

seems to adopt the position that the food is chyle which is produced by the addition of an acid to the royal jelly. He states that the royal jelly is due to the fact that three-fourths of 1 per cent of acid. The contents of the royal jelly on the other hand, and all the parts of the alimentary canal are alkaline. Hence, it is supposed that if the diet of the drones and workers and, as from the stomach, it is furnished by the glands, it is the difference between the food in the cells and the food in the stomach. The difference is so great that if a very substantial addition of more than a mere trace of acid must be made to the

food is given to the queen. The royal jelly, is a gummy substance of white color when fresh. When it comes out of the cell it soon becomes yellowish. When examined by the microscope it appears as a granular, very minutely granular substance, is very acrid and pungent, and must be strongly examined by the microscope. The queen larvae containing queen larvae are old contained a number of digested pollen grains but such as occur in the stom-

enteric origin of a part of the food and its regurgitation is discussed when we treat of the writer does not adopt a personal view regarding the value of food—the fact is that it is known about it to enable us to form any opinion worth while. It is that the whitish paste in the mouths of the workers is made of where it is made. Hence we can be sure of further investigation

The brood food is fed to the larvæ by the workers and is produced in greatest abundance by the younger individuals. The larvæ of the queens are said to receive nothing but pure royal jelly throughout their entire developmental period, while the larvæ of the drones and workers are given the pure product only during the first three days of their life. From the beginning of the fourth day on, honey is said to be mixed with the diet of the drones and workers and, in the case of the former, undigested pollen also. Moreover, the adult queens and drones receive a certain amount of pre-digested food throughout their lives; if they do not get it they become weak. While they can feed themselves with honey, they apparently cannot eat pollen, and consequently are not able to obtain the proteid element of diet unless fed this in a pre-digested condition by the workers. During egg-laying activity the queen especially demands this food, and by withholding it the workers probably have the power of stimulating or inhibiting her production of eggs. Arnsperg (1906) says that the workers feed it to weak or starved members of their own class, the material being accumulated upon the upper surface of the mentum of the bee whence it is sucked up through the proboscis by the other. All of these statements, however, concerning the feeding of the brood and the differences in the diet need to be verified. They are based chiefly on the work of Planta, published in 1888. Cheshire (1886) states that the stomachs of queens contain a substance which is "microscopically indistinguishable from the so-called royal jelly," scarcely a pollen grain being discoverable in it. If this is so, it would seem to prove that the queen is fed this substance by the worker, for the stomach of the latter is invariably filled with a dark-brown slime containing a varying amount of pollen and in no way resembling royal jelly. Cheshire further states that before impregnation the stomachs of

the queens always contain pollen, the royal jelly being found in them two or three days after impregnation, when all traces of pollen have disappeared.

The narrow œsophagus is a simple tube, with a thick chitinous lining and muscular walls. The epithelium is very rudimentary, its cell boundaries being lost and its nuclei appearing as if imbedded in the lower layers of the thick transparent intima. The muscles are disposed in an outer layer of transverse fibres, and an inner layer of longitudinal ones.

The honey stomach is simply an enlargement of the posterior end of the œsophagus lying within the anterior part of the abdominal cavity. It is best developed in the worker, but is present also in the queen and in the drone. The organ should perhaps have been named the nectar stomach, for its principal function in the bee is to hold the nectar as it is collected from the flowers, and to allow the worker to accumulate a considerable quantity of this liquid before going back to the hive. Hence, since the honey stomach is a sac, with very distensible walls, its apparent size varies greatly. When empty it is a small flabby pouch, but when full it is an enormous balloon-shaped bag with thin tense walls. The histological structure of the honey stomach is exactly the same as that of the œsophagus. The numerous high folds into which its epithelium is thrown permit the enormous expansion of which the sac is capable. When a worker with its honey stomach filled with nectar reaches the hive, the nectar is either stored directly in a cell or is given up first to some other worker, who places it in a cell.

It would appear that all the food swallowed by a bee must go first into the honey stomach, and since the bee's diet consists of pollen and honey as well as nectar, one would suppose that in regurgitating the latter the bee would also disgorge the pollen it might have recently