

fact that such tender plants as *Cistus purpureus*, Lam., *Cheiranthus mutabilis*, L'Hérit., and many others have survived the last six winters unprotected; while large bushes of *Laurustinus*, *Euonymus japonicus*, bay, &c., were evidently little, if at all, injured by the terrible winter of 1895. Yet, even within the limits of my own grounds, with a rise of only 35 feet up to the 400-foot contour line, there is a marked difference of climate. On November 27, 1904, in the upper part of the garden, dahlias planted within 4 feet of a high wall facing south were blackened by frost, while in the lower garden those in the open border were uninjured.

The difference between the climate of this place and the Public Gardens at Maidstone is fairly shown by the following comparative statement, the temperatures from the latter having been taken when I chanced to pass the place where they are put up, and therefore not selected:—

May 11, 1904	Max. in shade	Min. in shade	Min. on grass	Range in shade
Ulcombe ...	50°0	39°5	35°5 (corrected)	10°5
Maidstone ...	56°0	38°0	30°0	18°0
May 28 to 30, 1905				
Ulcombe, 28th	67°6	47°5	43°8	20°1
„ 29th	70°6	57°0	44°5	13°6
„ 30th	76°0	52°0	48°0	24°0
Maidstone, 28th	76°0	43°0	39°0	37°0
„ 29th	81°0	50°0	42°0	39°0
„ 30th	85°0	50°0	42°0	43°0

The maxima in both cases are those of the previous day. Maidstone is seven miles from here, and lies in the valley of the Medway.

Yet, in spite of the fact that the thermometer, even on the grass, has not been below 32° since April 3,¹ we are no better off for apples than our neighbours! The apples did not begin to flower until the end of April, so some other cause than frost must be found to account for the bad crop. This is an example of the difficulties of the question; other complications are the nature, mechanical and chemical, of the soil; period of blooming of different varieties of the same fruit; shelter from the generally prevailing cold winds in spring, &c. Still, some effort should be made to ascertain the conditions under which, on an average of years, the best crops can be obtained, and so avoid the waste of time, money, and land that has been incurred in hundreds of instances by planting orchards in unsuitable localities, while hundreds of acres of suitable land are used for corn and other crops that would grow as well elsewhere.

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Islands for Weather Forecasting Purposes.

IN NATURE for June 1 is a very suggestive article by Dr. Lockyer under the above heading, in which specific reference is made to the meteorology of Western Australia. It is becoming increasingly evident that the Indian Ocean and its neighbouring continents form one of the most interesting fields in the world for the study of meteorology, and as the officer-in-charge of an important section of this region I am most anxious to assist in this study in any way possible. Our progress will be slow if we start with incorrect theories, and my present object is to point out the probable inaccuracy of a few of the fundamental concepts, and to indicate briefly a few of the observed facts which seem to have a bearing upon the whole matter.

There is little or no rain in Perth of a monsoonal character. The wettest months are May, June, July, and August, during which time the prevailing winds are *not* from the S. or S.W. Rain is almost always associated with the passage of a “low” along the south coast, setting in with the wind at N. or N.W., and *finishing* when the wind veers to S.W. and S.

There is a tendency throughout the year for the winds to alternate from the eastward during the forenoon to the S. or S.W. in the afternoon. This is most marked in the summer months, when the prevailing feature of the weather

¹ Yet severe frost with great damage to crops in the Dartford, Rochester, and Ho districts; also at Maidstone and Seven Oaks on May 22-3, is reported in the *Kent Messenger* of May 27.

map is a “high” stretching along the ocean *south* of our coastline. How far south or west this extends I cannot say. The prevalence of southerly winds in the summer time is probably due to this anticyclonic area, and Fig. 2 on p. 111 is therefore somewhat misleading.

As the sun moves north the high pressure follows it, and in June and July forms a belt across the centre of Australia. It is, however, constantly on the move from west to east. A “high” will generally during these months strike the west coast about, or to the north of, Perth, and gradually work across to the eastern States. As it passes our wind sets in strongly from the eastward, gradually veering more northerly. By the time the “high” reaches, say, Adelaide, our wind is N.N.E., the isobars are running nearly parallel to the west coast, and we are looking out for a “low” to approach from the ocean. As a general rule, the “low” is first heralded from Cape Leeuwin, the extreme S.W. corner of Australia, but rain sets in with a N. and N.W. wind all along our west coast as far as the N.W. cape. It is heaviest in the extreme S.W. The “low” generally passes south of Cape Leeuwin and across the bight to Tasmania. So long as our wind, and especially that at the Leeuwin, has any *northerly* component, we are pretty certain to have more rain, but as soon as it reaches W.S.W., and especially S.W., we anticipate clearing weather.

Whence these “lows” come before they reach us is therefore a question of great importance. I believe the usual theory upon this point is incorrect. That is, that these “lows” are northerly extensions of the Antarctic low-pressure belt, which sweep past the Cape of Good Hope, and after the lapse of a few days reach Cape Leeuwin, and so travel along the south coast of Australia. I think this is incorrect for several reasons. In the first place, I have endeavoured to trace notable storms either forward from the Cape to Australia, or backwards from Australia to the Cape, and have not been able to find any connection whatever. Secondly, from theoretical considerations, a rotating body of air in the latitude of the Cape would possess a sufficient southerly component to its motion of translation to carry it well south of Australia. Thirdly, the more direct evidence stated in the next paragraphs.

During the summer months, January, February, and March, there is a class of storm which strikes our N.W. coast and then travels across the State in a S. or S.E. direction, emerging in the Great Australian Bight, and travelling thence in an E.S.E. or S.E. direction towards Tasmania. Before striking the N.W. coast it can sometimes be traced from the extreme north of the State moving towards the S.W., down the coast, but keeping well out to sea, then gradually recurving, and striking the coast about lat. 20°. The existence of this class of storm and its approximate path is now beyond doubt, though until recently it was ignored in practical Australian meteorology. I think, however, it would now be safe to say that it dominates the weather of at least the western and southern portions of Australia during the summer months, though on account of the paucity of stations in its track our knowledge of the various conditions is at present elementary. It is important to bear in mind that the study of Western Australian meteorology is in its infancy. Not until the last few years was the importance of this class of disturbance recognised, and therefore any theories which had been formed require to be modified. During the last two years evidence seems to me to be accumulating that this particular class of storm persists throughout the year, and is, in fact, the dominating influence in Australian meteorology. If this be so, it can easily be seen how profoundly older theories are affected, and how necessary it becomes to make a fresh start.

Even during the summer the disturbances do not all follow along the same track. Sometimes they strike the coast near or even south of the N.W. cape, and occasionally they just miss the coast, but can be traced, following it down, but keeping out to sea, and eventually rounding Cape Leeuwin and behaving like an ordinary winter storm. It is this latter path to which I wish to direct special attention.

In the winter, as a general rule, the first intimation of an approaching “low” is obtained from Cape Leeuwin,

and the storm centre invariably passes to the south of that spot. It was but natural, therefore, to suppose that the storm came from the W. or W.S.W. of the Leeuwin, and the winter and summer disturbances have been regarded as two distinct varieties. Within the last two years, however, circumstances have been noted which seem to show that there is no real distinction between the two. In July, 1904, I first directed public attention to the fact that certain of our winter storms could be distinctly traced down the west coast, affecting N.W. districts first, and then travelling in a S. or S.E. direction. I have gone somewhat fully into this matter in my "notes" on the climate of Western Australia for the month of July, 1904, and when once the fact has been indicated it becomes easy to find numbers of cases when winter storms can be seen to have a considerable southerly component of motion. Only a few days ago, for instance, a disturbance struck the N.W. coast in about lat. 20°, and travelled in a S.E. direction across the State, giving rain just along the fringe of our most eastern settlements, probably much heavier in the interior desert, and causing a heavy downpour in South Australia from the centre to the south coast. Again on May 20 a disturbance approached the N.W. cape, causing rain there, next day being definitely located in the ocean a little to the S.W. of Perth, and certainly considerably north of Cape Leeuwin, then continued to travel down the coast, rounded the Leeuwin, and behaved thenceforward just like any other winter disturbance.

There is, therefore, plenty of evidence that "lows" do travel down the Indian Ocean, even in the winter months, in a southerly or S.E. direction towards Cape Leeuwin, and probably all, or nearly all, of our storms come in this way. If this be so, the charts on p. 111 are misleading. Our rain certainly does not come mainly with a S.W. or S. wind, nor is there (probably) any stationary "high" as marked. Instead there is a series of "highs" moving towards our west coast, broken up by a series of "lows," which pass between and make for the extreme S.W. corner of Australia. The weather which we specially desire to predict comes with these "lows." Several things follow from this. One is that the Amsterdam and St. Paul Islands are far too much to the southward to be of any use to us for practical forecasting purposes, though a few years' records from there would be exceedingly valuable. Another is that Dr. Lockyer's theory about the S.E. trades and S.W. monsoon requires some modification, though it is very probable that the Indian and Australian weathers are inter-dependent and require to be studied together. A third is that Sir John Eliot's proposal for an Empire study of meteorology ought to be acted upon as soon as possible, and all our observations coordinated to some definite purpose. A fourth is that, failing this, Australian meteorologists ought to make every effort to bring about the establishment of a central Australian bureau for the study of scientific meteorology, as recommended at the recent conference held in Adelaide.

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Perth Observatory, Western Australia, July 3.

DUTY-FREE ALCOHOL.

HOW far the trade in synthetic colours and fine chemicals has been lost to the country through the heavy customs restrictions placed upon the use of alcohol is a question which has been agitating manufacturers for many years past. On the one hand, we are told that the entire chemical trade has been diverted from our shores because of the high cost of alcohol; on the other, that the alcohol question has very little to do with the matter. After the agitation for the use of duty-free alcohol had been going on for some years, and owing to its increasing intensity and to the pertinacity of a few, the Government in the autumn of last year appointed a departmental committee to take evidence in order to find out whether the high duty on alcohol really was the factor which caused the practical extinction of the aniline dye industry and accounted for our inability to found an industry in fine synthetical products. The

committee commenced to take evidence on November 8, 1904, and finished on February 17 of this year.

More is heard about the loss of the synthetic colour trade to the country than about the loss of any other industry, or about the failure to establish new industries which flourish on Continental or American soil. The loss of the coal-tar colour industry is variously ascribed to incompetence on the part of our manufacturers and their failure to realise the importance of employing—and paying for—highly trained scientific chemists, to our patent laws, to trade protection abroad, and to the excessive duty charged upon alcohol in this country. The report with which we are at present dealing has to do with the last question—duty-free alcohol. A careful perusal of the questions to and the answers of the witnesses before the commission, which included most of the well-known names in the coal-tar colour industry in this country, does not convince one that this special industry has been lost to the country owing to the high cost of alcohol.

The amount of alcohol used at the present day for preparing the dyes is not very large. At one time many of the dyes were sold as alcoholic extracts, and alcohol was somewhat largely used in the preparation of the products. Since the introduction of the azo dyes, however, alcohol is not nearly so largely employed as formerly. There are, indeed, certain dyes in which the methyl or ethyl radical is introduced during the process of manufacture, and these require the employment of methyl or ethyl alcohol in their preparation, and, of course, in this case the alcohol cannot be recovered; for example, the dyes in which dimethyl aniline is the starting product. British manufacturers who desire to make these colours import all the dimethyl or diethyl aniline from abroad. It came out, however, in the evidence that one large aniline dye company which desired to manufacture dimethyl aniline obtained Government sanction to employ methyl alcohol mixed with one-twentieth of 1 per cent. of mineral naphtha—"a condition which the company stated would suit their purposes." Although from the evidence before the commission it appeared that there was "a substantial profit to be made upon the manufacture of dimethyl aniline," for some reason or other it was never manufactured.

Reviewing the evidence of the different persons connected with the coal-tar dye industry, one is brought to the conclusion that, although the high price of alcohol has militated against the success of the industry, yet there are other even more potent factors which have prevented the industry being successful. Manufacturers, with a few isolated exceptions, have not even been successful in meeting Continental competition in dyes which do not require the use of alcohol. Prof. Green probably came very close to the truth when he said, in reply to a question as to what he considered the cause of the decline of the coal-tar colour industry:—

"They (the manufacturers) did not realise the great importance of research; the great importance of theory. They expected to see an immediate result from experiments, and if they did not get an immediate result they considered that they were wasting their money. They did not employ a sufficient number of research chemists, and they did not pay those research chemists they had to encourage them to remain. . . . There may be other contributory causes, such as the patent laws and this question of the spirit."

There seems to be a strong consensus of opinion that in the xylonite and gunpowder manufactory leave to use pure alcohol is much to be desired. Xylonite when made with methylated spirit is inclined to darken, and there is thus a difficulty in