

The work is a striking example of what can be done when scientific zeal and business capacity have behind them resources such as those of the Carnegie Institution. Dr. Bauer and the staff of the department of terrestrial magnetism—both those who took the observations and those who did the necessary office work—are to be congratulated on the progress made towards the achievement of one of their principal objects of ambition, a general magnetic survey of the globe. C. CHREE.

#### ADVANCE IN ECONOMIC ENTOMOLOGY.

A NOTABLE feature of recent biological research is the attention paid by medical experts to the study of insects. Capt. F. W. Cragg, of the Indian Service, has lately published two Scientific Memoirs (Nos. 54 and 55) of the Medical and Sanitary Departments of the Government of India, which are of importance to students of the anatomy of Diptera. Both memoirs deal with blood-sucking species, No. 54 with *Philaematomyia insignis*, and No. 55 with *Haematopota pluvialis*. The excessively small number of males of the latter fly is believed by Capt. Cragg, after examination of the genitalia of the female insect, to be explained by heavy mortality as the result of pairing. We notice that the bibliography of this paper contains some remarkable misprints, of which "Verh. yool-bat. Gas. Wein" is worthy of record as a piece of unconscious humour! The last published part of the Bulletin of Entomological Research (vol. iii., part 4, December, 1912) contains valuable systematic papers on blood-sucking Diptera, by Mr. E. E. Austen and Prof. R. Newstead, and some very useful diagnoses of the larval stages of African mosquitoes, by Messrs. F. W. Edwards and A. T. Stanton.

The same number of the bulletin is noteworthy for a suggestive paper by Dr. J. Dewitz on the bearing of physiology on economic entomology. The author points out, for example, the importance of a precise knowledge of the effect of stimuli due to light of varying intensity and wave-length if luminous traps for destructive moths are to be used to the best advantage. Temperature is also found to be a factor in the working of this reaction; "the colder the night the fewer the females (and in particular females with eggs) that are caught by acetylene trap-lamps."

In a lately issued bulletin (Entomology, No. 113) of the U.S. Department of Agriculture, Messrs. W. D. Hunter, F. C. Pratt, and J. D. Mitchell describe the principal cactus insects of the United States. The "prickly pears" (*Opuntia*) are well known as furnishing food and habitation for the cochineal insect; since the decline of the cochineal industry, however, these plants were regarded rather as noxious weeds until the recent recognition of the fact that they furnish valuable fodder for cattle. Insects which injure them are therefore regarded as economically important, and in this short memoir a number of species of various orders are described and figured.

Some very important observations are contained in a small bulletin (No. 203) issued by the Maine Agricultural Experiment Station in 1912. Miss Edith M. Patch has apparently shown that the aphid causing "leaf-curl" on the elm (*Schizoneura americana*) migrates in spring to the apple and other Rosaceæ, and becomes the parent of the aerial colonies of the notorious woolly aphid, *S. lanigera*. The elm is thus the normal host of the sexual forms in autumn, and the apple is to be regarded as an "intermediate" host. The extreme rarity of sexual forms of *S. lanigera* on apple in these countries may perhaps be explained by a similar unsuspected migration here, though our

native elm "leaf-curl" aphid (*Schizoneura ulmi*) is generally regarded as distinct from *S. americana*, and identical with the polyphagous root-feeding form, *S. jodiens*.

The gipsy moth (*Porthetria dispar*) and the brown-tail moth (*Euproctis chryssorhoa*) are well-known examples of European insects which, having been introduced into America, have become there very serious pests. From among the voluminous writings of forest entomologists on these species, one or two recent papers are worthy of especial notice. A. F. Burgess gives an account (U.S. Dept. Agric., Entom. Bull. 119, 1913) of the means by which the gipsy moth extends its range. On account of the excessive weight of the female's body, she is unable to fly, though provided with wings, and the spread of the insect from place to place is carried on mostly during the larval stage. The caterpillars are often artificially though unwittingly transported by farm carts, and it appears that one generally unrecognised evil result of automobile traffic is that these destructive insects are carried far more widely and rapidly than formerly by the passage of motors along main roads which are bordered by infested woods. The young larvæ, however, are provided with a natural means of dispersal in form of long hairs, which enable them to be carried by wind for considerable distances. Some ingenious experiments on this subject have been made by erecting tall platforms provided with traps in which the little caterpillars are caught on their aerial journeys.

As these destructive insects were introduced from Europe, the American entomologists have naturally tried the experiment of importing some of their natural enemies, and an exhaustive report on this subject has been published by Dr. L. O. Howard and W. F. Fiske (U.S. Dept. Agric., Entom. Bull. 91, 1912). To summarise the mass of material in this bulletin is impossible, but the magnitude of the work undertaken may be judged from such a fact as that 11,000 egg-clusters of the brown-tail moth were imported from Europe in the autumn of 1906, and 40,000 specimens of a single species of hymenopterous egg-parasite, *Pteromalus egregius*, reared from these were turned out in New England woodlands during the succeeding spring. Many valuable bionomic details with regard to the parasites—successful or otherwise—to introduce predaceous enemies of other harmful insects into countries where the latter have themselves obtained a foothold. A short special paper on a cognate subject is R. S. Woglum's report on a trip to India and the Orient in search of the natural enemies of the Citrus white-fly (*Aleyrodes citri*); this forms Bull. 120 of the Entomological Bureau of the U.S. Dept. Agric.

A much-needed systematic monograph of the "white-flies," or "snowy-flies" (*Aleyrodidae*) is commenced by A. L. Quaintance and A. C. Baker in the Technical Series, No. 27, of the same bureau. These insects are allied to the Coccidæ and Aphididæ, but have received far less attention from entomologists than those two families. In the work now begun their structure, classification, and bionomics are dealt with as fully as possible in the present state of knowledge; ultimately the authors think that the family may prove as rich in species as the Coccidæ or Aphids.

Another valuable systematic paper of economic interest is Prof. M. Bezzi's memoir on Indian Trypaneids, or fruit-flies (Memoirs Indian Museum, vol. iii., No. 3, 1913). These are small Diptera included in what used to be known as the "acalypterate" series of the Museidæ. The careful, systematic study of such insects is of importance, and Dr. Annandale, the director of the Indian Museum, is to be con-

gratulated on having obtained the help of such an eminent European student as Prof. Bezzi, of Turin.

The Imperial Bureau of Entomology begins this year to supplement the Bulletin of Entomological Research by a *Review of Applied Entomology*, issued in two series—A, Agricultural, and B, Medical and Veterinary. Containing records of recent literature, with full summaries, these publications cannot fail to be valuable to students of insect life.

G. H. C.

#### METEOROLOGICAL REPORTS.

WE have received the meteorological observations made at the Hamburg Astronomical Observatory for 1910-12. This institution was established in the town of Hamburg in 1825, and was for many years under the able superintendence of Dr. Rümker; it is now situated at Bergedorf, 19 km. E.S.E. of its former position, and is under the superintendence of Dr. Schorr. Very complete and careful observations are made five times daily; the amount of cloud is also given for each hour between 6h. p.m. and 6h. a.m. The sunshine is recorded by Campbell-Stokes (burning) and Jordan (photographic) instruments. The average annual difference in the possible percentage for 1910-12 is 6.7 in favour of the Jordan recorder. Although the observations are not strictly comparable, we should not have expected so much difference. An interesting comparison of temperature and humidity in English and French screens is made with the readings of an Assmann's aspiration psychrometer. The hourly means of temperature in both screens are generally higher than those of the psychrometer; the greatest differences occur in daytime, especially in the French screen (open at bottom), but at the 9h. p.m. observation the reverse obtains. Humidity in the screens is generally higher than the readings of the psychrometer, especially during summer.

The report of the Sonnblick Society for the year 1912 contains the results of the meteorological observations on the summit of the Sonnblick, Salzburg (3105 metres), for twenty-five years, 1887-1911, prepared by Hofrat Dr. J. v. Hann. The mean monthly temperatures were:—January,  $-13.3^{\circ}$  C. (February,  $-14.0^{\circ}$ ); July,  $0.9^{\circ}$ ; year,  $-6.6^{\circ}$ ; mean of absolute extremes,  $9.5^{\circ}$ — $29.7^{\circ}$ . Mean yearly precipitation, 1715 mm., on 216.7 days. Fog was observed on 251.5 days. The mean yearly sunshine was 1496.9 hours, being 35 per cent. of the possible amount. The duration of sunshine varies greatly in different years; September, 1895, had 241 hours, August, 1896, only eighteen hours! November and January have relatively the most sunshine, May and June the least. Winter and late autumn are the brightest seasons, April to June the dulllest months. Among other useful summaries contained in the report we may mention the observations at the summit of the Donnersberg, Bohemia (835 metres), for the years 1905-9. The observatory is attached to the German University at Prague, under the direction of Prof. R. Spitaler.

The report and meteorological observations at the Royal Observatory, Hong Kong, for the year 1912 have reached us; the results have been carefully prepared by Mr. T. F. Claxton, formerly director of the Mauritius Observatory. The tables include hourly values of the principal elements, five-day means, and results of magnetic observations. The mean annual air-temperature,  $71.9^{\circ}$ , was about normal; maximum,  $92.5^{\circ}$ , in September; minimum,  $45.3^{\circ}$ , in December. The rainfall, 63.9 in., was about 20.5 in. below the average. The colony was not actually visited by a typhoon, but the tracks of those and of the more important depressions which occurred in the Far East

during the year are shown on two plates. A weather map and reports from about forty stations are issued daily; the forecasts drawn from these data for various districts show a very high percentage of success. A large amount of data is extracted from ships' logs; this is utilised in determining typhoon tracks, and to some extent for the eventual publication of pilot charts of the Pacific for the area  $9^{\circ}$  S. to  $45^{\circ}$  N. latitude, and  $100^{\circ}$  to  $180^{\circ}$  E. longitude, divided into two-degree squares.

#### HORTICULTURAL INVESTIGATIONS AT THE WOBURN EXPERIMENTAL FRUIT FARM.<sup>1</sup>

IN a flower, such as that of an apple-tree, there is a tubular structure in the centre, forming the female portion of the flower, and that is surrounded and overtopped by a number of rods, bearing at their extremities sacs of pollen, this constituting the male element. When a grain of pollen, either of the same or another flower, enters the central tube, or pistil, fertilisation occurs, and a seed, or pip, begins to form near the base of the pistil. As it develops, the woody substance surrounding it, which is really a portion of the stalk of the tree, gradually swells to a remarkable extent, and eventually forms the fleshy or edible portion of the fruit. We commonly call it the fruit, but it is only a metamorphosed portion of the mother-tree: the real fruit of the tree, the progeny of male and female elements, is the pip. When this is sown in the ground, it germinates, and eventually forms a new tree, which, though probably showing some resemblance to its two parents, will be a new variety, and will not bear apples of the same sort as the mother-tree. One reason which makes it all the more improbable that a pip will give rise to a tree bearing fruit like that of the mother-tree, is that in many cases the female portion of the flower cannot be fertilised except by pollen from a tree of a different variety.

As it is impossible to reproduce a fruit-tree of any given variety from seed, other methods of multiplication must be adopted, namely budding or grafting. A young tree of a similar character is taken (the stock), and in the one case a bud, or in the other case a twig (scion), from the tree to be propagated is united with the stem of the stock. All the growth arising from this bud, or buds, is similar to that of the tree from which it was taken; the stock acts as little else than a channel for conveying nourishment to the ingrafted buds; yet it does exert a certain influence on the character of the growth of scion. For apples we use two classes of stocks; the one, the crab stock, is obtained by sowing the seeds of crab-apples, and is characterised by forming a scanty number of roots, but these are stout, and have a tendency to obtain deep hold of the ground; the other, the paradise stock, is derived from a French variety of apple, and forms a much larger number of roots, but smaller, and tending to spread out near the surface of the ground. The grafted tree partakes of the character of the roots of the stock; on the paradise stock it becomes more spreading in its habit, and grows less vigorously than on the crab stock, and, whilst the former is more suitable for growing trees in the bush form, the crab stock is more suited for standard trees.

In the case of pears, the corresponding stocks are: the pear stock for standard trees, and the quince stock for bush trees.

It must be remembered, however, that the effect of the stock on the growth of a tree is a subsidiary

<sup>1</sup> From a discourse delivered at the Royal Institution on Friday, February 21, by Mr. Spencer U. Pickering, F.R.S.