SCIENCE NEWS

Science Service, Washington, D. C.

HYDROGEN PROMINENCES ON THE SUN

GREAT flame-like masses of gas, which sometimes shoot out from the surface of the sun to a height of a million miles, recently have been under scrutiny of astronomers at the Harvard Observatory, at Oak Ridge, Mass., with a new instrument.

Until now the most useful device for showing these prominences, which may be visible to the naked eye when the sun is totally eclipsed, is the spectro-helioscope, a fairly complicated device with a number of optical parts and a set of prisms rotated by a motor.

The new device, less than two feet in length, has been used as an attachment to one of the observatory's smaller telescopes. It was constructed by John W. Evans, of the Chabot Observatory, Oakland, Calif., who loaned it to the Harvard Observatory.

The reason prominences can not be seen ordinarily is because of the great glare of the atmosphere around the sun. The glare consists of white light, made up of all colors, while the light of the prominence is mainly one color, that of glowing hydrogen. Thus, to the eye, sensitive to all these colors, the total illumination from the sky drowns out the prominence. However, if some way can be found to pick up just the wave-length of hydrogen light, the prominence can be seen, for, with other wave-lengths excluded, it is much more brilliant than the sky.

This has been done with the spectroscope, but Mr. Evans used what is called a "quartz monochromator." This consists of a series of six crystals of quartz, each half the thickness of the preceding one. Between them are sandwiched layers of film which polarizes light, making it vibrate in one plane instead of many.

The spectrum of colors, which would be obtained by analyzing through a prism the light from the first quartz plate, would show a series of broad alternate bands of light and dark. Each successive plate widens the dark bands and squeezes the bright ones, until, after enough have been used, one of the bright bands is just wide enough to pass the hydrogen light. Colored filters cut out the others.

First suggested by a French astronomer, Dr. Bernard Lyot, the device was tried in Sweden by Dr. Yngve Ohman. However, he was not able to use as many quartz plates since he did not have the polarizing film available. Instead, he employed another method for obtaining polarized light, the Nicol prism. With one of these between each pair of quartz plates, the instrument was quite long.

Mr. Evans has also used the monochromator for photography, by the simple expedient of holding a camera at the eyepiece. For other than such experimental photographs, a more stable support would be used.—JAMES STOKLEY.

MEASUREMENT OF THE EXTENT OF STRETCH OF METALS

"SPEED laws," concerning the extent to which metals will stretch under heavy loads in machinery over a period of years, can now be determined in tests requiring from fifteen minutes to a few days. The testing machine used in these measurements was described at the New York meeting of the Society of Rheology by Dr. A. Nadai, consulting engineer of the Westinghouse Electric and Manufacturing Company's research laboratories at East Pittsburgh.

In building steam turbines, for instance, parts which are subjected to ten years of service at a temperature of 1,000 degrees Fahrenheit must not stretch more than a tenth of one per cent. during that time. Formerly, to test materials for these parts, three to six months were required.

"This new testing machine," explained Dr. Nadai, "will permit engineers quickly to assemble a vast library of intimate data on the creeping properties of a variety of steels and other metals and alloys, so that the designer may select the exact metal that will stand up under the service to be expected of it."

In a typical test with the device, a half-inch-diameter cast carbon-steel bar was subjected to a pull which was gradually increased to about six tons. All the time, an electric furnace around the specimen kept the temperature at 850 degrees Fahrenheit. In four minutes the bar stretched about a tenth of its length. With a pull of only four and one half tons, four days were required for the same stretch. Dr. Nadai finds that the difference in speed between the slow-moving turbine parts and the relatively rapid deformation of the steel plates in a rolling mill is about one quadrillion (1,000,000,000,000,000) to one. Since it is known that large rock masses in the outer layers of the earth's crust change shape by creeping, he suggested that these same laws may apply in geology as well.

A NEW METHOD OF STUDYING METALS

A NEW method of studying metals, with the microscope and x-ray in combination, that may yield useful information in connection with their use in guns, airplanes, engines and other defense needs, was described at the Cleveland meeting of the American Society of Metals by Dr. George L. Clark, of the University of Illinois, and Dr. William M. Shafer, of the Iowa State Teachers College.

Though x-rays are similar in nature to light waves, their waves are much shorter, and they can not be bent by lenses the way light can. Thus, no one has yet found a way to focus them, which would be necessary to magnify x-ray images directly. Instead, the method used is to take an x-ray picture, the same size, of a thin sliver of the metal being tested. Then, with light, a magnified photograph of the tiny x-ray negative is taken through a microscope. To get best results, it is essential to use a film with externally small grains, otherwise they would be magnified as well, and would mask details being studied in the metal. By using a special emulsion imported from Belgium, Drs. Clark and Shafer have found it possible

to magnify the finished result as much as 200 diameters, without losing detail.

Ordinary photographs of metallic specimens through the microscope are made of the surface, by light reflected from it. With the x-ray method a three-dimensional view is obtained, since the x-rays pass through the specimen. This shows better the internal irregularities of structure. Cracks and voids inside the piece are revealed. With the ordinary microscopic picture, the specimen must be carefully prepared and polished, but this is not necessary with the x-ray method.

Also, in some cases, it is stated, the usual treatment does not differentiate between different materials in the metal, but whenever the two materials have a different density, they are shown up by the x-rays.

THE KLYSTRON TUBE

WITH electrical waves as short as four inches in length, wireless power to light small electric lamps, has been transmitted at the Westinghouse Lamp Research Laboratories at Bloomfield, N. J., over a distance of many feet. Unlike the usual short waves used in radio, these can not penetrate non-metallic substances. They are stopped by a block of wood between the transmitter and the small antenna which picks up the energy to light the lamp.

I. M. Mouromtseff and G. M. Dinnick, as well as other Westinghouse engineers, have been working on the device, which is an intricate sort of vacuum tube, called the "klystron." It originated in the laboratories of Stanford University and is being developed in cooperation with the Sperry Gyroscope Company, designated by the university to promote its applications. The Westinghouse researches have greatly simplified it and reduced its size. Formerly, it required circulating water for cooling, but now it is air cooled.

Two doughnut-shaped copper tubes, called "rhumbatrons" because of the dance of the waves within their walls, are used to break up an electron stream, bunching the separate electrons, and converting their energy into high frequency waves, vibrating as much as 3,000,000,000 times a second. With the aid of a six-foot horn, these can be transmitted like a searchlight beam. When held in the beam, a small flashlight lamp, to which is connected a copper wire antenna, lights as if connected to a battery.

Electrical production of bodily heat for medical purposes and increasing the number of television channels as well as methods of transmitting more telephone messages over a single circuit are other possible applications of the klystron.

VITAMIN B

DR. NORMAN JOLLIFFE, of the New York University College of Medicine, speaking before the American Dietetic Association meeting in New York, stated that the average American consumes too little vitamin B for grade A health.

This vitamin, which has proved so complicated that it is now technically called the vitamin B complex, is known to contain at least twelve fractions. Five of the fractions are available in crystalline form for clinical use.

Lack of this vitamin, which occurs in such foods as milk and eggs, whole grains, liver and some other meats and fresh vegetables, is held responsible for a variety of ills, including some cases of neurasthenia, pellagra, an eye malady and a nervous disease which until recently was 100 per cent. fatal.

Dr. Jolliffe advised nutritionists to look out for vitamin B deficiency in diet of the following: Low income and poverty stricken groups; persons with bad dietary habits and food idiosyncracies; alcoholic addicts and patients with diseases which alter the requirements of this vitamin.

Vigorous use of nicotinic acid, one factor in vitamin B, has spectacularly reduced mortality from 100 per cent. to 15 per cent. in the nervous disease known as encephalopathy, which is now known to be caused by acute lack of this food factor.

While not all neurasthenia is caused by too little thiamin—another fraction of vitamin B—in diet, Dr. Jolliffe stated that lack of this vitamin plays a larger rôle in the nerve malady than is commonly believed. As common neurasthenic symptoms of too little thiamin, he cited poor appetite, fatigue, insomnia and often with them irritability, nausea, depression, constipation, headache, backache, "gas" and palpitations. Patients with paralysis agitans treated with still another part of the B vitamin, known as pyridoxin, have shown definite improvement.

NUTRITION AND DIET

FOR long life, better be thin than fat, is the lesson from latest experiments in which elderly white rats have gone through regimes of diet and taken running exercises in barrels, to shed light on the growing-old process.

Dr. C. M. McCay, professor of nutrition at Cornell University, reported to members of the American Dietetic Association studies with these animals which show that diet can retard the aging process and that types of diet may actually lengthen the life-line.

"It is evident," he said, "that nutrition workers have it within their power to learn much about the factors that govern the total span of life and about the diseases that attack us in our prime and later life. Factors such as the degree of body fatness and the calory intake are of great significance and should not be pushed entirely out of our thinking by the present stress upon vitamins, minerals and proteins." Describing his experiments, Dr. McCay said that some groups of rats have lived to be 900 days old, the equivalent of a 90-year lifetime in humans, and one rat passed the 1,400-day mark, putting it in the class with famous Thomas Parr, who claimed to be 152 years old when he died in 1653.

In tests recently completed, rats nearing "middle-age" have been started on routines in which some became fat and lazy on high calory diets and no exercise, while others became thin on low calory diets, with or without exercise. Rats forced to keep thin enjoyed significantly longer spans of life. If a rat became too thin or too fat, the life span was shortened.

By feeding rats a diet containing all needed substances for normal growth, but low in calories—the energy and fuel producing foods—Dr. McCay has shown that rats grow at a slow pace, and their life-line lengthens. This is significant as a method of postponing old-age diseases which terminate life. In tests now in progress, he has learned that at 500 days of age, only about one rat in

ten on the retarded regime has diseases of the lungs and middle ears, while half of the rats following normal rat diet have these diseases.

The goal of such nutrition studies, he emphasized, is not to prolong extreme age "when one foot is in the grave," but to prolong the active period of productive effort in middle life and to alleviate the suffering of old age.

THE CURE OF CANCER AND SLOW NEUTRONS

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CURE of a certain type of cancer in mice by slow neutrons is announced by Dr. Paul A. Zahl, Dr. Franklin S. Cooper and Dr. John R. Dunning, of Memorial Hospital, the Haskins Laboratories and Columbia University, in a report to the National Academy of Sciences.

This appears to be an important step toward the better treatment of human cancer which physicists and physicians have hoped would come from the atom-smashing cyclotron in which the neutrons are produced.

Fast neutrons, like x-rays, can destroy cancer, but their usefulness in treatment is limited by the fact that they also destroy other living tissue. Slow neutrons, of the kind used in the spectacular splitting of the uranium atom, should be able to pass through the body with little or no damage to the tissues. When slow-neutron-capturing chemicals, such as boron or lithium, are injected in or around a cancer, the action of the neutrons on the capturing chemical should result in destruction of the cancer, while surrounding body tissues are unharmed.

Test-tube experiments with cancer tissue removed from the body showed that the boron-slow-neutron attack on cancer was five times as effective as a fast-neutron attack on cancer. This was reported by Dr. P. G. Kruger, of the University of Illinois. The mouse experiments now reported show the effectiveness of the slow-neutron-boron attack on cancer in living animals.

For any possible future use of this attack in treatment of cancer, it is believed that a better device than hypodermic injection should be developed for localizing either boron or lithium in the cancer tissue. Attaching lithium to large-particle colloidal dyes and injecting this into the veins is a promising improvement in the technic now being investigated.—JANE STAFFORD.

ITEMS

LIQUEFIED helium gas, at a temperature of about 460 degrees below zero Fahrenheit, the coldest substance in the world, has many peculiar properties. One newly discovered one was described by A. D. Misener, of the University of Toronto, at the Cleveland meeting of the American Society of Metals. If a channel through which an ordinary liquid is flowing is decreased in diameter, the speed of flow is lowered, but with this form of liquid helium it increases. He described a new theory of the distribution of the heat energy among the atoms of the liquid to explain this behavior.

CURRENT theories of the evolution of the huge spiral galaxies, star systems that look like pinwheels and are really similar to our own Milky Way but outside its limits, are questioned by Dr. Gunnar Randers, of Norway, who is now working at the Yerkes Observatory of the University of Chicago. In a paper to appear in the *Astrophysical Journal*, he says that there is no observational evidence for the idea now held that the "old" spirals are formed from "young" eliptical nebulae. "Many spirals suggest that the greater part of their material may be in the arms. If the arms were ejected from a system originally densely packed, the almost complete dissolution of that system would have been accomplished against the pull of the system's gravitational force." He suggests that "the nebular patterns are formed by the redistribution of the matter inside the originally 'smooth' nebula. This redistribution would take place early in the evolution of the nebula while it is still young and stars have not yet been formed from the gas of which it is composed."

IN a paper read before the Society of Motion Picture Engineers Dr. E. W. Kellogg, of the R.C.A. Research Laboratories in Camden, N. J., reported that sound reproduction in the movies is being made more realistic, with elimination of unwanted sounds, by keeping the sound track as dark as possible. The sound track, on the edge of the film, is a series of light and dark areas corresponding in intensity to the sound waves that recorded them. As the film runs through the projector, a light shines through the track, to a photoelectric cell, or electric eye. Light variations are converted into electrical variations, then back into sound through the loud speakers. Particles of dust and other foreign matter cause unwanted interruptions of the light, and this makes "ground noise" which spoils the perfection of the reproduction. The new system simply keeps the film track as dark as possible, so that if any foreign matter settles on it, there will be no effect. With loud noises, such as explosions or storm, the track becomes nearly clear, but then the objectionable sounds are drowned out.

PLANTS acquire immunity to disease, and in much the same way as animals do, is the conclusion reached by Dr. James M. Wallace, of the U. S. Department of Agriculture. Testing the destructive sugar-beet curly-top disease on tobacco, Dr. Wallace found that severely affected plants recovered, or at least showed very few evidences of the malady. At the same time, he discovered that there seemed to be developed by the plant an unnamed something which caused the disease to be held in check. The disease was still in the plants, Dr. Wallace explained, for healthy tobacco plants could be infected from the recovered ones. Dr. Wallace grafted healthy scions on diseased stocks, and diseased scions on healthy stocks, and found that the healthy portion became diseased, but mildly, depending on the length of time the disease-masking "something" had had to develop. "In short," says Dr. Wallace, "the phenomena are comparable to those known in animal diseases in cases of active immunization and the production of passive immunization by protective substances or antibodies. On the basis of the evidence obtained in these experiments, the behavior of the recovered plants is interpreted as acquired immunity and this acquired condition results from protective substances produced by a specific relation between the tobacco plants and the curly-top virus."