must be done in the interest of the working man himself, because the present administration of our form of insurance wastes enormous sums of money.

Of course we have very limited means for scientific investigations, but we still have enough for matters of the highest importance. Our real anxiety is for the future.

I have tried to draw in its varied aspects a picture of a great scientific man. It is happy to think that we may all learn many lessons from the life of such a man as Max Rubner. For the whole of the individual life in health and in disease depends upon the energy metabolism. And the whole of the life of the state, for weal or for woe, depends upon the ability to furnish sufficient calories in food to provide the energy required to maintain the individuals composing the state.

THE TOTAL ECLIPSE OF THE SUN OF AUGUST 31, 1932

By Professor FREDERICK SLOCUM

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THE total eclipse of the sun of August 31, 1932, will cross New England at the height of the vacation season and will attract not only the professional and amateur astronomers but a throng of others to the path of totality.

This path will be about 100 miles wide, extending down across Hudson Bay, the Province of Quebec and New England. A portion of the path is shown in Fig. 1. The eclipse will be total between the heavy lines. The dotted line marks the center of the path, where the duration of totality will be longest, ranging from 102 seconds north of the St. Lawrence River to 98 seconds on the Maine coast.

The duration of totality diminishes very slowly with the distance from the center line. Ten miles from the center line the duration is only 2 seconds less than the maximum; 20 miles from the center line, 8 seconds less than the maximum. On the northeast shore of Cape Cod the eclipse will be total for 60 seconds; tip of Cape Ann, 70 seconds; Portsmouth, N. H., 85 seconds; Portland, Maine, 92 seconds; summit of Mt. Washington, 99 seconds.

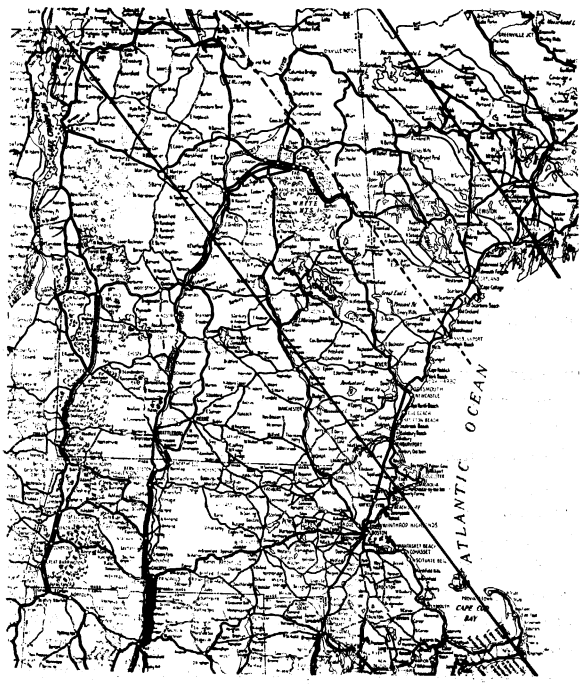

FIG. 1

For the White Mountain region the eclipse will begin at 2:19 P. M., Eastern Standard Time. The total phase will occur at 3:30 P. M. and the eclipse will end at 4:33 P. M. For places north of the mountains the corresponding times will be a few minutes less and south of the mountains a few minutes greater. For Daylight Saving Time add one hour to the above times. The moon's shadow will travel across New England at a rate of about 3,000 feet per second.

From weather observations made especially for the purpose during the past seven years, the probability of clear sky in Quebec and New England, except for the White Mountain region, is about 55 per cent. For the higher mountains it is somewhat less. Even if the forenoon is clear, cumulus clouds may form in the afternoon, with broken masses of sufficient density to obscure the sun. There are so many days of this type in August and September that the scientific expeditions will be widely scattered along the line to distribute the risk of clouds. A partial list of eclipse expeditions, with their locations and leaders, follows, in order of position from NW to SE.

PARTIAL LIST OF ECLIPSE EXPEDITIONS, LOCATIONS AND LEADERS

Parent, P. Q. Royal Observatory, Greenwich, England, Dr. J. Jackson; Dominion Observatory, Ottawa, P. Q., Director R. M. Stewart.

St. Alexis, P. Q. University of Toronto Observatory, Professor C. A. Chant.

St. Lawrence River, P. Q. Paris and Marseilles Observatories, Count A. de la Baume Pluvinel.

Montreal, P. Q. McGill University, Professor A. S. Eve; University of London, Professor A. Fowler.

Magog, P. Q. Solar Physics Observatory, Cambridge University, England, Professor F. J. M. Stratton; Leander McCormick Observatory, University of Virginia, Professor S. A. Mitchell; Royal Astronomical Society, London, Group C.

Derby, Vt. Sproul Observatory, Swarthmore College, Professor J. A. Miller.

North Stratford, N. H. Cincinnati Observatory, Professor E. J. Yowell.

Lancaster, N. H. Mount Wilson Observatory, Pasadena, Director W. S. Adams.

Whitefield, N. H. Seagrave Observatory, Providence, R. I., Director F. E. Seagrave.

Bethlehem or Maplewood, N. H. Adler Planetarium, Chicago, Professor Philip Fox.

Mount Washington, N. H. "Science Service," Washington, D. C., Mr. Watson Davis.

Bartlett, N. H. Tokyo Imperial Observatory, Professor Okuroh Oikawa.

Conway, N. H. Franklin Institute, Philadelphia, Mr. James Stokley.

Center Conway, N. H. Van Vleck Observatory, Wesleyan University, Professor F. Slocum.

North Conway, N. H. Electric Testing Laboratories, New York, Dr. C. H. Sharp.

Fryeburg, Me. Lick Observatory, University of California, Professor J. H. Moore; University of Michigan Observatory, Professor H. D. Curtis; Dearborn Observatory, Northwestern University, Professor O. J. Lee; Georgetown College Observatory, Washington, D. C., Prof. P. A. McNally; Hood College Observatory, Frederick, Md., Professor Leah B. Allen; Goodsell Observatory, Carleton College, Professor E. A. Fath.

Douglass Hill, Me. Perkins Observatory, Ohio Wesleyan University, Professor H. T. Stetson; Warner and Swasey Observatory, Cleveland, Ohio, Professor J. J. Nassau; Royal Astronomical Society, London, Groups A and B.

Sebago Lake, Me. (Region of). Harvard College Observatory, Dr. W. J. Fisher.

South Limington, Me. U. S. Naval Observatory, Captain C. H. J. Keppler.

Biddeford, Me. Deering Observatory, Biddeford, Me., Mr. Frank Deering.

The various expeditions will be working upon one or more of the following problems:

(1) Accurate observation of the times of beginning and end of the eclipse and photographs of the crescent phase of the eclipse for a better determination of the relative position of the sun, moon and earth.

(2) The outline of the corona and the details of its apparent structure. This problem will be attacked by means of photographic telescopes of from 3 to 9 inches diameter and 20 to 80 feet focal length. By means of filters and plates sensitive to various colors, photographs will be taken in blue, yellow and red light.

(3) Chemical composition and physical nature of the chromosphere and corona. Powerful spectrographs will be used during the total phase of the eclipse and especially at the instant of beginning and end of totality.

(4) Light and heat of the corona. The apparent brightness of the corona and its gradation outward from the sun may be measured on the photographic plates, provided they are photometrically standardized. The photoelectric photometer and thermoelectric photometer will be used to measure the total light and heat and the polariscope to study the relative amount of intrinsic and reflected light.

(5) Rotation and internal motions of the corona. This will be studied by the displacement of the lines in the spectrum, by interferometers and by the comparison of photographs taken at different places and at different times.

(6) The appearance and motions of the "shadow bands" which appear just before the beginning and just after the end of the total eclipse.

(7) The effects upon terrestrial magnetism by the eclipse.

(8) Meteorological changes during the passage of the moon's shadow.

(9) Effects of the eclipse upon radio transmission.

(10) Psychological effects upon animals and human beings.

In order that the astronomers may have accurate time the U. S. Naval Observatory will send out special signals by radio from 1:55 to 2:00 P. M. and from 3:55 to 4:00 P. M., Eastern Standard Time, on August 31. These signals will be rebroadcast by Station WGY, Schenectady, and by Station WCSH, Portland, Maine, for those who are not equipped to receive the Arlington signals. WGY uses a frequency of 790 and WCSH of 940 kilocycles.

For the benefit of the general public special road maps, showing the region of the total eclipse, have been issued by the Socony Co., The New England Hotel Association, and the Publicity Bureaus of Maine, New Hampshire and Vermont. Eclipse folders giving data in regard to special trains, excursions, etc., have been put out by the New York, New Haven and Hartford and by the Boston and Maine railroads. Several auto bus companies have also announced their schedules for excursions to the eclipse area.

Local officials, Chambers of Commerce, etc., will cooperate with the transportation companies in finding suitable places from which the public may view the eclipse. Such places will, of course, not be near the camps of the scientific expeditions. The astronomers will require silence and freedom from annoyance of any kind in order to carry out their programs successfully in the few precious seconds that will be available.