SCIENCE NEWS

HOW TO OBSERVE THE COMING ECLIPSE OF THE SUN

Science Service

EVERY one can have the thrills of an astronomer during the coming eclipse of the sun on Monday, September 10.

This great astronomical event will be visible in its partial phase in all parts of North America, and although the darkening will be total in only a small part of California and Mexico, the amateur can make many observations at home without the trouble of traveling to this area.

Amateur observations, like those of professional astronomers, can be both visual and photographic.

Plan your program carefully in advance of the eclipse time. Pick out a location from which the sun will be easily visible and where no smoke, dust or clouds are likely to obscure the spectacle.

Dozens of crescent suns can be observed if you will look under shady trees and on tree shaded walls while the eclipse is in its partial phases. These images, with the horns of the crescents turned in an opposite direction to those of the sun above, have a striking appearance. Tiny holes in the leaves act as lenses, as they do in pin-hole cameras, and form the images with the ground or wall as a screen. In ordinary times when the sun's light is not in conflict with the moon, the sunlight filters through the leaves in a series of tiny, overlapping disks on the ground, each round since it is an image of the sun. In photographing the crescent images of the eclipse period, an ordinary snapshot exposure with a large stop in the lens may be used. These exposures should be developed full time. Because of the fact that the images obtained with ordinary hand cameras will be quite small, it is recommended that enlargements be made and these enlarged pictures should prove very attractive.

For observing the sun directly, the old and tried method of smoking a piece of glass over a fish-tail gas jet or with a candle will prove satisfactory. This smoked glass should be prepared before the time of eclipse so as to obtain a carbon coating of proper density. Dark spectacles will be popular with those who do not wish to get their hands dirty. A photographic film or plate that has been exposed to light and developed can also be used.

With such eye shields it will be possible, by beginning observations a few minutes before the predicted time of eclipse, to check up on the actual time that the moon first infringes on the sun's disk. The magnitude of the eclipse, or the amount of the sun's diameter that is covered by the moon can also be estimated through the protectors and also the time that the moon passes off and ends the eclipse should be noted. A drawing of the sun showing the location of the points at which the eclipse began and ended would be an interesting record.

The eye strain of looking directly at the sun can be obviated by using the pin-hole method of observation. A hole is punched with a fine needle through a piece of cardboard or dark film and a smooth white card is used as a screen. The needle-hole acts as a lens since it is so small. Rays from opposite edges of the sun pass each other in going through the hole and the result is a perfect image of the sun on the cardboard screen that can be enlarged if desired with a small magnifying glass. This simple apparatus can be constructed and tried out on the uneclipsed sun.

To get the most effective and interesting photograph of the partial eclipse, a series of exposures should be made at intervals of say five minutes covering the duration of the eclipse. For this the camera should be placed on a tripod, the legs of which are arranged so that the camera points upward sufficiently to show the image of the sun in the upper right corner of the Kodak finder. All preparations should, of course, be made before the eclipse starts.

In localities where the eclipse starts with the sun low enough in the sky, it would add to the pictorial value of the picture to include the horizon line in the picture area. As to exposure, it is suggested that the smallest stop be used in the lens and that the shutter be set for the fastest speed. Then make one exposure every five minutes without turning the film for the duration of the eclipse. A single exposure can, of course, be made of the eclipse, in which case, the camera can be held in the hands, but a succession of images at equal distances apart will make a more effective showing.

A color filter would aid in preventing overexposure if the day is unusually clear, and the atmosphere free from haze. No change should be made, however, in the stop and shutter speed combination mentioned above, even if a very deep colored filter, such as the "G," is used on the lens. In place of the filter a piece of film that has been flashed to light and developed to a good density could be used in front of the camera lens to prevent overexposure. It is also recommended, that if the sun is not obscured by clouds, that the time of development be reduced to one half of that which would be given normally.

Where the eclipse is total, however, the camera should be placed on a tripod and a succession of exposures of 2, 5, 10, 20, 40 and 60 seconds made, the film being wound a complete turn of the winding key between each exposure. A filter or piece of film need not be used in front of the lens when photographing a total eclipse. Such a series of exposures just mentioned should give interesting studies of the eclipse and the sun's corona. The corona can neither be seen nor photographed except where the eclipse is total. A record could be obtained with a pin-hole camera, but to make a really successful camera of this sort requires a little knowledge of photography and would necessitate some previous experimenting as to exposure time.

The common box camera equipped with lens and shutter will make excellent pictures. Motion-picture cameras could be used, exposing at intervals several feet of film during the partial eclipse and cranking continuously during the several minutes of totality. An amateur motion-picture camera, like the new Cine-Kodak, could be used.

GIANT FOSSIL REPTILE TAKEN TO CAPITAL

Science Service

DIPLODOCUS, the gigantic eighty-five foot long reptile which over eight million years ago waded through the swamps of what is now Utah, has just arrived in Washington. Dr. C. W. Gilmore, paleontologist of the U. S. National Museum, has reached here with the twenty-five tons of sandstone and fossil remains of this monster which were chiseled from the cliffs near Vernal, Utah, and hauled 152 miles across the mountains to the railroad.

Five years will probably be required to free the fossilized bones from the stone in which they are imbedded and mount the huge skeleton in the position in which it probably stood when alive. When completed it will be made the central feature of one of the large halls of the museum.

Some eight to twelve million years ago, this fossil creature was alive from the end of its slender tapering tail to the top of its head on its long neck and stood fourteen to sixteen feet high at the hips. It could stand in water forty feet deep with its feet on the bottom and thrust its head above the surface. It is estimated that alive and in its skin it weighed from sixteen to eighteen tons.

Since its time, rocks have been laid down burying the lagoons and swamps in which it lived some 10,000 feet below the most recent strata. The forcing up and folding of the layers of rock to form mountains brought these ancient rocks up to where the fossils were found, a locality set aside some years ago as Dinosaur National Monument and from which the Carnegie Museum of Pittsburgh has taken many specimens of the same species.

What were once low swamps have been raised during the ages to 4,000 feet above sea level. After cutting the fossils and their surrounding sandstone from the cliff, the twenty-five tons of material representing the remains of this swamp-living creature were carried 5,000 feet higher to get them across the mountains to the railroad 152 miles away.

One of the seventeen vertebrae of the neck of the diplodocus was three feet long, while one of the pelvic bones weighed, as boxed, nearly 2,000 pounds. For shipment the fossils were roughly hewn out of the stone, and much careful work will be required to remove the remaining rock from around the fossilized bones.

THE "DEVIL'S GRIP"

Science Service

"DEVIL'S GRIP" is an infection but the elusive germ that does the work is still at large. This sums up the status of the inquiry into the cause of this strange disease now prevalent in Virginia, as reported by Dr. George C. Payne, epidemiologist of the Virginia State Board of Health, and Charles Armstrong, past assistant surgeon in the United States Public Health Service.

The epidemic appears to be confined to rural communities and to be spread within families by contact. Children are more frequently attacked than adults. The symptoms point to an inflammation of the surface of the diaphragm and the disease might be called, technically, epidemic transient diaphragmatic spasm, and is quite possibly related to some of the other infectious conditions which follow the epidemics of influenza.

The condition was first reported by Dr. Maud M. Kelly, of the State Board of Health, of Virginia last month. She had seen a number of persons in Hanover County who had recently suffered from an illness characterized by an acute onset, with abdominal pain but without the usual history of summer digestive disturbances. On July 21, similar cases were reported in Carolina County and since that time they have appeared throughout the northeastern part of the state. Cases have been reported by thirty-eight physicians from twenty-two counties. A similar disease appeared in Virginia in 1888 and was described by Dr. W. P. Dabney under the name "Devil's Grip." His paper was called, "An account of an epidemic resembling dengue which occurred in and around Charlottesville and the University of Virginia in June, 1888." The attack comes on suddely with severe abdominal pain which later extends to one or both sides of the lower part of the chest cavity. Breathing is difficult and rapid. The temperature rises in practically all cases and there is intermittent pain. Most of the patients perspire freely. The pain is increased on movement and in some cases by swallowing. In general, the patients are constipated, but the condition is followed by diarrhoea. Most of the patients complain of headache and pain in the back. After from four to ten hours of severe pain and difficult breathing, the condition begins to subside, but there may be relapse. Most of the patients recover without any secondary complications.

INFANT MORTALITY AND ITS CAUSES

Children's Bureau, U. S. Department of Labor

RESULTS of an extensive investigation into infant mortality and its causes in Baltimore, Maryland, have just been made public by the U. S. Department of Labor through the Children's Bureau.

This study is the latest and in many respects the most important of the infant mortality studies made by the bureau (previous investigations having been made in Johnstown, Pa., Manchester, N. H., Waterbury, Conn., Brockton, Mass., Saginaw, Mich., New Bedford, Mass., Akron, Ohio, Pittsburgh, Pa., and Gary, Ind.).

The Baltimore study is especially important because Baltimore is the largest of the cities studied, and also because it is, in its population, the variety of its industries and the rate of infant mortality prevailing, a typical American city.

Poverty, employment of mothers outside the home, housing below the proper standard, short intervals between births, and the death of mothers at or soon after child-birth were among the conditions causing high death rates among certain groups of babies under one year of age, in Baltimore. Similar conditions were found responsible for high infant mortality rates in other cities.

A summary of the findings of the Baltimore report is as follows:

The mortality in the entire group of 10,797 legitimate

births studied was approximately the same as the infant mortality in the cities of the United States birth-registration area for the same year.

Mortality rates markedly above the average for the entire Baltimore group occurred among the colored families, foreign-born Polish families, and the very poor native white families.

Low mortality rates—approximating those in New Zealand, which has the lowest in the world—were found among the babies of foreign-born Jewish mothers and in families of the highest earnings groups.

Breast-fed babies in every group of the population had lower mortality than artificially-fed babies in the same group.

New evidence is afforded by the Baltimore study that poverty is an important factor in infant mortality. Eliminating differences in color and nationality and considering only the babies born to native white mothers, the facts showed that infant mortality rose as the fathers' wages fell. In the poorest families studied about one baby in six died within the year; in the most prosperous families about one baby in twenty-six died within the year.

Employment of the mother away from home during pregnancy (which was chiefly in factory work) was accompanied by a high percentage of premature births and high infant mortality, especially from the causes peculiar to early infancy. Employment of mothers away from home during the first year of their babies' lives also markedly increased the hazard to the baby. Room congestion and lack of sanitary equipment in the house were accompanied by death rates above the average.

First-born babies had a mortality slightly higher than second or third babies, but among the later orders of birth the mortality rose steadily.

Babies of mothers under twenty and of mothers of thirty-five years or older showed higher mortality rates than other infants.

Births following a preceding birth by an interval of less than two years had a higher mortality than births occurring after a longer interval.

The babies born to the 105 mothers who died within the year following the babies' birth had the highest mortality in the entire group. When the mothers died within two months after the babies' birth, the infant mortality rate became six times as high as the rate for babies whose mothers lived.

TRANSMUTATION OF THE ELEMENTS

London Times

NEXT month, at Liverpool, we shall expect to hear from Sir Ernest Rutherford, president-elect of the British Association, some account of his recent progress in transmuting elements and liberating sub-atomic force. What he is known to have accomplished already may be stated shortly. Of the eighty-seven known chemical elements, hitherto in practice, if not in theory, ultimate pieces of matter, distinctive moulds into which the stuff of the universe in cast, he has succeeded in transforming six—boron, nitrogen, fluorine, sodium, aluminium and phosphorus.

His method has been to knock chips from the atoms of these elements; the fragments removed are not scraps of unknown or indeterminate matter but are definitely known substances; the mutilated atoms also are not unknown, or indeterminate matter, but are the atoms of other known elements, lower in the scale than those from which they have been dislodged. In the process energy is liberated, which Rutherford did not put into his apparatus, and which can have no other source than the sub-atomic energy until now securely locked up against human effort.

But let it not be thought that his discovery is yet ready to form the basis of economic processes. He has had to employ radium, the rarest and most valuable of all known substances, and he has worked on a scale infinitely minute. The triumph, so far, has been purely scientific, but it is among the three or four greatest and most startling of the conquests of natural knowledge.

There are now known to be ninety-two species of elements, which, studied by Moseley's method of X-ray spectral analysis, can be arranged in an orderly series from 1, Hydrogen, the lightest, to 92, Uranium, the heaviest. Of these, all but the five occupying numbers 43, 61, 75, 85 and 87 have been isolated and their chemical properties studied. The unit of the different elements is an atom, but the atom of each element is a different arrangement of a common stuff. It consists of a complex nucleus surrounded by satellites termed electrons. Hydrogen, No. 1 in the scale, has only one satellite electron, and each successive element differs from its lower neighbor by having one more electron satellite, until Uranium is reached at the top with 92 electrons. The one, or many, satellites revolve at a relatively great distance from the nucleus, the space occupied by their orbits being many thousand times that occupied by the nucleus. They have a vast importance in the chemical qualities of the atom, but the essential difference between one atom and another resides in the nucleus.

The nucleus of an atom is a closely bound assemblage of nuclei and electrons. It is of such a kind that the nucleus of helium contains only hydrogen nuclei, together with electrons, and the nucleus of each higher element consists of so many helium nuclei with either two or three hydrogen nuclei. It may be said that a prophetic guess by the English chemist Prout has now been proved. All the elements are built up of hydrogen. But the unit is not the atom of hydrogen, but the nucleus of that atom, and there is another factor, unknown to Prout, the electron, or unit of negative electricity.

The radio-active elements disintegrate spontaneously, throwing out helium nuclei and electrons, and in so doing changing from one element to another. But these elements are extremely rare and break up extremely slowly, so that, so far as their effect in the every-day world goes, they are of little except theoretical importance. None the less, in their decomposition they unloose sub-atomic energy, and in proportion to their mass eject the most powerful missiles that are known. The substance known as radium-C, for example, throws off what are known as

alpha particles. These are helium nuclei shot out at a velocity of 12,000 miles a second, and, mass for mass, with about four hundred million times the velocity of a rifle bullet.

Sir Ernest Rutherford has used these missiles to bombard the atoms of a large number of elements. Only very few of the shots take effect, but a certain very small proportion penetrate the orbits of the satellite electrons and reach the nucleus itself. In the case of the six elements already mentioned, when a shot does take effect it chips off a piece of the nucleus; the piece broken off in each of the six cases has been proved to be a hydrogen nucleus and the remaining piece becomes a new element. Thus the building up of matter from hydrogen has been experimentally proved, and on a minute scale the transmutation of some of the elements has been accomplished.

The forces liberated can be measured accurately by measuring the distance to which the moving particles travel and the resistances which they overcome on their journeys. If an ordinary missile hit a target, break off a piece and carry it forward, momentum is lost in the impact and the missile and the broken fragment will together travel for a shorter distance than if the target had been missed. But the alpha particle, with the hydrogen nucleus which it has broken off, travels farther and is able to overcome more resistance than the particle before its impact. The only source of the energy gained is the sub-atomic energy of the particle.

SAFETY IN MINES

TWELVE thousand coal miners are being trained annually by the government in safety methods of mining, rescue and first-aid work, according to an estimate made by the Department of the Interior through the Bureau of Mines.

Ten mine rescue stations and ten safety stations are now being maintained throughout the mining sections of the country that assist in rescue and recovery operations in mine disasters. In addition the Interior Department maintains nine rescue automobile trucks that have proved of great value for quickly rushing to nearby accidents and for mobile training units in regions not easily reached by rail.

The miners trained by the government form a nucleus of safety crews in the mining industry and most companies now maintain efficient and well organized safety departments with privately operated rescue stations. A useful agency in maintaining interest among miners is the Joseph A. Holmes Safety Association which was organized by the Bureau of Mines of the Interior Department and now has chapters all over the country.

The purpose of the organization is to prevent accidents, improve health conditions, facilitate training in mine rescue, first aid and safety methods and promote recreational activities. Government engineers also investigate all coal mines in which disastrous explosions or fires occur, and make a detailed study of the conditions to determine the way in which the fire or explosion originated. Recommendations are then made to the mine operator, as to what steps he should take for preventing any future recurrence.

In the past 14 years 300 coal-mine disasters have been studied, and the records constitute an invaluable guide on the causes and mode of occurrence. Large-scale tests of the explosibility of coal dust and mine gases, conducted over many years, in the department's experimental mine near Pittsburgh, the only underground mine in the world dovoted to experimental work, have conclusively demonstrated to mine operators the fact that coal dust is an explosion hazard, alone or with gas present.

The Interior Department also has determined the exact degree of explosibility of representative dusts from hundreds of mines, and the proportions of inert dust which must be added to render the coal dust harmless, the effectiveness of sprinkling the roadways and walls, adding moisture to the intake air and other means of combating the menace.

ITEMS

Science Service

TWO of the world's largest airships will be added to the air force of the navy this fall. About September 1 the ZR-1, gigantic all-American built ship now being inflated with helium gas in its hangar at Lakehurst, N. J., will be launched, the Bureau of Aeronautics of the U. S. Navy Department has just announced. Some time in November the still larger ZR-3, now nearing completion in Germany, will probably be flown to this country for delivery to our government. Both ships are to have their home in the huge hangar at Lakehurst. Hydrogen gas will be used by the German builders of the ZR-3 in the transatlantic flight to deliver the big ship. When turned over to the United States, it will be refilled with the non-explosive helium gas for actual service. The ZR-3 will be slightly larger and somewhat heavier in appearance than the ZR-1 built in this country. It will be 660 feet long, while the ZR-1 is 680 feet in length. But, although twenty feet shorter, it will have a diameter of 92 feet as compared to 79 feet, the diameter of the ZR-1. It will have a total gas capacity of 2,400,000 cubic feet as against 2,100,000 cubic feet gas capacity of the American built ship. The German built craft will be driven by five Maybach 400 horsepower engines, while the power plant of the ZR-1 consists of six 200–300 horsepower Packard engines.

THAT creosote oil offers the first practical method yet discovered for protecting the crudely built homes of negro tenants on many farms in the southern states from malaria-carrying mosquitoes is indicated in a preliminary report of experiments in Yazoo County, Miss., by C. P. Coogle, acting assistant surgeon of the U. S. Public Health Service. Observation of the difference in numbers of mosquitoes under creosoted timber bridges of a railroad and on the untreated timbers of bridges on a parallel county road near by led to the discovery.

TWENTY miles of pearl oyster beds that will begin to yield in 1926 have been discovered in the Gulf of Mannar, at the lower tip of India. Government officials in India predict that the largest pearl fisheries of a century will develop. The new beds are directly opposite the ancient fisheries of Ceylon exploited by the Greeks and Romans.