

xxxiii., of *The Astrophysical Journal*. Feeling dissatisfied with the Crova alcohol actinometer obtained in 1902, Mr. Abbot conceived the idea of constructing a new form of pyrheliometer. This consists of a double walled, large test-tube blackened within, with a stream of water circulating between the double walls and absorbing the heat collected inside the chamber. The sun's rays shine into this chamber through a measured orifice, and the heat collected by the water is measured by a system of platinum wires forming a resistance thermometer.

Test experiments with electrically heated coils, in which the heat could be measured with great accuracy, have shown that the water system collects all the heat introduced within 1 per cent., and that the solar heat can be collected and measured to within 0.2 per cent. Thus the scale of the solar-constant observations of the Astrophysical Observatory is reduced to the absolute scale of calories ( $15^{\circ}$  C.) per square centimetre per minute within a probable error of 0.2 per cent., an accuracy hitherto not attained.

**DOUBLE-STAR OBSERVATIONS.** Circular No. 6 of the Transvaal Observatory contains a list of about 350 double stars discovered with the 9-inch Grubb refractor of the observatory during 1910. Mr. Innes directs attention to the common statement that the southern heavens offer a practically unexplored field to the would-be double-star discoverer, and shows that this is by no means the case. The circular also contains a list of double stars discovered by Mr. Ward at Wanganui, New Zealand. The list contained observations of 212 stars, but has been revised, and in some cases the observations confirmed, by Mr. Innes.

Nos. 4486 and 4488 of the *Astronomische Nachrichten* also contain series of double-star measures, the former by Herr J. Voûte at the Leyden Observatory, the second a longer list of micrometer measures by Prof. H. E. Lau at Copenhagen.

**MICROMETRICAL MEASUREMENTS OF NEBULÆ.**—A useful catalogue of nebulae lying south of the equator is published as No. 17 of the Publications of the Cincinnati Observatory. In the preface Prof. Porter explains that when the 16-inch Clark refractor was ready for work at the end of 1904 it was decided to observe those nebulae of Dreyer's N.G.C. which have southern declinations, and the work has been carried on since. There was no idea of discovering new objects, but seventeen were found, of which nine appear certainly to be novæ. The catalogue includes the positions of 669 objects, with the micrometrical measures of them and of the companion stars.

**THE MOTION OF CERTAIN STARS IN SPACE.**—As an extract from the *Bulletin Astronomique*, we have received a paper in which Prof. Stroobant discusses the question of the sun being a member of a group of stars having a common motion through space. In the result, he finds a fairly strong indication that the sun does belong to such a system, which also comprises the stars  $\alpha$  Cassiopeiæ,  $\beta$  Persei,  $\alpha$  Persei,  $\alpha$  Scorpionis,  $\gamma$  Cygni, and  $\epsilon$  and  $\alpha$  Pegasi.

#### THE COMPOSITION OF THE GASES CAUSED BY BLASTING IN MINES.<sup>1</sup>

THE report before us was drawn up for the Government of Western Australia by Mr. E. A. Mann, the Chief Inspector of Explosives. The importance of investigations on the subject of the composition of gases caused by blasting in mines cannot be overestimated, since, hand in hand with the safety in actual use of blasting explosives, there is the possibility of accidents arising from the products of the explosion accumulating in badly ventilated headings. This risk has been recognised by several Governments, and investigations instituted. In the present case a most valuable and suggestive report is the outcome.

Nitroglycerine is the only largely employed explosive which contains more than sufficient oxygen for its com-

<sup>1</sup> Report on investigations into the Composition of the Gases caused by Blasting in Mines, by E. A. Mann, Chief Inspector of Explosives for Western Australia. (Perth: by authority: Fred. Wm. Simpson, Government printer.)

plete combustion, and on firing should therefore yield only carbon dioxide, nitrogen, water vapour, and an excess of oxygen. The explosives investigated were mainly nitroglycerin explosives: blasting gelatin (nitroglycerin with approximately 10 per cent. soluble nitrocellulose), gelatin dynamite, and gelignite, both of which contain wood meal and potassium nitrate. Generally speaking, the former contains a slight deficiency of oxygen, whilst the latter two an excess.

The gases produced on firing under actual working conditions were collected by Mr. Mann, who wore for the purpose a Fleuss oxygen apparatus. In all 131 entries were made into the dangerous gases, and analysis invariably showed that carbon monoxide, which is so highly poisonous, was produced, together with small quantities of oxides of nitrogen, dangerous by reason of their physiological activity.

An important ratio obtained is that between  $\text{CO}:\text{CO}_2$ , which is a fair measure of the relative dangers of gas-poisoning with the different explosives. The highest is found with blasting gelatin (1:6.5), a general average for all the explosives being about 1:13. It is well known that pressure on firing exercises an enormous difference in the distribution of oxygen to form carbon dioxide or monoxide, high pressures increasing the  $\text{CO}_2$ , and this has an important bearing in practice. If the explosives mentioned are fired in a bomb, the maximum oxidation results, since maximum pressure is attained. In a rock, the greater the resistance, either from its character or the position of the charge, the lower should be the ratio  $\text{CO}:\text{CO}_2$ . The ideal condition would be where the rock only gives just when the maximum pressure is reached; but this is a condition impossible to realise in practice, so that holes are invariably overcharged, i.e. the rock is blown out before oxidation has been completed, hence the production of carbon monoxide.

Two very important points are brought out, first, the influence of the paper wrapper of the cartridge, which gives a deficiency of oxygen on the whole charge. Comparative tests with and without wrappers show that in the case of gelignite the ratio  $\text{CO}:\text{CO}_2$  has been reduced from 1:16 to 1:51, and in the case of blasting gelatin from 1:95 to 1:52. Secondly, the influence of the physical condition of the powder; where the most intimate mixture of the ingredients is obtained, there is every chance of oxidation proceeding more rapidly to the maximum actually obtainable before rupture of the rock. Some excellent coloured plates of the microstructure of many of the explosives under polarised light emphasise the frequent heterogeneity of their structure.

The effect of fuse firing as compared with electric firing is carefully considered, and everything is greatly in favour of the electrically fired charge, fuses being responsible for much deleterious gas.

#### DRAINAGE AND MALARIA.

IN India, the sanitary expert adviser of the complacent type must either "bend or break" under the weight of official opinion (held as strongly by the youngest Under-Secretary as the veteran Financial Member) that the Sanitary Department must be classed financially as "unproductive," and must therefore be, in its representations involving expense, tactfully unobtrusive. Hence, possibly, the unconscious evolution of the policy of "quinine prophylaxis," which would relieve the Government of India from applications for loans and "free grants" for radical anti-malarial measures, such as drainage works, requiring the sinking of capital, and would throw upon the inhabitants of malarious areas (who are notoriously impecunious as a sequence of disability to labour) the onus of purchasing an expensive drug—through an indefinite number of years.

In connection with the letter in NATURE of February 9 by Dr. Bentley—one of the small circle of supporters of this policy—and the reply thereto by Dr. Malcolm Watson, there is now available a record<sup>1</sup> of facts at issue, which will enable those interested in a question of much import-

<sup>1</sup> "The Prevention of Malaria in the Federated Malay States." By Dr. Malcolm Watson, with a preface by Prof. Ronald Ross, C.B., F.R.S. Pp. 139. (Liverpool: School of Tropical Medicine, 1911). Price 7s. 6d.

ance to communities of tropical countries, and, consequently, of our national commerce, to draw their own conclusions. Readers of this very valuable statement of work fulfilled and observations made by a keen and practical sanitarian will find no difficulty in recognising that the "marked rise of subsoil water," which coincided with the increased incidence of malarial fevers, was the "special influence" at work in Klang; that this occurred in an already malarious town in constant communication with surrounding malarious areas, with the result that transfer of infected inhabitants to the swamps of Port Swettenham found ready-made conditions for the continuance, if not aggravation, of epidemic malaria; and, consequently, the increased incidence was not due to the ephemeral effect of importation of ill-fed coolies, but primarily to local physical conditions remediable, and actually remedied, by judicious engineering operations.

This record shows that in Klang and Port Swettenham the abolition of pools by drainage (without the aid of quinine prophylaxis in the former case, even as a temporary measure) rapidly rendered possible commercial undertakings of great monetary value, which had been interrupted on account of disability of the available labour; that whilst there obviously is no desire on the part of the author to belittle the utility of quinine prophylaxis, he found that to secure maintenance of coolie labour upon estates the daily consumption of quinine necessary, under careful supervision of the subjects, was in quantities that a free Indian population could neither afford nor be persuaded to take; that the survivors of this temporising effort remained at the end of two and three years of daily administration of quinine the bearers of malaria parasites, and therefore were a danger to themselves and their neighbours; and that by effectual removal of surplus moisture of the soil, there is excluded fear of epidemic malaria following the introduction of malaria-parasite bearers—an "influence" which, in the absence of drainage, certainly cannot be ignored. Nor is it only in Klang and Swettenham that these results have been illustrated, but in several planting estates, where previously the loss by coolie labour paid for, but unavailable from sickness and death, was of grave moment; here also has been gathered valuable information as to the necessary radius of protective zones.

Seeing that, in accordance with the policy of the sanitary expert advisers of the Government of India, the Punjab Government has recently inaugurated an anti-malarial campaign by purchasing a ton of quinine, it is not likely that the amount of this drug found necessary by Dr. Malcolm Watson for the mitigation—not eradication—of malaria in a free population will surprise them. The Government of Eastern Bengal and Assam has, however, adopted a method more likely to be grasped by the people; whilst assigning drug prophylaxis to the millennium, it, in the meantime, asks its malaria-stricken populations to indulge in the so-called quinine "treatments" at three annas *per head per attack*—or a sum exceeding the total average annual taxation *per head* on account of district boards serving under it.<sup>1</sup> In this case, presuming two attacks *per annum per head* in a population of 15,421, there would be spent (in one sense) "unproductively" against a preventable disease sufficient to meet the sinking fund and interest, by annual instalments, of a loan for thirty years of one lakh of rupees. Yet the chances are that were a lakh sunk in any well-designed anti-malarial drainage scheme, there would be illustrated the truism that "prevention is better than cure"—both for commercial and humanitarian reasons.

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#### SOME PAPERS ON INVERTEBRATES.

IN the report of the Government entomologist, issued by the U.S. Department of Agriculture, for 1910, will be found a full account of the work accomplished during the year under review, and a scheme for future work. Certain points connected with the life-history of the brown-tail and the gipsy moth engaged attention during the year, more especially the presence of isolated colonies of

<sup>1</sup> In Italy, under laws passed 1901-03, the poor and all workers have the right to receive quinine for treatment and prophylaxis gratuitously from the State.

the latter in woodland districts. As the result of these investigations, it was found that newly hatched caterpillars may be carried by wind to a distance of nearly 2000 feet. Of late years the Argentine ant has caused such damage to orange-plantations in Louisiana that several have been abandoned, but it is believed that a practical method of keeping this pest in check has now been discovered.

New species of artificially reared ichneumon-flies and new South American parasitic Hymenoptera form the subject of two articles, respectively by Mr. H. E. Viereck and Mr. J. C. Crawford, in the Proc. U.S. Nat. Mus. (Nos. 1789 and 1786).

It seems somewhat strange that it should be left to a Japanese naturalist to describe new cicalas from Europe and the Mediterranean countries. Nevertheless, such has been the case, and in the Journal of the College of Science of Tokio University, vol. xxvii., art. 18, Prof. S. Matsu-mura, who writes in German, concludes his paper on this subject, describing as new no fewer than forty-two species, together with two new genera.

In *Naturwissenschaftliche Wochenschrift* of February 5 Prof. J. Meisenheimer records the results of experiments for testing the power of regenerating their wings in insects, the moth *Lymantria dispar* being the subject of these experiments. The first traces of the wings occur as minute outgrowths from the sides of the last two limb-bearing segments of the caterpillar, and in the large series of specimens submitted to experiment these were cut away on one side. In a few instances the wings on the injured side were represented by mere knobs, but in most cases more or less well-developed wings were grown, although very generally smaller than the normal ones. Sometimes one wing on this side may be fairly well grown, and the other quite small. Details on this point, and also in regard to variation in the colour-pattern, are given in the paper.

The *Entomologist's Monthly Magazine* for March contains two papers—one, with a coloured plate, by Miss E. M. Alderson, and the other, by Mr. E. A. Atmore—on the beautiful little lace-wing fly, *Chrysopa dorsalis*, first added to the British list in 1900 on the evidence of specimens taken in Surrey, but subsequently found in Norfolk. The species, which frequents the needles of Scots fir, has been bred in confinement by Miss Alderson.

A synopsis of the true crabs inhabiting Monterey Bay, California, forms the subject of an article by Mr. F. M. Weymouth, issued as No. 4 of the Leland Stanford Junior University Publications. This communication, which is very fully illustrated, is to form one of a series of papers of similar scope dealing with the fauna of Monterey Bay for the purpose of rendering the local forms of invertebrates easily identifiable by the students at the Marine Biological Laboratory of the University.

The structural arrangements in the females of the decapod crustaceans of the family Peneidæ for receiving and storing the sperm are described and illustrated by Mr. E. A. Andrews in No. 1791 of the Proc. U.S. Nat. Mus. The females of this family present the comparatively rare feature of having special receptacles, or spermatheca, for this purpose on the ventral aspect of the body, and the different degrees of complexity of these structures in the various species and genera are illustrated by sections. The alleged existence of receptacles of the same type in the females of the deep-sea prawns of the group Eryonidea is considered by the author to be improbable.

North American parasitic copepods of the family Ergasilidæ form the subject of No. 1788 of the same serial. The family, according to Mr. C. B. Wilson, includes ten genera, three of which are described for the first time, while the definition of a fourth is revised. All its members live almost entirely on the gill-filaments or within the gill-cavities of fishes, but whereas adult females become more or less fixed, the males remain free-swimmers, and in the case of one genus do not appear to be parasitic at all. Hence males are much scarcer in collections than females, and after the breeding season can only be taken in the tow. The genera may be arranged in the three subfamilies, of which one is typically fresh water, while the other two are marine.

No. 1783 of the Proc. U.S. Nat. Mus. is devoted to the ninth portion of Mr. C. B. Wilson's memoir on North American parasitic copepods, the author dealing in this