manence in spelling or definitions. "The times change and we [the words] change with them." Hard and fast rules are wholly foreign to the spirit of growth that permeates every living language. Why should we unreasonably fetter the growth of that which is full of life and beauty. The lexicographer catches the current aspect of words as the artist paints the beauty of the fading flowers.

Undoubtedly the meteorologist will continue to define "chinook" and "foehn" technically as descending warm and dry winds, while the newspapers and the people will continue to use the words with differing meanings according as they reside in Montana, on the Pacific coast, or in central Europe, very much as has been done with those unhappy words "tornado" and "cyclone." Hereafter one must be careful to state whether he means a "wet chinook" or a "dry chinook."

But, worse than this! The opening paragraph of our quotation shows that we shall have to write a wholly new meteorology for the school children on the Pacific coast. It would seem that they are taught to believe "that the equatorial trade wind blows during the winter months from the southwest, laden with moisture." The standard trade wind of the English language is not an equatorial wind at all. Every English navigator from before the days of Dampier has told us about the equatorial calms or doldrums, but no one ever yet met an equatorial trade wind lying around loose on the ocean in latitude 40° north. It is really preposterous.—*C. A.*

REFORM IN METEOROLOGICAL METHODS.

In a letter, dated June 3, 1909, Professor McAdie makes the following comments on Prof. W. Koeppen's suggestion that atmospheric pressures be expressed in standard units of force referred to a new normal level:

> The mean altitude of the German weather stations is 107 meters, excluding mountain stations for which the barometer readings are not corrected for height. It would be the same for Europe on the average and for the eastern half of North America. It would not, however, be of any special value for the stations west of the 100th meridian in the United States and Canada; and it may be remarked in passing that this is just the section for which it is of the utmost importance for accurate forecast work in America, that true temperature and reduction factors be obtained. Koeppen points out that—
>
> "the new normal level would lie in the atmosphere and the calculated pressure have a real meaning; while at present the reduction level * * * lies in the ground where the air pressure denotes only a numerical value, and also the temperature used in the calculation has no reality."
>
> This is undoubtedly a good point and Doctor Koeppen voices the feeling of all who are actively engaged in forecasting, that there is a need of eliminating the large temperature variation at the earth's surface, in reducing air pressure to a common plane of reference. Many of the "low" and "high" pressure areas marked upon the daily weather charts would disappear, or be greatly modified in outline if the accidental ground temperature values used in reductions were replaced by temperatures more truly representing the conditions in free air.

This is precisely the train of thought followed by me in 1871 and which led to the prompt abolition of the method of reduction then being used for our high stations, namely, above 4,000 feet. An annual constant was adopted for each station which was equivalent, as then stated, to the idea that the use of temperatures varying with each hour of the day was misleading and that at present no reduction whatever should be attempted for these stations. In 1881 monthly constants replaced these annuals by order of a board of officials. The most rational method is that which I recommended to General William B. Hazen as Chief Signal Officer and by him communicated to the International Meteorological Committee at Paris. This was based on the well established fact that the temperature of the free air at any considerable altitude does not change rapidly from hour to hour, hence that the proper temperature to assume and to attribute to the air at any given altitude is the average daily temperature observed at the mountain station or plateau station at that altitude. There are various ways of approximating to this daily average. The simplest way consists in taking the average of the observed maximum and minimum or the average of the current and the next preceding observation with some additional correction for the diurnal variation. Apparently some such idea as this must pervade every good method.—*C. A.*

NORTHERS OF THE SACRAMENTO VALLEY.

By THOMAS A. BLAIR, Assistant Observer. Dated Sacramento, Cal., April 20, 1909.

The northers of the Sacramento Valley form one of the well-marked characteristics of its climate, as distinctive as the foehn winds of the Alpine valleys, or the chinooks of the eastern slope of the Rocky Mountains, to which winds, indeed, these northers are closely related. They occur at intervals throughout the year, attain an average velocity of from 20 to 30 miles an hour, and blow steadily from the north or northwest, accompanied by a very low humidity and, except in the winter months, by a marked rise in temperature. They result from the development of areas of high barometer over the north Pacific coast, and owe their warmth and dryness to the adiabatic cooling and heating which they undergo in their passage over the Siskiyou Mountains. For, in ascending the northern slope of these mountains, which rise to elevations of from 5,000 to 7,000 feet, the air loses much of its moisture; and precipitation occurs with northerly winds on the northern slopes of the Siskiyous, while south of the mountains are the cloudless skies and the dry heat of the California norther.

The exceeding dryness of these northers is their most noteworthy characteristic. On June 17, 1907, at the regular evening observation a relative humidity of 9 per cent was observed at this station, and percentages below 20 are not at all uncommon. In general also, these winds, though northerly, are noticeably warm; but during the winter months their temperature is slightly below the normal, for, coming from regions whose winter temperatures are much below those of the Sacramento Valley, though losing much of their vapor, they are still insufficiently warmed to raise our temperatures. In October, 1906, there were ten consecutive days of prevailing northerly winds, during which there was an unbroken period of 147 hours of north or northwest winds. Three of these days showed in a marked degree the characteristics of the norther. On these days the maximum wind velocities were 31, 33, and 28 miles per hour, respectively; the relative humidities at the afternoon observations, 21, 17, and 20 per cent; and the departures from the normal temperature,—4°, —5°, and —3°. A typical summer norther occurred on June 27 and 28, 1908, on which days the maximum winds were 22 and 15 miles per hour, respectively; the relative humidities, 15 and 19 per cent; and the temperature departures +7° and +10°.

In constructing the accompanying tables, the following conditions were taken as defining a norther: A maximum velocity of 15 miles per hour or more, accompanied by a relative humidity of 40 per cent or lower, during the period from October to March, inclusive, or of 30 per cent or lower, from April to September, inclusive. The tables cover the period from 1902 to 1908, inclusive, being the only years for which we have a complete record of wind directions.

Table 1 shows the number of northers and the duration of each, e. g., March, 1902, had one norther of two days' duration and one of four days. It will be noticed that there were 305 days of northers in the seven years, making an average of 43.6 days a year, or 3.6 days a month. Table 2 is taken from Table 1 to indicate more readily the number of northers and their distribution throughout the year. It is evident that they occur with greatest frequency during the spring and fall

months, and are rare in December, January, and February, and in July and August. A considerable variation in the yearly number is also apparent, the extremes being 14 in 1902 and 21 in 1908. Dividing the total duration, 305 days, by the total number, 118, gives the average duration 2.6 days. It is the popular impression that these winds always last 3 days; but, though the average length just found might tend to confirm this belief, the records in detail show its inaccuracy. For instance, in Table 1 we find 25 northers lasting only 1 day, 40 of 2 days' duration, 27 of 3 days', 17 of 4 days', and 9 of more than 4 days'. Table 3 gives for each month the maximum wind velocity and direction occurring during the prevalence of a norther. The highest velocity during this period was 45 miles from the northwest in May, 1902, Though known as "northers" these winds are more frequently and characteristically from the northwest.

TABLE 1.—*Duration of northers (in days).*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual duration.
1902...	2	0	2,4	1,3	3	4,2	0	1	3,2,4	1	1	0	33
1903...	0	4,3	2	3,3,2	4,4,2	3,1	3,1	1	3,2	2	0	0	44
1904...	3	0	3	5,2	2,4,1, 5,2	3,2,3	1	2	4	4	0	0	46
1905...	0	1	2,3	2,1	1,1,3	0	6	0	2,2	5,1,2,2	4,2	4,3	47
1906...	1	0	2	5	1	3,3	0	0	2,2	5,1,1,10	4,3,2,2	0	46
1907...	0	2	2	4,1	2,1,5	4	0	2	1	4	5,2,2,1	0	38
1908..	0	2	3,2,3	3,3,1, 1,2	2,4, 2,3	1,2,3	0	3	4	2,3,2	0	0	51
Duration.	6	12	28	42	52	34	11	9	32	44	28	7	305

TABLE 2.—*Number of northers.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1902...	1	0	2	2	1	2	0	1	3	1	1	0	14
1903...	0	2	1	3	3	2	2	1	3	1	0	0	18
1904...	1	0	1	2	5	3	1	1	1	1	0	0	16
1905...	0	1	2	2	3	0	1	0	2	4	2	2	19
1906...	1	0	1	1	1	2	0	0	2	3	4	0	15
1907...	0	1	1	2	3	1	0	1	1	1	4	0	15
1908...	0	1	3	5	4	3	0	1	1	3	0	0	21
Sums..	3	5	11	17	20	13	4	5	13	14	11	2	118

TABLE 3.—*Maximum wind velocity and direction of northers.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1902.	33 n.	0	28 nw.	23 nw.	45 nw.	28 nw.	0	18 nw.	32 nw.	24 nw.	15 nw.	0	45 nw.
1903.	0	40 nw.	15 nw.	35 nw.	40 nw.	15 nw.	40 nw.	15 nw.	40 nw.	24 n.	0	0	40 nw.
1904.	18 n.	0	15 nw.	22 nw.	36 nw.	30 nw.	15 nw.	15 nw.	16 nw.	24 nw.	0	0	36 nw.
1905.	0	16 n.	20 nw.	30 nw.	36 nw.	0	15 nw.	0	20 nw.	38 nw.	40 n.	27 nw.	38 nw.
1906.	29 nw.	0	16 n.	35 nw.	15 nw.	16 nw.	0	0	22 nw.	33 nw.	36 n.	0	36 n.
1907.	0	20 nw.	15 nw.	31 nw.	25 nw.	16 nw.	0	19 nw.	15 nw.	29 nw.	28 nw.	0	31 nw.
1908.	0	26 nw.	33 nw.	36 nw.	39 nw.	22 nw.	0	28 nw.	24 nw.	34 nw.	0	0	36 nw.

The desiccating effect of these winds on soil and vegetation is marked; the soil quickly bakes and cracks, vegetation refuses to grow, lawns and alfalfa fields droop and wilt. Disagreeable and depressing effects are felt by man also; the skin becomes dry, sensitive persons have headaches, and all are cross and irritable. It is said that in the early days of rough and ready justice in California, if murder or violence resulted from a quarrel occurring during a norther, the fact that the north wind was blowing was taken into consideration as an extenuating circumstance! The air at these times is always said to be "full of electricity," and, as was suggested by the investigations made in connection with the foehn, the excess of positive electrons in the lower air may account for some of the disagreeable physical effects of these northers.

These dry and descending winds, cool at night and hot by day, were observed in 1871 and 1872, and in fact occurring as predicted in the early California forecasts. The explanation then given agreed with that of Mr. Thomas A. Blair, adding only that the high area did not always appear first over the north Pacific coast, but more often formed over the mountains of Oregon and Canada and moved southward, spreading westerly a little but mostly to the eastward. Several of the great areas of high pressure studied by Prof. Thomas Russell showed this overflow westward down into the valleys of the San Joaquin and Sacramento. The table given by Mr. Blair is exceedingly instructive and opportune.—*C. A.*

THE FORCE OF GRAVITY AT THE EARTH'S SURFACE.

We have often called attention to the importance of properly appreciating the influence on the atmosphere of any variations in the force of gravity. The subject is now almost definitely set at rest by the researches of Prof. Dr. O. Hecker, of the Prussian Geodetic Institute. In his memoir of 1908 Doctor Hecker states that the most important result of his latest measurements on the ocean is—

That the force of gravity is normal over the Indian as well as over the Pacific Ocean and corresponds to the gravitation formula published by Helmert in 1901. Therefore, for both of these oceans, as well as for the Atlantic, Pratt's hypothesis as to the isostatic location of the masses that form the earth's crust is proven to be correct, so that we can now call it a general law, except for local anomalies. Hence, it can be considered as proven that the smaller density of the water of the ocean is compensated by the greater density of the crust forming the ocean bed. Inversely the continental masses, rising above the surface of the ocean, are not true accumulations of masses upon the earth's crust, but the apparent excessive mass is compensated by a deficiency of mass below the continents.—*C. A.*

METEOROLOGY AT HARVARD COLLEGE OBSERVATORY.

The Astronomical Observatory at Harvard College has carried out several special researches bearing on meteorology in addition to the extensive meteorological work which it has conducted in South America. Especially are we indebted to it for studies into the transparency of the atmosphere from an astronomical point of view. In its Annals, Vol. LXI, part 1, Cambridge, 1908, Prof. W. H. Pickering (the brother of the Director, Prof. E. C. Pickering) summarizes the work recently done by the Boyden department, the expenses of which are defrayed from the fund left by Mr. Boyden.

The late Uriah A. Boyden left $230,000 in trust to aid in the establishment and maintenance of an astronomical observatory on some mountain peak so as to be as free as possible from atmospheric influences. In the search for favorable localities Mr. Pickering says:

It is well known that the deserts of the world lie in two bands, one on either side of the Torrid Zone. They extend in general between 20° and 35° north and south latitudes. These bands nearly coincide also with the regions of calm and of high barometer. As might be inferred from these facts they are also the regions of greatest freedom from cloud. The earth, indeed, according to Leon T. de Bort, (Annales du Bureau Central Météorologique de France, 1884,) as seen from without, must present the appearance of a belted planet, although not so markedly so as Jupiter. The terrestrial belts, however, have this peculiarity, that they move north and south with the sun, but are always a little behind it. Accordingly in tropical countries the rains do not begin until after the sun has crossed the latitude of the place, after which they last for several weeks. Also, as we leave the equator the two rainy seasons approach one another, coinciding near the Tropics.