties of the cellulose molecule were discussed by Dr. R. F. Nickerson, of the Mellon Institute of Industrial Research. The microscopically fine cellulose fiber of cotton, wood pulp or other natural material is built of long, slender molecules, more or less aggregated into crystals, together with a high content of linked oxygen-hydrogen atoms. Cellulose molecules are not kinked as are wool and rubber molecules, which accounts for the lower degree of stretchiness and bounce to be found in cotton and similar materials. Understanding of these submicroscopic structural details is important in present-day efforts to find suitable cotton or other substitutes for hemp, silk and other "war-short" fibers.—FRANK THONE.

ITEMS

THAT puffed-up sand, known as silica aerogel, is about twice as good a heat insulator as any other substance, was reported at the Boston meeting of the American Institute of Chemical Engineers by John F. White, of the research department of Monsanto Chemical Company. The material is now being used chiefly in the insulation of high-temperature laboratory furnaces and extremely low-temperature chambers for the liquefaction and freezing of gases. When peace comes and new household refrigerators appear in the stores, the present three-inch walls can be reduced to one and a half inches, he said. The present six and a half cubic foot model can have its inside expanded to nine cubic feet without any increase of outside dimensions.

A NEW plastic filler material made from sawdust, scrap wood, cotton, plant fibers or other waste cellulosic materials was announced at the meeting by A. O. Reynolds, of the Northwood Chemical Company, and Raphael Katzen and Dr. Donald F. Othmer, of the Polytechnic Institute of Brooklyn. The filler material can be combined with phenolic resins in the proportion of three parts of filler to one of resin. This gives a plastic comparable to that obtained from one part filler to one part resin when ordinary fillers are used, according to the authors of the paper. Thus the present limited supplies of phenolic resins can be made to go twice as far. Or more phenol and formaldehyde can be saved for the munitions program.

DISCOVERIES at the National Bureau of Standards show how iron and steel can be heat-treated in airless furnaces to speed production in war industries. One of the difficulties in hardening or annealing ferrous metals through use of high temperatures in ordinary air has been the formation of oxide scale that must be removed by pickling, grinding or polishing. This costs time and money and delays the flow of production. Investigations by V. C. F. Holm, metallurgist at the bureau, show that if the heating is done in a practically inert atmosphere or in a vacuum furnace iron and steel can be heat-treated without oxidation.

REDUCTION of weight in airplane engines to less than one pound per horsepower, through the Wright Aeronautical Corporation's new method of forging cylinder heads, promises to give American airplanes a considerable edge over enemy combat aircraft in speed, altitude, load and range. The new forged heads are made by a process of extrusion through a die, and nine separate drop-hammer operations are eliminated. The cooling fins are cut on the exterior of the cylinders by a high-speed milling machine. The new head allows twelve to fifteen per cent. increase in power output without weight increase. The development is applicable to the big 2,000 horsepower engines that power such ships as the Douglas B-19 bomber.

BRAIN waves go on after death. It is not thought that this is a sign that brain activity of conscious, thinking variety continues after death. But experiments reported at the Boston meeting of the Federation of American Societies for Experimental Biology may lead to a greater knowledge of how nervous tissue like the brain functions. The experiments were reported by Dr. Morton A. Rubin, Dr. Hebbel E. Hoff, Dr. Alexander W. Winkler and Dr. Paul K. Smith, of the Worcester, Mass., State Hospital and Yale University School of Medicine. Brain waves are the records of electric currents discharged during brain activity, which scientists have been using in the study of such disorders as epilepsy. They were hailed, when first discovered, as being likely to throw as much light on brain functioning as the more familiar electrocardiograms shed on heart function. The discovery that these brain waves, and therefore the brain activity responsible for them, continue after death may make it necessary to revise some of the ideas of what the brain waves mean, as well as to reopen the question of what constitutes death. In cats brain waves continued for fifteen minutes after the animals had stopped breathing and their hearts had stopped beating. The deaths were of a rather special kind, even in these days of high explosives and other lethal devices. The deaths followed injections of the chemical elements calcium, potassium or magnesium. In death due to the cutting off of oxygen or of the blood supply to the brain, the brain waves stop within a few seconds. After the chemical deaths, the waves continued for fifteen minutes and might have gone on longer if the scientists had been able to continue their observations for a greater period.