rent kinds, and it is necessary carefully to distinguish between them. Thus certain periodic movements occur only during the growth of the part, and cease entirely when the structure has become full-grown; and the term "nutation" is restricted by Pfeffer to these recurrent movements during growth. In other cases periodic movements occur which are not determined by the growth of the part, but are due exclusively to the elongation and contraction of certain portions of tissue; and these latter are called by Pfeffer "movements of variation." These movements of variation which occur so commonly in the Leguminosæ are due to the action of more or less joint or hinge-like portions of the leaf. Nutations on the other hand which occur in very many leaves or petioles are due to unequal growth of the tissues, and not to the presence of a joint. As the movements of nutation are dependent on the growth of the part, they cease when growth ceases; and as the zone of maximum growth of the part changes its position, so also the seat of the nutation will vary. The movements of variation have a very different character, as they continue when the leaf is full-grown, and naturally, as they depend on a definite structure having a fixed position, they do not change their place during growth. The two forms of movement are very closely related, and jointed parts during growth often exhibit movements of nutation, thus showing the close relationship that exists between the two.

Periodic movements, whether movements of nutation or of variation, are either entirely independent of external stimuli, or are conditioned by them. The former class are the "autonomous" or "spontaneous" movements, the latter are the "paratonic" or "induced" movements—"Receptionsbewegungen," and depend on the paratonic action of external agents, as, for example, light and heat. As a consequence of the paratonic action, the leaf makes, in addition to the simple to-and-fro pendulum-like movement, certain further oscillations with decreasing amplitude, which Pfeffer calls "Nachwirkungsbewegungen," but which for want of any better word we may call simply secondary movements. It is by the help of these "secondary" movements that Pfeffer explains the peculiarities of the daily periodic movements of plants. The first chapter of the work now before us is devoted to these general remarks on the movements.

The second chapter treats of the mechanism of the induced movements evoked by alternation in illumination, the so-called sleeping and waking of plants. These movements are either movements of variation, as in the *Phaseolus vulgaris*, or they are movements of nutation, as seen in the leaves of *Impatiens noli-me-tangere* and the flowers of *Leontodon hastilis*. The measurements of the movements are made by an instrument described and figured by Pfeffer as the Lever Dynamometer.

The third chapter treats of the daily periodic movements. The subsequent chapters treat of such subjects as the mechanism of the daily movements, the intensity and internal causes of the movements, the influence of temperature and gravity, autonomous movements, and the like. A short chapter is devoted to the distribution of periodic movements. From it we learn that movements of variation are common in plants belonging to the Leguminosæ and Oxalidaceæ. All the plants of an order do not necessarily show movements of variation. Thus in the Euphorbiaceæ they occur in Phyllanthus; while in Euphorbia we have movements of nutation. A short historical review and *résumé* of results concludes this most interesting volume. W. R. M'NAB.

Jahresbericht der Meteorologischen Centralstation Carlsruhe über die Ergebnisse der an den Meteorologischen Stationen des Grossherzogthums Baden im Jahre, 1874, *angestellten Beobachtungen*. (Bearbeitet von Oscar Ruppell.)

THIS report gives a very satisfactory discussion, by copious tables and accompanying remarks, of the meteorological observations made at sixteen stations in the Grand Duchy of Baden during 1874. In addition to the tables usually printed in such reports, the temperature is given for the five-day means at all the stations. The monthly means of temperature, humidity, pressure, &c., include also the means of the separate hours of observation,—a feature of the report which deserves, from the important practical questions it throws light upon, to be more generally followed. The tabulation of thunderstorms shows each day on which these phenomena occurred at each of the stations. This method is greatly to be preferred to giving only the gross number for the separate months, since the data so published will be available in determining the periodicity of thunderstorms through the year,—an inquiry with which many interesting inquiries are intimately bound up. It is unnecessary to remark that 16 stations are miserably inadequate as a representation of the rainfall over the diversified surface of the Grand Duchy. Future reports will doubtless show a large increase to the staff of rain-observers. The daily pressure is given for two stations, Carlsruhe (404 ft.), and Höchenschwand (3,322 ft.), but unfortunately only the mean of the three daily observations is given, instead of one, or, better still, the whole three observations, it being only observations at particular hours which can be turned to account in charting the weather.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

Dr. Richardson's Hygeia

THE eloquent address in which Dr. Richardson has sketched the possible Health City of the future might furnish matter for much discussion—among other points, the probable statistics of the community. The author contemplates the possible reduction of the death-rate to 8 per 1,000 in the first generation, and to 5 or less in the next, as suggested by Mr. Chadwick. It sounds simple enough to talk of knocking 1 or 2 per 1,000 from a death-rate, and, so long as the rate is tolerably high, such as 20 or more, the effect is not so startling, but when we come to such low figures as 8 and 5 the difference becomes enormous. Thus, whereas a diminution from 21 to 20 raises the expectation of life by only 1½ years, a fall from 9 to 8 raises it by 9, from 6 to 5 by 21 years, and from 5 to 4 by 40 years. We should thus have at 8 per 1,000 death-rate an expectation of life of 86 years, and probable mean duration of 120, whilst there would be cases of old people living to 160. Again, at 5 per 1,000 the ages would be respectively 137 years for expectation at birth, and old people living on to 250; at 4 per 1,000 the expectation would be 177, and old people would live to beyond 330. Compare these figures with Dr. Richardson's closing address, where he claims a modest 90 years as the proper length of human life.

Another aspect of the case is the probable increase of population, which we may thus calculate:—The mean birth-rate of England for the last 35 years is 33·8; if the death-rate be 5 the net increase would be 28·8 per 1,000. At this rate the population of Great Britain and Ireland would reach 66,000,000 by the year 1900, and, by the year 2000, no less than 1,120,000,000, or about the present population of the inhabited globe. At the same time the model City of Hygeia would more than double itself by the end of the present century, whilst, by the end of the next, its population would be 3,450,000, or as nearly as possible that of our overgrown metropolis. What check does Dr. Richardson contemplate to this inordinate hypertrophy?

F. DE CHAUMONT

Photography in the "Challenger"

WHEN the *Challenger* was fitted out, I was asked to prepare certain special dry photographic plates to go with her. I wished to give them the sensitiveness of wet collodion and unlimited keeping qualities, and the following letter from the chief photographer on board is very satisfactory. The stains alluded to on