Where do we stand in Brückner's Weather-cycle?

THE problem of future weather is one which has a fascination for many. Our present inability to get beyond (or much beyond) the daily forecast, may well, at times, seem a reproach, considering the immense amount of industry that has been given to weather studies. Where is the professional meteorologist in this country (we vainly ask), who, on the basis of some cycle, or proved recurrence, or other facts, will tell us, even in the most general way, what the coming years have in store for us?

Yet the time may not be so very distant, I think, when science will be able to say, *Nous avons changé tout cela.* The evidence of cycles is growing; and their character is being more exactly fixed. An attentive reader of that excellent record, the *Meteorologische Zeitschrift*, may observe, now and again, a feeler (so to speak) put forth into the obscure; a serious attempt to extend the range of prevision, a suggestion, by some well equipped mind, as to the course of weather in coming years or seasons. Have we not in such the hopeful beginnings (hopeful even in case of failure) of a new and difficult art?

There are two weather-cycles, which have lately been (shall I say?) knocking for admittance; that of 11 years, and that of 35 years. It is well to bear in mind that these are not mutually exclusive. They may be found to usefully supplement and help each other.

Brückner's views as to the recurrence, at intervals of about 35 years, of cold and wet periods, alternating with warm and dry ones, seem to have hardly received, as yet, in this country, the attention which they deserve. They are destined, I believe, to have a large influence on future thought about such matters. It may be useful to ask how our London weather is related to this 35 years' cycle; and I propose to do so here from the standpoint of barometric pressure.

The method adopted is this: Each month, in a long series of years (from 1786), is first characterised as + or −, according as its pressure has been above or below the average. (Tables by Eaton and Glaisher have been used for the purpose.) Then the plus months in each year are counted, and the series of numbers so obtained is smoothed by additions of 10 (*i.e.* adding the first 10, then from the 2nd to the 11th, the 3rd to the 12th, and so on, each sum being put down in the *fifth* place). This gives us the dotted curve A in the diagram, in which may be seen, underlying minor variations, a succession of long waves. The general outline of these waves may be more clearly brought out by a further smoothing process (continuous curve).[1]

In order to clear understanding of this curve A, consider, for a moment, its lowest point, that for 1842; this means, that, in the 10 years, 1838–47, there were 50 months of + barometric pressure, out of 120. Similarly, the highest point (that for 1891), means that in the 10 years 1887–96, there were 67 months of + pressure out of 120.

Note the intervals between minima of this curve A. From 1813 to 1842, 29 years; 1842 to 1876 (34 years). Or, taking the twice-smoothed curve, we get 35 and 32 years. On the other hand, the two completed waves are approximately bisected by the vertical lines for 1830 and 1860 (interval 30 years).

At the top of the diagram are two linear series representing, the one, Brückner's warm and cold, the other, his dry and wet, periods (warm and dry, continuous lines, cold and wet, dotted lines). These two series, for temperature and rainfall, are not, it will be seen, exactly coterminous; the latter tend to lag somewhat on the former. Brückner's general figures may be given, so far as they here concern us.[2]

Temperature.		Rainfall.	
Warm ...	1791–1805 (15 yrs.)	Dry ...	1781–1805 (25 yrs.)
Cold ...	1806–1820 (15 ,,)	Wet ...	1806–1825 (20 ,,)
Warm ...	1821–1835 (15 ,,)	Dry ...	1826–1840 (15 ,,)
Cold ...	1836–1850 (15 ,,)	Wet ...	1841–1855 (15 ,,)
Warm ...	1851–1870 (20 ,,)	Dry ...	1856–1870 (15 ,,)
Cold ...	1871–1885 (15 ,,)	Wet ...	1871–1885 (15 ,,)

Now, it will be noticed that our barometer curve A at its lowest points is generally about the middle of the cold periods, while the middle of the waves is about the middle of the warm periods. Also, that the parts of the twice-smoothed curve above the average line are about coterminous with warm periods; while the parts below the average line are in general coterminous with cold periods.

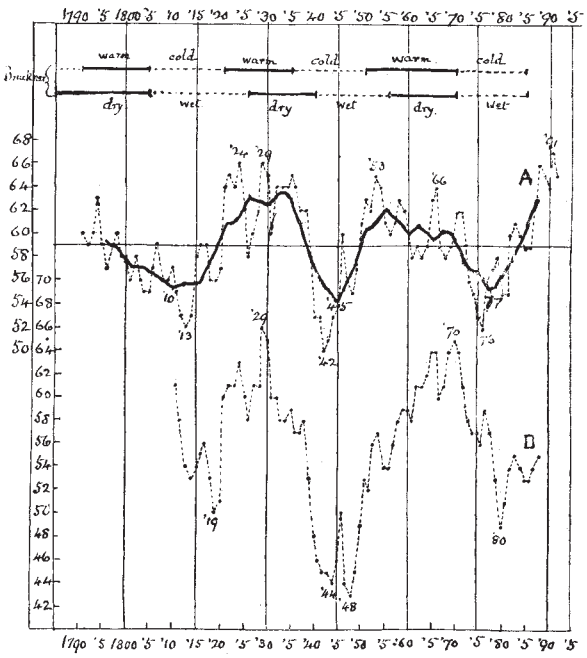
[1] Here the sum of 10 items is put down in the *sixth* place.
[2] *Klimaschwankungen*, p. 236.

It is surprising, I think, that an agreement so considerable can be brought out by a method so rough

Do not these facts throw some light on the future? An interval of 35 years from the last minimum, 1876, brings us to 1911, about which time (perhaps a little earlier) we might fairly look for another minimum, the middle of another cold and wet period. At present we are still, apparently, in the warm and dry period commencing about 1886, and probably near the end of it, as (say) 15 years from 1885 brings us to the end of the century. We next enter (by programme!) on another time of cold and wet, with preponderance of low barometers. Thus our curve A should be turning down soon towards its next minimum (situated somewhere between 1906 and 1911).

The rainfall aspect of the current warm and dry period may be put thus: Of the fifteen years, 1883–97, twelve have been dry, and only three wet. 1882 seems to mark the end of a long time of preponderance of wet years.

The curve B is one for Paris, made out in the same way as A (the data, however, extending only to 1893). It shows much the same kind of fluctuation. One curious feature is a lag in the three minima behind those of the London curve.



Regarding barometric pressure in these regions, Brückner considers that in a dry period there is a deepening of the usual cyclone in the North Atlantic (on an annual average), and an intensifying of the ridge of high pressure reaching from the Azores to the interior of Russia, especially in Central Europe; also a general increase of amplitude in the yearly variation (*Klimaschw.*, p. 217). In wet periods, the pressure differences (both from place to place and from season to season) are lessened.

There can be little doubt that this cycle of Brückner's touches life at many points, and that a promising field of study is thus opened up. Take health for example. Brückner himself shows how the mortality from typhus at Bâsle has varied with the cycle (being worst in the dry periods). In a recent valuable work on epidemic diphtheria, Dr. Newsholme correlates the mortality from that disease in England with the thirty-five years' cycle, showing that a succession of dry years afford the most favourable conditions for growth of the disease.

ALEX. B. MACDOWALL.

Soakage into Glazed Porcelain.

I MIX salt with water for occasional gargling, and keep it in a porcelain pot with a lid. Some weeks ago I began to use for the purpose a small well-glazed pot, in which cold cream had been bought a long time since. It was thoroughly washed by a

careful servant, and the salt put into it. However, after a few weeks the salt became so strongly impregnated with the odour of rancid grease that it was not fit to be used, and I threw it away. The pot was washed a second time with scrupulous care: it seemed to me quite pure and free from odour; a new supply of salt was put into it, and now for the second time the salt has began to smell intolerably rancid. The interest of this is twofold. First, it shows how large an amount of impurity is able to penetrate glazed porcelain, as photographers know to their cost; and secondly, it proves the possibility of concentrating odour. An imperceptible discharge from the porcelain was accumulated and stored in the salt until, when the lid was removed, it was found to be overpoweringly strong. The scent may therefore be said to have been *magnified* by these means, as much as a sound is magnified by an ear-trumpet, or a visible object by a lens. F. G.

The Twelfth Movement of the Earth.

UNDER the above heading a short article appears in the *Bulletin de la Soc. Astronom. de France*, October 1898, p. 449, which on account of its interest and of its brevity, as well as its geological significance, is well worth citation, although the matter of it has already been brought before the public by other *Journals* and *Proceedings* of learned bodies.

"The planet which we inhabit has been known by astronomers to be subject to eleven different movements.

(1) Its diurnal rotation around its axis in 23h. 56m.

(2) Its annual revolution round the sun in 356¼ days.

(3) The precession of the equinoxes in 25·765 years.

(4) The monthly movement of the earth about the centre of gravity of the earth-moon couple.

(5) The nutation caused by the attraction of the moon in 18½ years.

(6) The secular variation of the obliquity of the ecliptic.

(7) The secular variation of the eccentricity of the terrestrial orbit.

(8) The displacement of the line of apsides in 21·000 years.

(9) The perturbations caused by the constantly changing attractions of the planets.

(10) The displacement of the centre of gravity of the solar system round which the earth annually turns, which centre depends on the variable position of the planets.

(11) The general translation of the solar system in the direction of the constellation Hercules.

A twelfth movement, that of the terrestrial pole to the extent of 15m. to 17m. per year, which gives rise to a slight variation of latitudes for all countries, is at present the object of assiduous verifications in a certain number of observatories.

Mr. Albrecht has traced out the path followed by the pole about its mean position from month to month, according to the observations of latitude made since January 1, 1890, to June 1, 1897. This slight displacement is due more especially (surtout) to a variation of equilibrium produced by the movements of the atmosphere of the ocean."

It appears singular that this movement of the pole (and consequent variation of latitude) thus clearly determined to be taking place, has not led to any appreciations as to its possible and probable significance in geology. Amongst the many causes advanced to account for the derangements of land and ocean, and consequent changes of climate at various geological periods, has been a supposed displacement of the axis of the earth, which astronomers have been unwilling to admit as having taken place to any notable extent, and which up to the present it was not possible to prove as having really ever existed. Sir Arch. Geikie, in his "Text-book of Geology" (1885), p. 15, discusses the question sufficiently fully, and arrives at the conclusion (p. 17): "Under the most favourable conditions, therefore, the possible amount of deviation of the pole from its first position would appear to have been too small to have seriously influenced the climates of the globe within geological history."

Secular contraction is admitted as a consequence of the slow cooling of the earth, but the rate at which it acts, or its estimation as a force, is hardly attainable. That it may be, and is frequently a cause of earthquake action is admitted. Hence, considering it as a force acting at all parts of the earth's surface with greater or less energy, it is presumable that it is maximum in certain places, and may be so at points in the vicinity of the equator. Its energy may, indeed, here in places, have reached the point, from time to time, of balancing the centrifugal force proper to these places; and in this case it is evident that the ground in such places might be considered as being in unstable equilibrium, and liable to elevation or depression on the occurrence of very slight differences between the two forces in question arising from one cause or another. Now, under such conditions of equilibrium, it is just possible that a very slight variation of intensity of the centrifugal force at the place considered, could give rise to a derangement of the earth's surface such as would be attributed to an earthquake. This variation in the intensity of the centrifugal force might be the result of the movement of the polar axis, and possibly of a very slight movement such as recently observed. But if it be admitted that this movement is continuous, and if it be supposed that it may have been much more intense and much more frequent in former times, it is evident that it may have been a potent agent in bringing about alterations in the relative distribution of land and water in the zone of the equator, and it is reasonable to examine the actual state of this zone for some evidence of such former movements of the polar axis. Now, the equatorial zone lying between 10° to 15° north and south of the equator, is markedly characterised by the predominance of the ocean surface. The equatorial line only traversing land in Africa and South America, Borneo and Sumatra over a total length of about 90°, the remaining 276° of its extent lying on the Pacific, Atlantic and Indian Oceans. The localities where it traverses the land surface are remarkable in respect to their level as regards the sea. Thus the African part of the belt covers a large extent of the watershed valley of the Congo River, and the Victoria Nyanza basin. In a quite recent article in the *Scientific American Supplement* (Sept. 24, 1898, p 19008), the basin of the Congo "has (it is said) been compared by geologists to the dried up bed of an interior sea." In South America the southern portion of the zone represents the watershed valley of the Amazon, that is, a low-lying tract of land. The course of the zone where it traverses the Indian Ocean and the islands of Borneo, Sumatra, and Celebes, is over one of the most disturbed portions of the earth's surface, that is, where alterations of level, with accompanying seismic and volcanic phenomena, have been frequent and almost continuous. Furthermore, one of the results of a change in the position of the polar axis and variations of the intensities of the centrifugal force on the equatorial zone would be, that for points diametrically opposed, the decrease of centrifugal force at one point would necessarily imply an increase of the force at the opposite point, so that if subsidence took place in the one, elevation should be the result in the other, so that wherever the equator traverses land (representing elevation) it should be found traversing ocean (or low land) at the opposite end of the diameter corresponding to this elevated land surface. This practically holds good, since to the African belt is antipodal, a certain extent of the Pacific, while to the South American belt corresponds diametrically the portion of the Indian Ocean occupied by the islands of Sumatra, Borneo and the Celebes, so markedly characterised by the evidences of former and present seismic and volcanic actions. There is, therefore, some probability that in the present arrangement of land and water in the equatorial zone, there may be the traces of former changes of the polar axis. It is well to bear in mind, as regards these small movements of the axis frequently recurring, if not continuously, and giving rise consequently to small but repeated changes in the relative intensities of secular contraction and centrifugal force, that they may really be most potent agents of change, and that therefore, however small, they acquire great significance if found to be recurrent and tending to repeat themselves at more or less regular intervals, and intervals much shorter than those usually assigned to geological phenomena. J. P. O'REILLY.

The Geminid Meteors.

WILL you allow me to supplement the observations of the Geminids recorded in the first paragraph of your "Astronomical Column" in NATURE of December 19, p. 157, by mentioning some of my own? They may be interesting as showing the continuance of the shower, as I was unable to begin to keep watch until 12h. 30m. on the 12th. Twenty-seven meteors which appeared in the south and south-east were charted between that hour and 14h. 45m., when clouds finally covered that part of the sky. Of these, sixteen were from one or other of three radiants in Gemini, the most brilliant occurring at 12h. 42m. (= 1st magnitude), at 13h. 35m. (= magnitude 1½), at 14h. 16m. (= 1st magnitude), and at 14h. 23½m. (= Jupiter in bright-