ASTRONOMY

Eclipse Will be Observed From Brazil and South Africa

Several Parties Already on Way to Points of Vantage In Southern Hemisphere; Special Apparatus Carried

DESPITE difficulties imposed by the war, astronomers and other scientists are taking their positions in South America and South Africa along the path where the next sun eclipse will be seen on Oct. 1. With the U. S. Navy so busy preparing for better national defense, the proposed expedition from the Naval Observatory in Washington has been called off. But at least four other American groups are either on the way, or preparing to leave.

One of these, from the Cruft Laboratory at Harvard University, has taken about ten tons of equipment to Queenstown, South Africa. Much of this is electrical and radio apparatus, for study of the behavior of radio waves at eclipse time is one of their principal aims.

To Measure Ultraviolet

Dr. J. A. Pierce, who is in charge of the party, has explained that one of their researches will measure the amount of ultraviolet light from the sun which is absorbed in the upper atmosphere. This absorption knocks electrons from the gaseous atoms. These free electrons form layers which reflect radio waves as a mirror does light. They are important to long distance radio communication for otherwise the waves would spread out into space, and would not bend around the earth's curvature.

The number of such electrons in a cubic centimeter can be determined by finding the shortest radio wave that will be reflected. Their height above the ground is obtained by broadcasting a series of very short radio impulses. A receiver alongside the transmitter receives these signals, first directly, then after they have been reflected, a minute fraction of a second later. The time difference is greater, the higher the reflecting layer.

As the moon's shadow passes through the atmosphere, 100 to 200 miles above the ground, the ionization, or breaking off of electrons, is changed, and this will be studied by the observers. Since there are large variations from other causes, it will be necessary to make observations for a total period of about three months, to show the normal conditions with which the eclipse data may be compared.

Clear weather is likely at Queenstown on the afternoon of the eclipse but, unlike the astronomers, these observers do not mind clouds, for the radio waves penetrate them freely. However, for record purposes, and also to check the timing, a complete motion picture film of the eclipse from beginning to end will be made. The total phase of the eclipse, when the moon will completely hide the sun, will last about 3 minutes 10 seconds at this location.

Use "Ash Can" Camera

Other American parties will be in South America, near Recife (formerly Pernambuco), Brazil. A powerful star camera, familiarly called the "ash can," will photograph the eclipse from Quixeramobin. It will be used by a party from Brown University, under the leadership of Dr. Charles H. Smiley, director of the Ladd Observatory.

Optical parts of the instrument, known as a Schwarzschild camera, are mounted in an aluminum cylinder four feet long and 15 inches in diameter. Thus comes the undignified name applied to it by the astronomers. At the bottom of the tube is a twelve-inch diameter aluminum-coated concave mirror, which reflects the light of a heavenly body to a second smaller six-inch mirror 45 inches above. This sends the light back through a hole in the main mirror, where it falls on a circular film, two inches across.

In general, the path of the light is the same as in the Cassegrain telescope often used by astronomers, but the curves of the mirrors are different. A much wider angle of view is thus obtained, for the area covered will be about 36 times the diameter of the sun. Named after the German astronomer who invented it in 1905, only one successful model has previously been made, by Dr. W. A. Cogshall, of the University of Indiana. Dr. Smiley's camera was constructed by a group from the Skyscrapers, Providence astronomical society, which is sponsoring his expedition jointly with the university.

Dr. Smiley hopes to use the camera to photograph the zodiacal light, a double wedge-shaped halo seen near the sun, and believed to come from myriads of minute particles circling around the sun. At an eclipse visible in Peru in 1937 he made photographs with another type of camera which seem to show the effect. The instrument used then, known as a Schmidt camera, will again be employed this year.

Near Center of Path

Another expedition departed recently when a party under the joint auspices of the National Bureau of Standards and the National Geographic Society started for South America. They intended to go first to Recife and then travel some 200 miles inland to the village of Patos.

Only five miles south of the central line which the moon's shadow will trace across the earth, this location offers many advantages. The sun will be covered for nearly five minutes. The chance of cloudy weather interfering is minimized because the site is in a high, dry plateau region. An American cotton company has a gin at Patos, and thus mechanical and electrical facilities will be provided that might otherwise be difficult to obtain.

Observations of the sun's corona, seen best at eclipse time; spectroscopic studies of the solar atmosphere; a color motion picture of the entire eclipse, including partial phases, from start to finish, and measurements of the behavior of radio waves in the moon's shadow will be some of the problems investigated by the group. To accomplish this, seven and a half tons of equipment, including cameras, spectrographs, clocks, motors, batteries and radio apparatus, will be transported to Patos by truck from Recife.

Robot Program Clock

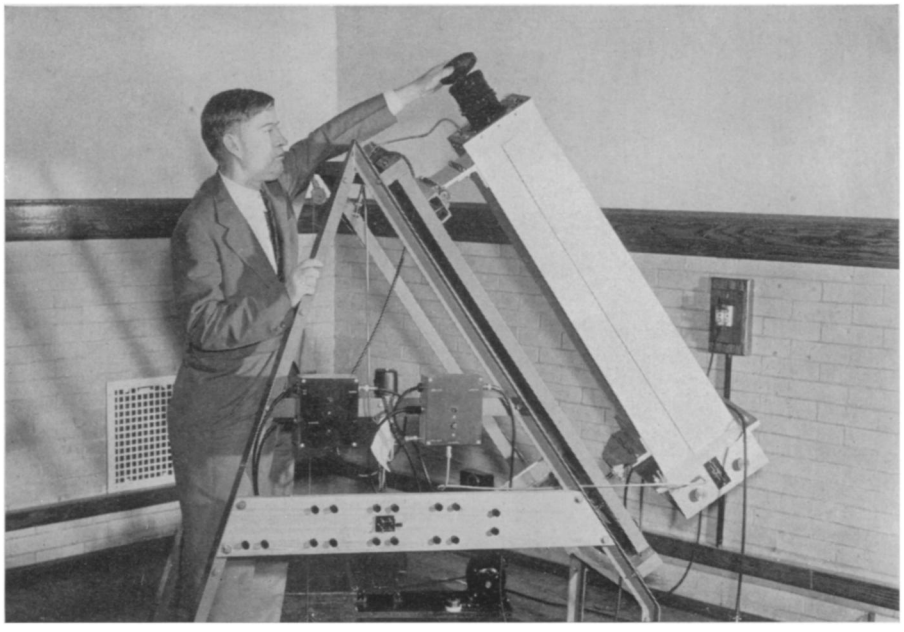
A novel feature will be an automatic program clock which will make sure that camera shutters are opened and closed, switches turned on and other operations performed at the precise instant during the fleeting moments of totality. After the exact schedule has been determined, a roll of paper, something like that of a player piano, will be punched with holes. As this is unwound by a motor, metal fingers will feel the holes, and close electrical circuits to operate the equipment. Some fifty years ago, at an eclipse in Africa, and later at one in Japan, Prof. David

Todd used a similar idea, operated pneumatically, like the player piano. Probably because of its complexity when air-operated, it has never been used since.

Dr. Irvine C. Gardner, chief of the optical instruments section of the National Bureau of Standards, will head the party. Accompanying him are Dr. E. O. Hulbert, of the Naval Research Laboratory; the Rev. Dr. Paul A. McNally, S. J., director of the Georgetown University Observatory; Dr. Carl C. Kiess, spectroscopist, and Dr. Theodore R. Gilliland, radio research specialist of the Bureau; and Richard H. Stewart, staff photographer of the National Geographic Society.

In addition, a group from the Amateur Astronomers Association, in New York, led by Charles A. Federer, Jr., editor of the magazine *Sky,* will leave early in September for Campina Grande, Brazil, a city of about 90,000, through which the National Geographic party will pass on their way to Patos.

Science News Letter, September 7, 1940



TO PHOTOGRAPH THE HIDDEN SUN

Dr. Irvine C. Gardner, leader of the National Geographic Society-National Bureau of Standards Solar Eclipse Expedition, makes final adjustments to one of the specially built cameras with which the expedition will photograph the eclipse on Oct. 1. The camera will take 12 to 15 photographs of the corona, the halo that extends outward around the sun but which can be seen only during total eclipses, during the moon's five-minute blackout of the sun.

GEOLOGY

Life Founded Upon Rock, Is Argument of New Book

ASK FOR bread, and you must first receive stones. For there can be no bread without there first being stones.

Such is the argument which opens the first chapter of a new volume, *The Rock Book,* by Dr. Carroll Lane Fenton and Dr. Mildred Adams Fenton.

Rocks, declare the Fentons, "decide what shape the earth shall have, how its outer part shall shift and what its surface shall look like. They also determine what plants and animals shall do on this planet, telling where, when and how they may live."

This claim is substantiated by rapid examples: Plants must have minerals, which can come only from dissolved, broken rocks. Animals' habitats are determined in one way or another by rocks, from the barnacle on the seashore ledge to the cony among the tumbled mountain stones. Man himself has lived successively in rock caves, stone-built castles, and apartment houses of reinforced concrete—which is an artificial stone. A modern knowledge of rocks (and their offspring, soil) is indispensable for successful farming, mining, engineering, industry of all kinds. Life indeed is founded upon rock.

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An insect "zoo" of living *pests* that damage crops was a feature of the New York State fair at Syracuse in August.

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set of records pronounced unique in American archaeology.

In Oklahoma, to take another example, Indian villages and cliff dwellings in the path of Grand River Dam are being examined while they can be, by WPA workers directed by Dr. Forrest E. Clements of the University of Oklahoma. Indians of Oklahoma are shown here as trading with tribes as far away as the Gulf of Mexico. They are also shown as skilled in cloth making and many crafts. No more than six months of exploration is expected at one area, where the work of the dam will have to proceed.

Mexico, like the United States, is keeping up its archaeological field work in more or less usual manner, with the excavation and repair of Indian temples, pyramids, and monuments.

Rated one of the youngest sciences, archaeology has made amazing strides in the Herculean task of digging up buried history the world over, and some archaeologists think it a good thing to have a breathing spell from so much digging. Now is the time, they philosophically say, to study valuable evidence that has been unearthed and carried safely to laboratories, and to write more fully what it all means.

Science News Letter, September 7, 1940

Alaska bought more than $44,000,000 worth of goods from continental United States last year—a record.

● RADIO

E. K. Cohan, director of engineering of the Columbia Broadcasting System, will describe the new 50,000-watt transmitter to be constructed on Long Island Sound, as guest speaker on "Adventures in Science" with Watson Davis, director of Science Service, over the coast to coast network of the Columbia Broadcasting System, Thursday, Sept. 12, 4:00 p.m. EDST, 3:00 EST, 2:00 CST, 1:00 MST, 12:00 PST.

Listen in on your local station. Listen in each Thursday.