

CAPTAIN DEVOIRS ARCHÆOLOGICAL RESEARCHES IN BRITTANY.

SOME months ago Sir Norman Lockyer directed attention in NATURE (vol. lxxvii., p. 56) to several interesting cases of inter-relation among the stone monuments of Britain. Captain Devoir, a distinguished officer of the French Navy and an accomplished surveyor, has sent us some plans he

ANTS AND THEIR GUESTS.

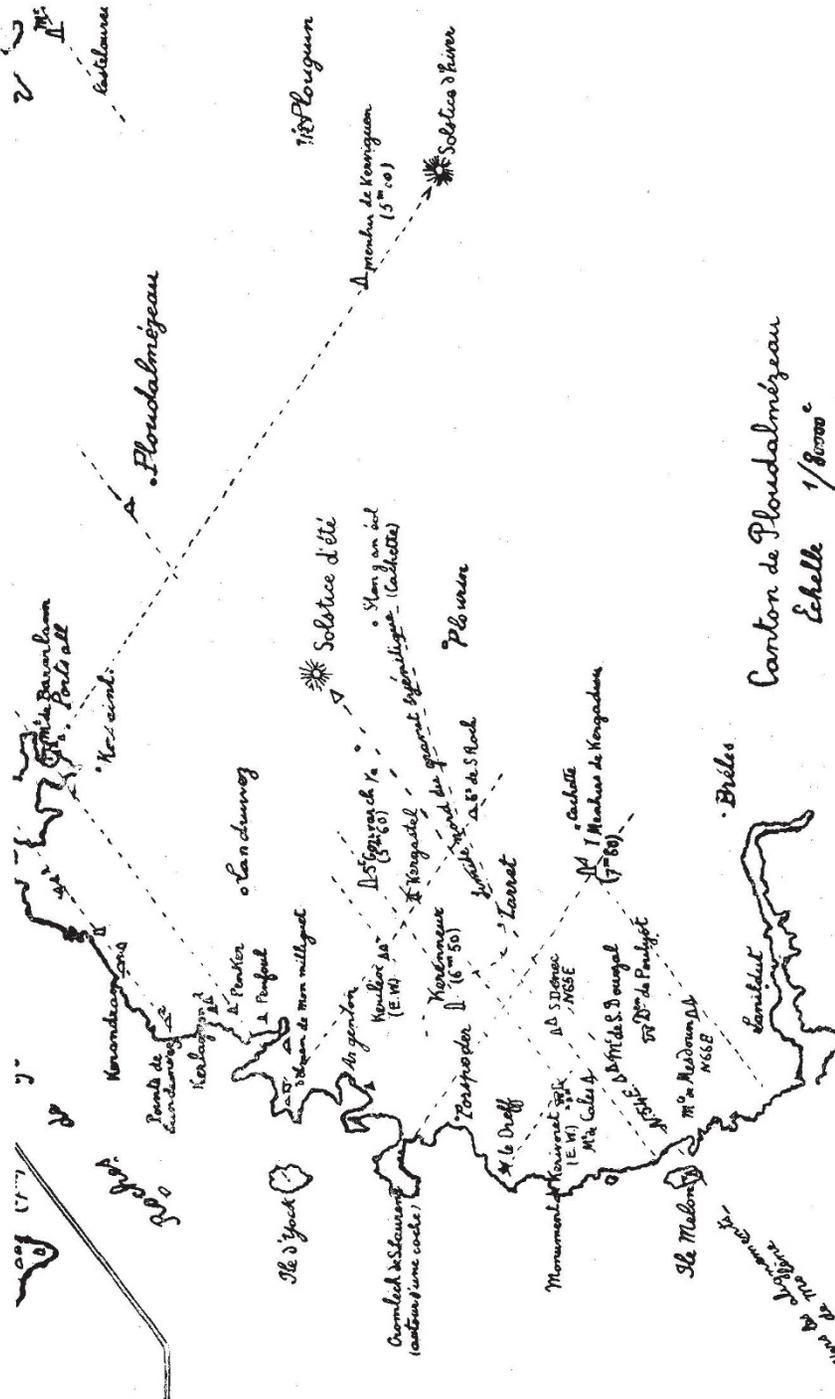
IN a series of papers recently published in the Biologisches Centralblatt,<sup>1</sup> Father Wasmann gives us the result of recent elaborate observations and experiments respecting the behaviour of different species of ants living together in the same nest towards each other, and likewise their treatment of the small beetles and other parasites which are in the habit of taking up their abode in ants' nests.

The position of these beetles is very peculiar. By some species of ants they are encouraged and by others they are destroyed, and what is still more remarkable is that some of the beetles which are encouraged and tended by the ants themselves actually feed on the eggs or larvæ of their hosts. The beetles of the genus Ateameles are killed in nests of *Formica rufa* and *F. pratensis*, but they are tolerated in mixed colonies of *F. pratensis* and *F. fusca*, and of *F. rufa* and *F. fusca*. However, as soon as a queen of *F. rufa* was introduced into one of these nests, the Ateameles, which had previously been unmolested, were discarded and massacred. The larvæ of a beetle referred by Wasmann to the genus *Lomechusa* is extremely destructive to the ant-brood, and although it seems to be tolerated in the nests of *F. sanguinea*, yet its eggs and larvæ seem to be sooner or later devoured by ants of other species if they happen to be found there, and though the perfect beetles do not seem to be molested, they generally die after a few days in nests of other species of ants.

Similar observations on beetles belonging to the genus *Dinarda*, and on various other ant-guests, including spiders, we will pass over, but the small isopod *Platyarthrus hoffmannseggii* deserves notice. Ants are usually so indifferent to its presence that it has been said they took as little notice of it as if it was invisible, but when a considerable number were introduced into a nest at once (twenty into a nest of mixed *Formica rufa* and *fusca*, or twelve into a nest of *Myrmica laevinodis*) they were at once attacked and massacred by the ants, except a few which were left to live and breed unmolested afterwards. Father Wasmann suggests that in these cases the *Platyarthrus* might either have been attacked before their peaceable character was recognised, or their

sudden invasion in such large numbers may have caused alarm, or they may have brought with them a hostile odour from the ant's nest from which they had been taken.

<sup>1</sup> "Weitere Beiträge zum sozialen Paratismus und der Sklaverei bei den Ameisen." Von E. Wasmann, S.J., Luxemburg (*Biologisches Centralblatt*, April 15, May 1, 15, June 1, and July 1).



Captain Devoir's map of some of the Brittany alignments.

has recently prepared of a similar inter-relation he has found in Brittany, and among them one in the Canton of Ploudalmézeau. The plan, which he has permitted us to reproduce, shows how all the alignments there are directed to the solstices, or the May-year sun, and that they are continuous over a large stretch of country.

Other observations on *Lomechusa* seem to show that the numbers of ant-guests are kept down to a moderate level, and if they become too numerous, they are killed off to reduce their numbers sufficiently to suit the ants, the survivors being protected. Indeed, some of the beetle-guests of the ants may live to the age of two or three years in the nests.

Other observations relate to mixed nests of *Formica exsecta* and *fusca*, which are met with in a state of nature. The development of such colonies, and their generally hostile treatment of *Atemeles* and other beetles, is discussed in detail.

Further observations relate to experiments on the rearing of other species of worker-pupæ in the nests of *Formica truncicola*, with similar experiments, for comparison, with other ants. While worker-pupæ of *F. fusca* are adopted and reared by *F. truncicola*, those of other species of ants are mostly destroyed, sooner or later, if they are introduced into their nests. It was noticed that some months after the reception of *F. fusca* into one of the nests the queen of *F. truncicola* had become perceptibly darker, but whether this was due to the presence of the darker species (*F. fusca*) or was merely the result of old age requires further investigation. Interesting observations are also recorded respecting the migration of ant colonies, and on their behaviour after the death of the queen.

Another section of the papers is devoted to experiments on the founding of colonies, with special reference to the parasitic and slave-holding species of *Formica*. Sometimes queens of one species are adopted into the nests of other species, but sometimes they are attacked and killed.

Further observations relate to the founding of colonies of *Polyergus*, *Strongylognathus*, and *Anergates*. Of these, the latter is the most interesting genus. These curious ants develop only into males and females, without workers, and live parasitically in the nests of ants of the genus *Tetramorium*, where their colonies are met with only rarely, but where they are found they are very numerous. The males are small and wingless. So much was previously known, and Father Wasmann's latest experiments do not throw much fresh light on the subject.

Finally, the author discusses the relationship between parasitism and slavery in ants (which he regards as closely connected), with special reference to Wheeler's views on the subject. These phenomena cannot be explained on phylogenetic principles, on account of the wide differences between the species, which often dwell together in mixed colonies. We have not sufficient space to follow this question further, but strongly recommend students who are interested in ants to wade through Father Wasmann's papers for themselves, for though the observations are sometimes tedious, and seem to us to include a good deal of superfluous detail, yet they include a great amount of material which must be taken into account by all who interest themselves in the numerous problems presented by the habits and psychology of ants. W. F. KIRBY.

### RAYS OF POSITIVE ELECTRICITY.<sup>1</sup>

IN 1886 Goldstein discovered that when the kathode in a discharge-tube is perforated, rays pass through the openings and produce luminosity in the gas behind the kathode; the colour of the light depends on the gas with which the tube is filled, and coincides with the colour of the velvety glow which occurs immediately in front of the kathode. The appearance of these rays is indicated in Fig. 1, the anode being to the left of the kathode KK. Since the rays appeared through narrow channels in the kathode, Goldstein called them "Kanalstrahlen"; now that we know more about their nature, "positive rays" would, I think, be a more appropriate name. Goldstein showed

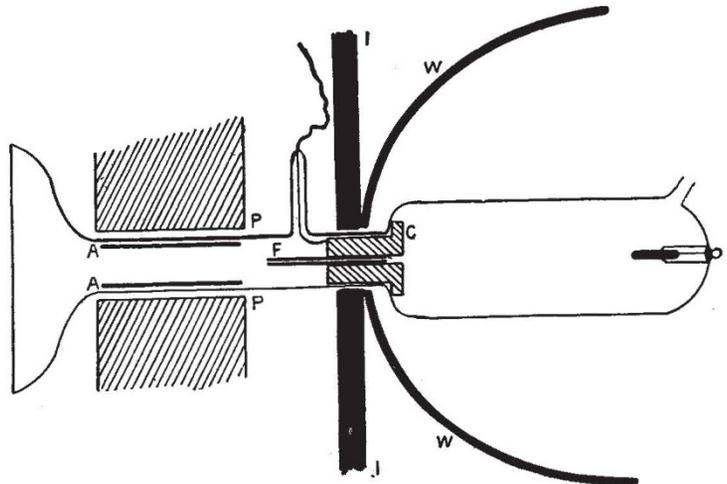
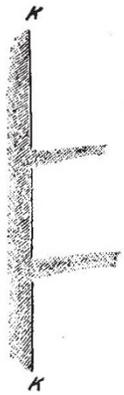
<sup>1</sup> Discourse delivered at the Royal Institution by Sir J. J. Thomson, F.R.S.

that a magnetic force which would deflect kathode rays to a very considerable extent was quite without effect on the "Kanalstrahlen." By using intense magnetic fields, W. Wien showed that these rays could be deflected, and that the deflection was in the opposite direction to that of the kathode rays, indicating that these rays carry a positive charge of electricity. This was confirmed by measuring the electrical charge received by a vessel into which the rays passed through a small hole, and also by observing the direction in which they are deflected by an electric force. By measuring the deflections under magnetic and electric forces, Wien found by the usual methods the value of  $e/m$  and the velocity of the rays. He found for the maximum value of  $e/m$  the value of  $10^4$ , which is the same as that for an atom of hydrogen in the electrolysis of solutions. A valuable summary of the properties of these rays is contained in a paper by Ewers ("Jahrbuch der Radioaktivität," iii., p. 291, 1906).

As these rays seem the most promising subjects for investigating the nature of positive electricity, I have made a series of determinations of the values of  $e/m$  for positive rays under different conditions. The results of these I will now proceed to describe.

#### Apparatus.

**Screen used to Detect the Rays.**—The rays were detected and their position determined by the phosphorescence they produced on a screen at the end of the discharge-tube. A considerable number of substances were examined to find the one which would fluoresce most brightly under the action of the rays. As the result of these trials willomite was selected. This was ground to a very fine powder and dusted uniformly over a flat plate of glass. Considerable trouble was found in obtaining a suitable substance to make the powder adhere to the glass. All gums, &c., when bombarded by the rays are liable to give off gas; this renders them useless for work in vacuum-tubes. The method finally adopted was to smear a thin layer of "water-glass" (sodium silicate) over the glass plate, and then dust the powdered willomite over this layer and allow the water-glass to dry slowly before fastening the plate to the end of the tube.



The form of tube adopted is shown in Fig. 2. A hole is bored through the kathode, and this hole leads to a very fine tube F. The bore of this tube is made as fine as possible, so as to get a small, well-defined fluorescent patch on the screen. These tubes were either carefully made glass tubes or else the hollow thin needles used for hypo-