

Heredity in Bees.

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ARE we to assume that the most social of all insects has developed into its present high condition from ancestors who have had less and less of the social instinct in them as we go back into the remote past, age by age, until we find a seemingly perfect solitary honey-bee, queen and drone, male and female, themselves workers, able to gather their own food, as in the case of the queen humble bee, able to secrete wax and rear its young until the progeny becoming numerous, take these duties upon themselves? If so, in vast spaces of time, the necessity of honey-gathering and wax-secreting, the part of the queen being removed, the organs and glands used for this purpose would by disuse become aborted and atrophied, the tongue would get shorter by degrees until it became, as we find it to-day, too short altogether for the purpose of gathering nectar from flowers, and the wax-secreting glands would disappear entirely, the pollen-baskets would also for the same reason go by the board, or remain only in a rudimentary form. The reproductive organ would remain, of course, as perfect as we find them, and by the whole energies of the queen being devoted to egg-laying, the ovaries would be developed into the vast egg-producing organs we know them to be. On the part of the worker (a female bee), the necessity for its participation in the re-peopling of the hive being removed, the requisite organs would at the same rate become atrophied, as we find them, whilst the constant and increased use of other parts (the tongue and the pollen-baskets), would be gradually developed under the marvellous loss of compensation into what we see they are in the present stage of their development. The fact of certain varieties of *Apis mellifica* having longer tongues than others would support the suggestion that our bees are not yet on the apex of perfection as regards the development of the parts necessary for nectar gathering. Other varietal differences strengthen the assumption.

The development of the social idea always brings with it specialisation of parts, devotion to special labour, and the division of work. Thus we find the probational nursing period, and its following honey and pollen gathering life, with the divisions of labour into cell-building, wax-secreting, water-carrying, sentinel works, and so on.

Now the question forces itself upon us, how and by what means are all these specialisation

handed down to the generations. The queen per se has only the re-peopling instinct to transmit, which she does in the worker and drone eggs, the worker bee having certainly as strong desire to keep up the strength of the huge colony as the queen can have, perhaps more so; but she, the queen, inherits nothing from her parents beyond the faculty of depositing eggs by the thousand. She inherits no instinct for mutual defence, the necessity of seeking food, building cells, &c., neither can she transmit these instincts, for neither the queen nor the drone have the power of handing down to posterity something they do not possess. The truly wonderful developments of various instincts in the worker bee are not possessed by the parent bees, and as these developments must have extended over enormous periods of time, in order, little by little, by constant use, to reach their present pitch of perfection, these minute advances of the worker must have been perpetuated by some means for the benefit of her successors in the hives of the future.

The queen-bee is more the daughter of her nurses than the daughter of her mother, for, we know, it is only by the changed treatment of a worker egg by the worker bees, that she becomes a queen at all. The queen can only lay queen eggs and drone eggs, no worker egg, only perfect male or female ova, it is the treatment the female eggs receive at the hands of the workers which decides the future line of usefulness in the female progeny. How, then, can any characteristics developed in the worker be transmitted other than by the food fed to the brood out of the digestive organs of the worker bee herself? Food, perhaps, contaminated by germs of foul brood by having passed through the workers' own diseased system, but food as much characteristic of the nurse-bee as is the milk of a nurse mother—a foster-mother—amongst the mammalia.

We have then only this dilemma to face:—Peculiarities of the worker bee not possessed by either of its parents must be handed down somehow by itself; and there seems to be no way out of the difficulty other than by assuming she does this in the manner I suggest. If you insist that these are latent in the worker egg as soon as laid, quite irrespective of any hereditary tendency handed down in the worker brood food, then I contend that even in this case the queen mother inherited these tendencies in the so-called royal jelly, on which she fed when in the grub state, but still a brood food which had passed through the system of workers. The same argument applies also to inheritance through the drone.