event in either of these classes is preceded by one in the other class, so that it is quite as proper to say that human events are forerunners of remarkable celestial phenomena as it is to reverse this statement. The article in the Managua Daily gives the proper optical explanation of the nature of the phenomena of halos as formed by the action of ice needles in thin cirrus clouds upon the beams of light from the sun; it also shows that halos are as often followed by good events as by evil, but it fails to bring out as clearly as is desirable the great principle that men must banish from their thoughts every tendency to imagine that meteorological phenomena have even the slightest value as prophetic signs or prognostics of future events among mankind.

FROST FORMATIONS AND ICE COLUMNS.

We are indebted to Prof. D. T. MacDougall, of the University of Minnesota, at Minneapolis, for the following references to recent publications on this subject, in continuation of the short notes published in the MONTHLY WEATHER REVIEW for May and July, 1897:

MacDougall, D. T. Science, 1893, Vol. XXII, p. 851.
MacDougall, D. T. Botanical Gazette, 1894, XIX, p. 120.
Ward, Prof. Lester F. Botanical Gazette, April, 1893.
Bay, J. C. Botanical Gazette, 1894, XIX, p. 321.

Professor MacDougall states that he expects to carry on some experimental work on plant life in the San Francisco mountain range near Flagstaff, Ariz., during the coming season. Any person in that vicinity who keeps meteorological records will confer a favor by corresponding directly with him. It is hoped that some one in that region or some institution will maintain a continuous thermograph record.

PRAIRIE SKIES.

The following extracts are from a recent letter by E. J. Couch, voluntary observer at Cornlea, Nebr.:

Our prairies have rains principally in spring and summer. A general absence of cloud in the surface current gives opportunity to observe the upper air currents. Observation leads to certain generalizations. The rains seem to have their origin principally in the air currents at moderate elevations. The surface clouds are generally fog, scud, or squall. In spring the whole upper atmosphere seems to lift; and the air currents bring moisture from an easterly or southerly direction which falls as rain at the front of a low or with a sudden fall in temperature. The summer rains at times are similar, but they arise often from thunderheads.

When thunderheads project into a current above that is calm, the cloud spreads out forming the anvil cumulus. In most cloud areas we note two or more motions. A roll or rotating motion and a forward motion; clouds expand or contract with advancing or closing day, or with increase or decrease in evaporation.

A NEW GAS IN THE ATMOSPHERE.

Prof. William Ramsay and Mr. Morris W. Travers announced to the Royal Society at London on June 9, and to the Academy of Sciences at Paris on June 6, their discovery of a new constituent of atmospheric air to which they propose to give the name "Krypton," referring to the fact that it has been so long concealed from our knowledge. On the other hand the French chemist Berthelot suggests the name "Eosium" on account of the distinctive bright green line in the spectrum of this new element. This line is in almost the same position as the green line in helium and, as was suggested by Professor Schuster as well as independently by Berthelot, this line also agrees with the green line of the aurora borealis. As physicists are agreed that the light of the aurora must come from an incandescent gas, although its temperature is low as compared with most of the incandescent substances that are dealt with in our laboratories, it would seem certain that the incandescence of "Krypton" does contribute to the brilliancy of the aurora. The following table gives approximately some idea of the relative proportions, both by volume and by weight, of the gases that have thus far been discovered in the lower portion of our atmosphere.

Near sea level, under a standard pressure of 760 mm. of mercury at 0° C. and standard gravity, the dry gases of the atmosphere have densities, volumes, and pressures as follows:

	Volumes.	Pressures.	Densities.	Weights.
	Per cent.	*Mm.*	*Kg. p. m³.*	*Per cent.*
Oxygen	20.95	159.22	1.10563	23.16
Nitrogen	79.02	600.55	0.97137	76.77
Carbonic acid gas	0.03	0.23	1.5201	0.046
Dry air	100.00	760.00	1.29322	99.976

The remaining constituents, argon, helium, krypton, and ammonia, represent quantities far less than carbonic acid gas. What these proportions may become 10 miles above the earth's surface can hardly be stated as yet. The relative density of the new gas, taking hydrogen as unity and oxygen as sixteen, is as follows:

Krypton, 32.321 cubic centimeters at pressure 521.85 millimeters and temperature 15.95° C. weighed 0.04213 gram, or a density of 22.47. A second determination gave 22.51.

Like argon and helium, krypton is probably monatomic; it is heavier than argon and less volatile than nitrogen, oxygen, and argon. But Professor Ramsay states that its density is at present problematic, and it may be that the gas belongs to the helium series and has a density of 40, with an atomic weight of 80. The spectrum of the gas is characterized by two very brilliant lines in the yellow besides the brighter green line before mentioned and a somewhat weaker green line. In order to obtain a small quantity of this gas for their observations, the authors state that they obtained about 750 cubic centimeters of liquid air; all but 10 cubic centimeters were allowed to evaporate away slowly; the residue was secured in a gas holder and after removing the oxygen and the nitrogen, there was left 26 cubic centimeters of a mixture of argon and krypton.

The authors conclude by saying: "We have already spent several months in preparation for a search for a gas lighter than nitrogen that may possibly be found in the air and will be able to state ere long whether this supposition is well founded."

SAMUEL E. BLACK.

Mr. Samuel E. Black, observer, Weather Bureau, died May 21, 1898. Mr. Black entered the meteorological service by detail from the Office of Director of Experimental Stations, Department of Agriculture, August 21, 1894, and July 31, 1895, was transferred to the Weather Bureau. He was assigned to duty as assistant at the station at Colorado Springs, Colo., until September 17, 1894, following which he served in the same capacity at Denver, Colo., until September 5, 1896, and then at Santa Fe, N. Mex., until the date of his death.

NOTES FROM THE REPORTS OF THE CLIMATE AND CROP SECTIONS.

ARIZONA.

Mr. Henry M. Gee, voluntary observer at Tombstone, notes that during May, "day after day the wind was easterly in the morning, south about noon, and southwest the rest of the day." Nearly all the other observers in Arizona report that the month has been very windy at least in the daytime, and in general they report that the prevailing direction was southwest.

If the diurnal change in the direction of the wind was at other stations similar to that at Tombstone, which is in the northeast corner of Arizona, it would constitute a general

phenomenon that is eminently worthy of an attempt at a general explanation. At the surface of the ground, on plateaus and lowlands, the wind is calm or comparatively light during the nighttime because the colder air near the surface does not partake of the movement that prevails overhead. But during the daytime, when the lower stratum is heated and rises, the upper stratum descends bringing with it its great horizontal velocity, and the direction of the wind, as well as its velocity at the surface, will depend upon the height from which the upper current comes down. Thus, if an east wind descends into calm air the result would be a lower east wind; if subsequently a south wind descends into the latter, it will become a southeast wind and if, afterwards, a west wind descends into the latter, it may become a southwest wind. A careful study of the cloud motions will, undoubtedly, help the observer to explain the diurnal veering ,or backing, of the surface wind as it progresses from hour to hour during the day.

ARKANSAS.

Mr. E. E. McCollum, voluntary observer at Moore, notes that "on the night of the 21st there was a heavy cloud in the northwest, with wind; the lightning played continuously and a body, like a large meteor, seemed to burst from the cloud and float slowly to the east until it passed out of sight."

This reads exactly like a case of ball lightning, for large meteors can scarcely be said to float slowly. Faulkner County is near the center of Arkansas, and if any one else north of Mr. McCollum was so fortunate as to have observed this bright ball it would be very interesting to determine its height and velocity by comparing the two records. In general, ball lightning has been sufficiently well observed to establish the fact of its existence, but no plausible explanation of its nature has yet been considered acceptable to physicists; every observed fact bearing upon it is of value.

COLORADO.

Mr. Brandenburg continues his monthly summary of snow in the mountains. In general, heavy precipitation characterized the entire month in the foot hills and plains, but this only extended westward into the mountainous region to a small extent, and practically none fell on the westward side of the Continental Divide.

At Canon City a severe hailstorm occurred on the 21st, lasting forty minutes. The hail belt was about 5 miles wide east and west, and in some portions the ground was covered to a depth of 8 inches.

INDIANA.

The observer near Portland, in Jay County, reports that on the evening of May 18 a heavy hailstorm prevailed at Fort Recovery near that city; hailstones over 10 inches in circumference, and weighing six ounces, were picked up; even iron roofs were punctured and much damage done. It would be a fair problem for an observer to determine by actual experiment what the speed of a falling hailstone must be in order to accomplish the destruction that he witnesses. Hail or ice can probably be fired from guns or cannons with a small charge of powder in such a way as to determine the velocity required to produce any given destruction. The statement as to the size of the biggest stones is not quite so important to the meteorologist as a statement of the average depth of the hailstones, or still better, the equivalent depth of the solid sheet of ice. The following rule, given on page 399 of the MONTHLY WEATHER REVIEW for September, 1897, refers to the case of spherical balls of ice, namely, the sphere of ice, when converted into a hexagonal cylinder that precisely incloses or circumscribes the sphere, will cover that hexagon to the depth of 0.6045 times the diameter of the sphere. In other words, a layer of continuous spheres of ice four inches in diameter is equivalent to a solid layer of ice 2.418 inches thick. But as the fall of hail comprises stones of every variety of diameter, the simplest method for the observer is to gather all the hail that falls on a small area, equal to say, five times the area of the mouth of his rain gauge, put it all into the gauge, and when melted measure and divide by 5 to get the equivalent rainfall, or in this case, the equivalent sheet of ice.

IOWA.

A newspaper paragraph, quoted from the Sioux City Journal, says that at Sabula, 3 miles north of the late destructive tornado of the 17th, when scarcely a breath of wind was stirring at the place, the iron roof of a large warehouse in town was lifted and thrown into the street at the same time that those near the building felt the air grow hot. We can easily understand that a sudden diminution of barometric pressure over Sabula would allow the air within a warehouse to expand and lift off the roof; this is a common occurrence in tornadic phenomena; but we do not quite understand why the air in the neighborhood of the building should grow hot at this moment, and hope that some observer will give us a more minute account of the whole series of phenomena.

MONTANA.

There is no doubt but that the enthusiasm of Mr. Eddy and Mr. Woglom of New York City in the matter of kite flying has been of the greatest possible service both to meteorologists who raise their apparatus by means of kites and to patriots who insist on raising the American flag as high as possible. Mr. James T. Woods, of White Sulphur Springs, Meagher County, in central Montana, in the valley of the South Fork of the Deep River, and about 40 miles east of Helena, gives a description of his use of the Hargrave kite for raising a large United States flag to a height of 1,400 or 1,500 feet, so that it could be distinctly seen from all the ranches within several miles. We beg to commend to Mr. Woods the importance of the work that he can do for meteorology by using his kites to determine the temperature and the winds and the heights of clouds for several thousand feet above his station, which is probably already 4,000 feet above the ocean. The good work done by Mr. Allen at Bayonne, N. J., as published in the April number of the MONTHLY WEATHER REVIEW, should serve as an incentive to many other enthusiastic kite flyers. Every station has its own local peculiarities as to diurnal and local winds, which can be best investigated by the help of the kite. The work of the voluntary observers in America ought to rival that done by their colleagues in Europe in the investigation of local peculiarities that must eventually prove to be of great interest for general meteorology.

NORTH CAROLINA.

An unusual number of stations report remarkable hail and hailstorms. The general distribution of hail is frequently such that the heaviest occurs only in the lowlands and flat countries, but in North Carolina the most destructive seems to have been midway between the lowlands and the mountains. It would be worth inquiring whether the statistics of the last twenty years show any law of this kind.

RECENT EARTHQUAKES.

Prof. E. W. Morley, of Adelbert College, Cleveland, Ohio, and Prof. C. F. Marvin, of the Weather Bureau, Washington, D. C., report no earthquake disturbances of their respective seismoscopes during the month of May. Other reports have been received as follows:

April 29.—Managua, Nicaragua. Concerning this earthquake, Mr. Chester Donaldson, United States Consul at Managua, reports as follows in a letter dated May 4: