SCIENCE NEWS

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MEASUREMENTS OF THE VELOCITY OF LIGHT

REFLECTING a beam of light back and forth on a ten-mile journey through a mile of iron pipe from which the air has been exhausted, in order to measure light's speed, from preliminary experiments just completed at the Mount Wilson Observatory, seems to be feasible. The method was proposed by Dr. A. A. Michelson, who will go to Pasadena next spring for the final experiment.

Previous measurements by Dr. Michelson of the speed of light were made near Pasadena by reflecting the light to a distant mountain peak and back, but uncertainties were introduced by the lack of knowledge of the condition of the air over the entire path. By using an evacuated pipe for the light path this difficulty is overcome.

In order to see whether a satisfactory image could be obtained, 1,100 feet of the pipe were laid, and preliminary tests made by F. G. Pease and E. C. Nichols, both of the observatory staff. The light came from a narrow slit, and was made into a parallel beam by a concave mirror. Thence the light passed to the other end of the pipe, where a flat mirror reflected it back. At the first end another flat mirror sent the light down the pipe again, and so it went back and forth, traveling all told about a mile. Finally, it reached a second concave mirror, which was intended to form an image of the slit.

When the pipe contained air at the same pressure as in the atmosphere, no image could be obtained. But when the air pumps were started and the air exhausted to about one eighth of normal pressure, an image appeared. When a vacuum of about a thirtieth of ordinary pressure, or half a pound to the square inch, was reached, a clear and sharp image of the slit was seen. This shows that the method is practicable, and the rest of the mile of pipe, which is made of corrugated iron, with soldered joints, will be laid.

Professor Michelson is now convalescing from an attack of pneumonia, and expects to go to Jamaica for a few months. He plans to go to Pasadena on about May 1, when the pipe will be finished, and the final experiment can then be carried out.

INFRA-RED PHOTOGRAPHS

BECAUSE movie producers wanted a film that would give night effects to pictures taken in the daytime, Mount Wilson Observatory astronomers have been able to prove conclusively the presence in the sun of carbon, most typical element of all living things, by spectrum photographs in infra-red light.

Speaking at the Carnegie Institution of Washington, Harold D. Babcock, of the Mount Wilson Observatory, told of this and other phases of his researches into methods of taking photographs with light vibrating too slowly to be seen. This is called the infra-red region of the spectrum.

When the white light of sunshine is broken up by the prisms of a spectroscope, it is spread out into the familiar colored spectrum, ranging from the shortest and most rapidly vibrating rays that make violet light to the longer and more slowly vibrating red rays. Though not visible to the eye, the spectrum extends far beyond each end. Ordinary photographic plates record the ultra-violet or the region beyond the violet end, but are insensitive to even the visible red. Panchromatic plates are sensitive to red light, but not to a great deal of the infra-red, the still longer waves. These are the heat waves, and so it has been possible to study them by temperature effects. At best, however, this method is not as good as direct photography, and physicists and astronomers have sought a way of photographing these long waves. Many years ago Sir William Abney, an English experimenter, succeeded in photographing by very long infra-red rays, but his method was difficult and uncertain, and has not been used since.

The movie produces sought a way of photographing night scenes in the daytime, so as to avoid the use of powerful and expensive lights required for night photography out of doors. Photographs made by infra-red light give a black sky, and so they sought film to take movies by the infra-red part of sunlight. To meet this commercial need, explained Mr. Babcock, research chemists at the laboratories of the Eastman Kodak Company produced a new dye, neocyanin. Film or plates bathed in a solution of this dye acquire sensitivity to infra-red light, and the demands of the movies were satisfied.

Mr. Babcock also showed a photograph taken by these same plates in absolute darkness, to the eye. Using three bowl-type electric heaters, supplied with just enough current to heat their coils, without giving any visible red light whatever, he photographed some bottles and laboratory apparatus by infra-red light. An exposure of 48 hours was required.

"The significance of lines in the spectrum lies in the fact that they announce the occurrence of definite changes of atomic energy," said Mr. Babcock. "The arrangement of lines in the spectra of the elements leads to a knowledge of the arrangement of the outer electrons of the atoms, of fundamental importance to the understanding of their physical and chemical relationships."

With the new plates, it is possible to extend this study far into the invisible infra-red part of the spectrum. Mr. Babcock has made photographs of the solar spectrum by light waves nearly half again as long as the longest visible red waves. These waves are about twice as long as those of green light, and lie about twice as far beyond the end of the visible spectrum as those photographed by Sir William Abney.

One of the first results of this new method has been the definite proof of the presence of carbon in the sun. Previously only a few weak lines of this element have been photographed, but with the new plates one of the

principal groups of the lines of carbon can be recorded. These are in the same position as carbon lines from a terrestrial source, and show conclusively that the sun, like our own bodies, contains carbon.

ACORN-STORING WOODPECKERS

THE acorn-storing woodpecker of California has become one of the most successful of birds because it uses its head. It uses its head not merely figuratively, in intelligent adaptation to the advantages and disadvantages of its environment, but also literally, in that its head is its chief physical means of making such adaptation.

These are the conclusions reached by Dr. William E. Ritter, emeritus professor of zoology at the University of California, after several years of critical study of the California woodpecker in its native haunts, which will be described in the forthcoming issue of the *Quarterly Review of Biology*.

Unlike almost all other American woodpeckers, the California species has taken to a vegetable diet, consisting mostly of the acorns of two species of oaks. Examinations of the stomachs of numerous woodpecker specimens have shown, in most cases, little more than a trace of the insects that form the bulk of the food of most woodpeckers; and these are mostly insects caught in the open on the wing, instead of being laboriously drilled out of tree trunks.

The California woodpecker does bore holes in trees, but only for the purpose of putting acorns into them. California trees and telephone poles are frequently fairly peppered with acorn-filled holes, as though some one had been driving round-headed nails into them.

Dr. Ritter finds that the woodpecker makes good use of his head in four ways: in boring holes to fit his acorns according to their size, in selecting acorns of a size he can best handle, in choosing places where he can store his acorns with the best economy of labor and in splitting some of his acorns in half, thereby making their handling easier. The bird prefers acorns from two species of oak, black oak and live-oak, which are of a shape convenient for him to handle, but he passes up the acorns of the valley oak, which are too big. Yet he will take live-oak acorns to valley oaks to store them, because it is easier for him to drill storage holes in this tree, or to wedge his acorns into the ridges of its bark.

However, the California woodpecker is no paragon of wisdom, Dr. Ritter has found. He is as big a fool as the rest of us, on occasion. Sometimes he will, in an excess of storing zeal, drill holes and fill them with completely useless objects, such as pebbles, or hard-shelled nuts that he will never be able to open. He will also drill holes through the side of a house, and then stuff quarts of acorns into this (for him) bottomless pit whence they can never be recovered—just like an amateur speculator dumping his money into a bucket-shop! Or he will work hard on holes that might be filled with acorns, and then go gadding off on some pointless errand and forget to come back and fill them.

Yet in spite of his occasional flights of folly, the California woodpecker has a decided balance of sense in his favor, if his success in filling the oak woods of his native state with his own species can be taken as any criterion. By adopting the fruit of a wide-spread tree as his principal food, and by learning how to lay by a stock of it in secure storage places, he has been able to increase and multiply until he outnumbers his nearest competitor in the woodpecker family of the same geographical range in a ratio of about five to one.

CARE OF THE GREAT ELK HERD

EXTENSION of their winter range, eliminating as much as possible the crowding and concentration incident to feeding with hay, is one of the keys to the promotion of good health in the great elk herd of Jackson Hole, south of Yellowstone National Park. This was brought out at a meeting of the Commission on the Conservation of the Jackson Hole Elk, by O. J. Murie, of the U. S. Biological Survey, who has spent something over two years following the herd and learning their ways and life problems. The commission consists of representatives of U. S. Government departments, the state of Wyoming, various wild life organizations and business men of the region.

It is necessary to feed hay to the elk comparatively early in the winter under present conditions, Mr. Murie explained, because if this it not done the animals crowd upon the ranches in the valley, stealing hay intended for the farmers' livestock and in general raising a disturbance. This prolongs the period of their crowding together on the elk feeding grounds, and crowded elk interchange disease germs just as crowded human beings do. If some or all of the ranch lands can be acquired and turned into elk range, the elk can be left to shift for themselves farther into the winter, keeping them uncrowded and in better condition than they are at present.

The most prevalent of the serious diseases among the elk, Mr. Murie stated, is necrotic stomatitis, known to cattlemen as "soremouth." Its symptoms are severe inflammation and lesions, finally causing eating away of the bone. It also evidences itself in other parts of the body through pneumonia, pleurisy, arthritis and a condition like diphtheria, resulting in death through strangulation and general poisoning.

The mode of entry of the disease is not definitely known as yet, but suspicion attaches to the long, sharp bristles of fox-tail grass, which is very common on the valley ranch lands. This makes punctures in the mouth lining of the elk, and may thus initiate the infection.

The chief sufferers are the calves and the adult cows. Both of these groups lose as many as 18 per cent. of their numbers in an ordinarily severe winter, whereas the average loss for the herd as a whole is less than 6 per cent.

The conversion of practically all the Jackson Hole area into a game range is not unattended by difficulties. All the various interests involved wish to see the elk herd prosper, and are willing to cooperate toward that end. There are, however, several problems in land economics that have to be met in the acquisition of the ranch lands and their restoration to public ownership, and it is toward the solution of these that the efforts of the commission are now being directed.

ANTHROPOLOGICAL EXPEDITION TO AUSTRALIA

NATIVES of Australia who still live as prehistoric men of the Old Stone Age will be sought out for study by an expedition from the University of Pennsylvania Museum, it is announced. Dr. D. S. Davidson, who will lead the expedition, will leave for Australia this month to spend two or more years there.

"The Australian tribes have many physical features similar to those of the Neanderthal race which inhabited Europe about 50,000 years ago, and it would seem that they have not advanced from that time to this," according to Dr. Davidson.

The Australian aborigines have no clothing, even in regions where the climate is far from tropical, he explained. They have no domestic animals, and raise no crops, but eat chiefly game and wild fruits and vegetables. They live in temporary huts which offer little protection from rain or cold, and have no knowledge of pottery or basket-making. Clubs and spears are their only weapons.

The fact that the Australian tribes do not use the bow and arrow, which is one of the most important inventions of early man, would seem to indicate that they must have emigrated from the mainland of Asia before the bow and arrow was known, hence in very remote antiquity.

One puzzle which anthropologists have not solved is why a people with such primitive economic standards should have an extraordinarily complex social system. The regulations and procedures governing ceremonies, marriages and social groupings are perhaps the most involved of any living race.

The Australian tribes are fast disappearing. Dr. Davidson will not only gather as much information as possible about the remaining groups, but he will also seek traces of tribes which once occupied Australia and have become entirely extinct.

ITEMS

PARA rubber trees planted by the Department of Agriculture in Florida are making encouraging progress, according to a report recently given to the Appropriations Committee of the House by Dr. Karl F. Kellerman, associate chief of the Bureau of Plant Industry. The oldest trees in the experiment are four years old. The department has discovered that young rubber trees in such a climate as Florida's must be protected by lattice work. The trees will grow about as well as they do in Haiti, Dr. Kellerman believes. The growth in Haiti is satisfactory, inasmuch as the trees produce as much rubber as they do when grown in the tropics, though they do not seem to be quite so vigorous. A new type of rubber plant from Madagascar is being grown in the department greenhouses and in the Southwest, Dr. Kellerman says. This rubber is known as *Euphorbia intisy*. Growing in its wild state, it formerly produced a superior rubber of the Para type, for which purchasers would pay three or four times as much as they would give for any other rubber.

BY his fruitfulness and cunning the wild boar of Europe, traditional pièce de résistance at Christmas feasts, is managing to hold his own in spite of the lack of protective game laws of any kind. In eastern Germany, particularly in Brandenburg and Pomerania, the land owners appreciate the value of the boar to the forests and see that it is not hunted down too closely. Eighty-five per cent. of injurious forest insects and small animals are estimated to have been destroyed by the boar. In west and south Germany, however, the asset of the boar to forest lands is not so well understood, upwards of 12,000 boars having been killed in Germany in 1925.

TRAVELERS to the south of England for winter holidays may now count on the benefits of the vacation beginning almost the moment they board the train. For its Cornish Riviera express service, an enterprising railway has fitted all its cars with window glass permeable to ultra-violet light. In this way passengers are assured the full value of the sunlight as they travel. The Cornish Riviera is so called because Cornwall, in the extreme south of England, has pleasant, mild winters with more than the average amount of sunlight. It is a favorite winter resort where inhabitants of fog-ridden, smoky cities go for intensive doses of sunlight and health-giving ultra-violet rays.

ONE of the moulds (a Penicillium) has been found to kill cultures of some bacteria, notably pus-forming cocci and diphtheria bacilli. This interesting news comes from Dr. Alexander Fleming, of the laboratory of the inoculation department, St. Mary's Hospital, London. The mould is similar to the common fungus that sometimes spoils oranges and other fruits. Even when cultures are filtered, the resultant liquid which is called "penicillin" is effective. It can be kept for some time if it is neutralized, but, if not, it loses its power after from 10 to 14 days at room temperature. It does not affect all bacteria; for instance, the typhoid group is resistant to its action; on the other hand, staphylococci, streptococci and diphtheria bacteria are killed rapidly. Penicillin is not toxic to animals even when given in large doses, and it is also non-irritant. It is therefore possible that it may turn out to be a useful antiseptic for combating infections caused by certain pathogenic bacteria.

HOW one of the large Hollywood motion picture laboratories has turned its tanks of old developing solutions into a silver mine yielding $6,000 a month is told by the Bureau of Standards. The emulsion on undeveloped film consists largely of silver, associated with bromine to form silver bromide. When developed, the silver bromide that has been exposed to light changes to metallic silver. In the fixing bath, the unchanged silver bromide is dissolved out, leaving clear spaces where the film was in darkness. Every pound of silver bromide contains over nine ounces of silver. Though miles of film are run through the solutions weekly, and they contain large quantities of silver, they were formerly thrown into the sewer when their power was exhausted. Now, by a simple chemical process, the silver is recovered, and sold to the U. S. Mint at San Francisco. Old film is also burned to recover the silver, and sometimes yields as much as $1,000 worth of silver a month in addition.