Le Verrier in this work. In 1872 the meteorologists of the departments of Hérault, Gard, Lozère, Aude, and Pyrénées-Orientales combined to appoint a meteorological committee for the western Mediterranean region; Prof. A. Crova was the general secretary of the committee. Each of these departments established stations with the necessary apparatus, and according to the original plan the observations were to be collected and published annually, together with the memoirs and discussions. Eventually all documents were to be deposited with the president and secretary of the committee. A public subscription was opened for the purpose of collecting funds for the support of the stations and the work. In August, 1873, the General Council of Hérault voted an appropriation for the printing of the meteorological bulletin of Hérault, and this has been continued annually. In 1879 the former commission was replaced by the meteorological commission of Hérault, established under the auspices of the Minister of Instruction for the Republic. This commission continued the work on thunderstorms started by its predecessor, and originated numerous other works under the direction of its president, Professor Crova. In 1881 Professor Crova was called to occupy the chair of physics in the National Agricultural School at Montpellier, and has utilized this favorable position to develop this organization of the meteorological observatory. In 1885 Professor Houdaille succeeded Professor Crova as professor of physics and director of the meteorological station. In 1888 the faculty of science was authorized to incorporate the laboratory, archives, and library of the meteorological commission with the collegiate department of physics. Therefore, the latter is now installed in a spacious locality adjoining a garden, where one can make experiments in the open air, uninfluenced by the vicinity of dwellings. The total amount of material accumulated in these volumes is very considerable, and the general index greatly facilitates the use of the data by students. Prof. M. Chassant temporarily fills the place of Professor Houdaille, who was attacked by a severe sickness in 1901. The general table of contents is divided into the following four sections:

1. The general alphabetical index by subjects, 18 pages. 2. Systematic index of subjects, 11 pages. 3. Author index, 15 pages. 4. List of plates and illustrations, 17 pages.

This is followed by a bibliography of those connected with the meteorological work of the department covering 58 names of persons or institutions, among whom Crova appears to be the most active.

The bulletins for the years 1902 and 1903 have been edited by Prof. Maurice Chassant, who conducts the course in meteorology and geology at the National School of Agriculture. This college, therefore, may be classed among those in which meteorology is associated with geology rather than with geography or with physics, as is done in many other cases.—*C. A.*

TORNADO IN MOBILE COUNTY, ALA.

[Reported by Albert Ashenberger, Observer, Mobile, Ala.]

On the afternoon of May 30, 1904, a tornado with a typical funnel-shaped cloud occurred in Mobile County, about 12 miles west of the Mobile Weather Bureau station.

The morning weather map of that date showed an area of low pressure central over eastern Arkansas and overlying the lower Mississippi Valley, with an extension of the depression merging with another low area over the lower St. Lawrence River. The accompanying rain area was characterized by numerous thunderstorms, and it was coextensive with the barometric depression.

The day's weather conditions at Mobile were marked by three thunderstorms. The sky was partly covered with clouds until 10 a. m. and was overcast with lower clouds afterwards. The winds were from the south and southwest and of light to fresh velocity. The temperature was normal. A high relative humidity obtained, the percentage recorded at both observations being among the highest during the month. The barograph shows no marked sudden changes; the pressure [reduced to sea level] fell almost steadily from 29.90 inches, at 9 a. m., to 29.76 inches, at 2:45 p. m., then the fall was less rapid and 29.75 inches was registered at 4:45 p. m., at which time a sudden fall of .02 inch occurred; this was followed by a stationary period of two hours and then a steady rise.

At Melton's farmhouse, five and one-half miles from the beginning of the storm track, the projecting top of the chimney was prostrated, and the roof of the kitchen, 50 feet south of the main building, was carried 60 feet in a northeasterly direction. This house did not indicate any sudden atmospheric expansion, as the sashes of a window facing the east were blown inward. About half a mile beyond Melton's house is the end of the path, marked by four prostrated trees. An occupant of the house stated that light rain fell at about 3:30 p. m., and thunder was heard and lightning observed in the southwest. At about 4 p. m. a violent commotion in the intensely dark clouds in the southwest was observed, and then the funnel-shaped cloud, like the smoke from a locomotive, was seen approaching, sometimes descending to the earth, and again receding. In a few moments the tornado passed with a heavy, roaring noise, like an approaching train. No lightning was observed in the cloud, but after the tornado had passed lightning was observed in the southwest, thunder was heard, and light rain fell. Rain amounting to .36 inch fell at Mobile from 4:07 p. m. to 6:05 p. m.

Mr. Leonard Lane observed the storm from the porch of his house, which is about one hundred yards to the right of the tornado's track, and about a mile from its beginning. He stated that the whirl was about two hundred yards in diameter, and the upward spiral movement from right to left was plainly discernible from the flying tree branches and other débris, and the rotating mass while passing his house had the appearance of an immense dry whirlwind without any low moisture-laden clouds.

The width of the path of the storm was not well defined, but near Mr. Lane's place, as stated by him, it was 200 yards; at Melton's place the prostrated fences indicated a width of about three hundred and fifty yards. The estimated value of the property destroyed is $200.

The time used in this report is ninetieth meridian.

HAILSTORM AT PUEBLO, COLO.

[Reported by J. P. Slaughter, Observer, Pueblo, Colo.]

On May 20, the worst hailstorm in the history of the city was experienced. Hail fell from 3:40 to 4:15 p. m., seventy-fifth meridian time. The ground was nearly covered with lumps of ice, ranging in size from ¼ to 2¼ inches, with an average diameter of about 1 inch. Some of the hail is reported to have been 9 to 10 inches in circumference, weighing 4 to 6 ounces. The hail is known to have covered a strip about 6 miles wide, and extended from a point about 8 miles west of this city to an unknown distance to the northeast. There was nothing unusual in the character of the storm except the size of the hailstones.

Damage to windows, fruit, and crops of all kinds will run far into the thousands.

EARLY AMERICAN WEATHER RECORDS.

In the report of the Maryland and Delaware section for May, 1904, Dr. Fassig has reprinted a letter dated February 27, 1755, written by Dr. Richard Brooke, of Prince Georges County, Md., communicating a record of maximum and minimum temperatures as observed with a Fahrenheit thermometer in September, 1753, to August, 1754. Dr. Brooke also says, "I have seen an account of the weather kept by a friend in Philadelphia which agrees with mine."

It is very much to be hoped that this latter record will also be discovered. The first Fahrenheit thermometer used in this country is supposed to have been that of Dr. Lining, of Charleston, S. C., March, 1738. His instruments were a thermometer by Fahrenheit, presumably graduated according to Fahrenheit's fourth or last method, and the same as now used; another thermometer by Thomas Heath, of London, divided into 90 equal parts, having No. 65 at the freezing point, No. 49 at temperate, and supposed to be the same as Hawksbee's. The hygroscope was a whip cord, which stretched five inches between its saturated and its driest point; these five inches were divided into a hundred equal parts analogous to our modern scale of relative humidity.

In 1742, Dr. John Winthrop, professor at Harvard College, began his record at Cambridge, Mass. He used Hawksbee's alcohol thermometer. "The scale is divided into 100 parts, beginning from a certain point above marked zero, and the hundredth degree falls just about at the bulb of the thermometer. The freezing point is numbered 65°. The divisions are upward to 8° above zero. The instrument shows the highest temperature, but not the lowest, for it goes into the bulb. How it was adjusted in London I know not, but it appears to me that the freezing point is marked considerably too high, for having plunged the bulb into a vessel of snow, I found that the spirit fell down to 76.5 and there rested."

In 1748, John Bartram began his record at Philadelphia, using a thermometer graduated to the Celsius scale. There seems to be a gap in his record between 1748 and 1758.

The record by Richard Brooke, in Maryland, extends only from 1753 to 1755. Much more information as to early observers may be found in the memoirs by Prof. A. J. Henry and others in Bulletin 11, part 2, but undoubtedly manuscripts and rare printed volumes, or almanacs and newspapers still exist and should be brought to light.—*C. A.*

WEATHER AND CROPS IN ARIZONA.

For the benefit of present or prospective Arizona farmers the Agricultural Experiment Station of that State has issued its Bulletin 48, Relation of Weather to Crops, by Alfred J. McClatchie. Observations under ordinary climatic conditions are scarcely applicable to Arizona, with its exceptionally low humidity and wide range of temperature. The report is based upon observations made during the past six years, and the effects of the weather upon each crop are considered in some detail. Almonds, olives, dates, and pomegranates are among the crops that may be successfully cultivated. According to the author:

The total amount of agricultural products that Arizona will yield is limited principally by the quantity of water available for irrigation, but the nature of these products is determined principally by the climate of the region. The lowest temperature recorded at the experiment station during the last eight years in a shelter 5 feet above the ground was 17° F., and the highest 119°. The mean relative humidity is 35 per cent, and the annual rainfall is only from 5 to 8 inches. A larger number of crops endure the low temperatures that occur than endure well the high ones, a condition the opposite of that existing in the northern portion of the country. Instead of crops being grown between two winters, as is the case in the North, the most of them are grown between two summers, the number that grow through the summer here being about the same as live through the winter in the North.

In considering the effect of weather upon different crops, some difficulty is experienced in distinguishing with certainty between the results caused by the different phases of the weather and those caused by soil conditions. Differences in the physical and chemical conditions of the soil, especially differences in the amount of alkali present, cause more or less marked differences in the ability with which crops resist unfavorable weather conditions. * * *

Crops affect considerably the temperatures about and among them. Through the cooling effect of evaporation and radiation combined the temperature becomes lower among growing plants than it is over bare ground. The temperatures to which crops are subjected are, therefore, more trying during frosty nights and less trying during hot days than thermometers situated outside of their foliage would indicate. * * *

During weather too cool for the normal growth of a plant, direct sunshine promotes its activities and results in benefit. The almost continuous bright sunshine of our winters is, therefore, a distinct advantage to vegetation. During the warm portion of the year parts of many plants become overheated in direct sunshine and injury to tissue results. This is especially true of exposed stems, fruits, and vegetables. Since the leaves are continually being cooled, more or less, by the evaporation of moisture from their tissues, they do not become as highly heated as do stems and tree trunks, from which no evaporation is taking place. Hence, a plant or tree with heavy foliage that shades the other parts has a distinct advantage over one with slight foliage, provided it is supplied with sufficient water. * * *

Of the 80 crops discussed in a preceding part of the bulletin, 74 thrive best in an atmosphere having a somewhat higher relative humidity than prevails in southern Arizona. In some cases deciduous trees, though abundantly watered, are so affected by the dryness of the winter and spring atmosphere that they put out their leaves very tardily and incompletely, presenting the appearance of having been injured by extremely low temperatures. Very rarely is the atmosphere of the region too damp for the proper development of any crop. * * *

The direct effect of the local rainfall is not great. The higher humidity that accompanies it is a benefit, and the lower temperatures that accompany the summer showers are a relief to most crops. Local rains are heartily welcomed, chiefly because rain falls at the same time in the region furnishing the supply of water for irrigation.

The author made a series of temperature observations by decades for three years, with a sheltered thermometer 5 feet above the ground, and with three unsheltered thermometers at elevations of a few inches, 5 feet and 10 feet, respectively, and also, with the view of obtaining the temperatures to which the foliage of plants of various heights is actually subjected, with three unsheltered thermometers at elevations of a few inches, 5 feet and 10 feet, respectively. These last results have little quantitative value, as a bright-bulb thermometer exposed to the sun gives neither the temperature of the atmosphere on the one hand, nor, on the other, the temperature of foliage similarly placed, but probably approaches more closely to the former than to the latter.

The author also compares his results with the sheltered thermometer with those obtained from a thermometer at Phoenix, 2 miles distant, in a shelter 50 feet above the ground, and finds that the minimum temperatures recorded at Phoenix are from 3° to 6° higher. While the dry atmosphere of Arizona is favorable to temperature inversion, it is hardly safe to assume, with the author, that "this difference is evidently due entirely to the difference in elevation." He finds a decrease of about 2° in the mean maximum temperature at the higher elevation.

The undersigned is acquainted with but few researches that suffice to show, for moderate elevations, the effect upon the maximum temperature of height above ground. Some that have been published are of little value, on account of their short duration or the faulty exposure of the thermometers. Wild, observing at Pulkowa from September, 1872, to October, 1874,[1] with sheltered thermometers at heights of 1.9 meters, 15.9 meters, and 26.3 meters, obtained from the 1 p. m. observations the following mean departures from the readings of the lowest thermometer:

	Difference in ° C.	
	At 15.9 meters.	At 26.3 meters.
November–March....	+0.12	+0.11
April–September.....	−0.35	−0.37

Dines, in England,[2] September, 1876–September, 1878, found a mean maximum temperature of 58.7° F. in a shelter 4 feet from the ground, with a difference of —1.23° at an elevation of 50 feet. Glaisher, at the Royal Observatory at Greenwich,[3] with thermometers at 4 feet, 22 feet, and 50 feet, found in the mean temperature at 2 p. m. a decrease of 1.4° at 22

[1] Repertorium für Meteorologie, vol. 5, No. 2.

[2] Quarterly Journal of the Meteorological Society, vol. 8, p. 190.

[3] Proc. Met. Soc., vol. 5, p. 29.