

Hab. Many parts of New Zealand coast (v.L.); Australia; Singapore.

ELEUTHEROBLASTEA.

Hydridæ.

67. HYDRA VIRIDIS.—*Hydra viridis*, Linnæus, 1767, Syst. Nat., 1320; Hincks, 1868, Hist. Brit. Hyd. Zooph., 312; Coughtrey, 1876, Ann. and Mag. Nat. Hist. (4), xvii., 24.

Hab. Ponds near Dunedin.

ART. XLIV.—On the Habits of New Zealand Ants.

By W. W. SMITH, F.E.S.

[Read before the Philosophical Institute of Canterbury, 2nd October, 1895.]

At the present time the number of endemic ants described by F. Smith, Mayr, Hutton, Forel, and Emery comprise nineteen species, representing three sub-families, included in nine genera and three sub-genera. Professor Forel, in his recent classification, has carefully corrected the nomenclature and generic arrangement of the New Zealand *Formicidæ*. This is a valuable service to students of the native ants, while his masterly definitions of their specific characters should be a safe guide to them when describing new species or varieties. Professor Emery has also lately described and figured* a new species (*Discothyrea antarctica*) from New Zealand, and removed *Orectognathus perplexus*, Sm., to the genus *Strumigenys*, which species now remains as *S. perplexa*, Sm. It is highly satisfactory to have our interesting native ants described and classified by those eminent specialists on *Formicidæ*.

Professor Emery's observations on the occurrence of *Discothyrea antarctica* in New Zealand as a case illustrating the "cosmopolitanism and great antiquity" of most genera of the *Gonerinæ* are equally applicable to several other genera occurring at the Antipodes. The genus *Huberia* of Forel is represented at present by two species: *H. striata*, Sm., the largest native ant, occurs in large and small communities distributed over both Islands; *H. brouni*, Forel, was discovered by Captain Broun at Rotorua, but has not as yet

* Trans. N.Z. Inst., vol. xxvii., p. 636.

been observed in the South Island. Forel's new var. *Striata rufescens* was collected by Mr. A. T. Urquhart on Pirongia Mountain. *Prolascus advena*, Sm., occurs in large communities in both Islands. *Ponera castanea*, Mayr; *Acanthoponera brounii*, Forel; *Amblyopone cephalotis*, Sm.; *A. saundersi*, Forel; *Orectognathus antennatus*, Sm.; *Ponera antipodum*, Forel; *Strumigenys perplexa*, Sm.; and *Discothyrea antarctica*, Emery, have recently been collected by Captain Broun at Drury, Mercury Bay, and Rotorua, but are unknown at present in the South Island. The genus *Monomorium* is represented by five species, two of which are found in both Islands. *M. integrum*, *M. suteri*, and *M. smithii*, discovered three years ago at Ashburton, will probably also be found to inhabit the North Island. Before dealing with the habits of endemic ants and their economic and parasitic attendants, I may state that my observations apply only to the species occurring in Canterbury.

As the habits of European ants have been so exhaustively treated by Huber, White, Forel, and Lubbock, it would be superfluous to enter minutely into details of the habits of the native *Formicidæ*. There is practically so little difference in the relative habits of the European and Antipodean species of ants of the same genus that it will only be necessary to record the more striking or characteristic features of the latter. The five species of *Monomorium* all occur commonly in large and small communities, under variously-sized stones on the Canterbury Plains. Perhaps no country can show so many species of the same genus inhabiting separate nests within so small a radius. In addition to the nests of *Huberia striata*, the five distinct forms of *Monomorium* are frequently situated within a few yards of each other. The greater number of and more populous nests of *Monomorium* are found under stones half embedded in sandy situations supporting a stunted vegetation, such as we find on old riverbeds and the stony upper parts of the Plains. There are several causes which apparently guide the ants in selecting these sites. The network of roots generally growing beneath the cool, damp undersides of the stones supports several species of root-feeding Coccids, which are unquestionably of considerable economic value to ants. The removal of the loose sand or poor sandy soil from under the stones is also more easily accomplished by the ants when forming courts and tunnels than where stones are imbedded in deep, rich soil. We have occasionally found nests of *M. nitidum* under stones imbedded in coarse shingle where no plants grew, and which contained no Coccids or other insects—at least, so far as we could detect without molesting the whole of the nests. On the 19th November and 12th December last we examined two of these

nests for the purpose of collecting all insects, &c., we could find associating with the ants. In both nests we found none. Both were large communities, each numbering about eight hundred individuals. We found vast numbers of eggs and larvæ in the interstices of the stones at a depth of 15in. and 16in. from the surface. In one we obtained ten queens secreted in different parts of the nest, some in cool, moist chambers 17in. down in the shingle. Excepting some fragments of the elytra of minute beetles and wings of flies, we could not detect any other remnants of their food. We, however, have found large and small colonies situated among stunted vegetation containing considerable numbers of Coccids, some minute parasitic beetles (*Diarthrocera formiciphila*, Broun), and an Acarian (*Leiosoma longipilis*, Moniez). Notwithstanding the closest search in the nests of all the *Monomorium*, we have observed the beetles present only in the colonies of *M. nitidum* and *M. suteri*. *M. nitidum* is the most active native ant, and vigorously assails all intruders near its nest.

Huberia striata, Smith, is the largest endemic ant. Although it exists in fair-sized colonies on the old river-beds on the Plains, the largest are met with in limestone districts, or in warm rocky valleys near the main range. At Albury immense colonies exist beneath detached pieces of limestone lying among the tussock at the base of the whole length of the sloping bed of *débris* beneath the great rocks. Owing to the vast numbers of ants in the nests it was frequently difficult to examine their structure or collect the economic or other insects found associating with them. In many of the nests I found considerable numbers of the pretty little shell *Laoma haasti*, Hutton, lying in the courts and tracks of the ants. Some were bleached, and all were empty; but whether they had crept into the nests or been carried there by the ants I am unable to say. The mollusc is extremely common among the broken rocks, and I am inclined to believe that they were carried into the nests by the ants for food. I rarely found them under stones where there were no ants, and these were generally alive. One important fact which serves to illustrate the effect of situation on the economy of ants is that we never observed Coccids in their nests in the neighbourhood of the rocks. The latter is covered in parts with low vegetation, and generally teems with insect-life, especially beetles, whose elytra we found in quantities in the ants' nests. At Ashburton and on many parts of the Plains this fine ant exists in smaller colonies, and is almost invariably found associating with a large yellow subterranean Coccid (*Dactylopius arecæ*, Maskell). The latter is a root-feeder, and occurs plentifully on the roots of *Pimelea*, *Carmichaelia*, *Discaria*,

Acæna microphylla, and many other plants growing in poor situations. In the bottoms of some of the valleys of the Gawler Downs, Mount Somers, I have met with very large colonies under stones lying among the mixed vegetation. On the roots of *Pimelea*, *Poa*, and other plants were groups of a large slate-coloured form of *Dactylopius poæ*, Maskell. They were firmly attached to the roots, and did not appear to be molested by the ants. In order to test their relations I carefully detached a few and dropped them in the midst of the throng of excited ants. They were instantly seized by workers and carried into the dark galleries. On one occasion we noticed some extremely minute transparent-winged flies rise from the underside of the stone when turned over. The nest contained over sixty adult females of *D. poæ*, and possibly these minute flies were the males of this Coccid.

The presence of certain plants in some localities explains the presence of ants' nests near them. The roots of *Acæna microphylla* are particularly liable to the attacks of *D. areca*, and a species of root-feeding white woolly Aphis. Both insects are a great attraction to this ant, which forms clear passages alongside the Aphis- and Coccid-infested roots. These tracks are frequently traversed by the ants who attend on and obtain food from these rhizophagous insects. I have occasionally observed the ants moving leisurely over the Aphis and Coccids, gently stroking them with their antennæ, and moving their woolly and cottony secretions. The latter when freshly secreted unquestionably contains a sweetish moisture, which attracts the ants, and is much relished by them. The three economic insects alluded to above are the only species we have observed in the nests of, or being attended by, this fine ant. It is an enchanting scene in ant-life to gently turn over a large stone and look into a populous colony of *H. striata*. From September to January the courts and galleries of the nests contain groups of eggs and larvæ of different ages. When the light and air is admitted the eggs and larvæ are rapidly seized by the workers and borne away to places of safety in the inner galleries of the nest. The queens are very timid, and disappear into their chambers immediately the stone is raised. When examining the structure of the galleries we have occasionally found it difficult to trace the queens to their hiding-places in the nest. The galleries generally ramify in many directions, and often to considerable depths, especially when the site of the nest is on stony ground. I have observed young winged queens, males, and neuters of *H. striata* appearing earlier in their nests than in the nests of all other species occurring in Canterbury. They begin to appear about the 10th November, and continue to add to their number until they swarm in February. A calm, sultry day is chosen for

this great event in ant-life. If viewed in the sunshine a few days before swarming, the throng of busy ants with glistening wings presents a charming picture of social life among insects. Huber describes the attention bestowed by the neuters of some European ants on young queens during their development. In large colonies of *H. striata* it is a common occurrence to find queens in course of transforming lying in the common tracks and courts of the nests. I have frequently observed the males and workers run over and pass them by unnoticed, especially in the pupal stage. Whether the care of young queens is allotted to particular individuals I am unable to say. I have, however, seen a large worker seize the pupæ and carry them into one gallery. In the nest in question three pupal queens lay in different parts of courts. When the worker seized the first pupa I touched it gently with red ink to enable us to clearly observe its movements among the host of ants. After an absence in the gallery of two minutes it appeared, walked rapidly along the track where the pupal queen lay, then turned almost at a right angle along another track for about 5 in., seized another young pupal queen and took the same track back into the gallery where it placed the first. In two minutes more it again appeared, and, taking the one track, passed the entrance on the right where it picked up the second pupa, and, proceeding along another track to the right, seized a third pupal queen and bore it away with the clearest deliberation into the same gallery where the previous two were taken. The question of the allotment of labour among ants is one often discussed. The preservation of their young is an instinct common to the workers of all social ants. In communities of ants, like those of the higher groups of animals, more intelligent individuals will often occur. The removal of these young queens by the single individual showed very clearly its own undoubted intelligence and instinct for their preservation. In all probability the same ant had previously placed them in the tracks where they lay when we raised the stone. The case further illustrates the reasoning sentient powers of social ants. Huber cites a case of several workers being employed constructing a portion of a new nest. A single ant approached them and communicated his thoughts, whereupon the work done was pulled down and reconstructed on a better plan. The instinct of the preservation of their young exists in the minds of ants apart from their many intelligent habits which are unquestionably acquired during their existence. The following case, which occurred with a nest of *Huberia striata*, is another case in point. On 2nd November, 1892, Mr. T. Sealy, of Tinwald, informed me that he had seen a number of ants busy removing eggs from their nest situated under stones on

the Ashburton River-bed. We visited the place on the 4th, and found the ants inhabiting much higher ground than when Mr. Sealy observed them migrating two days previously. The object of removing the eggs was perfectly clear. The river had been slowly rising for several days before Mr. Sealy noticed them removing their eggs, and the water had penetrated the coarse shingle to within a few inches of the old site of the nest the day we examined it. It is worthy of note that our native ants, although long isolated from other regions, are in no sense inferior in intelligence to those existing in other countries. Too much stress is laid on instinct by writers in guiding the habits of social insects.

Monomorium antarcticum, White (= *M. fulvum*, Mayr), occurs plentifully in both Islands. I have met with large communities of this ant under stones in open situations in Westland. They, however, exist in larger communities on the eastern side of the Alps, especially on the outskirts of the bush, and in warm valleys of the lower hills bounding the Plains. Like *H. striata*, they haunt the habitats of subterranean Coccids, and may frequently be seen gently stroking them with their antennæ. I have frequently observed workers seize large females of *D. poæ* and remove them to places of safety. When studying the habits of ants it is important to gently raise the stones covering their nests. By doing so an excellent glimpse of the natural conditions of the nests is obtained. If this is practised on a calm, dull day the ants do not so readily become excited as they do on sunny or windy days. In some of the nests where Coccids were numerous we noticed the ants for a few seconds removing the soft cottony secretion from them. It is a common occurrence to see many of the ants moving about the nest with minute particles of the fine cottony substance adhering to their heads and mandibles. Where Coccid- (*D. arecæ*) and Aphis-infested roots of *Acena microphylla* are found in patches on the Ashburton River-bed they are attended by this ant, who treat these parasitic insects with care, gently stroking them with the antennæ, and manipulating the cottony secretions with the mandibles. My friend Mr. A. Brooks informs me that this species occurs in the bush at Danevirke in very large communities. Excepting the brighter colours of the specimens sent to me from Danevirke there is no other feature to distinguish them from specimens collected on the Plains. In the Mount Somers district this ant is found in the autumn in greater numbers in spiderwebs than other species of *Monomorium*, and the same fact is recorded by Mr. G. W. Hudson from the Wellington District.

M. nitidum, Smith: In addition to the foregoing remarks on this interesting ant I have to refer to some curious Coc-

cids, Acarians, Thysanura, and Coleoptera occurring in their nests. Mr. Maskell has described and figured* *Ripersia formicicola*, and made some suggestive remarks on this Coccid in relation to ants. On this question he stated that "There appears to be a general consensus of opinion that Aphides are made use of by ants for their honey-dew, or, as frequently stated, employed as 'milch-cows'; but this is the first instance that I know of where ants and Coccids dwell together, and the quantity of honey-dew secreted by the *Ripersia* cannot be very great. . . . It would be interesting to know whether in other countries Coccids are found under similar conditions, and, if so, how the ants and they mutually behave to each other." These very suggestive remarks on the mutual relations of ants and Coccids dwelling amicably together has created a general interest among students of the *Coccidæ*. There has lately been an earnest and extensive search made for Coccids in the nests of British and Continental ants, with the result that another new species (*Ripersia tomlini*, Newstead) was discovered by Miss Tomlin in an ant's nest in the Island of Jersey. Other new species belonging to different genera have also been discovered associating with ants in England, and have lately been described by Mr. Newstead. When the first specimens were sent to Mr. Maskell we had not previously examined the ants' nests to ascertain the possible number of *Ripersiæ* in each. Since reading Mr. Maskell's paper, three years ago, we have made a minute and prolonged search for *Ripersiæ* in the nests of all the known *Monomorium*. On first turning over a stone covering a nest we have observed from three to thirty-two *Ripersiæ* inhabiting the tracks and courts. When air and light is admitted into the nest these minute insects begin to move about, seeking concealment. When they are not seized and carried away by the ants they will occasionally walk unassisted into the galleries. They are frequently found moving about on the under-surface of the stone covering the nest. We have often raised the stone off the nest and witnessed the ants along with the Coccids seize the latter and carry them about for several minutes all over its surface. We have laid the stone down and allowed the ants to escape, when they generally went in a direct line for the nest and carried the Coccids into the galleries.

In a paper "On the Origin of Ants' Nests"† I have discussed the question of the presence of numerous Coccids under stones as frequently forming the basis of ants' nests. In referring to several points I wrote, "I have mentioned the presence of Aphides and Coccids feeding on the roots

* Trans. N.Z. Inst., vol. xxiv., p. 38.

† *Entomologists' Monthly Magazine*, second series, vol. iii., p. 60.

beneath the boulders as forming an economic basis for the origin of the ants' nests. The cool damp undersides of the boulders naturally draw the roots of plants and attract their parasites to them, while at the same time they afford the requisite conditions for establishing young communities of the ants. The latter instinctively search for these sites, and while thus engaged several of the sexes meet and associate together to form new nests. Beneath some of the stones we have often observed where they had only commenced to excavate their galleries, and we have seen others in course of progress—from the most rudimentary to the highly-finished and numerous galleries in the nests of the old and flourishing communities. When the work of excavating the galleries has commenced the ants do not readily desert the site, and they bestow great care on the domestic or economic inhabitants of their nests." These remarks applied chiefly to *M. nitidum*; and, although I mention having examined two nests situated in rough shingle which contained no Coccids, they are, as a rule, applicable to the origin of the nests of this species. We have counted eighty-four Coccids (*R. formicicola*) with a single colony, and probably we missed many more when digging up the shingly site of the nest. After a patient search for several years among hundreds of nests we have not discovered this peculiar Coccid elsewhere than in ants' nests. The curious beetle *Diarthrocerus formiciphila*, Broun, we observed in the imago state associating with ants.

Professor R. Moniez has lately described and figured an Acarian (*Lerosoma longipilus*) and two Thysanura (*Drepanura brachycephala* and *Lipura incerta*) found associating with *Monomorium* in New Zealand. Two more species (*Entomobrya multifasciata*, Tullb., and *Achoratis armatus*, Nic., Tullb.) were also among the insects sent to Professor Moniez. These latter species he considers occur accidentally in ants' nests.

M. suteri, Forel, is a somewhat smaller ant than *M. nitidum*, but of very similar habits. Large and small communities of this glossy-black species exist under boulders on the Ashburton River-bed. Like the preceding species, they haunt and protect colonies of Coccids parasitic on the roots of several plants. *R. formicicola* occurs abundantly in their nests, the white, cottony fringes of this minute Coccid rendering it a conspicuous object among the bustling ants. Although *D. poæ* is commonly found on the roots of several species of *Poa*, it attacks the roots of other plants, and occurs plentifully on roots under stones in nests of this ant. I have seen the adult females walking leisurely about the courts of the nest, where there were no roots near, each covered with masses of a white cottony substance. Twice have I noticed the little black ants struggling ineffectually to carry off some of these large Coccids.

After several failures to do so the ant turned, walked backwards, and dragged the Coccids into the galleries. We have found nests situated under large boulders lying on fine sand, with no roots penetrating them, which contained several dozen adult females of *R. formicicola*. It is a common occurrence to find numbers of this Coccid, in all stages of development, attached to roots in the nests. I, however, can only conjecture that these adult Coccids were brought into these nests by the ants from elsewhere. They walk freely about the tracks and courts, but on what they subsist, in the absence of roots, I am at present unable to say. When viewed with a strong lens the walks and courts of the nests of this species exhibit the perfection of workmanship. In some of the nests we have observed groups of minute yellow eggs, together with clusters of those of the normal colour—white or reddish-white. On the 10th October, 1892, we found several nests, all close together, containing clusters of queen eggs, or those which develop into queens, while only a few worker-eggs were observed in the nests. In all ants' nests it is a simple matter to distinguish these eggs, chiefly from their size, and different periods of time required for their development. My knowledge of the latter is too imperfect at present to enter into details of their development. I, however, hope to be able to deal with this question in a future paper.

M. integrum, Forel, recently described, is the rarest species of the genus—at least, in the neighbourhood of Ashburton. Except in size, it closely resembles *M. suteri*, and is of similar habits. I have observed the two Coccids, *R. formicicola* and *D. poæ*, in two nests which we examined, under stones on the river-bed, a few miles above Ashburton. In structure it is a more slender and graceful form than any of the preceding species. At present I am unable to give full details of its habits.

M. smithii, Forel, is the smallest species of the native *Monomorium*. It exists generally in small communities on the river-bed here, and is readily distinguishable from all the native ants by its minute size and clear brown colour. The nests generally occur on sandy situations, among stunted vegetation, which support the Coccids associating with the ants. *R. formicicola* associates with them, and is tenderly carried off by the workers when the stone is raised off the nests. In young colonies which contain few eggs it is a common mode of concealment to rapidly burrow into and disappear in the fine sand on the bottom of the nest. The smallest nest of this ant we have noticed contained one queen, one male, and five neuters. As the colonies increase in numbers during the summer, dozens of adult females of the minute star-like Coccid, *R. formicicola*, are occasionally found leisurely walk-

ing about in the nests. The Acarians and Thysanura, already mentioned, are generally found in the nests of this species. On the 28th November, 1893, we discovered a somewhat large colony under a stone lying near some plants of *Carmichaelia nana*. The roots of the latter were growing under the stone, and were badly infested with the *Ripersiæ*. The fine sand had been removed from under the roots, and left them clear in the nest. Attached to the roots were numbers of *Ripersiæ*, some of which the workers seized and removed to dark recesses in the nest. The ants had to climb up about 2in. of the perpendicular side of the nest to reach the horizontal roots. They each seized a Coccid, returned back along the root, walked down the wall, and disappeared into the recesses of the nest. It is therefore clear that the habit of preserving Coccids in their nests is general among the native *Monomorium*. Mr. Maskell states that the secretions yielded by these minute Coccids cannot be much. The species preserved by the ants are perhaps the only subterranean forms which secrete sweet, or at least edible, substances, so much sought after by the ants. Even the small amount secreted by some species is apparently sufficient to warrant our minute ants in protecting and preserving them in their nests. *R. formicicola* is a beautiful object when examined alive on a shaded field of the microscope.

Prolascus advena, Smith (= *Formica advena*, Smith; *Prenolopis advena*, Mayr): This peculiar ant is not uncommon on the Canterbury Plains. It is generally found in very large colonies, especially in limestone districts and in warm, rocky valleys sheltered from cold winds. The same habit of haunting the habitats of Coccids holds good with this as with the preceding species. As this ant is somewhat rare about Ashburton, I have not been able to study its habits and economy so fully as other species. It is a very timid and excitable ant, and no sooner is the stone raised off their nests than they present a scene of bustle and excitement. I have only twice seen them carrying Coccids about in their nests: but any further remarks on this ant I withhold for the present.

Swarming of Ants.—The calm, sultry days of February and March bring forth vast swarms of young ants to seek "fresh woods and pastures new" wherein to establish young colonies. For weeks before they take flight the nests are crowded with winged ants awaiting the proper time and natural conditions to do so. Seven years ago I recorded in the *Field* our meeting with a vast swarm of *M. nitidum* when driving across the Plains from Ashburton to Mount Somers. When we met the swarm we were moving at a walking-pace, and halted to witness it passing over us. In a few seconds horse, trap, and occupants were covered with minute winged ants. I alighted

and went towards the wire fence, which was also covered with millions of ants from the swarm. Many had cast their wings, while others again took flight and mingled with the dense swarm. The densest part of the swarm appeared to be about 6ft. to 10ft. from the ground, and flew at the rate of perhaps a mile an hour. As they proceeded numbers kept dropping out of the flight, and alighted on the tussocks, shook off their wings, and disappeared in the grass. As a natural means of distribution, the dispersion of immense swarms like the one under notice would thickly people with ants the line of country it passed over. An immense swarm of this nature could only be formed by the union of numerous nests which would be advantageous to the species. After the flight the queens meet and associate with males from other nests, and establish new colonies.

When referring in my former paper* to the general economy of the *Tetramoria* I stated that, "In order to ascertain if the *Tetramoria* form granaries or otherwise store food in summer and autumn for winter use, we have carefully examined many old nests in the months of April and May, but in no instance did we discover any food stored; we, however, have noticed a greater number of Aphides and Coccids in their nests during winter than in summer or autumn, and I think it probable that they are brought into the nests by the ants before the winter from beneath the adjacent stones." I have often observed ants with Coccids, excepting *Ripersia*, under stones apart from their nests. Owing to the presence of numerous rhizophagous Coccids—and in some cases Aphides—I am inclined to believe that these minute ants never possessed the instinct or knowledge of storing food. The milder climate and shorter winters at the Antipodes favour the ants in procuring food. When the relations of ants and Coccids are perfectly known, it will be found, I believe, that their mutual dependence will be, in many instances, more general, especially in temperate climates. The following case, from the report of the Inspector of the Cape (South African) vineyards for 1886, is of interest: "I have met with," the Inspector wrote, "a very singular subterranean Coccid, both at Moddergat and at the Praal, attended upon in one case by a small ant, *Acantholopis capensis*." The mutual relations of ants and Coccids, of ants and Aphides and the larvæ of several species of butterflies and other insects, require further investigation. In the case of some subterranean Coccids, they must belong to very ancient forms, especially so as species of the same genus are found in ants' nests in both hemispheres.

* *Loc. cit.*, p. 64.

I have now to thank Mr. Maskell, Captain Broun, and Professors Forel and Emery for naming and describing the new species of Coccids, Coleoptera, and ants submitted to them respectively. To Mr. H. Suter, who took much interest and trouble in forwarding the ants to Europe, my thanks are also due.

ART. XLV.—*On the Construction of the Comb of the Hive-bee.*

By COLEMAN PHILLIPS.

[*Read before the Wellington Philosophical Society, 4th September, 1895.*]

DURING the past autumn, whilst shifting my bee-boxes, I disturbed a couple of hives to such an extent that the bees deserted them. These boxes were really double hives (two boxes to each hive), with a hole, $3\frac{1}{4}$ in. square, leading from the lower to the upper box. I had consequently a good opportunity of carefully examining the deserted comb in the lower boxes, which I will name A and B. To my surprise I noticed that the square hole in the top of box A had been bridged across by two walls of comb, whilst in box B a comb-bridge leading straight across the hole had only just been begun. This was all the comb in box B.

Box A, it will be noticed, is almost full of comb, lines of it stretching from side to side, and two of these across the square hole, proving that, in both instances, the bees, having apparently satisfied themselves of the dimensions of the holes, ignored them completely, and relied upon the bridging-powers of their comb-construction to span the distances. The fact that in box B the new line of comb (which, when complete, would stretch from side to side of the box) had been begun directly at the aperture, and the bridge of comb at once thrown straight across, almost reaching to the other side, shows how thoroughly the bees recognised the obstacle, seeing that they had the whole of the box at their disposal in which to start operations.

Darwin makes no reference to these honeycomb bridges in his "Origin of Species." All that great writer does is to strive his utmost to show that the comb of the hive-bee arose in accordance with his great theory of natural selection. He enters very fully into the cell-making instinct of the hive-bee. He cites other authorities to support his theory, which, if wrong in this instance, is certainly wrong throughout his