Honeybee: Imaginal Discs

Most beekeepers learn quite a bit about the short, six-week life of the adult bee, much less about the three weeks of development preceding each bee's emergence as an adult.

It all starts with a single egg cell encased in an oblong egg deposited by the queen at the bottom of a wax brood cell. Within 3 days, that one cell (fusion of a queen's egg and a sperm she collected during her nuptial flight) has divided by mitosis again and again and again ... cell division frequency averaging perhaps once every 3-1/2 hours ... when the egg hatches on day 3, a larva of nearly 1,000,000 cells is born.
For the next few days, the larva is fed by its sisters ... and bee milk is its only food. ( Though more commonly termed royal jelly, this white liquid is produced by nurse bees, who secrete the protein-rich fluid from sets of glands located in the head. ) After three more days of feeding, which includes pollen and honey, the larva is sealed into its brood chamber with a wax cap.

Metamorphosis begins.

Over the following two weeks, the grub-like larva - which no longer eats - is digested from within by groups of cells - imaginal discs - organized according to the structural parts of the adult bee which they are destined to become. ( The word itself is a bit magical: imaginal derives from imago, Latin for image ... in insects, the imago is the adult body form attained in the last stage of metamorphosis. )
Though imaginal disc formation in honeybee embryos has been observed by microscopists for over a century, our understanding of the underlying developmental biology is ongoing. On a molecular level, genes responsible for coordinating the assembly of body parts - of honeybees and of all living things - are organized into segments called homeobox - or Hox - genes. Hox genes code for short (60 amino acid long) proteins - transcription factors - which bind to specific areas of honeybee larval DNA and direct the sequential expression of certain DNA segments, orchestrating the assembly of an adult bee from the formless larva sealed into the brood chamber on day 6 of life. The Nobel Prize in Physiology or Medicine for 1995 (<click) was awarded to three scientists for their work in elucidating the role of Hox genes in guiding embryonic development. Though they studied the model organism Drosophila (fruit fly), their findings apply to other organisms, including honeybees and mice ... and men.
The attached images and references will give you insight into the transformations occurring in each of the hexagonal wax brood cells in the warm darkness of the hive, as late winter turns to early spring.

image sources and additional references:  [http://imagessays.com/#/hox/](http://imagessays.com/#/hox/)