

# Age Polyethism

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A ‘Super Organism’ is “a colony of interdependent organisms, as in the social insects, whose castes, individuals, etc. act as a unit.”<sup>1</sup> A colony of bees is considered a super organism because of the individual’s codependency and inability to live without one another. This is exemplified by one theory of hive organization: Age Polyethism.

Age Polyethism is a theory that consists of age\* determining the bee’s job. When our bee hatches she is called a *callow bee* and becomes a housekeeper. She sustains herself on her fat bodies and, after 24 hours, she eats, grooms, cleans her cell and surrounding cells. Undertaking is the next task she does for up to 13 days. She and her sisters take sick or injured bees and brood away from the hive.

Next our bee becomes a fanner and some of her sisters become nurse bees, honey makers, or part of the queen’s retinue. She fans cool air into the hive to help with the ripening of the honey. She also fans to expose her Nasonov Gland, which is located underneath her 6th tergite. This gland has a very sweet scent that lures forager bees back to their hive. It’s saying, “Come hither. This is your hive and where you belong.”<sup>2</sup> Architecture is another job. Once she and other bees are 12 days old, they start to produce wax flakes. These are molded by the architects into the correct shapes of comb. This new comb, known as *wax comb* will become Honeycomb or Brood comb depending on the need of the hive. It can be filled with honey, bee bread, or developing brood and larvae. They can do this job for 23 days, at which point they are 35 days old.

When our bee is 18 days old, “her sting glands have developed to contain an authoritative amount of venom”<sup>2</sup> allowing her to become a guard bee. Alien bees, and other enemies, who do not have the correct and familiar scent, “are bravely driven off.”<sup>2</sup> When an invader enters the hive the guard and undertaking bees will surround it and use their body heat to kill it. This is called *balling* and most colonies use it to protect their hive instead of stinging. Though, if the bees become desperate, they will sting the invader to death. An invader that is too large to be taken out gets covered in propolis (sticky resin from trees) and mummifies.

The last job for our little worker is foraging for pollen and nectar. Now 22 days old, half of her life is over, and she courageously goes out of the hive and starts her

orientation flight. She flies up and down, all around the hive. She starts flying circles, beginning with small ones then increasing up to a 2-mile radius. She’s mapping the landmarks that will guide her home. She finishes her flight and goes out to collect nectar. The nectar is stored in her honey crop, which is “an enlargement of the back or posterior end of the bee’s esophagus that lies in the front of the abdomen. This organ can hold a large amount of liquid due to its invaginated walls.”<sup>3</sup> She also collects pollen. Collecting pollen from one plant species at a time, she ensures that each plant is pollinated correctly. The pollen gets stored on her corbicula, which is “a flattened depression surrounded by curved spines located on the outside of the tibia of the bees third set of legs. It is used to carry pollen gathered from flowers back to the hive.”<sup>3</sup> Of the workers, 75 percent go to the field, some may never return, eaten by birds or chilled from the oncoming dusk. This theory, Age Polyethism, explains why bees do what they do and is widely accepted by beekeepers worldwide.

There is a sub-theory that explains why some bees never leave the hive; it involves a responsibility called *Heater Bees*. When bees are in their pupae stage, they need heat. With the help of “temperature-sensitive film”<sup>4</sup> Dr. Jurgen Tautz, a German bee expert, found out that the bees “decouple their wings so the muscles run at full power without moving the wings and this allows them to raise their body temperature extremely high.”<sup>5</sup> This extremely high temperature is “10°C higher than normal bees”<sup>4</sup>. The queen may leave an empty cell here or there for the heater bees to climb in, head first, to distribute the heat more efficiently. “The waxy cells also help circulate the heat around the rest of the hive.”<sup>5</sup> The heat can penetrate up to seventy cells surrounding one heater bee. “They remain about thirty minutes, or until their bodies drop back down to a normal temperature.”<sup>4</sup> This newly emerged theory states “pupae kept at 35°C turn



Kate Elizabeth Riding recently received a letter from Oregon State University, 4-H Development, that her Beekeeping essay, which appears on these pages, was selected as the winner for Oregon. Congratulations, Kate Elizabeth!

\*Average age at which bees can begin task.

into foragers that search out sources of nectar and pollen, while pupae kept at 34°C become ‘housekeeper bees’ that perform chores within the brood nest such as feeding and cleaning.”<sup>4</sup> If the heater bees only need to heat one bee, it will press “its thorax against the top of a developing capped pupa, keeping it warm”<sup>4</sup> thereby heating it to the needed temperature. Heater bees are very important to the colony and may determine if the pupae becomes a house bee or a field bee. The Heater Bee theory was proposed in 2010, and is constantly being expanded upon.

Honey bees have multiple organizational systems. Age Polyethism is a widely accepted theory with which many beekeepers agree. I believe that this theory is one example of the many aspects that qualify the honey bee as a Super Organism. The more we discover, the less we realize we know, and only with time and research will we discover the depth of hive organization and find more ways to call this magnificent creature *Super!*

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