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XVI.—*On the House Ant of Madeira.* By Professor O. Heer, of Zurich. Translated from the original* by R. T. Lowe, M.A.†

[With a Plate.]

I. *Apparition and Habits.*

Amongst the richly varied insect-tribes the Ants stand foremost probably in point of numbers. We meet with them everywhere, in field and garden, meadows and forests, from spring to latest autumn. In general the unwinged labourers alone are seen; but in July and August the winged males and females issue from their nests, and rise in such vast swarms into the air as to attract occasionally general attention. This was especially the case in August 1849. On the 7th of August immense swarms, consisting of *Myrmica rubra*, F., *Formica fuliginosa*, F., and *F. nigra*, made their appearance in Winterthur. From two o'clock till near sunset they appeared in small clouds, glistening in the sun and reaching up into the higher regions of the atmosphere. The ground in the town and its environs was quite strewed over with these little winged creatures. On the 8th of August a whole tract in width of the Lake of the Four Cantons, between Bauen and Flüelen, was completely covered with little black, winged ants (doubtless *Formica fuliginosa*, F.), so that from forty to fifty could be taken up out of the water at one handful. Many were yet alive; others were dead: they had not therefore been immersed collectively, but must have fallen on the spot into the water. On the same evening great bodies of the *Formica fuli-*

* An die Zurcherische Jugend auf das Jahr 1852, von der Naturforschenden Gesellschaft, Liv. Stück.

† The Translator desires thus to express his special thanks to Professor Heer for a copy of this valuable and interesting Memoir.

ginosa, F., were also seen in the Lake of Zurich; but it is related that at Schondorf in Wurtemberg, on the same evening, swarms like clouds (to judge from the description), of *Myrmica rubra* were moving between three and four o'clock through the country; and a like report referring to the same day was made from Soleure, Friburg, Bubendorf and Gelterkinden in the Canton of Basle: whence it is to be inferred that the swarms were moving in a southerly direction. The last great swarms (of *Myrmica rubra*, F.) we observed on the 11th of August, on the summit of the Uetliberg. Similar phænomena occur however every year, though not in these environs*. It depends in great measure on the weather. Should this happen to be fine at the time when the winged ants are quitting the chrysalis state, they all leave their nests at the same moment, and thus form those immense great cloud-like swarms; on the other hand, should the weather be unfavourable at this epoch, the swarms are distributed over a longer period, and are not therefore so striking. This is indeed the case too with our May Chafers. Let fine May weather all at once set in after a wet April, and all at once (in years when they abound) great quantities of them make their appearance, and again after a short time disappear; but if May

* The following account, which appeared in most of the leading journals at the time, is copied from the 'English Churchman' of Sept. 2, 1852 (No. 505, vol. x. p. 575).—Tr.

"*Extraordinary Phænomenon.*—A lover of natural history, who was in Romney Marsh on Tuesday the 17th ult., about 5 P.M., gives the following:—'I saw what appeared to be a column of smoke approaching me, about a quarter of a mile off. On the column reaching me, I found it was composed of red ant-flies. I think the column was a good quarter of a mile in length, and about from 50 to 100 yards in circumference: it quite darkened the sky. After it passed me it went over the river Rother, into which millions and millions of flies fell; and when I crossed it, the water was quite black. I watched the column for a mile and a half, and, notwithstanding the numbers left in the river, and on the trees, hedges, &c. over which it passed, the column appeared undiminished, and like a wreath of dark smoke. The extraordinary thing is, that the ant-flies throughout the whole marsh, thirty miles in length (as I hear it was so all through the marsh), should all have taken wing at the same time, and collected together in such vast numbers. A man who was collecting ant-eggs for me, informs me that he found himself covered with them, running up to the tops of the strands of grass and then taking wing. After the flight he scarcely found one ant-fly in the nests. Other persons who saw the flight, and who I do not believe intended to exaggerate, considered the length of the column to be a mile. The wind was in the east, the temperature very sultry, and there was every appearance of a thunder-storm. Had not my man observed the ant-flies rise from the ground, I should have thought that they came from the Continent. The column travelled at the rate of five or six miles an hour. Those persons fond of natural history will find an interesting account of these flights, and the reason, in the 2nd volume of Kirby and Spence, pp. 51, 52.'—*Sussex Express.*"

proves rainy, their flights are spread over a much longer period, and are thus less numerous. The great ant-swarms of August 1849 lead us by no means therefore to admit, that in that year an unusually great number of ants were produced; but make it only most evident to every one, how populous the Ant-tribe must be to send out such myriads of winged individuals, from any two of which a new colony might spring. Nor must we at the same time overlook that these winged ants form but by far the smaller portion of the colony, and that an infinitely greater number of unwinged ones remain behind in the nests. These creatures not only thus abound with us in the lowlands, but are met with here and there up in the higher Alps (up to 8000 feet above the sea), as they are also found in higher northern latitudes; Lapland, for instance, even possessing thirteen kinds. Still, in warmer countries they are met with in much greater numbers and more varied forms than with us. Thus they have their home all over the world, and everywhere belong to the most numerously constituted tribes of living creatures. The same condition existed also remarkably in the old world. We are already made acquainted with eighty-three kinds of Ants belonging to a former epoch, from the tertiary formation only; although but two localities (Œningen and Radoboj) have been more closely examined in this respect. These creatures therefore in all ages formed a very important section in the insect world. They must consequently perform a part of the highest importance in the œconomy of Nature. In Nature all is motion: unbroken continual production and destruction. Many animals, indeed, in all classes are appointed to destroy and carry away dead substances, and thus prepare again organic matter for new combinations. This office has been assigned to the ants also. They work up and destroy, with industry become proverbial, the productions of the vegetable and animal kingdoms. Though the chief bent of their activity is destructive, yet is it, through its operativeness in breaking up and clearing away, besides making preparation for new forms, of the greatest importance in Nature's collective household. And a good deal of the mischief, too, charged upon ants is very unjustly placed to their account; as when with us people maintain that they do harm to fruit-trees, and try therefore to drive them from their trees. Our species however only hurt the trees when they build their nests amongst their roots; but the trees themselves, as in general all plants, they only ascend to collect honey from the flowers, and to search for Aphides, whose sweet juices they lick off. Into our houses they seldom intrude, and the harm they do in them is, in fact, inconsiderable. In warm countries, on the other hand, the case is very different. There, ants are

found which not only cause much harm to cultivation, but also force their way in enormous companies into the dwellings of man, and thus become terrible pests of the country. One of these kinds I had opportunity last year in Madeira to become acquainted with. At first, by the ravages which it caused in my dwelling, it occasioned me many annoyances; but afterwards, when I began to pay attention to its habits, it afforded me much amusement. I communicate these observations in the hope that they will induce some of our young friends to institute similar ones themselves, for which the richness of our environs in insects affords such manifold opportunity.

In the accompanying Plate (III.) is figured the small minute Madeiran Ant. Fig. I. represents the female, fig. II. the male; figs. III. & IV. the neuters, which present two very distinct forms. The one (fig. III.) has a remarkably large head; it is larger than all the rest of the body, and gives the little creature a most extraordinary appearance; in the other, the head is much smaller and nearly circular. These small-headed ants are the working-class of the colony, and form the mass of its population; we shall therefore call them the *labourers* or *workers*. The large-headed ants can scarcely amount to $\frac{1}{100}$th of these, and serve partly for the defence of the nest; we shall therefore distinguish them by the name of *soldiers*, from the rest. In still smaller number appear the *females*, which not only are much larger than the labourers, but are also distinguished by their transparent glassy wings and shining brown colour. The males are not much bigger than the labourers, and of a coal-black colour. Accordingly, with these ants the family consists of four quite different-looking individuals: of workers, soldiers, males, and females. This ant-colony is consequently further developed than those of our species, in which only one form of neuters (the common wingless ants) occurs.

The house-ant lives in very numerous societies, under stones in the ground, and also under the bark of trees, and within the walls of houses. The stones serve them, in common with all ants living in the ground, in place of a roof for shelter. Their nests go down pretty deep into the earth, and are divided into a great number of passages and chambers. They have several entrances, which are sometimes covered over, and run like burrows under the stones. Not unfrequently they form their nests in flower-pots standing before the windows and on the balconies.

They are found on the whole south side of the island of Madeira, up to a height of about 1000 feet above the sea, in incalculable numbers, especially in hot sunny places. In turning over ten stones in such places, these ants are pretty sure to be

living under eight. In the city of Funchal there can scarcely be a house which does not harbour millions of these creatures, which mount up to the highest stones, issue forth in whole troops out of the chinks of the walls and floor, and in orderly regular columns traverse the room in all directions. They creep up the table legs, along their edges, upon the tables themselves, and even into chests of drawers, boxes, &c. Being extremely small, they can get in through the smallest cracks and holes. You may kill thousands on thousands, and yet perceive no decrease of them; they are continually replaced by new hosts in the rear. Only after very heavy rains, during which the water that came down in torrents made its way between the walls of our house, did we observe some sort of diminution, which we thought might indicate that a large number had been drowned. I found these ants however not only in Madeira, but also at Seville, in the rooms of our hotel in the middle of the city.

This little creature is attached to no particular kind of food; in houses it attacks all sorts of provisions laid in store, especially preferring sweet things (sugar, honey, syrup, preserved fruits); but not less also fresh fleshy fruits of all kinds. If you leave on the table a custard-apple, a lemon, or an orange, having only the smallest opening possible through the rind, you may safely reckon that in an hour's time it will be full of ants, going to and fro in whole trains. But if there be no opening in the fruit, it is then safe. It would be indeed an easy matter for the ants to gnaw through the leathery coats; but the essential oils, which they plentifully contain, appear to protect them; for all insects are known to avoid these oils. They seem to prefer flesh to vegetable substances. Raw and boiled meat is eagerly sought by them; but insects are very decidedly preferred. I had great trouble to guard my collections of insects from them. At first they made their way in numbers into the boxes, and my painfully collected treasures were grievously mutilated by them, until I found a means to make them more secure from them. They do not however seek after dead insects only, but attack also the living. Very droll it is to see how these tiny little creatures seize on flies! Let a fly settle on the table-cover near an ant, and at once the latter springs upon it, seizing it by a leg. The fly tries instantly to get free from its enemy and escape; but the ant has grappled on to the table-cover by its legs, and with its pincers holds the fly fast. Other ants soon come to help the first, and the fly is lost. This is much sooner the case when soldier-ants are near. These spring at once like cats upon the fly, and gnaw off first its wings and legs, so that it is then easily carried off by the labourers. But the soldiers never make the first seizure; they are much more cowardly than the labourers,

and often quit the fly when it makes very active exertions to shake off its assailants. I have never seen the labourers do so. Sometimes they cannot, indeed, hold the fly fast, as when it is on a smooth wall or polished table; but they do not therefore let go their hold with their pincers, but remain clinging to the fly's legs when it flies away. When it again settles, the ant tries again to hold it, and, with the help of its companions hastening up, to master it. I often shut up flies and ants together in glasses, in order to observe this battle of the ants and flies; and have frequently had opportunity to satisfy myself with what extraordinary obstinacy* the labourers pursued the flies buzzing about, and how so insignificant a wingless little creature could master a winged one about a hundred times bigger. General Hardwicke relates, that the ants in India are the worst enemies of the Termites (the so-called White Ants); those also of Brazil are known to clear the houses of these dangerous guests. With what keenness our little ant attacks the Termites, I have more than once had occasion to observe. I had procured a great number of Termites, and had placed them, with the pieces of wood in which they lived, in a tin box, which was closed with a lid. The ants however managed to get into the box through a small chink, and within two hours the box was swarming with ants, which had destroyed nearly the whole of the Termites, amounting to a couple of hundred. But it is still much more extraordinary that even grasshoppers cannot withstand them. I had in a box half-a-dozen specimens of the Cape Grasshopper (*Gryllus capensis*, L.), which is abundant in Madeira, in order to observe their habits and their mode of chirp. To my surprise, I soon discovered that whole troops of ants had crept into the box, furnished as it was with little air-holes, and had attacked the grasshoppers. These were hopping restlessly about the box, and had also bitten and killed whole masses of ants, so that the bottom of the box was quite covered with their nibbled remnants; but at last the grasshoppers were forced to yield to hostile numbers, and, with the exception of the horny portions, were completely devoured. How should we be astonished to see an animal of the size of a mouse hunt elephants, and master them; and yet a grasshopper in proportion to our ant is bigger than an elephant! We can but be grateful to these ants for living in continual warfare with the flies, and other troublesome inmates of our houses. But they attack also useful insects. I had

* We have observed also the same obstinacy in our own ants, which will often rather let themselves be torn in pieces than release an object into which they have once fixed their jaws. I once saw an ant (*Formica fusca*) that had seized by the leg a great courser-beetle (*Carabus hortensis*), which, in spite of all its efforts, could not free itself.

placed in front of my room, on a balcony, a Cactus (*Opuntia Ficus indica**, L.), with cochineal insects, in order to acquaint myself more closely with the metamorphoses of these wonderful little creatures. Soon however the ants made their appearance here also, and, by degrees, ate up all the cochineals. This is a fact very well worth noting, since our ant must do great injury to the cochineal-breeding, which for some years past has become of the greatest importance to the Canary Islands. At least I saw this ant very plentiful in cochineal-gardens, where they ought to be exterminated as much as possible.

The predaceous animals, as a rule, spare those of their own kind. Strange to say, this is not the case with our ant. In hope of becoming more closely acquainted with their œconomy, I placed four winged females, with two soldiers and six labourers, in a glass, which was stopped at top, but with a hole in the stopper just large enough to let the labourers go out and in, but not the bigger soldiers and females. These therefore were obliged to remain in the glass, in which was placed sufficient food. The glass was soon entered by other labourers from without, which presently attacked the females and tore up their wings. Since the labourers are said to tear off the females' wings to prevent their flying away from the nests, I thought at first the matter might be thus explained; but in the course of a few days the females had their antennæ and legs also torn off; and at last we found their heads pulled off, and the labourers busy in tearing them completely asunder, and in carrying away the separate pieces out of the place. Strange to say, the females did not defend themselves in the least, which would however have been easy for them to do, from their considerably larger size and stronger fangs. They bore all these attacks with the greatest, and to us incomprehensible, resignation. Nay more; even the soldiers were attacked, and one of them killed; some of the labourers took all sorts of pains to carry away the head, and get it through the little hole in the stopper; but through this it would not pass. Thus individuals of their own species are killed and eat up when they are found in circumstances in which they can be no longer profitable, as was the case with these individuals shut up in the glass. Not unfrequently I saw ants that had been hurt† carried away by labourers, to which

* Rather *O. Tuna* (Mill.), D.C., which is the common species in Madeira, and that on which the Cochineal there usually exists. I do not recollect to have ever seen the true *O. Ficus indica*, L., in the island, though *O. vulgaris*, Mill., sometimes occurs.—R. T. Lowe.

† But apparently healthy ants also were sometimes carried off in this way. Rengger relates the same thing (Reise nach Paraguay, S. 250) of the Issu ant (*Œcodoma cephalotes*, Latr.). "The labourers are very often seen,"

they had affixed themselves by laying hold with their fangs at the abdominal pedicle. I imagined that they were carrying them to the nest to nurse them, in the same way as they treat their young with the greatest care; but the very barbarous habit above related would make it seem more probable that they were carried into the nest in order to be there fed upon, as being no more capable of work. With the ants, everything is turned to the most careful possible advantage of the common stock; and this reaches so far, that one of the same species, nay, even of the same family, is not spared, when it can no longer serve its purpose.

With this bad propensity, it must seem very strange that any different sorts of animals should be ever met with in their nests. Snails, worms, caterpillars, and such like, in general are never found under the same stone; seldom even a millepede (*Julus*), which they however attack only when the nest is disturbed, and then all the ants of every sort fall with great fury on the strangers, as if they considered these the cause of the misfortune which has befallen them. The millepedes then try, with violent contortions, to get free from the ants that cling to them. But claiming attention as animals peculiar to ants, are a Coccus, and a very curious little beetle (*Cossyphodes Wollastoni*, Westw.), which is never found elsewhere. I found it first in an ants'-nest in the country; but afterwards in the balcony of our apartment, where an ant-colony had established itself in a tub in which grew a *Diosma alba*, L.* I have seen at different times more examples of the same insect, and always at the entrance of the nest. For what reason this very peculiar little beetle lives in these ant-colonies, I am not able to explain. We are acquainted already with a great number of minute beetles which occur in the ant-nests of our own country. Some of these (such as the little club-beetles) are regularly tended by the ants; and, as I have often satisfied myself, they are carried down into the deeper parts of the nest with the same care and anxiety as the pupæ when the nest is disturbed; but the others are probably merely tolerated, without being adopted into the family. The *Cossyphodes* seems to belong to the former class.

says he, "travelling home laden with another of themselves. These are not chance prisoners from another nest, but they belong to one and the same household; for the one carried is often bigger than its bearer. Besides, I have often observed, when two ants were returning home, that one would lay hold of the other and carry it home. If moreover its load be taken from one of these carriers and placed on the ground, both travel then along the same road quietly home." The like has been observed also amongst our own ants. (Compare Huber, 'Recherches sur les Mœurs des Fourmis,' p. 140.)

* *Diosma ericoides* (Sims), Curt. Bot. Mag. t. 2332.—Tr.

In order to look more into our ants' manner of proceeding in their work, I placed a small wooden vessel in a tumbler of water, and stretched a thread from the vessel through the air to a ledge on the wall two feet off, and from this ledge a second thread to the ground. This thread was perpendicular, the first horizontal. The ants soon passed along the horizontal thread to the vessel in the water, on which I had laid a small piece of meat. No sooner was this discovered, than the ants set to work at it. In a short time, whole masses poured in. At first they were only labourers, but presently a few soldiers made their appearance in the train of the former. The soldiers cut up the meat into little pieces, drawing up their abdomen into an almost vertical direction, like that of their head. (Compare fig. III. 3). They presented thus a most curious appearance, when one looked down from above, and saw only the middle part of the body and the crown of the head. The meat was cut up into quite small fragments with their great hatchet-shaped pincers, being held fast at the same time by the two fore-legs. The labourers took these fragments between their pincers, and carried them away. Whole trains passed along the horizontal thread, and each of those that formed them had a fragment in its mouth. But the labourers alone were engaged in this act of transport: I never saw a soldier carrying away anything. At times, indeed, one or another went back over the thread, but always without taking anything with him. The ants soon discovered the perpendicular thread, and found out that they could get easier to the floor of the room by it than by the wall; and thenceforward the whole train always passed along this perpendicular thread down to the ground, and from thence to a corner of the room, where they disappeared through a little hole in the wall. Thus, from the vessel in the water they first passed along the horizontal thread to the wall, where they had to run along a ledge, and then arrived at the perpendicular thread, which reached down to the ground. The thread was always thickly crowded with ants, some passing downwards laden with fragments, the others empty, mounting upwards; and the up and down passers always arranged in files, so as not to disturb each other mutually in their way. More than once I placed ants, which I had fetched out of another room, in the vessel in the water. These also soon found, indeed, the thread leading to the wall; but there they dispersed themselves on all sides; whilst the others, without stopping, always ran to the perpendicular thread. This gave me a ready means of ascertaining whether ants from different nests came into my room or not. A closer investigation proved the first to be the case. It turned out that all the ants which resorted to the vessel in the water to fetch food, belonged to one colony, as well as all which appeared on the

table on which the vessel stood; and that, on the other hand, those which were destroying the fruit on the window-seat, must belong to another nest. From this, however, I could not quite draw the conclusion, that one ant-colony, when it has fallen in with a prize, excludes another from a share in it. At least I have never seen them fighting with each other, which in such a case would scarcely not have happened. Probably all provision that may be discovered is considered common property, and each party keeps as much of it as it can carry away. But if once a nest has taken entire possession of a thing, then probably the others keep aloof, and leave it altogether to the first. Here, too, it is to be considered, that ants clearly have a sort of power of communication; for let only a single labourer discover a supply, and without delay there appears a whole troop of ants to work at it. We cannot otherwise explain this circumstance to ourselves, than that the exploring labourer had gone back into the nest, and thence procured help. It would be in consequence of this circumstance that, as a rule, ants of the same nest are always collected for a common work.

That ants have memory, Huber has already pointed out; and the following observation would also confirm it:—One of my fellow-lodgers had arranged in his room a similar apparatus to that which I have described above; only in this, from the middle of the horizontal thread, which was several feet long, a second shorter thread was carried to the nearest wall. The ants soon chose this last road; thus going from the vessel in the water to the middle of the horizontal thread, and thence to the wall over the thread at right angles to it. After some time this last was removed. At first all the ants stopped suddenly, exactly at the place where, before, the thread that led sideways was fastened, and ran no farther along the horizontal thread. They had therefore observed closely for themselves the place whence the side-thread had branched off, though it had no sort of mark. At last, after having run restlessly backwards and forwards for some time, they tried to proceed further on the thread, and thus arrived at the wall, where they collected together in a cluster, having thence to seek the way for themselves. Perhaps too the fact here communicated may be explained by the faculty of tracking in ants. The dog tracks out, as is well known, the way which his master has taken to a great distance; and so the ant, perhaps, possesses a like fine "scent," which enables it to find again with certainty the way along which it has once passed. As above noticed, the larger pieces of meat placed in the vessel were torn up on the spot into scraps of pretty equal size, such as a single labourer could well transport; in like manner were grasshoppers and larger insects also dealt with; but dead flies, which were

placed in the vessel, were not divided, but carried off quite entire. To ascertain the strength of these little creatures, I tied with a thread first two, then three and four dead window-flies together, and they dragged even this load of four flies first to the perpendicular piece of wood to which the level thread was fastened, aloft, then horizontally along this, and then down the perpendicular thread till they brought it to the hole in the wall. Here the flies were first pulled in pieces, because the hole was too small to let them be carried through it entire. This carriage of the flies over the thread stretched through the air, was extremely droll to see. A single fly would sometimes be dragged away by only two ants; on the load of four flies were mostly from six to twelve labourers employed. Most of these had laid hold with their fangs in front, and pulled, going backwards, at the load; the rest had fastened on the other side, and pushed, going forwards, in a straight direction, holding on meantime by their legs to the thread. The motion forwards was always by short impulses; on each jerk there followed a longer or shorter rest. Men are well known to do the same in shoving along a great load: when several share the work, it is always managed by a cry (Yo ho), that all may lay hold at once, and so bring equally to bear the force applied. A like co-operation in these ants could not but be discerned: the hinder pushed at the same time as the front ones pulled, and at the same time they left off and rested for an instant together. But by what kind of means this unanimity in their operations was attained, I was not able to discover. The most remarkable thing moreover was, that sometimes all let go together, and a single one held the whole load in suspension. Here therefore again some agreement must have taken place, for not one fly ever fell to the ground: there was always an ant ready to hold on: but had all left loose at the same time, the load must have naturally fallen down. The load was altogether held by the fangs only; with their legs the ants clung fast to the thread, wherein the peculiar curvature of the first joint of the foot, and the remarkable claw (see fig. 1. 6 *b*, *c*) corresponding thereto, had each essentially their share. Thus a single, and that an unusually minute ant, was able, hanging to a thread, to support four flies. What immense muscular power in the fangs and legs does this display!*

Whilst the ants were transporting this burden, they were not easily disturbed at their work; whilst otherwise they quickly run off when they are meddled with. For example, if one lifts up a fruit full of ants, or shakes it, they hurry out as fast as

* A house-ant (dried) weighs $\frac{1}{10}$ of a milligramme; but four window-flies (also dried) $18\frac{4}{10}$ of a milligramme. Thus this ant was able to bear a load 376 times its own weight.

possible. They do not go back to their nest, but hide themselves in some cranny, or else under some near object; but as soon as the danger is over, they come out again, and betake themselves afresh to their work. On such occasions one may satisfy oneself that they do not see far. On taking away from an ant the morsel it is carrying, it seeks about for it for some time, running hastily in zigzags up and down; but at times stopping still, and lifting its head up in the air. When placed at the distance of some inches, the ant does not go straight up to it, as would be the case if it could see it, but runs round about in different directions, and only when at the distance of about an inch, springs forward on it, as if seeming then to have first seen it. If we examine the eye of this ant, we shall find that (as, however, generally in all ants) it is of simple structure, as in most other insects, and only consisting of a small number of lenses (Ocellen).

In order to see whether these ants would try to pass over water, I several times destroyed the connexion formed by the thread between the vessel in the water and the wall, so that the ants which happened to be in the vessel were quite cut off. If there was a scum formed over the water (which is always the case when the water has stood some time, a thin film spreading over the water from the falling dust), then they tried to run away over it; a few got quite safe over, when the film could bear them; but others broke through and were drowned. But I never saw such a number fallen into the water that a bridge was formed by the dead bodies, as is related of other sorts of ants, and that by this means they reach vessels of provisions placed in water.

The work of these little creatures goes on alike day and night; and if you look after them during the day, or in the night, or early in the morning, you see always the same stirring activity. Hence they seem to observe no fixed resting-times, at least none in connexion with the change of day and night. This is also the case with most of our own native ants, of which Pliny already relates that they work by moonlight. These however hybernate. The ants of warm countries, and so of Madeira, on the contrary, do not. One of our own kinds (*Formica fusca*, L.) is also found there, and it too continues the whole winter in activity. Our house-ant is found throughout the whole year in nearly equal abundance. The males and females probably appear at the end of summer. Of the former I found only a single example, whilst females were found in several nests till the new year. In most cases it might well be that I observed none, because they keep in the deeper parts of the nest. The females lay minute little white eggs, out of which proceed little white maggots; the pupæ are free, not enclosed in cases, as in our common ants

(*Formica*), which pupa-cases with us are falsely called ants' eggs. The soldiers are met with in the nests in proportionally greater numbers than outside; they appear therefore to be provided for the work within the nest and its defence, whilst the labourers procure food and take care of the young. At least it is these which carry away the pupæ when the nest is disturbed. That the soldiers however go out also with the labourers, and are serviceable to them in their operations on the treasures they discover, has already been mentioned. Lacordaire (Introduction à l'Entomologie, ii. 498) relates of the Train-ant* (*Œcodoma cephalotes*, Latr.) of Bengal, that the soldiers accompany the trains, without mixing with the mass of the army. Stationed at the sides of the column, they are to be seen marching forwards, then again turning back to an earlier occupied post, halting a moment to see the train file past, and running hastily up and down, especially if a stoppage anywhere occurs, and their help be necessary. Nay, they will often, as Lacordaire relates, climb up the plants near the train, station themselves on the edges of the leaves, and from this elevated post inspect the train of their troops. In our Madeiran ants the soldiers play no such prominent part, always marching along in the same rank and file as the labourers.

All that we have said above relates to one kind of ant only, the *Œcophthora pusilla*; but in hot countries there are whole numbers of species which have similar habits, and which come into hostile collision with man. In Brazil this is so much the case, that the inhabitants there say, "The ants are the queens of Brazil, for they have the most power in the country." One of the largest and most dangerous kinds, which is spread over the whole of tropical America, continental as well as insular (*e. g.* Cuba, from whence we have specimens), is the Train-ant (*Œcodoma cephalotes*, Latr.). The female is bigger than our hive-bee; the labourers about twice as big as those of our red wood-ant. It lives in very populous colonies in the ground, into which they dig their dwellings, sometimes nine feet deep. It marches in great regular trains, and on its course strips bare of leaves, often in a short time, trees and shrubs. Rengger relates of the Isau ant (which I do not consider different from the train-ant†), that in one night many millions, inhabitants of a single nest, levelled to the ground whole plantations of manioc, maize, potatoes, melons, garden-stuff, &c. Having rapidly ascended the plants which they intend to plunder, they place themselves at the

* Visitor-ant, Angl.—Tr.

† From specimens seen by me in Rengger's Collection.

edges of the leaves, and with their fangs cut out in a short time a piece of about half the size of a farthing, which they then directly carry home. If, as very often happens, the piece falls to the ground before they have been able to lay hold of it, they set themselves at once afresh to work, and do not go down to look after the fallen piece. It has been maintained, that the Isau throws this piece on purpose to the ground to save itself and its fellow-labourers the trouble of carrying it down. But this is by no means the case; for the ants approaching from the nest pay no heed to these pieces of leaf, though the ground is often quite strewed with them, but each for itself bites its own piece out of a leaf whilst yet attached to the plant. This communication of the close observer Rengger serves to correct earlier statements, that the Train-ant bites the leaves off at the stalk, and lets them fall to the ground, where their companions stand ready to clip up the fallen leaves and carry them home. This stripping process is often so rapidly effected, that sometimes in the morning trees look like besoms which the evening before were standing in their whole beauty of foliage; nay, Lund relates, that he has seen a tree stripped within half-an-hour. Dr. Delacour speaks of a similar species, which sometimes in New Spain robs a garden of its whole crop of plants in one night. One of his acquaintance had planted a very fine vineyard: at the end of three years the ants made their appearance, and, in the space of one night, it was despoiled of the whole of its leaves and destroyed.

The Train-ant properly lives in the open air; but sometimes it makes inroads in regular trains, like a great army, into houses, where it immediately makes chase after the flies, the spiders, cock-roaches, and all vermin generally. However useful this activity, yet is it so troublesome a guest, that those who live in the house are not unfrequently obliged to leave their dwelling for some time. When these ants swarm, the females are caught in great quantities; the abdomen is cut off, fried in butter, and esteemed a delicacy. Eaten undressed, its taste, says Rengger, is like that of a hazel-nut; and when slightly toasted, or covered thick with syrup, it tastes like burnt and sugared almonds. The Train-ant does not attack people; but this is by no means the case with certain other American species. Dr. Delacour speaks of a little reddish-yellow kind, which, by its sharp bite causing inflammation, is very dangerous to little children. His own child, twenty months old, once, in the middle of the night, awakened him by a violent shriek; on examination he found it covered by a crowd of ants, which had bitten it so violently, that in the morning it was quite covered with pustules, and for forty-eight hours lay in a violent fever. The same kind is a

great enemy to young chickens, and makes it in many places very difficult to rear them. But still more dangerous, according to Dr. Delacour, are some of the wood-ants. In the year 1834, he says, a young man of respectable family, resting under a tree on the way from Tampico to Mexico, was attacked by the ants and completely eaten up. On the following day nothing was found but his skeleton, with the clothes. A similar accident he relates also to have happened in the year 1838; nay, he had once himself nearly fallen a victim to these creatures. In a forest near Turpan he had been leaning for a few minutes against the trunk of a tree, when all at once he was so violently bitten in all parts of the body, that he would have sunk down under the violence of the pain had not two of his hunting companions come up, stripped off immediately his clothes, and freed him from his enemies. In Paraguay, also, a species (*Odontomachus*) is found, which, when it makes its appearance, puts the inhabitants there into fear and terror. According to Rengger ('Reise nach Paraguay,' S. 262) it appears all at once in great companies, and attacks men as well as beasts; crickets, spiders, grasshoppers are immediately torn by them in pieces. I have, says Dr. Rengger, seen mice, covered with these insects, leave their hole in torture; young mice, which have been eaten up by them in their nest; lizards, and even snakes, flying before them. They attack people in their sleep, and gnaw them till the pain awakens them. Dr. Rengger saw a drunken mulatto whose eyebrows, partly during his own presence, as well as eyelashes, these beasts entirely eat off, and also gnawed the skin of his face to the quick. Two of his patients were attacked by these creatures in their bed, and one of them died soon after, partly in consequence of the fright.

In tropical Africa, also, certain ants occur which prove extremely troublesome to man. The most exact information we possess about them is that afforded by Mr. Savage concerning the Driver-ant (*Anomma arcens*, Westw.), which is found on the west coast of Africa. It is a little black ant, with very sharp and pointed fangs; and the neuters also present two forms, one smaller (the labourers) and another larger (the soldiers). They have no fixed dwelling, but seek their lodging in shallow hollows under roots of trees, overhanging rocks, and such like, where they find shade. The direct rays of the sun being fatal to them, they only come out on cloudy days and by night. If surprised by the sun at their work, they build over their path a vault with earth, which they glue together with their saliva. At other times the soldiers form a vault over the path for the shelter of the labourers. At the rainy season, if their places of abode are

inundated, they form themselves into a round cluster; the young, with the weaker ones, within, the stronger on the outside, and thus float about till they come to dry land. If they fall in with a broad piece of water in the way, they form, by laying hold of each other, a chain across the water, along which the rest pass as over a bridge. The Train-ant is also said to do the same. Madame Merian relates the process thus:—The first ant places itself on a little bit of wood, and holds fast on to it by its fangs; a second lays hold of the first, a third in like manner of the second, and so on. In this way they let themselves be wafted over by the wind, until the last of the chain reaches the other side, and then at once they pass over the bridge by thousands. The Driver-ant often forms similar chains from the twigs of trees to the ground. Their food consists principally of animals, and they kill large-sized ones; even the gigantic snake (*Python natalensis*) is exposed to their attacks. Their first assault is directed on the creature's eyes; and, when surprised by them, their immense numbers win the day. They make their way into houses in crowds by night, when a universal flight of rats, mice, lizards, beetles, and other vermin, announces their arrival, and the inmates are obliged to leave their beds and take to flight into the open air.

Amongst the Ants of India, the *Formica indefessa*, Sykes, is spoken of as destructive in houses; and Lieut. Sykes has furnished (Transact. of the Entomol. Soc. of London, p. 104) some interesting observations, from which we shall extract the following in particular:—A table laid out with sweets and dishes had its legs placed in a vessel of water, and the water covered with oil of turpentine, making it impossible for the ants to reach the legs of the table. The table stood however near the wall, so that the larger ants, holding on by their hind-legs to the wall, could reach the table with their fore-legs and thus get upon it. The table was therefore drawn further back; but now the ants went a foot higher up the wall than the level of the table, and jumped down upon it from the wall, never falling between the table and the wall to the ground, but always alighting on the table.

In New Holland there are in particular two kinds of *Eciton* (*E. gulosum* and *E. forficatum*, Latr.) which are much dreaded, from their appearing in great numbers, and for their violent bite. They are distinguished by their long and straight fangs.

[To be continued.]