

The results of the precise levelling operations for the year are published in Appendices Nos. 6 and 7, which submit them in a detail that makes them immediately available for the requirements of surveyors and engineers. These extend the precise level net, as previously published, six hundred miles to the westward, from Red Desert, Wyoming, to Owyhee, in eastern Idaho, and from Holland, Texas, two hundred miles south-west, to Seguin, Texas. An interesting feature is an account of the change in the manner of support for the levelling rods, with the comparative discussion of the old and the new methods, and the consequent confirmation of the importance of the new system.

The account of operations submitted by the assistant in charge gives the story of the work of the various computing, drawing, engraving, and chart divisions of the office in which the results of the field work are discussed or prepared for the publications and charts wherein they are placed at the service of the public.

A full account of the first recording transit micrometer devised for use in the telegraphic longitude determinations of the Coast and Geodetic Survey is submitted in Appendix No. 8, with an account of the exhaustive tests it was subjected to, and a recapitulation of the results of experience with this form of instrument, mainly in Europe, during the last thirteen years. The results of these experiments indicate that with the transit micrometer the accuracy of telegraphic longitudes may be considerably increased if desirable, or the present standard of accuracy may be maintained at much less cost than formerly.

The results of all triangulation in California south of the latitude of Monterey Bay are printed in the concluding appendix in full, including descriptions of stations as well as their latitudes and longitudes and the lengths and azimuths of the lines joining them. In compact and convenient form there is given all the information in regard to this triangulation that is needed by an engineer or surveyor who wishes to utilise the results in controlling and checking surveys or in constructing maps or charts. The locations of more than 1300 points are accurately fixed by this triangulation.

The report, in addition to the details of the foregoing operations and results, contains a record of a wide range of important work for which the aid of the Survey was sought because of the special training of its officers.

PROTECTIVE RESEMBLANCE.

AN interesting paper on "Protective Resemblance in the Insecta," by Mr. Mark L. Sykes, is published in the *Proceedings of the Manchester Field Club* (vol. i., part ii). After briefly describing the law of natural selection, as propounded by Darwin, the evolution of new species through variations, and the elimination of the least fit during long periods of time, reference is made to the colours of insects, to the advantage of conspicuous adornment, and the consequent easy identification of those of them which possess some feature repellent to the insect-eating animals. The absence in young animals of an intuitive faculty of discrimination between edible and inedible material in the selection of food is emphasised, and reference is made to authors who have experimented on the subject.

Müller's theory of mutual protection, through similarity of colours and patterns, amongst inedible Lepidoptera, and Bates's explanation of the "mimicry" or simulation of distasteful species by edible species, are described, and the superficial resemblances between entirely different species and genera are attributed to the influence of natural selection and elimination, and the transmission and accumulation of variations. The method by which many of these likenesses are produced is shown by a number of camera lucida drawings of the wing scales of many of the butterflies and moths referred to and illustrated in the article; and the scale variations, in colour, size, pattern and arrangement, which produce a common resemblance in the insects, are described. Another branch of the subject, treated in some detail, is protective resemblance of environment, as seen in the striking similarity of many insects,

especially amongst the Lepidoptera and Orthoptera, to leaves, twigs, moss, &c.; and a number of illustrations are given of resemblance to natural surroundings, three of which we select as examples.

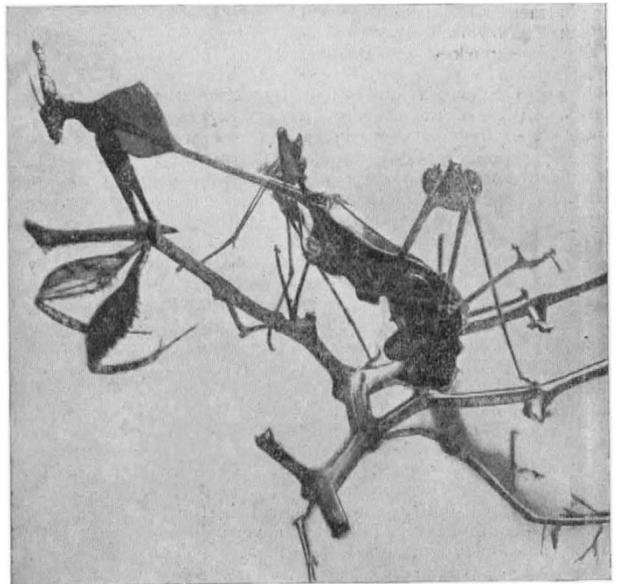


FIG. 1.—*Embusa gongylodes* (Ceylon) at rest on twig

Among the many curious and interesting insects which are found in Ceylon, *Embusa gongylodes* is one of the most singular. It is a brown insect. The thorax is like a long

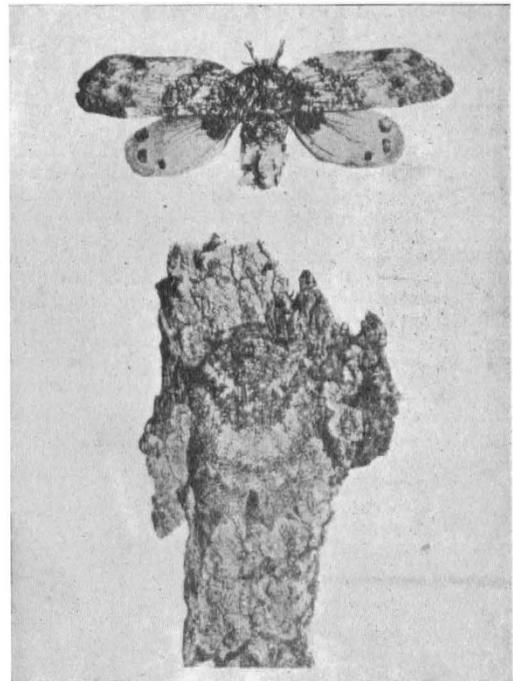


FIG. 2.—*Eurybrachis Westwoodii* (Ceylon) with the wings expanded, and at rest upon a piece of bark.

thin twig, with a wide leaf-like expansion immediately behind the head. The wings are broad, veined and crumpled, like dried leaves, and the long legs, which are spread out in any direction as the animal is at rest, har-

monise so closely with the twigs to which they cling that it is difficult to see where one begins and the other ends. Fig. 1 illustrates this insect in the attitude in which it was resting before being captured.

Another interesting insect from Ceylon is one of the moths, *Eurybrachis westwoodii*. The fore wings of this insect are marked in a mottled pattern of green, grey and brown, the hind wings being white, with deep claret-coloured marks near their base, and when it is on the wing the moth is an attractive-looking creature. But its appearance alters when it is at rest, with the mottled wings folded over the back. In Fig. 2 it is shown with the wings expanded as it appears when flying, and below is a piece of bark with the same insect resting upon it, where it was discovered by the keen sight of the collector—a clever capture, as will be admitted when it is noticed how excellently the wings and bark harmonise, and how they seem almost to merge one into the other.

There is found in Madagascar a small beetle which, looked at apart from its natural surroundings, has nothing specially interesting about it except that it is a conspicuous, rugged-looking, pure white and black insect, about three-quarters of an inch long. It feeds upon a species of fungus, which grows upon the bark of trees in mixed cream and black coloured patches. The beetle is shown at the

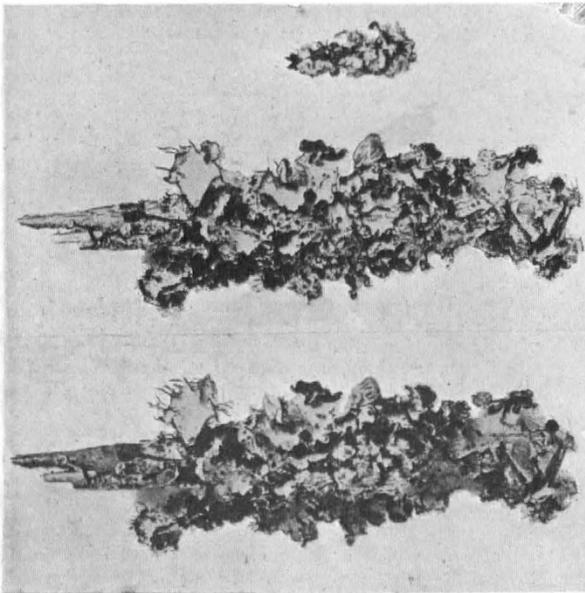


FIG. 3.—*Lithinus nigrocrivastatus* (Madagascar). The upper figures show beetle and bark separately, and in the lower figure the beetle is on the bark.

top of Fig. 3, and beneath it a piece of twig with the fungus growing upon it. At the bottom of the same illustration the same piece of fungus-covered twig is shown, but here the beetle is resting right in the middle of the fungus, effectually concealed amongst the vegetation upon which it feeds.

The paper is very fully illustrated by more than two hundred figures of the insects described, with the localities in which they were taken, covering the whole subject treated by Mr. Sykes.

Exception is taken to the use of the words "imago" and "imagine," introduced by Linnæus, as representing the final stage of insect metamorphosis, and "matura" (maturato=to ripen) is suggested and employed as a substitute, conforming conveniently with the accepted terms for the earlier stages—larva and pupa. The word "mimicry" is also adversely criticised, as implying conscious resemblance, which is not known to exist, and "simulism," "simulation," "simulating," are substituted "as being at once expressive, explanatory and euphonious, and free from the inference of designed and cognitive resemblance."

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REPORT OF THE CARNEGIE INSTITUTION, 1904.¹

IN NATURE for January 7, 1904, a list was given of the awards made by the Carnegie trustees for the prosecution of inquiries in various scientific directions. The third year book, just published by the board of trustees, contains reports upon most of these researches, but the time is far too short to gather in the full harvest, which may hereafter be expected, from so lavish and, presumably, judicious expenditure. There is abundant evidence that many well-known men, engaged in every department of science, have been enabled to attack problems which must otherwise have been neglected, or pursued with inadequate material and less energy. Beyond this general fact, the present volume does not, in most instances, enable us to estimate the results. The balance sheet attached shows that the trust is in a very flourishing condition, and that 267,000 dollars have been provided for inquiries, which the management discuss under the three heads of large, special, and minor grants.

Under the division of large grants, we have a description of the station erected, or adapted, for the study of experimental evolution at Cold Spring Harbour, some twelve miles from New York. Plans of the building are given, and a full account of the opening ceremony, at which Dr. Hugo de Vries gave a scientific address. The objects sought to be gained by such an institution are typical of the uses of the trust, and legitimately appeal to a liberal consideration. The investigations must be long continued, the results may be doubtful or negative, and it is a research which no individual or institution is likely to undertake on a scale sufficiently broad to produce decisive results.

Another far-reaching scheme, the Marine Biological Laboratory at Dry Tortugas, Florida, under the care of Dr. H. G. Mayer, is quite in its first stages of development, but one whose usefulness may be confidently predicted in due time. The buildings that have been erected consist of a main laboratory, 100 feet long, one story high, and with special arrangements for keeping the building cool in the hot weather of those latitudes. A feature in the construction of the laboratory and of the smaller buildings connected with it, is that all are made portable, so that they can easily be removed from their present site and erected elsewhere if thought desirable. Attached to the station is a sea-going vessel of light draft, fifty-seven feet over all, and sixteen feet beam, with a 20 h.p. naphtha engine. There is sufficient accommodation for seven men on board, and the vessel is specially designed to dredge in depths of 500 fathoms or less. Among other projects for which large grants have been made is the subject of economics, whose many subdivisions include, among others, population and immigration, mining and manufactures, banking and finance, social legislation and the labour movement, &c. Reports on all these subjects have been added, showing the scope of the respective inquiries and the progress that has been made. Historical research and terrestrial magnetism are the remaining two subjects which come under the division now being considered. On the latter subject we have some of the results of the discussion of the magnetic disturbance observed during the eruption of Mont Pelée, which are of special interest, since the inquiry discloses the fact that in certain respects the disturbance resembled those storms which are believed to be of cosmic origin.

The Transcaspian archaeological expedition and geophysical research are the subjects of special grants. The former is under the charge of Prof. Pumpelly, who left America in December, 1903, and began excavations in the following March, first attacking Anau, in Turkestan. By means of excavations in tumuli and by shafts sunk in the city of Anau, the exploring party has traversed some 170 feet of the accumulations of successive generations of peoples, extending from recent times, through the iron and bronze civilisations, and some 45 feet deep into the stone age. Among the objects of this investigation is the hope of throwing some light on the source of our domestic animals.

The reports on the subjects of the so-called smaller grants cannot be particularly referred to here. The inquiries cover

¹ Carnegie Institution of Washington. Year Book, No. 3, 1904. (Washington: Published by the Institution, 1905.)