SCIENCE NEWS

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RED ARC LIGHT FOR FOG

A BRILLIANT red arc light that makes use of the rare atmospheric gas neon, and which can shine through thick fog, has been developed at the research laboratory of the General Electric Company. The new lamp is the result of the work of Dr. Clifton G. Found, in collaboration with J. D. Forney, of the Cooper-Hewitt Electric Company, and was recently demonstrated by them to engineers.

Airplane landing fields will probably be among the first to make use of the lamp, for by outlining the fields with them aviators flying above through fog will be enabled to make a safe landing. Such an occurrence as that of Commander Byrd on his flight to Paris, when he actually flew over Le Bourget, but could not see to land, would probably be prevented.

Docks in harbors may also be marked with the lamp. According to Dr. Found, the light has been tested for this use when one was recently placed on a pier in the Hudson River. "Observations from boats during fog," he says, "have shown that it was possible to pick up the red neon light before any of the other lights in the same vicinity were observed."

Earlier forms of neon tubes, which give the characteristic red neon light that is now so common in advertising signs, suffer from what is called the "cathode drop." This is the great difference in voltage between the electrode through which the electric current enters the tube, and the near-by gas. On account of it, also, tubes must be operated with a high voltage, and must be made quite long in order to be efficient. Another disagreeable effect is that the gas is made to gradually disappear.

The new tube of Dr. Found and Forney heats the cathode, or the electrode through which the current enters the tube, by means of an additional electric circuit. This causes it to give off the electrons which cause the neon gas to glow, but without the high voltages that are needed in the older tubes. By such means an extremely efficient source of brilliant red light can be obtained. Light of this color is best for penetrating fog.

Another possible use of the lamp is in photography, especially in colors. The mercury vapor-lamp, which gives a characteristically violet-colored light, has often been used for ordinary photography, but the unnatural pallor which it causes is a disadvantage, especially where colors are concerned. By combining the neon light with the mercury vapor-lamp, the former supplies the red rays which are lacking in the latter, and the result is a good approximation to white light.

SYNTHETIC SUGAR

THE synthesis of sugar by two Swiss chemists, Professor Ame Pictet and Hans Vogel, has aroused great interest among the chemists in this country. For this is a problem on which investigators have worked in vain for over fifty years because of its scientific interest and possible commercial importance. Sugar of the common sort, extracted from cane or beet, is easily split up, or, as it is called, "inverted," by weak acids, forming two other sugars. One of these is glucose, which is now manufactured in the United States from corn. The other half is fructose, which can be manufactured from Jerusalem artichoke, as has recently been demonstrated by the U. S. Bureau of Standards.

But to bring these two sugars together so as to form sugar of the common or table variety has hitherto been impossible. Professor Pictet has discovered that the difficulty has come from the fact that fructose exists in two forms identical in composition, but differing in the arrangement of their atoms. By transforming the normal fructose over into what is called the "gamma" form he was able to combine this with an equal amount of glucose and get sucrose or common sugar. This he accomplished by first joining to each molecule of glucose and fructose four molecules of acetic acid, the acid of vinegar. After the two sugars have been combined the acid is easily eliminated by alkali.

Since this is a difficult and expensive process it could not be employed on a commercial scale, but it is important as proving that it is possible to make sugar artificially and it suggests the possibility of inventing new kinds of sugar which are not to be found in nature. Some of them might prove to be sweeter than common sugar or safer for the use of diabetics.

Professor Pictet, of the University of Geneva, is now seventy-one years old and has long been one of the world's leading authorities on the constitution of sugar and cellulose. Within the last two years he has succeeded in synthesizing two other of the double sugars, lactose, which occurs in milk, and maltose, which occurs in malt.

PHOTOGRAPHS ON STEEL

SHOOTING a photograph into the hardest of chrome steel with the aid of high explosive nitrogelatin, and so making a photographic record as permanent as the steel itself, is the feat that has been accomplished as a result of the "Munroe effect." This effect was the discovery of Dr. Charles E. Munroe, of the U. S. Bureau of Mines. An incidental result of the work is the proof that the blacks in a photographic print are due to varying thicknesses of finely divided silver, the thicker the deposit, the darker being the shadow in the photograph.

The steel photograph was made recently by G. St. J. Perrott, superintendent of the Bureau of Mines Experiment Station at Pittsburgh, and sent by him to Dr. Munroe. To make it, a photograph of Dr. Munroe was laid on a piece of steel about two inches in diameter and an inch thick. On top of this was placed a disc-shaped piece of the nitrogelatin explosive, which was then fired. Though the paper photograph was completely destroyed, when the steel cooled sufficiently to be handled, the profile of Dr. Munroe was found impressed on the surface. Where the photograph had been black, that is, in the

shadows, the surface of the steel was raised, and where there had been high lights, the steel was incised.

Another example of the effect that is in Dr. Munroe's possession now was made by W. O. Snelling, director of research of the Trojan Powder Company. In this case the words "Munroe effect" were impressed into the surface of a block of the explosive, so that the letters were in intaglio. When this was exploded on a disc of the steel the letters appeared on it. However, they were also in intaglio on the steel. This is the opposite from what would be obtained with a die, for then the intaglio letters on the die would come out in relief on the finished product.

Dr. Munroe explains the effect by saying that when the detonation of the explosive occurs, the entire amount of the solid is converted to gas. This volume of gas, however, momentarily has the same size and shape as the original block of the explosive, and is therefore extremely compressed. Where there was a cavity in the original explosive is the line of least resistance for the escape of the rapidly moving gas molecules. In seeking to escape, they collide with each other, producing a vast number of tiny molecular drills, which bore into the hardest steel.

Using the same principle, Dr. Munroe once blew a hole in a safe with a hollow cylinder of dynamite. He took a bundle of sticks of dynamite, then, by pushing a tin can through the center, he pushed out the center sticks, and bound together the other ones so as to form a ring. This he exploded in a vertical position upon a safe. The result was a hole in the top of the safe corresponding to the hollow center in the ring of dynamite sticks. This hollow cylinder had acted as a gun to fire the gas molecules through the steel.

Any thin objects, such as a leaf, or photograph, can be reproduced on steel in this way, and so a permanent record can be obtained. The explosion has the effect of greatly magnifying slight differences in thickness, such as between the layers of silver in the shadows and highlights of the photograph.

ZINC AND BORON FOR PLANTS

THE common metal zinc, together with boron, the chemical basis of borax, are needed by plants if they are to live and grow in full health, according to Miss A. L. Sommer and Professor C. B. Lipman, of the University of California, as described in an article in *The Scientific Monthly*. The amounts needed are exceedingly minute; one part of each in two million parts of the solution surrounding the roots will suffice, but without these microscopic quantities plants drag out a dwindling, sickly existence or even perish altogether. These minerals, together with several others needed in equally minute amounts, are likened by the experimenters to the almost undetectably small amounts of the vitamins needed by man and the lower animals.

To test the response of plants to such low concentrations of the two elements, most elaborate precautions had to be taken, the two researchers report. Even the dust of the air might carry enough zinc or boron to feed a plant otherwise kept completely deprived of it by specially refined chemicals dissolved in double-distilled water; so a smaller greenhouse was built inside a large one, and all the air used in ventilating it carefully filtered. Since ordinary glass contains a little zinc, the jars used in part of the experiments were made of pyrex glass.

A number of different kinds of plants were grown in the culture jars. One set was given a properly balanced ration of mineral nutrients, but no zinc. Another set was similarly deprived of boron. Other plants were supplied with a full ration plus both boron and zinc, in the very low concentration of one part of each to two million parts of water. The plants supplied with both boron and zinc made a healthy and flourishing growth, while those that lacked either of the two elements showed only a fraction of normal growth or even failed to advance beyond the seedling stage.

THE RECENT PACIFIC EARTHQUAKE

BY means of records obtained on seismograph instruments at observatories as distant as Massachusetts, Alaska, Hawaii and the Philippine Islands, and gathered by Science Service, the earthquake experts of the U. S. Coast and Geodetic Survey have located the center of the quake on May 14. It was at latitude 8.0 degrees south and longitude 80.5 degrees west, and occurred at 5 hours 14 minutes 20 seconds P. M., Eastern Standard Time. This location is in the Pacific Ocean about 70 miles off the Peruvian coast. Fortunately for residents of this region, the slip of the ocean bed which produced it was mostly in a horizontal direction. Had the shaking been up and down, a severe tidal wave would doubtless have been the result.

At Guayaquil, Ecuador, nearly four hundred miles to the north of the center of the shake, severe shaking was reported. This, and the fact that seismograph observatories at such distant points recorded it, shows that it was a quake of great severity.

The seismograph stations that reported their records of the quake to Science Service were those of the U. S. Coast and Geodetic Survey at Tucson, Arizona, Sitka, Alaska, Honolulu, T. H., and Chicago, Ill.; of the Jesuit Seismological Association at Georgetown University, Washington, Fordham University, New York; Regis College, Denver; Loyola University, New Orleans, and St. Louis University, St. Louis; and the stations of Harvard University, Cambridge; the Dominion Observatory, Ottawa, Canada, and the Manila Observatory in the Philippine Islands.

THREE ECLIPSES IN ONE MONTH

THREE eclipses in a single month, one of the moon and two of the sun, the first of the trio happening on Saturday, May 19, form the coming celestial program. This is the first time that three eclipses have followed at such short intervals since 1924, and the last time that it will happen until 1931, say astronomers at the Nautical Almanac Office of the U. S. Navy Department.

Since an eclipse happens when the shadow of the moon, cast by the sun, falls on the earth, or when the moon itself gets into the earth's own shadow which stretches

out into space, an eclipse can not happen any oftener. It takes two weeks for the moon to travel from a position between the earth and sun, to one where the earth is between the moon and the sun. An eclipse occurring at the former position is of the sun, and one at the latter is of the moon.

On May 19, the moon's shadow swept across a small area about a thousand miles south of South Africa, just on the edge of the Antarctic region that Commander Byrd will explore next year. As the eclipse was extremely brief, and the region where it was visible most inaccessible, no astronomers traveled to see it.

Two weeks later, by June 3, the moon will be half way around its orbit encircling the earth, and then will enter the earth's shadow. As the moon is lighted by the sun, it will then be temporarily darkened. Unfortunately for most American observers, this eclipse happens after the moon has set for all but the extreme western states, and so will not be visible over the greater part of the country. From Hawaii and the Philippines, as well as eastern Asia, it will be possible to view it.

When another two weeks have passed, on June 17, the moon will again be between the sun and earth, and then part of its shadow will cross the Antarctic region. During this eclipse, at no part of the earth's surface will the sun be completely covered by the dark lunar disc. Therefore, like the first of the trio of eclipses, this one will be completely without scientific importance.

Unfortunately for astronomers, eclipses that are really satisfactory for observing can not occur as often as this. When the moon's shadow lands squarely on the earth, by the time the moon travels around its orbit again, the shadow will miss the earth completely. The next eclipse that Americans can observe without leaving the country will be on August 31, 1932, and will be seen in parts of Maine, Vermont, New Hampshire and Massachusetts.

ITEMS

A CURIOUS crop is described in a bulletin of the Missouri Botanical Garden. It consists of a tomato vine grafted on a potato stock, which yields tomato fruits above and potato tubers below. The graft is fairly easy to make, it is stated, requiring no more skill than is needed for a similar operation on an apple twig. Apparently the first one on record was made over a century ago by an amateur scientist named De Tchudi, who reported his experiments to the Horticultural Institute at Fromont in France. Neither partner in this double plant body seems to have any influence on the other. The tomatoes are like those of sister plants grown on their own roots, and the potatoes differ in no way from those grown in the ordinary way from other eyes cut from the same parent tuber.

ANCIENT mythologies tell of gods slain by their worshippers; and something of the kind is happening in the Big Tree grove of Mariposa County, where thousands of tourists are unconsciously destroying that which they come hundreds of miles to admire. At the request of the National Park Service, Dr. E. P. Meinecke, U. S. Forest Service plant pathologist, has investigated the present status of the cherished sequoias and has reached the conclusion that long-continued and heavy tramping of human feet has destroyed the root endings and finer roots of many of the trees. Without these of course the trees are unable to absorb water and mineral nutrients from the soil. The rescue of Grizzly Giant, one of the finest Big Trees in existence, from a similar fate about 25 years ago, is recalled. Trampling had destroyed its endings, and friends of the trees were at a loss to know what to do. Finally it was suggested by George T. Harlow, at that time guardian of the grove, that the soil surrounding the tree be loosened somewhat and that additional soil be placed around the tree and over the roots to a height of three or four feet. The experiment, though ridiculed at the time, proved entirely successful, and the old tree was restored to health.

A COUNTRY zoo, where tired animals of the London Zoo can go for a holiday and where sick animals can go to recuperate, is proposed in a bill considered by the British Parliament. The estate which would be set aside for the animals covers 480 acres and provides enough room for the animals to exercise in surroundings somewhat like their natural home country. The holiday home for the wild animals would be about 40 miles from London.

YELLOWSTONE PARK headquarters at Mammoth Hot Springs will have a house built of elk antlers to display to visitors during the coming season, as part of the exhibits of the park museum. It will be only a little house, containing a single room six by eight feet and seven feet high, but even so its construction will require some thousands of pairs of antlers. Each year every adult male in the 20,000 elk in the park herds sheds a pair of antlers, so that large quantities of these have been easy to obtain. Enough have been brought to Mammoth Hot Springs to provide walls and roof for the "house of horn," which Chief Ranger Sam Woodring has undertaken to construct.

THE insect-catching leaves of a southern species of pitcher plant are sometimes borrowed by tree frogs for their own insect-catching purposes, according to Professor E. A. Andrews, of the Johns Hopkins University. On several occasions, during a sojourn in North Carolina, he found these little yellow-green frogs ensconced inside the narrow, trumpet-shaped hollow leaves of the pitcher-plant, whose color almost exactly matched the color of the froglets. Inasmuch as the leaves of the pitcher-plant normally serve as traps for insects, whose remains apparently nourish this predatory vegetable, it seems that the frogs were in a way playing the part of parasites, by robbing the plants of their rightful prey as it tumbled in at the mouths of the pitchers. In a few instances the frogs were in their turn cheated, for he observed frog-inhabited leaves across whose openings spiders had spun their webs, so that any insect undertaking to enter the inviting mouth of the trap would reach neither the frog's stomach nor the plant's digestive pit at the base of the leaf.