of Williams College, maintains an excellent course in meteorology.[1]

This course occupies the first half year of each annual session. It is based on Davis's Elementary Meteorology, but much outside material is given in the form of lectures. In order to systematize the work, a syllabus covering both textbook and lectures is closely followed, but in this the order of topics is rearranged from the work by Davis to suit the needs of Professor Milham's classes.

Additional practical laboratory work is also imposed, consisting in the use of apparatus for observations, work on meteorological statistics, essays or short theses on special subjects, and work with the weather map in making forecasts. The following is the first page of the list of problems relating to statistics:

Monthly extremes of temperature for March, April, and May at Williamstown, Mass.

Monthly extremes of temperature for July, August, January, and February at Springfield, Mass.

Ice days at Amherst, Mass.

Normal absolute yearly range of pressure at Amherst, Mass.

Difference in temperature between Amherst and Williamstown, Mass.

Freezing days at Amherst, Mass.

Constancy of mean annual temperature at Amherst, Mass.

Extremes of temperature for January and July at Albany, N. Y., as compared with those at Williamstown, Mass.

Monthly extremes of temperature for July, August, January, and February at New Haven, Conn.

Monthly extremes of temperature for December, January, and February at Williamstown, Mass.

Extremes of temperature for July and January at New York, N. Y., as compared with those at Williamstown, Mass.

Difference in temperature between Albany, N. Y., and Williamstown, Mass.

Monthly extremes of temperature for July, August, January, and February at Minneapolis, Minn.

Difference between mean monthly temperatures computed from hourly observations and ½ (max. + min.) at Amherst, Mass.

Annual barometic variation at Amherst, Mass.

Monthly extremes of temperature for July, August, January, and February at New York, N. Y.

Monthly extremes of temperature for June, July and August at Williamstown, Mass.

Monthly extremes of temperature for September, October, and November at Williamstown, Mass.

The following list contains some of the special topics on which essays must be written by the students.

Lightning.	Maximum and minimum thermometers.
Waterspouts.	Ocean and lake temperatures.
Blizzards.	Tornadoes.
Artificial rain.	Weather proverbs.
Foehn and chinook.	Sunspots and rainfall.
Sunset colors.	Snow line.
Thermometer shelters.	River stages.

During the current winter the students and various voluntary observers will carry out a special investigation into the distribution of abnormal low temperatures in neighboring valleys and the vertical temperature gradient during still clear nights.—*C. A.*

WEATHER BUREAU STATION AT CHARLES CITY, IOWA.

By CLARENCE J. ROOT, Assistant Observer.

A new Weather Bureau station was opened at Charles City, Floyd County, Iowa, on November 1, 1904. The longitude of Charles City is 92° 38′ W., latitude 43° 04′ N., and elevation 1015 feet above mean sea level. The city is situated in the valley of the Cedar River and is partially surrounded by hills ranging in height from 50 to 68 feet above street level. The station is located one block from the river. It is furnished with a full instrumental equipment, the wind instruments and electrical sunshine recorder being mounted on a 50-foot steel tower, in the base of which the thermometer shelter is suspended. The rain gages have a ground exposure in the yard. Two observations will be taken daily and the usual records kept.

METEOROLOGY IN NEW SOUTH WALES, AUSTRALIA.

Two important steps looking to a higher appreciation of meteorology have lately been taken in Australia. The first relates to the introduction of the so-called nature study in the public schools. In February last the Department of Public Instruction issued a syllabus of instruction to guide the course pursued by the teachers in schools under that department. This gives suggestions and instructions as to methods of teaching in the different grades from the kindergarten to the seventh class, or children of the age of fourteen or fifteen. Throughout this course the observation of nature is inculcated. Thus, in the lowest or first class the beginners receive a series of lessons on plant and animal life, and cultivate plants and flowers in the ground or in pots, observing the various stages of development. They use sand trays for modeling representations of the geographical features; they observe the appearances of the sky. In the second class the same course is pursued, but is applied to more difficult subjects. The observation of sky phenomena is continued and the effects of seasonal changes are observed. In the third class "Observing and recording simple meteorological phenomena and seasonal changes, with lessons based on these observations." In the fourth class we read "Physical features associated with the chief towns, with climatic conditions and commercial products; lessons on climate and atmospheric phenomena." In the fifth class "A course of experimental lessons in some branch of elementary science; lessons bearing on agricultural pursuits, with such scientific principles as will enable the pupil to understand the reasons, etc.

The whole course is adapted to direct the attention of the youth toward the studies and sciences that have a practical application in everyday life.

The second important meteorological feature is a so-called new departure, namely, the publication of a daily weather chart in the Daily Telegraph, which is the principal newspaper of the colony. We are indebted to Hon. Andrew Noble for copies of the Daily Telegraph of October 12, 13, and 14, containing the very first charts with isobars and winds. Such charts will undoubtedly educate the people to a condition of intelligence that ought to render impossible a repetition of the numerous rain-making schemes and other evidences of deplorable ignorance that were manifested during the recent terrible and disastrous drought. We quote the following from the Daily Telegraph of October 12.

The inclusion of meteorology in the new public schools syllabus has directed special attention to consideration of weather conditions. Correspondents, including a number of public school teachers, have applied to the Daily Telegraph for amplified daily information on this subject and the meteorological branch of the Sydney Observatory also has been requested to furnish details of the weather conditions and atmospheric pressures, the information upon which the weather forecasts are made.

The Daily Telegraph has arranged to publish daily a chart showing the principal features of weather conditions, including the high and low pressure isobars. Where possible the rainfall area will be indicated, and conditions on the coast will also be given.

This chart will be prepared from information supplied by Mr. H. A. Hunt, the acting meterologist of this state. The publication of isobaric charts will enable students with their local knowledge of physical surroundings to anticipate in detail their probable weather more completely than is possible at the central office, where precise knowledge of local

[1] It was at Williams College that the eminent meteorologist, Prof. John Henry Coffin, was professor of natural philosophy, 1839–1843, and here he established our first mountain observatory for meteorological work, i. e., that on Mount Greylock, where continuous self-registering instruments were maintained for two years. "Coffin's Winds of the Northern Hemisphere," Smithsonian, 1851, is still one of the great storehouses of data relative to both the upper and lower clouds and the winds. The elaborate work, "Winds of the Globe," 1873, was quite an epoch in American meteorology. Professor Coffin was born in Northampton, Mass., 1806, September 6, and died in Easton, Pa., 1873, February 6. He was a graduate of Amherst College, and, after leaving Williams College held the position of professor of mathematics and astronomy in Lafayette College at Easton, Pa., until his death, when his son, Selden J. Coffin, succeeded him.

peculiarities is lacking. In framing forecasts at the observatory, Mr. Hunt explains, a wording is used sufficiently comprehensive to appiy as nearly as possible to the whole of the state, and until detailed topographical charts are available, it would be useless issuing other than general forecasts.

INFLUENCES ON AUSTRALIAN WEATHER.

Briefly describing the origin of Australian weather, Mr. Hunt recently explained that in the latitude of Australia the general movement of the air is from west to east; in fact, there is a great atmospheric stream always traveling eastward. This stream varies in velocity relatively from a few miles at the earth's surface, where friction retards motion, to a very much greater velocity in the higher levels. This easterly drift is by no means uniform in motion, but is divided up into a number of irregularities, known as anticyclones and cyclones or barometric highs and lows, respectively. To the anticyclone must be given first place as the great control system, determining the air movement which gives us our weather in the Southern Hemisphere.

"Although our rainfall is more immediately due to ascending convectional motion within the cyclone, it must be remembered that the energy of the latter is largely derived from, and its position governed by, the former, to which it acts the part of a secondary. These anticyclones or controls travel eastward with a normal daily velocity of 400 miles, but there are wide departures from this normal and sometimes the easterly translation for a single day may be as much as 1000 miles, and there may be within the lower levels, so far as the position of Australia is concerned, no forward movement of the atmospheric stream, when the anticyclone remains stationary for days over our mainland, as often occurs during the winter months, or there may be an actual retrogression, but any backward movement rarely lasts. All our weather phenomena may be said to be due to the varying intensity, and to the altered position day by day of these high and low pressure areas."

THE CHART EXPLAINED.—INTERVIEW WITH THE ACTING METEOROLOGIST.

The acting meteorologist (Mr. H. A. Hunt) furnishes the following details respecting the publication of a daily isobaric chart:

"The curves on the above chart represent lines of equal barometric pressure, known as isobars, and are drawn through simultaneous barometer readings received daily from 90 or 100 stations throughout Australia. These are carefully plotted on blank maps, after corrections for varying temperature and altitudes have been applied, together with those for index and gravity. If these charts are carefully studied from day to day, it will be noticed that a general translation takes place to the eastward with varying rates, occasionally halting, and in remote instances showing a retrogression. It will also be observed that at times the whole of the systems, anticyclonic, and cyclonic, are occasionally impelled to and from the equator.

"The pressures (high and low) which for the moment are lying over Australia, constitute a link in a vast atmospheric stream or belt surrounding the earth, which is fed by return currents from the equator and the poles. A like belt exists in the Northern Hemisphere in a similar zone. The mean latitude in which these belts travel varies with the seasons, and they are drawn to and from the equator as the sun goes north and south. Mr. Russell, in his paper on 'Moving Anticyclones in the Southern Hemisphere,' determined the mean easterly rate of progress at 400 miles per day, any variation in which rate brings about a break in the normal weather sequence, as also does a variation of path from the normal latitude for each period of the year.

"Were the rate and latitude of this belt constant, weather anticipations would be a very simple matter, but these occasional deviations render them very complex.

"The normal cyclonic systems of the Southern Hemisphere take the form of depressions, in shape not unlike an inverted capital letter V, the apex of which forms a wedge between the links or anticyclones in the anticyclonic belt. The isobars of these low pressures undergo a straightening in high latitudes, until they become parallel, and control the westerly trade winds, familiarly known as the 'Roaring Forties.'

"Similar isobaric formation exists in the equatorial zones, the monsoonal Vs or wedges extending southward between the anticyclones from the tropical low-pressure belt, more especially during the summer months.

"Occasionally these V-shaped depressions extend so far northward or southward by reason of occasional variations in the movements of the anticyclones—a neutral or dormant area intervening—that with an acceleration in the rear high-pressure system a portion of the V-pressure system is apparently imprisoned between the two anticyclones, and a violent cyclone is the result, such as caused the recent Nemesis storm. This is one of the principal causes giving rise to cyclones in the Southern Hemisphere, another being what is known as a backing or retrogressive movement, which is brought about in the following manner: An anticyclone, moving eastward, collides with a V-shaped depression that for some as yet unexplained reason has remained stationary, or a depression backs on to the easterly isobars of an advancing anticyclone. Both actions give rise to a steepening of gradients, with violent wind results. One memorable instance of this type is that known as the Ballarat storm in 1892, when a V-shaped depression over the Tasman Sea backed on to a high pressure to the west of Tasmania. Other instances with like eventuations occur when incipient depressions visit the coast of New South Wales from the northeast tropics, resulting in violent cyclones such as caused the Maitland gale."—*C. A.*

HAWAIIAN CLIMATE AND CROP SERVICE.

We learn from Mr. A. McC. Ashley, Section Director of the Weather Bureau at Honolulu, that he is now receiving reports from 116 stations in the Hawaiian Islands, distributed as follows: Hawaii, 42; Maui, 18; Oahu, 25; Kauai, 28; Molakai, 1; Lanai, 1; Kahoolawe, 1.

Only 23 of these, including the last three on the list, are equipped with thermometers, but this number will be materially increased. Many of these stations reported to the former Territorial Service, but the exposure of the rain gages and the preparation of reports has been to some extent lacking in uniformity, and Mr. Ashley will endeavor to reduce the whole to a homogeneous system. It is hoped that the publication of regular monthly reports may begin early in 1905.—*F. O. S.*

ANTARCTIC METEOROLOGY.

At the recent International Geographic Congress, whose meetings where held in Washington, New York, St. Louis, and elsewhere, the antarctic explorer, Mr. Henry Arctowski, who had charge of the recent Belgian Antarctic Expedition, delivered an interesting address, from which we make the following extracts:

Only a few years ago we knew nothing, or nearly nothing, of the antarctic climates, as the first wintering in the south polar regions was that of the *Belgica*, which only dates from 1898.

The publication of the results of our meteorological observations is at last nearly completed, and the five reports already published on the hourly meteorological observations—on the clouds, on snow and frost, on optical phenomena of the atmosphere, and on the aurora australis—make it possible to judge of the contribution to antarctic meteorology brought back by the Belgian Antarctic Expedition.

The study of the results which we have obtained convinces me that all this work is only the wedge started into the unknown, and from this critical point it is fortunate that the expedition of the *Belgica* was followed so closely by those others which have in such a short time enriched our knowledge by great geographical discoveries and a mass of scientific material, the publication and discussion of which shall, unfortunately, take many years. But, notwithstanding all the importance of the results obtained by the *Belgica*, *Southern Cross*, *Gauss*, *Discovery*, *Antarctic*, and the *Scotia*, I consider the whole of these new acquisitions to science as being only a work of orientation—provisory work.

If all the expeditions, in whose happy return we rejoice, had wintered simultaneously, and if they had been seconded by stations, which could have been easily installed on the subantarctic islands, the discussion of the whole of those observations would probably have revealed not only the exact position of the isotherms and the isobars all around the south polar ice cap, but also the course of the tempests, and, perhaps, even the laws of the general circulation of the atmosphere in the Antarctic; whereas, on the contrary, because of the conditions in which the several winterings were made, we shall only have climatological data and a series of questions simply touched upon but not resolved in everything concerning the dynamique of the atmosphere.

The thing is to have as great a number of stations as possible working, all simultaneously, not only in view of accumulating the figures resulting from the ordinary hourly meteorological observations, but, first of all, in view of enriching our knowledge of the meteorological conditions of the upper regions of the atmosphere by experiments with self-registering instruments mounted on kites and by continuous study of the clouds, especially of their height and the direction and speed of their displacement.

The stations must be sufficiently near one another to permit, after the return of the expeditions, the drawing of daily synoptic maps, or even hourly, for the most interesting cases, and it is only under such conditions that we shall succeed in learning the usual tracks of the cyclones which are observed in the subantarctic regions all around the polar ice cap, and about the displacement of which we do even know whether they converge toward the pole, following a spiral track, or if, on the contrary, the depressions are formed on the borders of the ice (there where the isotherms are very close together) and go, leaving the polar circle, in a northwestern direction. The clouds, as well, must be studied very carefully, so that the distribution of the systems of clouds in the barometric depressions may be established exactly, and in this respect the Antarctic regions may give us very precious information.

From the detailed study of the clouds that Dobrowolski undertook and carried out on board the *Belgica*, we can deduct that those cloud