

SCIENCE NEWS

Science Service, Washington, D. C.

SOURCE OF THE SUN'S ENERGY

ELECTRICITY, under a pressure of ten million volts, about the same as that of a good lightning flash, is constantly flowing from inside the sun into outside space, and so "heats the solar atmosphere to incandescence in a manner precisely as the filament of an electric light is heated by the electricity flowing through it." This is the new and startling theory that has been developed by Dr. Ross Gunn, research physicist of the U. S. Naval Research Laboratory. Dr. Gunn discussed these implications of his theory with a representative of *Science Service*. A full technical report of his conclusions will shortly appear in *The Physical Review*.

Dr. Gunn pointed out that the rotation of the sun is peculiar. Not only does its equator turn faster than regions near its poles, but the rotation of the same part varies by a few per cent. over a period of about six years. A similar regular change occurs in the amount of light that the sun gives off.

Dr. Gunn said: "Study of the electric and magnetic phenomena in the sun's atmosphere has led me to an explanation of these observed variations and given a great deal of valuable numerical information. I don't need to go into technical details, but the way that we have observed the sun to rotate requires us to believe that it is constantly throwing off large amounts of electricity. This current is so large that it wouldn't mean much to the layman for me to express it in numbers, but the sun is caused to glow by a voltage equivalent to a good lightning discharge, about ten million. It is this continually flowing current that heats up the sun like the filament of an electric light, so we might say that the sun acts like a gigantic electric light radiating its energy into space. It is the ultimate power house and stimulant of the solar system.

"We can also calculate the total power required to light the solar electric lamp. The entire wealth of our nation would buy enough electricity, at present rates, to light the sun for a millionth of a second. Yet the sun has been burning this way for at least a million million years, and perhaps longer, so you might ask where the energy comes from.

"The latest researches seem to answer this question and it seems almost certain that the energy comes ultimately from the annihilation of matter. In the past few years physicists have come to believe that mass and energy are the same thing in different forms. Therefore, if processes take place in the sun which cause mass to vanish and light or electrical energy to appear, we need not be greatly surprised. This view is consistent with many other known astronomical facts. It is fairly certain that by means of some subatomic process the sun converts a million tons of its material into energy every second.

"This loss of mass is very great, but it is small compared with the sun's total mass. It is estimated that not until a million million years have elapsed will its size

be appreciably affected. Therefore, it seems likely that the sun will continue to shine as it does now for a great many generations, unless some new phenomenon appears and upsets the domestic economy of the old Egyptian god!"

RADIO RECEPTION

GOOD radio reception of broadcasting stations, accompanied by few sun-spots, is predicted for the coming fall months by Dr. Harlan T. Stetson, director of the Perkins Observatory at Ohio Wesleyan University. A detailed report of his findings will appear in the forthcoming issue of *The Journal of the Franklin Institute*, published in Philadelphia. By the time winter commences, however, there will be a general increase in the number of sun-spots, which will be associated with somewhat poorer reception of broadcasting stations.

But even though the spots will be slightly more numerous than now, we shall then be so far past the maximum in 1928 and 1929 of the eleven-year solar cycle that radio will not be affected nearly as much as in those years. After that the spots will become still less frequent, and by "1934 solar activity should be as quiescent as at the last minimum in 1923."

Dr. Stetson warns against trying to blame too much on sun-spots, however.

"The mention of sun-spots invariably raises the question of a possible connection between spots on the sun and terrestrial phenomena," he says. "Some statisticians with an insatiable appetite for correlations have attempted to connect with sun-spots almost every cycle in world affairs from fluctuations in the New York stock market to the fecundity of rabbits in northern Canada. In the popular mind almost every world catastrophe has sooner or later been attributed to sun-spots, from a Florida hurricane to the great World War, both of which, by the way, did culminate around a sun-spot maximum."

However, Dr. Stetson points out, there are some phenomena which have definitely been shown to be related to sun-spots, such as magnetism, displays of the northern lights and radio reception. By means of a series of measurements since 1926 of the reception of station WBBM, in Chicago, as received in Massachusetts first, and now in Ohio as well, it was demonstrated that "long distance night reception in the broadcast zone is in general poor when sun-spots are numerous, and good when the spots are few."

Dr. Stetson found that in addition to the eleven-year cycle of sun-spots there is a smaller period of about fifteen months, and that there is an exactly similar period of variation in the radio reception. In December, 1928, he predicted a marked increase in sun-spots in September or October, 1929, a prediction which was entirely fulfilled. The next maximum will thus come next winter, but because we are so well past the maximum of the great eleven-year cycle, the spots will probably not be very numerous, and so radio reception will not be greatly affected. Thus it may be that we will have a

return to the excellent conditions for long distance radio reception enjoyed in 1923, when radio was first coming into popularity.

NEW TECHNIQUE FOR THE STUDY OF LIVING TISSUE

A METHOD which enables scientists for the first time to study over a long period the microscopic details of the growth of living tissue in a warm-blooded animal has been developed in the laboratory of anatomy at the University of Pennsylvania's School of Medicine.

Through its use, the cellular changes in living tissues can be studied as by no other method, and fundamental information regarding the manner in which abnormal cellular reactions occur in infectious diseases like tuberculosis and in tumor growth like cancer will be obtainable.

That such cellular reactions occur has long been known by the end results seen in these diseases, but by enabling the observer actually to see the entire process of cell changes the new method opens the door to enormous advances in knowledge.

The method, for whose rapid perfection and extension the Rockefeller Foundation has made a \$75,000 grant to the university, consists of the introduction of a transparent, double-walled chamber, or "window," into a small hole made in the ear of a rabbit, the perforation being made in much the same manner as the human ear is pierced for the wearing of certain types of earrings.

One side of this "window" is of celluloid or glass, and the other of a very thin sheet of mica. The edges of the space intervening are left in contact with the tissues of the ear and from them the blood vessels and other living tissues invade the chamber until they form a complete new layer.

This new layer, only two thousandths of an inch in thickness, is quite transparent and it is necessary only to place the "window" under the microscope to see with the most extraordinary clearness at 1,000-fold magnifications the minutest elements—the individual cells—of which animals are made.

Moreover, since the new tissue is permanent and the chambers can remain in place for months without causing discomfort to the animal, it is possible to make repeated observations and careful studies not only of the exact way in which the new growth occurs, but also of the way the tissue elements behave in conditions of health and disease.

Heretofore there had been no satisfactory region in a warm-blooded animal in which such fine details could be studied on living, growing cells inside the body. Investigators depended either on cutting thin pieces of dead tissue, staining them in various ways, and placing them on glass slides in order to study tissues and cells under the microscopes, or on keeping small pieces of tissue alive in "tissue cultures" outside the body.

The development of the new method grew out of a number of research projects in which Dr. Eliot R. Clark, professor of anatomy at the university and director of the anatomical laboratory, had engaged, and in many of which he collaborated with his wife, Eleanor L. Clark.

VITAMIN A FROM CAROTIN

EVIDENCE that animals can manufacture the growth-promoting vitamin A in their bodies from carotin, the yellow coloring matter of some of their foods, has been reported to the Medical Research Council by Dr. Thomas Moore, of the Nutrition Laboratory at Cambridge. Dr. Moore's discovery reverses an earlier theory about vitamin A, that it is not made by the animal and that all of it found in animal bodies and glands comes directly from the food eaten.

Vitamin A, besides promoting normal growth, increases resistance to disease. It is found in animal fats, such as butter and beef fat, in eggs, milk and vegetables. It has always been found together with this yellow pigment, carotin. The yellow of the egg, butter, yellow carrots and yellow corn contain this vitamin. White corn, white carrots and white turnips, however, have very little vitamin A compared to the amount found in the yellow varieties. In green vegetables which contain this vitamin, carotin is also present but its color is hidden by the green color of chlorophyll which is abundant in such plants.

Not only do the two substances occur together but carotin has the same effect on growth and bodily vigor and health as vitamin A. Extracts of pure carotin can cure animals suffering from deficiency of vitamin A just as feeding the vitamin could cure them.

Chemical tests show that the two substances are not identical and investigators were at a loss to explain the matter until Dr. Moore showed that the carotin or some part of it is changed into vitamin A in the animal's body.

Dr. Moore fed rats on a diet lacking vitamin A until all the excess of this vitamin which they had stored in their livers and elsewhere in their bodies was used up. Then he fed them carotin in as pure an extract as he could get. The rats, which had been weak and sickly, recovered, and when a large amount of carotin had been fed, examination of their livers showed that they again had stored up some vitamin A.

AGE OF EXTINCT CHINESE ANIMALS EXTENDED MILLIONS OF YEARS

ACCORDING to a cable to *Science Service* from H. J. Timperley, Peiping, the family trees of two queer but extinct animals of the ancient eras of the earth were extended deeper into the past by the Central Asiatic Expedition under the leadership of Roy Chapman Andrews which has just returned to Peiping after five months' intensive scientific exploration of the Gobi Desert.

No trace of primitive man, one of the hopes of the expedition, was unearthed, but a large and important collection of fossils was secured, representing about seventy-five different species of animals, several new to science.

Skeletons of the coryphodon, a creature unlike any now living on earth, were found in strata of the earth of the Oligocene period, which extends the period of evolution of this animal several millions of years into the

past. The coryphodon was somewhat like a rhinoceros, but not a relative. It had feet built on the pattern of an elephant, however, with five toes. The bones of this vegetarian animal brought to Peiping by this expedition of the American Museum of Natural History are far older than any coryphodon fossils found in America.

Skulls and jaws of another group of extinct animals, called *calicotheres*, much more primitive than the types found in Europe and America, are also contained in the collections. These creatures had teeth like the moose and elk of to-day, lived on a vegetable diet, had long forelegs and five toes with compressed hoofs that had the appearance of claws and may have been used to tear food or enemies.

Among the new genera found were several *titanotheres*, extinct cousins of the rhinoceroses, and new kinds of true rhinoceroses, deer, antelopes and rodents.

Dr. Andrews declared that he hopes to continue his search for primitive man upon another expedition next summer.

PUBLIC HEALTH IN A CHINESE COUNTY

At least one rural county of disease-ridden China is to have modern doctors and nurses and a real health department and the 400,000 inhabitants will be given a chance for healthier, longer lives, according to a report to the Milbank Memorial Fund.

The county of Ting Hsien in the interior of China has been made the subject of a rural health experiment, which is part of the Chinese National Association of the Mass Education Movement. Many such experiments have been successfully conducted in America, but the experiment in China will be made under conditions hard to picture, the political unrest being merely one of the many difficulties to be met.

In the entire county of 400,000 people, there is not one physician of the modern scientific school. The native doctors believe disease is caused by heat and wind. Sanitation is unknown. Nine tenths of the people are unable to read or write. Nearly all of them are ignorant, superstitious and poor. Eighty thousand live in the county's one city, the rest huddling in the squalid, mud-hut villages. About 30 out of every thousand die each year, while the life expectation is only about 35 years.

The health demonstration has begun by educating the natives to come for examination and to accept medical advice and treatment. Vital statistics are being collected and native nurses, midwives and physicians are being trained in modern scientific methods. The head of the Ting Hsien Health Department is Dr. H. H. Yao. The Milbank Memorial Fund has given \$50,000 to aid in the work.

The present time is considered particularly opportune for this movement in spite of the political situation, because it is hoped that this non-political organization may lay the foundation for more effective governmental activities when the political situation is once more stabilized. The League of Nations has announced that it will support and cooperate in attempts to modernize China's health service despite the country's seeming preoccupation with civil war.

ITEMS

Fossils of *Sinanthropus*, the so-called "Peking man," found near Peiping within the past year will provide the most valuable clue yet unearthed for solving the riddle of early man, was the prediction of Professor G. Elliot Smith, noted British anthropologist, in a recent lecture before the Chinese Geological Society. Professor Smith is in Peiping at the invitation of the Chinese Government for the purpose of studying the *Sinanthropus* specimens, including the skull of the Peking man found last year and a second skull recently discovered. Although the report on the cast of the brain case obtained from the second skull is not complete, Professor Smith described the discoveries as unique in the whole history of anthropology and predicted that the evidence would throw a flood of light on the nature of the primitive brain.

Use of the airplane for scouting fishes has been successful in many places. Aviator Frank Dorbandt while flying high above Cook's Inlet recently saw fully a thousand whales play and sport in the sea under him and to assure himself of their numbers he circled over them several times. Spouting, rolling and diving, the whales seemed given more to basking in the sun than to seeking or pursuing any species of food fish. Some kinds of whales migrate in late summer to the south and it is possible the pilot noted one of these movements.

The natural fruit colors of certain canned fruits are preserved much better when the cans are kept in cold storage than when they are kept at ordinary temperatures. T. N. Morris and J. M. Bryan, of the Low Temperature Station, Cambridge, have recently found that canned strawberries stored for three months at a temperature just above freezing have a fine red color, whereas those kept at 10 degrees below zero Fahrenheit are pale, and those stored at ordinary room temperature are also somewhat pale. The strawberries from cans stored at just above freezing actually had a much better appearance than when they were first canned because the color had returned to the fruit from the syrup.

The ferns of the Hawaiian Islands are furnishing data toward the eventual solution of the tangled puzzle of the archipelago's geological history. This is the opinion of Dr. E. D. W. Brown, a woman botanist who has done much work in Hawaii. "We are now beginning to compare the migration of spore-bearing plants in the Pacific area with that of the seed plants," she said recently. "It seems that we should expect little or no endemism in the ferns, since the dust-like fineness of the spores would seem to adapt them particularly well for wide distribution by hurricanes and violent winds or even by slow-moving air currents; and it is a matter of considerable surprise to find how many species of ferns and fern allies are confined to local areas. Instead of being distributed in the paths of the trade winds, seemingly their migration has been nearly as dependent upon the emergence and submergence of the islands of the ocean and the attendant factors favoring plant dispersal as that of the seed plants."