in the Francis weir formula to determine the discharge. It is assumed that the maximum stage of 6.24 feet occurred about 9:45 p. m., the discharge at that time being 12,000 cubic feet per second. It is believed that the flow up to that time came from a point below the mouth of Cobb Creek, which is 9 miles upstream from the dam. The drainage area between the mouth of Cobb Creek and the power dam as measured from the topographic map is 32 square miles, and the run-off was therefore 375 second-feet to the square mile.

The drainage area, including Cobb Creek and everything below Butler, would be 46 square miles, and the maximum rate of run-off would be correspondingly reduced to 261 second-feet to the square mile if Cobb Creek is assumed to have contributed to this peak discharge. It is reasonably certain that the flow above Butler did not enter into this rate of discharge, as it would require an average velocity in Watauga River of 5 feet a second for the flow at Butler to reach the Watauga Power Dam in three hours, and the maximum flow at the dam occurred three hours after the rain began. It seems more than probable that this maximum discharge was derived entirely from the area below Cobb Creek.

The maximum discharge at the dam and other points in this region, as determined by this investigation, is given below.

Stream	Location	Gage height (feet)	Discharge (second-feet)	Drainage area included (square mile)	Run-off (second-feet per square mile)
Watauga	Butler	5.71	6,500	[1] 427	15.2
Watauga	Power dam	6.24	12,000	32	375
Watauga	Elizabethton	13.40	30,000	270	111
Doe	Valley Forge	6.70	5,000	[1] 132	37.9
South Fork of Holston River.	Bluff City	7.25	8,800	[1] 828	10.6

[1] Total drainage area of stream.

An attempt was made to obtain data on the run-off of some of the smaller tributaries that lie wholly within the region of highest rainfall, but on all such streams the slope was so steep and the amount of rock, trees, and other débris carried by the floods so great that nothing resembling an accurate estimate of maximum run-off was possible. All hope of getting any such figures was therefore abandoned. A very striking illustration of this point is the small ravine at Cardens Bluff, where two houses were demolished and nine of the occupants drowned. A careful examination of this ravine indicates that its total catchment area does not exceed 15 acres. One of the inhabitants who escaped stated that a wall of water, rock, and earth 8 to 10 feet in height crashed into these houses without perceptible warning, totally wrecking them. He himself was thrown 30 feet or more by the force of the blow and was severly injured.

The accompanying illustrations (figs. 1, 2, and 3) show something of the force of this record cloudburst and the resulting damage.

No accurate estimate of the damage to property has been made, but the best information available indicates that it was at least half a million dollars.

NOTES, ABSTRACTS, AND REVIEWS

TROPICAL CYCLONES

[Reprinted from Nature, London, June 28, 1924, p. 939]

In his presidential address to the Section of Physics and Mathematics of the Tenth Indian Science Congress, Dr. S. K. Banerji reviewed the present position of our knowledge regarding the origin and causes of tropical cyclones. The contributions to this branch of meteorology of Hann, Lodge, Dines, Bjerknes, and Shaw are considered and none of them found to give a satisfactory explanation of the phenomena. The recent work of Shaw contained in his essay "The Birth and Death of Cyclones" naturally received the most attention.

Doctor Banerji considers that the air currents on the two sides of the "trough of low pressure" which exist over northern India during the monsoon may be the origin of the storms which form at the head of the bay during that season, but he is unable to accept Shaw's explanation of the subsequent development and progress in the development of the theory of cyclones, but considers that many more data, especially from the upper air, are required before much further progress can be made.

LIGHTNING EXPLODES DYNAMITE

Six men were instantly killed at a rock quarry 7 miles south of Winston-Salem, N. C., on June 24, 1924.

The men had sought shelter from a passing electric storm in a temporary office structure in which was stored a quantity of dynamite. Lightning struck a near-by tree and in some manner not clearly understood, exploded the dynamite. The office structure was fired, as were also the inflammable parts of an automobile that was parked near by. The bodies of the men were badly mangled and burned. The explosion was witnessed by persons at a distance.—*News-Observer*, Raleigh, N. C.

WEATHER CONDITIONS IN THE POLAR REGIONS AND AMUNDSEN'S POLAR FLIGHT

[Reprinted from "The Meteorological Magazine," 59, No. 701, June, 1924, p. 1157.]

In the Tidens Tega for March, 1924, there was an account of the weather conditions in the north polar region, written by Doctor Hesselberg in view of Amund-

sen's proposed polar flight. Much valuable information is available from Jan Mayen Island, Bear Island and Spitsbergen, where Norway has permanent meteorological stations, and observations on other islands have been made by the different expeditions to the Arctic; those taken of the *Fram* expedition (1894–1896) form the most complete series and have been used for this article.

Doctor Hesselberg points out that the maximum wind velocity recorded on the *Fram* during any of the months, May, June and July was 15.5 m/s and that therefore the wind conditions do not constitute more of a hindrance than those in our own latitudes. Over the polar seas temperature rises rapidly during May. In June and July the temperature varies but slightly from the freezing point, and it is only the presence of ice which prevents it from rising still higher. Fog, however, is prevalent in the polar regions in the summer and it is this factor, and neither the cold nor the wind, which makes flying so difficult. The fog lies rather low so that there is no difficulty in flying above it, but a forced landing in a sea of fog might easily have fatal consequences. During the winter when the temperature and wind conditions make flying practically impossible there is little or no fog, but it makes its appearance in May and increases in frequency until the middle of July. The longest consecutive periods during which the *Fram* was surrounded with fog were 12 hours in May, 46 hours in June and 71 hours in July.

It is therefore very necessary that Amundsen should make his start as early in the year as possible and that the best measures should be taken to insure him as far as possible from running into unfavourable weather conditions which may occur even at the most favourable period of the year. Weather reports from as many stations as possible within the Arctic circle, from the Norwegian stations at Jan Mayen, Bear Island, Spitzbergen and Vardo, from Nome (Alaska) and from certain stations on the Russian and Siberian Arctic coast, will be sent to him.. Doctor Hesselberg considers that reliance should not be placed on reports from the *Maud*, as there is some doubt as to the capabilities of her wireless outfit.

In justification of such a flight he points out that the weather conditions in the Polar regions have a great influence over the weather of the rest of the globe. A single flight will not provide information of great value, but it will open the way for a regular service of meteorological observations.

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C. FITZHUGH TALMAN, Meteorologist in Charge of Library

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The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

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Die luftelektrischen Beobachtungen am Samoa-Observatorium 1914–1918. p. 81–104. figs. 24 cm. (Extr.: Nachrichten der Gesellschaft der Wissenschaften zu Göttingen. Math.-phys. Klasse. 1924.)

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Les publications du R. P. Élie Colin . . . Essai bibliographique, 1889–1923. [Tananarive. 1924.] 36 p. 22 cm. [Lists numerous papers on climate and weather of Madagascar.]

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Cloud forms according to the international system of classification. [Washington.] n. d. 22 p. illus. 31 cm. (Prepared by the Weather bureau cloud committee, B. C. Kadel, H. C. Frankenfield, F. G. Tingley.)

RECENT PAPERS BEARING ON METEOROLOGY AND SEISMOLOGY

The following titles have been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected