On one very important point, however, M. Wesmael was in error; he states that the abdomen of these abnormal individuals "ne contient aucun organe; ou plutôt, il n'est lui-même qu'un vaste sac stomacal." Blake even asserts that "the intestine of the insect is not continued beyond the thorax," which must surely be a misprint; and also that there is no connection "between the intestine and the cloaca"! These statements, however, are entirely erroneous; and, as M. Forel has shown, the abdomen does really contain the usual organs, which, however, are very easily overlooked by the side of the gigantic stomach.

I have now the honour of exhibiting to the Society a second species of ant, which has been sent me by Mr. Waller, in which a similar habit has been evolved and a similar modification has been produced. The two species, however, are very distinct, and the former is a native of Mexico, while the present comes from Adelaide in Australia. The two species, therefore, cannot be descended one from the other; and it seems inevitable that the modification has originated independently in the two species.

It is interesting that, although these specimens apparently never leave the nest, and have little use therefore for legs, mandibles, &c., the modifications which they have undergone seem almost confined to the abdominal portion of the digestive organs. The head and thorax, antennæ, jaws, legs, &c., differ but little from those of ordinary ants.

CAMPONOTUS INFLATUS, n. sp.

Operaria. Long. 15 mill. Nigra, tarsis pallidioribus; subtiliter coriacea, setis cinereo-testaceis sparsis; antennis tibiisque haud pilosis; tarsis infra hirsutis; mandibulis punctatis, hirsutis, sexdentatis; clypeo non carinato, antice integro; petioli squama modice incrassata, antice convexa, postice plana emarginata.

Hab. Australian.

The colour is black, the feet being somewhat paler. The body is sparsely covered with stiff cinereo-testaceous hairs, especially on the lower and anterior part of the head, the mandibles, and the posterior edge of the thorax. The head and thorax are finely coriaceous.

The antennæ are of moderate length, twelve-jointed; the scape about one-third as long as the terminal portion and somewhat bent. At the apex of the scape are a few short spines, bifurcated at the point. At the apex of each of the succeeding segments are a few much less conspicuous spines, which decrease in size from the basal segments outwards. The antenna is also thickly clothed with short hairs, and especially towards the apex with leaf-shaped sense-hairs. The clypeus is rounded, with a slightly developed median lobe and a row of stiff hairs round the anterior border; it is not carinated. The mandibles have six teeth, those on one side being rather more developed and more pointed than those on the other. They decrease pretty regularly from the outside inwards. The maxillæ are formed on the usual type. The maxillary palpi are six-jointed, the third segment being but slightly longer than the second, fourth, or fifth; while in *Myrmecocystus* the third and fourth are greatly elongated. The segments of the palpi have on the inner side a number of curious curved blunt hairs besides the usual shorter ones. The labial palpi are four-jointed. The eyes are elliptical and of moderate size. The ocelli are not developed.

The thorax is arched, broadest in front, without any marked incision between the meso- and metanotum; the mesonotum itself is, when seen from above, very broadly oval, almost circular, rather broader in front and somewhat flattened behind. The legs are of moderate length, the hinder ones somewhat the longest. The scale or knot is heart-shaped, flat behind, slightly arched in front, and with a few stiff, slightly diverging hairs at the upper angles. The length is about two-thirds of an inch.

ON THE THERMIC AND OPTIC BEHAVIOUR OF GASES UNDER THE INFLUENCE OF THE ELECTRIC DISCHARGE[1]

PROF. E. WIEDEMANN has undertaken an exact calorimetric investigation of the electric discharge through gases, and in spite of the serious difficulties which he had to encounter, he has already obtained valuable and important results. As a source of electricity, Töpler's machine was used; but we must refer to the original paper for all details of experimentation.

Three series of observations were made. In the first the total heat generated in a given time in the whole vacuum tube was measured. In the second series the capillary part only was examined, and in the third the thermal behaviour of the regions in the neighbourhood of the electrodes was investigated. The result of the first series is summed up as follows:—With decreasing pressure the total quantity of heat generated at first decreases, reaches a minimum, and then increases again. In hydrogen the amount of heat generated is smaller than in atmospheric air.

A smaller amount of heat developed corresponds to a larger number of discharges in a given time, and hence to a smaller potential at the moment the discharge begins to pass. The results of Prof. Wiedemann are therefore, as he points out, in accordance with those of Messrs. De La Rue and Hugo Müller, who found that the difference of potential necessary to cause a discharge passes through a minimum as the pressure decreases.

Somewhat more complicated results were obtained when an air-break was introduced into the circuit. In that case the air-break determines the difference of potential necessary to produce a discharge; but if the whole quantity of electricity would pass suddenly when that potential has been reached, and before it has had time to sink, the amount of heat generated would be independent of the pressure in the vacuum tube. This however is not the case; but the result is intermediate between that obtained when no air-break exists, and that which would be obtained on the above supposition.

The following results were obtained in the experiments in which the capillary part of a vacuum tube only was introduced into the calorimeter:—

1. The heating effect in capillary tubes at pressures above 1 mm. is almost independent of the quantity of electricity passing with each discharge, and nearly proportional to the total amount of electricity which passes.

2. The heating effect is almost the same whether the positive or negative electrode of the tube is connected with the machine (the other electrode being connected with the earth), although the number of discharges passing in a given time is different.

3. With decreasing pressure the heat generated decreases very rapidly without passing through a minimum.

4. The heating effect is independent of the shape of the electrodes. Some results obtained by Prof. G. Wiedemann, who had found that in tubes of different widths the same amount of heat is generated by the same current, were confirmed.

Calorimetric measurements made near the electrodes showed:

1. The heating effect near the positive electrode decreases with decreasing pressure rapidly. At very low pressures a small increase is sometimes observed.

2. The heating effect near the negative electrode decreases first with decreasing pressure, and then increases rapidly.

The heating effect near the positive electrode shows some anomalies when an air-break is introduced, the amount of heat generated being considerably increased.

Some measurements were reduced to an absolute scale, and showed that the total amount of heat generated is very large. Taking account of the number of discharges, and assuming that after each discharge the gas returns to its original state, the temperature in the capillary part of the tube must have been about 2,000° C. at 15 mm. pressure, and about 1,100° C. at 5 mm. pressure. If the width of the tube was increased ten times, the temperature would only be about 100° C., and this confirms the result obtained by Prof. Wiedemann in a former investigation, that gases may become luminous under the influence of the electric discharge at a comparatively low temperature.

In another part of the paper Prof. Wiedemann treats of a very important problem. When his tubes were filled with hydrogen, and an air-break was introduced in the circuit, the spectrum of the luminous gas changed suddenly at a given point. According to a now generally accepted hypothesis this change of spectrum is always accompanied by a change in the molecular constitution of the gas; and it is to be expected therefore that heat is either absorbed or given out by a gas when its spectrum changes. This heat Prof. Wiedemann has endeavoured to measure. Let us imagine, for instance, that the current has to do the work of decomposing the molecules of a gas. The moment the discharge has passed, recomposition will take place, and the heat then generated was measured by Prof. Wiedemann. Some of the suppositions on which the calculations are based might require further investigation, but the assumptions made are supported, and to a certain extent proved by the fact that the heat necessary to change the band-spectrum into the line-spectrum was found to be *independent of the pressure and cross-section of the tube.* It is

[1] By Eilhard Wiedemann. (*Wied. Ann.*, x. p. 202.)

clear that Prof. Wiedemann's line of investigation would afford an absolute proof that the changes of spectra are really due to the causes to which they are now hypothetically referred by the majority of observers. It is however rather unfortunate that in the particular case under discussion the chemical origin of the band-spectrum has not been settled to the general satisfaction of all observers. A good many of them believe the spectrum to be due to a hydrocarbon, and in that case Prof. Wiedemann would simply have measured the heat of combustion of hydrogen and carbon. No doubt Prof. Wiedemann will extend his measurements to other gases for which the spectroscopic difficulties have been more satisfactorily settled.

Prof. Wiedemann has also investigated some phenomena in vacuum tubes, which have also been partly discussed by other observers. Thus under certain conditions more exactly investigated by Messrs. Spottiswoode and Moulton, it is known that a conductor of electricity brought near a vacuum tube will deflect the discharge. Prof. Wiedemann finds, as had already been previously noticed by Mr. Goldstein, that the point touched by the conductor behaves like a negative electrode. It is known that as a rule the rays proceeding from a negative electrode are propagated in straight lines, and do not turn round a corner. An experiment however is mentioned by Prof. Wiedemann, in which an exception to this rule seems to take place; but Prof. Wiedemann himself suggests that secondary phenomena might have influenced the result. Perhaps an explanation is to be found in the fact proved by Mr. Goldstein, that when two tubes of different width are fused together the point of junction behaves like a negative electrode.

Some experiments were made to show that the rays producing the phosphorescence can traverse the positive discharge; also to prove that when the pressure is very small the shape of the electrodes has a great influence on the number of discharges and on the other phenomena attending them.

Prof. Wiedemann winds up with some interesting speculations on the nature of the discharge of electricity through gases, but it was our object to give an account only of his experimental results. A theoretical discussion would lead us too far, as we should have to take account of other writings which have lately appeared. We may return to this part of the subject on another occasion. It is evident from the account we have given that the calorimetric methods employed by Prof. Wiedemann have enabled him to take a very material step towards the elucidation of a difficult problem, and we may hope for another series of his valuable measurements. ARTHUR SCHUSTER

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

EDINBURGH.—The Baxter Physical Science Scholarship of 116*l.*, conferred by the University of Edinburgh on the most eminent B.Sc. who has taken his degree during the present or the preceding year, has been awarded to Mr. D. Orme Masson, lecturer on Chemistry at University College, Bristol, who is prevented from accepting it in consequence of holding his present appointment.

THE system of Fellowships in the Johns Hopkins University is of considerable interest. Twenty Fellowships, each yielding five hundred dollars, are annually open to competition in this University. The system of Fellowships was instituted for the purpose of affording to young men of talent from any place an opportunity to continue their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the Fellowships are not so much honours and prizes bestowed for past achievements, as helps to further progress, and stepping-stones to honourable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions (though such persons have not been formally excluded from the competition), but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or determined to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician, and the minister. Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and attainments. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study and of his plans for the future, together with such examples of his literary or scientific work as will enable the professors to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions and answers submitted to the candidates. First, the head of a given department considers, with such counsel as he may command, the applicant's record. The professors then collectively deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the president of the University to the Executive Committee, and by them to the trustees for final registration and appointment. By all these precautions the highest results which were anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognised by the calls they have received to permanent and attractive posts in different parts of the country.

A SPECIAL feature of Russian universities is that the students mostly belong to the poorer classes, and that they earn the means of existence by teaching or by translating foreign works for the monthly reviews. Thus, at the same time as the foundation stone of the Siberian University was laid at Tomsk, a subscription was raised for the erection of a building in which gratuitous lodgings might be given to students. The well-known explorer of Western Siberia, M. Yadrintzeff, immediately after his return from his last journey, delivered a series of lectures on the scenery of Altay, to raise funds for that purpose.

THE new university at Tomsk will be most liberally endowed. Up to the day of laying the foundation-stone 354,000 roubles (about 53,000*l.*) had been received for the building, 100,000 roubles (15,000*l.*) for teaching utensils, and 31,000 roubles (4600*l.*) for stipendia. A library of more than 35,000 volumes is ready, and only waiting the building of the necessary apartments to house it.

SCIENTIFIC SERIALS

Trimen's Journal of Botany, October, 1880–January, 1881.—Among the more valuable articles in the most recent numbers of this journal may be mentioned:—*Musci prœteriti* (new or badly-described mosses), by R. Spruce.—An account of the Acanthaceæ of Dr. Welwitsch's Angolan herbarium, by S. Le M. Moore, with descriptions of a number of new species.—On *Manihot Glaziovii*, the plant affording Ceara india-rubber, by Dr. Trimen.—On a collection of Madagascan ferns, by J. G. Baker.—On *Chara obtusa* (*stelligeræ* Bauer), a species new to Britain, by H. and J. Groves.—The history of the scorpioid cyme, by Dr. S. H. Vines.—On the plants of North Aran Island, co. Donegal, by H. C. Hart; with a number of interesting shorter notices and articles.

Journal of the Royal Microscopical Society, vol. iii. No. 6 for December, with special index number, contains—The Transactions of the Society.—Charles Stewart, on some structural features of *Echinostrephus molare*, *Parasalenia gratiosa*, and *Stomopneustes variolaris*, with plate 20.—Dr. H. Stolterfoth, on the diatomaceæ in the Llyn Arenig Bach deposit.—Dr. G. W. Royston-Pigott, on a new method of testing an object-glass used as a simultaneous condensing illuminator of brilliantly reflecting objects such as minute particles of quicksilver.—The record of current researches relating to invertebrata, cryptogamia, microscopy, &c.—The year's journal forms a volume of over 1100 pages, of which less than 200 are filled with the Transactions of the Society, and over 800 with the increasingly useful record. With the February number will commence a new series.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, January 4.—Prof. W. H. Flower, LL.D., F.R.S., president, in the chair.—Mr. Sclater exhibited and made remarks on a skin of the Southern Merganser (*Mergus australis*) from the Auckland Islands, belonging to the collection of Baron Anatole von Hügel.—Prof. A. Newton, M.A., F.R.S., exhibited on behalf of Prof. Alphonse Milne-Edwards, F.M.Z.S., an egg of *Coriama cristata*, laid last summer in the Jardin des