5. Mean sea-level pressures, by 2-degree squares, to the nearest tenth of a millimeter. Isobars for every 2.5 millimeters.

6. Air temperatures, by 2-degree squares to the nearest tenth of a degree centigrade. Isotherms for every 5 degrees centigrade.

7. Ocean surface temperatures, same as for air temperatures.

8. Routes, trajectories of cyclones, limits of fog, ice, the trades and the monsoons (with a page of discussion in Dutch). In connection with discussions in Dutch there are additional charts in the text showing the frequency of fog in the northwestern North Atlantic, a storm weather map of the North Atlantic, and the frequency of gales in the Atlantic.—*C. F. B.*

## NOTES, ABSTRACTS, AND REVIEWS.

### RETIREMENT OF MR. HENRY E. WILLIAMS.

Mr. Henry E. Williams, some time Chief of the Forecast Division, was among the first employees of the United States Weather Bureau on duty in Washington, D. C., to be placed on the retired list, August 20, 1920.

Mr. Williams is a veteran of the Civil War, having had three years service as first sergeant in the 17th Connecticut Volunteers. Shortly after the close of the war he enlisted in the Regular Army. He received his discharge in 1876, and immediately enlisted in the United States Army Signal Corps. His combined military and civil service aggregates 52 years and 4 months, 44 of which were spent in the Weather Service.

The greater portion of Mr. Williams's tour of duty in the meteorological service was spent in the Forecast Division of the central office in Washington. While not himself a forecaster, being chiefly concerned with administrative matters in connection with the division, he had the unique experience of a close-up view of the forecasting activities of the Army Signal Corps and the civilian organization—the United States Weather Bureau—that succeeded it in 1891.

He was assistant chief of the Weather Bureau from July 1, 1903 to June 30, 1912. The position in which he was best known to the men of the service was however that of assistant instructor at Fort Myer, Va., during the eighties. It was his custom in making the daily trip between Georgetown and Fort Myer to ride a fine old gray mule. In the minds of those who attended the school, the recollection of Instructor Williams astride the gray mule continues to be one of the most highly cherished landmarks of the time.

Mr. Williams is one of the best known and highly esteemed men of the Weather Service. His associates unite in congratulating him upon rounding out more than a half century of useful service to his country.—*A. J. Henry.*

#### *Dr. Jesse C. Green, 1817–1920.*

Dr. Jesse C. Green, cooperative observer at West Chester, Pa., died on July 26, 1920, at the age of 103 years. His death was caused by an accident, a fall from a step ladder.

Dr. Green began keeping weather records at West Chester in January, 1855, and continued without interruption until the time of the accident that caused his death. It is believed that this individual record for more than 66 years is unparalleled in this country, if not in the world.

It was a cherished desire of Dr. Green's that the Weather Bureau should publish his records as a separate pamphlet, and they were compiled for that purpose, but unfortunately the available funds would not permit of the expense, and his hopes were never realized.—*George S. Bliss.*

### DR. G. C. SIMPSON BECOMES DIRECTOR OF THE BRITISH METEOROLOGICAL OFFICE.

[Reprinted from Science, London, August 5, 1920, p. 721.]

Dr. G. C. Simpson, F. R. S., Meteorologist to the Government of India, has been appointed Director of the Meteorological Office as successor to Sir Napier Shaw, who retires on reaching the age limit after brilliant pioneer service. Dr. Simpson was meteorologist and physicist to the British Antarctic Expedition, 1900–1913, and served on the Indian Munitions Board from 1917 to 1919. In 1905 he was appointed a Scientific Assistant in the Meteorological Office, and in 1906 joined the staff of the Indian Meteorological Department. He is the author of a number of papers of scientific importance, including one on the electricity of rain and its origin in thunderstorms, published in the Philosophical Transactions in 1909. Only last year Dr. Simpson completed an elaborate discussion of the meteorological work of the British Antarctic Expedition, 1910–1913. As successor to Sir Napier Shaw his appointment promises a continuation of progress along lines which will advance meteorological science and maintain the high position which the British Meteorological Office now occupies through its work in recent years.

### COOPERATION IN THE INVESTIGATION OF GEOPHYSICAL PROBLEMS IN HIGH LATITUDES.

[Reprinted from The Meteorological Magazine, London, July, 1920, vol. 55, pp. 121-122.]

The recent visit of Captain Roald Amundsen to Berings Strait has again directed general attention to his projected voyage across the Polar Sea. In spite of the difficulties of organizing international cooperation at the present time, it is hoped that a large number of stations will be provided at various points in high latitudes so that observations of meteorological and magnetic phenomena, and especially of the aurora borealis, may be available for comparison with those of Amundsen's party. The Meteorological Office is organizing an observing station in the Shetland Islands for the purpose.

A publication entitled "Various Papers on the Projected Cooperation with Roald Amundsen's North Polar Expedition" has been circulated from Christiania by the Norwegian Geophysical Commission. It contains memoirs on the importance of various parts of the work, and also practical suggestions with regard to apparatus and methods. The authors are Th. Hesselberg, O. Krogness, and Carl Størmer.

Of special interest in connection with the projected observations is the memoir by L. Vegard and O. Krogness on "The Position in Space of the Aurora Polaris," issued by the same Commission. The memoir is illustrated by no less than 434 pairs of photographs from which the height of the aurora has been determined on as many occasions. Even on the small scale of the reproductions the corresponding points on the photographs taken with cameras about 30 km. apart can generally be recognized. *An interesting novelty is the successful use of the kinematograph for auroral photography.* As to the results set out in the memoir, the most important appears to be a confirmation of the discovery that the lower limit of the draperies tends to fall at one or other of two somewhat closely defined levels, 100 and 107 km. above sea level, a discovery which must, in the opinion of the authors, almost inevitably lead to the conclusion that a predominant part of the cosmic rays coming from the sun and producing the aurora borealis is made up of two groups of rays, each of which has its own quite definite penetrating power.

The development of auroral photography in the Shetlands, the most promising region of the British Isles for the purpose, will be awaited with great interest.

## OCCURRENCE OF OZONE IN THE ATMOSPHERE.

[The Victoria University of Manchester, July 14, 1920.]

[Reprinted from Nature, London, July 22, 1920, p. 645.]

With reference to the lecture of Lord Rayleigh published in *Nature* of July 8 on "The Blue Sky and the Optical Properties of Air," the conflicting results obtained by chemical methods in the estimation of atmospheric ozone are recalled. I beg to direct attention to my paper on "The Occurrence of Ozone in the Upper Atmosphere" (Proc. Roy. Soc., 1914, A, vol. xc, p. 204), in which it is shown that a reagent of potassium iodine solution can be made to provide a basis for the distinction of ozone and oxides of nitrogen at high dilutions and enable the approximate estimation of the former. By this method it is shown that, in accordance with the conclusions of Lord Rayleigh, ozone is present in the upper atmosphere, the amount present at an altitude of 10,000 feet being *of the order of* $5 \times 10^{-6}$ parts per unit volume. Measurements made with sounding balloons up to altitudes of 20 km. also showed the presence of definite amounts of ozone, but no detectable increase between 4 km. and 20 km. The view was put forward that this amount of ozone must be taken into account in considering the optical properties of the sky.

An extension of these measurements was made with greater precision at the Mosso Laboratory on Monte Rosa at an altitude of 15,000 feet, where an average proportion of about $1 \times 10^{-6}$ parts per volume of ozone was found.—*J. N. Pring.*

## THE RELATIONSHIP BETWEEN CLOUD AND SUNSHINE.[1]

By J. R. SUTTON.

[Abstract reprinted from Nature, London, July 22, 1920, p. 667.]

A brief discussion of the observations of sunshine and cloud made during the 20 years, 1900–1919, at Kimberley. In a general way much sunshine postulates little cloud; but the relation is not intimate, and a sunshine recorder can not be regarded as an automatic device for determining the cloudiness of the sky. August gets the most sunshine and February the most cloud.

## ATMOSPHERIC AND TERRESTRIAL RADIATION.

By W. H. DINES.

[Abstracted from Quar. Jour. Roy. Meteorological Soc., 46, 163–173, April, 1920.]

The atmosphere is divided into 10 layers of equal mass, each thus contributing 100 mb. to the pressure near sea level. The radiation emitted by each layer on each side is assumed to be $\eta\sigma T^4$, where $T$ is the absolute *temperature,* $\sigma$ *Stefan's constant, and* $\eta$ *a constant* depending upon the humidity, mass, cloudiness, etc., of the layer. The proportion of incident radiation absorbed by a layer is $\eta$, $1-\eta$, being transmitted. Then the net radiation absorbed or omitted by any layer as a consequence of the absorption and emission by the earth and the rest of the atmosphere may be calculated. For thirteen widely different assumptions as the values of $\eta$ and their distribution, corresponding to different vertical distributions of cloudiness, etc., the same general results were obtained: The known mean values of $T$ over England show that all strata up to the 400 mb. level are emitting more radiation than they are abosrbing, those from 400 mb. to 200 mb. are absorbing more than they emit, and those above 200 mb. are again suffering a net loss. Since the mean temperatures are not undergoing a systematic change, the losses and gains must be compensated for. In the lower layers the loss is made up by heating due to latent heat of condensation and to *solar* radiation, mainly through contact with the ground and convection; in the highest layers, probably by direct absorption of solar radiation. The gain in the intermediate layers is balanced by the loss due to forced mixing of different layers by winds, resulting in a tendency to estsblish an adiabatic lapse rate where normally the lapse rate is considerably less than adiabatic.

Equatorial temperature distributions, on the other hand, show that all the strata above 400 mb. are gaining by absorption, probably because of the small amount of emission at the low temperatures existing there. This indicates that these low temperatures are due to dynamic, not to radiational, causes.

This method of computation, devised by L. F. Richardson as a substitute for the complex methods used by Gold in his studies on the stratosphere, gives a value for the total loss of heat by the earth in good agreement with that of Abbot and Fowle.—*E. W. W.*

## LONG-RANGE FORECASTING IN JAVA.

By C. BRAAK.

[Reprinted from Nature, London, August 5, 1920, pp. 729–730.]

Publication No. 5, 1919, of the Royal Observatory of Batavia, entitled "Atmospheric variations of short and long duration in the Malay Archipelago and neighboring regions, and the possibility to forecast them," by Dr. C. Braak, embodies the results of a long investigation into the sequence of rainfall in the equatorial regions east of the Indian Ocean. Three kinds of variation are studied: (1) With periods of one or more years up to and including the sun-spot period; (2) secular variations; and (3) with periods less than a month, comparable with Abbot's short-period solar fluctuations. The variations, the period of which is intermediate between (1) and (3) above, are treated as disturbances of (1). Dr. Braak lays much stress on a three-year period, of the persistence of which he gives plausible, though not quite convincing, examples. He classifies three groups of years, of high barometer, low barometer, and transition (from high to low), but naturally finds a proportion of years not strictly true to any of these types. It is scarcely surprising that he finds in general a correlation between barometric pressure and rainfall. For the east monsoon he finds strong positive correlation between high pressure and drought, and weaker between low pressure and excess of rain. For the west monsoon he finds, with

[1] Royal Society of South Africa, Cape Town, May 19.