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ROTHAMSTED RESEARCH

The Cause and Control of Swarming in Bees

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THE CAUSE AND CONTROL OF SWARMING IN BEES

BEING THE REPORT OF A CONFERENCE HELD AT ROTHAMSTED ON APRIL 25th, 1935, UNDER THE CHAIRMANSHIP OF

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Historical Notes on Theories of Swarm Control

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HISTORICAL NOTES ON THEORIES OF SWARM CONTROL

By Annie D. Betts, B.Sc.
(Editor of *The Bee World*)

The methods a beekeeper uses to manage his bees influence his ideas about the nature and organisation of the bee-colony much more than is sometimes realised. The Greeks and Romans did not try to control swarming, and so most of them were quite content to believe that a stock of bees was a city-state, like Athens or Rome, which had a king or general set over it, made war on its neighbours at intervals, and—when it grew very prosperous and the population increased—sent out some of its citizens to found a daughter-city or colony elsewhere. The only ancient writer who seems to have an inkling of another idea is that good practical bee man, Columella. He writes of the swarm as being composed of the younger bees, who have grown tired of living any longer under the rule of the old ones, and so leave home. Whether he learnt this from some Greek writer whose work is lost, or from beekeepers in Spain when he was a boy, or whether he thought of it himself, is not known. But he seems to be one of the first—if not the very first writer on bees to realise that the colony is like a family rather than an army or a city.

During the Middle Ages, as in ancient times, most practical beekeepers could not read or write, and those who wrote bee-books generally copied the classical authors without adding much new material. No one wanted to control swarming, at any rate in England and most parts of Northern Europe; they wanted as many early swarms as possible, so as to have plenty of stocks to "take up" and sulphur in autumn. Only a few author-beekeepers seem to have practised any sort of swarm control. As an instance we may take our greatest bee man, Charles Butler. He copied the classics freely in his book; but he controlled swarming by a method which he did not learn from them. He used, not only the straw skeps general in Hampshire in his time and until recently, but also tall wicker skeps, shaped like a dunce's cap. When the stock in one of these prepared to swarm, he stood it on its head in a hole and put an empty skep on top of it, plastering the join between the two bottom edges with cow dung. This gave the bees plenty of room, and also killed most of the queen cells. I do not know, but am inclined to think that he learned this method in the Chilterns in his youth. The only place where it is now in use is in France—in the Gatinais district—so it must go back to the Ancient Britons at least, if not further—for we have no reason to think that Charles Butler was ever in France.

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It is almost certain that, if we knew more of the Britons and other prehistoric peoples, we should find that they had more accurate knowledge about bees than the Greeks and Romans. Having no writing or books, they have not been able to leave us any record of their knowledge, except in folklore and the survival of old skeps like the ones in the Gatinais.

In 1771, in Vienna, a Carinthian beekeeper, Anton Janscha, published a book on swarming. He, like Butler, was a poor man's son ; but unlike Butler, he had no education until he was over thirty ; and he died when only 39. His book is wonderful and most practical ; but he is a splendid instance that what a man believes about bees will govern his management of them. He says that swarming is due to two things—the bees' propagating instinct and their industry. When the stock grows crowded, these instincts cannot find satisfaction in the old home, and so a division of the colony takes place—the stock swarms. In exact accordance with this theory, Janscha says that to prevent swarming one should give more room, but adds that the surest way is to decapitate or cut out the drone brood and to remove the queen cells. He used those long shallow hives in which we still buy Carinthian bees, and no doubt it was fairly easy to find all the queen cells in such a hive, when the floor-board was removed.

Janscha anticipated a great many of Huber's discoveries ; but he died before he could answer the objections of the authorities of his day, who were opposed to his views ; and so his discoveries were forgotten.

Now we come to another continental beekeeper who did a great deal for the craft—the German cabinet-maker, Johann Mehring. In 1857 he invented foundation ; and in 1869 he wrote a book called, " The new One-Being-System as a Foundation for Beekeeping." In it he stated that the bee-colony must be regarded, not so much as a community of insects living together, but as a single organism. The book went out of print and was forgotten. But, a few years later, Rev. Schönfeld gave a copy of it to a young fellow-parson at Ossmannstedt in Thuringia. This man was Ferdinand Gerstung.

Gerstung himself had already hit upon this idea, that the bee-colony was a unit or single organism, and he was so delighted with Mehring's book that he brought out a new edition of it in 1901, in the preface to which he acknowledged his debt to Mehring for many of his own ideas.

Gerstung taught that a colony and its combs is one indivisible whole from the point of view of its life-processes. It consists of a number of layers or shells, one within the other. Imagine that the combs are transparent, so that you can look at the nest as a whole. You will see honey outside with the foraging bees on it, then a blanket of pollen all round the brood, and finally the brood itself in the middle with the nurse bees and queen. The queen, Gerstung

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believed, follows a definite course, in spirals, returning every three weeks to the same place, as the cells again become vacant for her to lay in. Therefore the beekeeper must not disturb the order of the combs, or even take them apart needlessly ; for by so doing he will upset the orderly movements of the queen and throw out the life-processes of the colony-organism.

The young bee—Gerstung taught—follows what he called the centrifugal law. That is, she moves away from the centre of the colony as she grows older. When newly emerged, she stays near her cell, and, when the queen comes by on her rounds to lay in it and other newly-vacated cells near by, feeds her. She tends the eggs, and when the grubs hatch, is at the right stage to feed them. When they are ready to be sealed, she is a wax-maker, and seals their cells. Then, her work as a nurse being done, she leaves the centre of the colony and goes further outwards. She cleans the hive, stands guard at the door, learns to fly ; and, finally, as a forager, goes far away from home in search of food.

The separate organs of an animal's body are all nourished by the blood, and each takes from it what it requires for its functions. So too—said Gerstung—is it with the bee-colony. Its blood is the brood food, which he thinks of as a stream circulating in the colony. The queen and nurses need protein for eggs and brood-feeding, and take this out of the stream ; the wax-making bees need fat ; and the foragers need sugar to supply energy for flying and other hard work. If the colony is properly balanced, the food stream is used up evenly and nothing remains in excess when all are satisfied. But, if some class of bees is not able to use up enough of the particular foodstuff they should take out of the stream, that foodstuff will be in excess, and the normal life of the stock will be upset. Thus, if the queen's laying is checked, the nurses and wax-makers will soon not have enough grubs to feed or seal over, and protein and fat will be in excess. The bees then try to find outlets for the superfluity. They produce warmth ; they build drone combs and rear drones. This fails to relieve the situation sufficiently ; so they start queen cells, which absorb a great deal of brood food. This makes things better for a time, until the cells are sealed, and there is a reduced call for royal jelly. The bees would then feed it to the queen ; but she has ceased to lay, and will not take it. They cannot eat it themselves, so there is now no outlet for the excess brood food ; and the bees must seek a new home to find occupation for their superfluous materials and energies. The swarm inevitably results.

Thus, according to Gerstung, the bees do not rear drones and queens in preparation for a swarm, but in an instinctive attempt to avoid the necessity of swarming.

It is obvious how helpful Gerstung's theory is in suggesting what we should do and avoid if we want to prevent swarming. Any action on the beekeeper's part which results in idle nurses—such as putting

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a sheet of foundation into the middle of the brood nest, or even pulling the nest about needlessly—may cause queen cells to be started. Again, cutting out unsealed queen cells might cause a swarm to come off instead of hindering it; for it would cause a sudden excess of royal jelly. One could think of other instances. Many modern methods of swarm control are based, directly or indirectly, on Gerstung's idea that the bee-colony is a unit—an organism. His work has had to be corrected in details; but his chief merit remains. He made beekeepers think of the colony as a unit, and thus gave them the first really solid basis for swarm control—and, I might add, for many other operations of practical beekeeping.

The idea that the colony is an organism also occurred—I believe independantly—to our countryman G. W. Bullamore, and was published by him in the *Beekeepers' Gazette*, 1911. This was, however, a good many years after Gerstung first published his ideas, and over forty years after Mehring's book. So I fear that we cannot claim any of the credit for this, one of the most important advances made in beekeeping theory. It is, however, pleasant to know that Britain is now taking quite a respectable part in developing the consequences of the theory for practical beekeeping, and also in extending the work of Rosch and others on the division of labour in the hive. It was this work which confirmed Gerstung's main idea, though it proved him wrong in many small details; and it is very regrettable that he did not live to see it. Gerstung died ten years ago, a few months before Dr. Rösch published his first paper.

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