ASTRONOMY

Few Astronomers Actually See Eclipse While Observing

Exacting Tasks in Dark Rooms at Ends of Long Cameras Will Claim Attention of Most of the Scientists

SPECTACULAR as will be the total eclipse of the sun visible in eastern Canada and New England on Wednesday afternoon, August 31, most of the astronomers along the path will be too busy to pay much attention to its beauties. Their time, in the brief hundred seconds during which the moon will cover the sun, will be occupied in taking photographs which they will study for months, and even years, to come. Few of the astronomers will be able to give the eclipse itself more than a passing glance, and some will actually have to work during the precious moments in a dark room at the end of a long camera, where they will not see the eclipse at all! (*SNL, July* 30, '32).

The cameras will be of all varieties and sizes. Largest will be one 85 feet long, which will be set up at Conway, N. H., by a party from the Franklin Institute, Philadelphia. This will be mounted horizontally, a clock-moved mirror reflecting sunlight into the lens. Two cameras of 65-foot length will be used. One will be erected by the party from the U. S. Naval Observatory, at Limerick, Maine, the other by the group from the Sproul Observatory of Swarthmore college, which will be erected at Derby, Vermont. These will be constructed on a slant, pointing to the place where the sun will be at eclipse time. The motion of the sun in the sky, caused, of course, by the daily rotation of the earth from west to east, has to be allowed for, however. In two minutes the sun moves its own diameter. A camera more than 60 feet long can not be turned so readily as one of more modest dimensions, so the plate on which the picture is taken is itself arranged to move, keeping the image of the sun fixed on its surface.

With smaller cameras—that is, cameras small compared to the "Big Berthas" mentioned above, but large beside the ordinary kodak,—supplementary photographs will be made by the various expeditions. Some of these cameras will be as long as 12 or 15 feet, while others may be only as many inches. These will be mounted "equatorially." That is, they will be placed on a polar axis, which is exactly parallel to the earth's axis. Such an axis turns by clockwork, once a day from east to west, thus precisely compensating for the motion of the earth, and keeping the cameras mounted on it continually pointed to the sun. Some of these cameras will take ordinary black and white pictures of the sun's corona, visible only at a total eclipse. Others will make exposures in natural colors. Still others will expose motion picture film.

Some of the most important eclipse photographs will be made with the spectroscope, which analyzes light into its constituent colors. These will be of the corona itself, and also of the "flash" spectrum. It is by means of the flash spectrum that the astronomer studies the sun's outer layer, its "atmosphere." Though the gases in this atmosphere shine continually with a light that is really very brilliant, the inner layers of the sun are far brighter. The spectrum of the atmosphere consists of a series of bright colored lines, while that of the inner part is a continuous band of colors, changing from red at one end to violet at the other.

Just before and just after a total eclipse, there is an instant when the moon covers all the rest of the sun, but the atmosphere shines by itself. To illustrate this, take two quarters, and slide one over the other. The lower one represents the sun, the rim being its atmosphere, and the upper one the moon. Just before one coin completely covers the other, only the rim, and only a part of that, remains visible. At the moment this occurs in an actual eclipse, the spectrum of the light changes from the continuous band of color, crossed by dark lines, to a series of bright lines, separated by dark spaces.

Crescent Replaces Slit

In the ordinary spectroscope, the light shines first on a narrow slit, and the resultant spectrum is really a series of images of the slit, in different colors. But with observations of the flash spectrum, the slit is not needed, the narrow crescent of light of the sun's atmosphere acts as a slit itself, and the spectrum shows a series of images of this C-shaped crescent, each representing a certain color, or wavelength. But some of the crescents are almost semicircles, others are short arcs. Look at the coins again, and you will see why this is. Place one over the other so that only part of the lettering, "Quarter Dollar," remains visible. Now you can see the tops of only the second R and the D, you can see the bottoms of all the letters, while you can see the rim half way around the coin. In other words, the farther the part of the coin is from the center, the more of it you can see,

Thus it is with the sun. The longer crescents of the flash spectrum are the gases that are highest, or farthest from the center, in the sun's atmosphere, while the short ones are lower. Thus, the flash spectrum enables astronomers to tell what gases the atmosphere contains, and where they are. They can also tell its height, which comes out at from 400 to 600 miles.