

represented discomfort. If now I curve the line to the right as the humidities increase, I find that with a temperature of 60° and a humidity of 80° and a 5-mile wind I am also comfortable. If I prolong the line further, it reaches the point where the temperature is 80° and the humidity nearly 100°, but here I am again uncomfortable, with a feeling of suffocation. In this way I try my way around over the diagram until I have drawn a curve, a sort of parabolic curve, connecting all the temperatures and humidities that produce a feeling of perfect comfort when a 5-mile wind is blowing. A similar curve may be drawn for a 1-mile wind. There is almost no curve for absolute calm. A 20 or 30 mile curve of comfort is confined to that region of the chart where the relative humidity is quite high.

A series of curves like this give one a clearer view of the relation between our sensations and the atmospheric conditions than any other method that I know of. It does not answer the query, how shall I compute the sensible temperature, but it does better than this in that it enables each person to make for himself his own personal diagram of what may be called sensible temperature curves. He may, for instance, draw one curve for extremely raw cold sensations, another for suffocating hot, another for stimulating or irritating dry sensations. A series of curves like these for various parts of our country and for persons of very different temperaments will constitute a most important contribution toward the eventual discovery of a method of computing and predicting the sensations of temperature, which, as is readily seen, is not temperature at all, but a nervous sensation of very complex origin.

SENSATIONAL METEORIC STORY.

In a New York paper of September 10 there appeared a remarkable story of a meteoric shower at Mill River, Jamaica, which was said to have occurred on August 30. On calling the attention of Mr. Maxwell Hall to this matter, he, as government meteorologist for Jamaica, replies as follows:

In the Gleaner (a Jamaica newspaper) of the 31st of August there was an account, given by a lady, of a supposed meteoric fall at her house on the 20th of August.

I wrote her September 1, but did not receive a reply until the 13th. The whole thing was a mistake; lightning struck a tree close to her house with an explosive effect; it may have been "ball" lightning. She wrote me that the little stones noticed at first are to be found all through the district; and they seem to me to be very small waterworn pebbles. I have, however, taken steps to have them analyzed.

The account given in the New York paper is shamefully exaggerated.

It would seem that the sensational dispatch from Kingston to the New York paper was intended especially to tickle the palate of the American reader. We are so accustomed to wonders in these days of great human inventions, we hear so much about the multimillionaire syndicates, the latest wonders in electricity, the fastest ships, and the wonderful guns, that the active newspaper correspondents have determined that nature shall not be outdone by man and have undertaken to assist her to perform miracles. They rarely describe any ordinary meteorological phenomenon without exaggerating it to such an extent and incorporating so much of the products of their own vivid imagination that one scarcely recognizes the kernel of truth in the mass of verbiage.

INCREASE AND DECREASE OF FRESH WATER LAKES.

The Editor has lately received a letter inquiring what are the recognized years in which lakes attain their maximum and their minimum extent. This query sounded at first as though there might be in some part of our country a recognized periodic increase and decrease of the lakes. Fluctuations of some kind undoubtedly occur everywhere throughout

the world and depend upon the balance between accumulated rainfall and accumulated evaporation. There is no reason for a regular or chronological periodicity. It can hardly be said that periodic fluctuations in rainfall alone would have anything like corresponding fluctuations in the height of water in large lakes, although this might be the case for small ponds. Many years ago the Editor made a calculation based on the best data accessible to him, showing that the annual fluctuation in the level of the water in Yellowstone Lake exactly followed the accumulated sum of the rainfall minus the evaporation. In this calculation he was much impressed with the uniformity of the outflow from this, and in fact from every large lake. A large change in the height of the lake level produces only a small change in the rate of outflow, so that months and even years may be required to counterbalance the influence of a special rainy season. In Europe some attempts have been made to connect fluctuations of lakes with the rainfall, but no periodicity that has been deduced for that part of the world can be said to hold good for America. In this country too many important changes are being made by human agencies to enable us to make any simple connection between the meteorological phenomena and the levels of the smaller lakes. For instance, in California, according to a newspaper paragraph, extracted from The Hanford Sentinel, Lake Tulare, which should have an area of at least three hundred square miles, is now as "dry as a chip." It is true that this statement is made by the Sentinel on the authority of one person, Mr. W. P. McCord, an old farmer of this region, and the Sentinel adds that:

The reclamation of lake lands has been regularly noted in the columns of this paper for years, but this season has witnessed the most extensive spread of the interests of the husbandman. At the mouths of Cross Creek and Tule River reclamation ditches and levees have been thrown up so that the water that may come with a wet season will be taken care of and an immense area of rich soil irrigated.

It is useless to attempt a meteorological or natural explanation of phenomena such as this, which are mainly due to the artificial conditions of civilization.

NOT BALL LIGHTNING.

The Pensacola Daily News of August 17 publishes the following paragraph on the authority of Mr. Ross E. Pollock:

Last evening at 8:42 a very luminous object made its appearance in the northeast and moved slowly toward the east, being visible for about two seconds, then disappeared. At the expiration of five seconds a tremendous explosion occurred like that of a big gun.

This interesting item appears as "a meteor," as it properly should, in the regular monthly journal of the Weather Bureau observer at Pensacola, Mr. A. B. Crane; but it is enlarged upon in the Pensacola Daily News by Mr. Pollock, who is a map distributor and not a regular observer, and is spoken of by Mr. Pollock as "probably ball lightning," which it certainly was not. It was an aerolite or small solid substance shooting from the outside interstellar space into the earth's atmosphere and made visible by the heat thus generated. It was seen at places many miles apart, and the lines of sight probably all converged toward a region 50 or 100 miles above the surface of the earth, where this body rapidly pursued its path until it was burned up. The noise, or so-called explosion, of these aerolites appears to be generated in a manner similar to that of the snapping of a whip or the striking together of two hard substances. It may be called an explosive noise, but there is no explosion, properly so called.

On the other hand, ball lightning is always near the ground; the so-called ball seems to roll along the surface of the ground or of some object near the ground, pursuing an irregular course, and eventually bursts with a noise like a pistol. It has never been observed at a greater distance than

500 feet, usually much nearer. It is undoubtedly an electric phenomenon, the exact nature of which is as yet completely unknown.

The calculation of the distance of an aerolite by allowing 1,100 feet for every second of time that elapses between its disappearance and the observed noise of the explosion is quite misleading. The noise originates at every point of the long path described by the aerolite as it rushes through the thin air overhead. A meteor may be in sight for ten seconds, moving majestically across the sky from one side to the other, describing in that time a distance of perhaps 200 miles, but the first sound that we hear comes from that part of the path that is nearest to the observer. Several other remarkable meteors, that is to say, shooting stars or aerolites, were observed during August in Georgia and Alabama, and are noted in the monthly reports of the sections.

Ball lightning is a rare phenomenon. Observers should be carefully on the lookout for it, but must not confound it with shooting stars or other phenomena.

HEAVY RAIN DURING HURRICANE AT PORT ROYAL, SOUTH CAROLINA.

The voluntary observer, H. D. Elliott, at Port Royal, S. C., reports through Mr. J. W. Bauer, Section Director, the following item with regard to rainfall attending the hurricane of August 30-31, 1898:

On the 30-31st a storm of considerable energy visited the section, reaching its height between 4 and 5 a. m. on the 31st. The maximum wind velocity was estimated to be between 60 and 70 miles per hour, from east to southeast. The precipitation of 10.82 inches during the twenty-four hours ending 8 p. m. on 31st exceeded by 5.89 any daily precipitation ever recorded, and the total of 24.68 for the month exceeded by 9.73 any previous monthly record.

WATERSPOUTS ON THE LAKES.

In 1889 the Editor had the good fortune to observe about twenty waterspouts one morning as the steamship *Pensacola* was sailing eastward on the southern side of an area of low pressure advancing northeastward toward Nova Scotia. Some account of these spouts was published in a Bulletin of the United States Eclipse Expedition to the west coast of Africa. It is not often that so many spouts are seen on one occasion, but records of five or ten occasionally come to hand. The following is condensed from an account by Capt. James Montgomery and First Mate J. E. Reynolds of the steamer *Kitty M. Forbes*, of their experiences on Saturday, August 13, on Lake Erie. The steamer was about 20 miles east of the Dummy going due east and expecting to touch at Ashtabula. About 8 a. m. a black cloud formed on the starboard quarter. It grew bigger and blacker and rose higher and higher, gaining on the ship and in a little while was off the bow. There was a fresh 10-knot breeze and the sun was shining as bright as could be on the vessel. Suddenly a portion of the cloud seemed to drop toward the water, dropping lower and lower while the surface water of the lake beneath it began to boil and whirl round and round and rise to meet the descending cloud. Then they came together and the cloud seemed to rise again. The spout appeared like a big cable 10 feet in diameter, connecting the great cloud and the lake. It was as black as the cloud. When we got nearer we found that the heavy mist surrounding the spout was descending water, falling like the spray from a fountain. The sun was shining and a rainbow was seen in the falling mists. Before long another part of the cloud began to descend and another section of the lake to boil and rise, and pretty soon there was another waterspout racing alongside of the *Forbes*, a bit closer than the first. The captain ordered on a full head of steam and sheered

the vessel off to the northward. While the two black fellows raced along on the starboard side five more big columns of black water were waltzing and swaying along, and at the base of each pillar the surface of the lake was churned into a white foam. Sometimes the columns of water would move along as stiff and straight as a squad of soldiers, and again they would all begin to stagger and swing around in crazy gyrations. After a while the first waterspout began to disappear just as it had formed; the cloud of spray at that point settled lower and lower to the lake surface; then the lower part of the column separated from it and rose and the water once more became quiet. One by one they disappeared until suddenly we found that the biggest one of all having grown still bigger was dead ahead and near at hand. This one did not move as fast as the others, and we steered so as to leave it well to starboard. In an hour and a half after the first appearance the show was all over and the sky as clear as before.

Mr. Reynolds says: "Our greatest fear was that the spouts might collide and go to pieces, causing a sudden fall of tons of water upon the vessel." But so far as we understand the nature of the waterspout, the Editor sees no reason to apprehend danger from this source. A rather heavy rain will fall from the spray hurled up at the foot of the spout, but the spout itself is not made of solid water. It is primarily a cloud due to the low barometric pressure in the center of the whirling mass of air. There may be also a little spray sucked inward and upward. If the whirl ceases, the cloud disappears instantly, and the spray or rain that falls from it is not severe enough to do any injury to a well built vessel. There are many records of vessels that have run into such squalls. The wind may tear away a sail but the rainfall is not at all serious.

Our Great Lakes seem to be as subject to waterspouts as the warm waters of the Gulf of Mexico and of our Atlantic coast. The general explanation of the phenomenon of the spout is given in a very satisfactory manner in Professor Ferrel's *Meteorological Researches* Nos. I-III, and is reproduced in his recent advances. One of the best opportunities to photograph and measure a waterspout that has ever occurred took place in Nantucket Sound in August, 1896. Fortunately many photographs and descriptions were obtained and an elaborate study of this spout has been in progress in connection with the work of Prof. F. H. Bigelow on the reduction of cloud observations.

Other similar positive additions to our knowledge are very much desired and can be made by any observer who will secure photographs from several different points of view and especially accurate measurements of apparent angular altitudes and azimuths.

LUNAR RAINBOW.

According to the *Daily Register* of Mobile, a fine specimen of the lunar rainbow was seen at that place about 7:30 p. m. July 31. The full moon had reached an altitude of about 45° in the east and the rainbow was plainly seen on the dark bank of leaden clouds in the northwest.

The Editor is very much pleased with the calm, judicious, and dignified manner in which the *Mobile Register* recorded this interesting phenomenon. There was nothing sensational or extravagant in the description. There was not even a single error from a meteorological point of view; it was not called "a heavenly display," "a celestial visitor," "ball lightning," or "a direful portent." The proprietor of the *Register*, Col. John L. Rapier, evidently understands what is due to his readers in the way of good English and sound meteorology, and we could wish there were many more such.