



Social Insects By C4A Academy



Social INSECTS live in highly organized SOCIETIES and display remarkable behaviors and social structures. These insects include ants, bees, wasps, and termites. Similar to other insects, social insects like bees and ants develop from an egg to an adult through a series of growth stages. The process involves four stages: egg, larva, PUPA, and adult. The process of growth from a JUVENILE form to an adult form is called METAMORPHOSIS.

SPELL: STAGES SERIES JUVENILE

Social insects live in highly organized _____. SOCIETIES

The process of growth from a juvenile to an adult insect is called?

METAMORPHOSIS

Social insects display remarkable _____. BEHAVIORS, SOCIAL STRUCTURES

Name two of the social insects mentioned in the lesson. ANTS, BEES, WASPS, TERMITES

Name two of the four stages of metamorphosis. EGG, LARVA, PUPA, ADULT

What comes to mind when you hear the word social?

Here's some more detail about the four stages of metamorphosis:

1. Egg: The female lays an egg, which hatches into a larva.
2. Larva: The larva is a worm-like stage in which the insect grows and MOLTS (sheds its outer layer) several times. In social

insects like ants and bees, the workers feed and care for the LARVAE (multiple larva).

3. Pupa: The PUPAL stage is when the insect TRANSFORMS into its adult form. During this stage, the insect does not eat or move, and its body undergoes significant changes.
4. Adult: Once the pupal stage is complete, the insect EMERGES as an adult and takes on its specific role in the colony, such as foraging, caring for the young, or defending the colony.

SPELL: SHEDS EMERGES UNDERGOES

The egg hatches into a _____. LARVA

The larva is a _____-like stage during which the insect sheds several times. WORM

The word used for “sheds its outer layer” is _____. MOLTS

During the pupal stage, the insect _____ into its adult form. TRANSFORMS, CHANGES

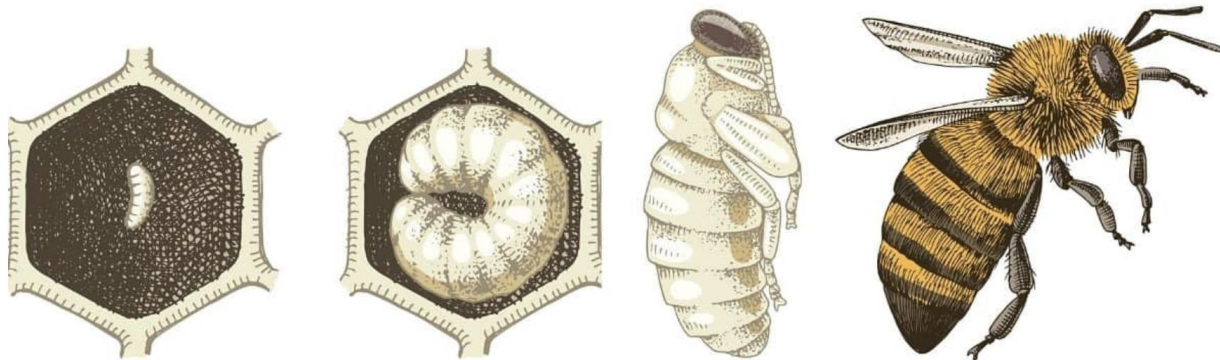
The insect undergoes what kind of changes? SIGNIFICANT

Once the pupal stage is complete, the insect emerges and takes on a specific role in the _____. COLONY

Name one role the adult insect might take on, as mentioned in the text.

FORAGING, CARING FOR THE YOUNG, DEFENDING THE COLONY

What's one way that humans transform from juveniles to adults?



Life cycle of the honey bee from <https://carolinahoneybees.com/honey-bee-life-cycle/>
From left to right: egg, larva, pupa, adult

It is remarkable just how different an insect looks at each stage of DEVELOPMENT. Consider that a human baby looks very similar to a human adult, and juvenile humans appear much like ‘small size’ adults. Not so with insects - a pupae looks nothing at all like the adult form of the

insect. However, insects and humans are alike in that they both take on different roles as they develop. For example, in ants and bees, the specific role an individual takes on is determined by the needs of the colony and can change as the insect ages and its RESPONSIBILITIES evolve.

SPELL: DETERMINED EVOLVE HUMANS

It is remarkable how different an insect looks at each stage of ____.

DEVELOPMENT

From the text, 'small size' adults were called ____.

JUVENILES
Insects and humans both take on different roles as they ____.

DEVELOP
The ____ of ants and bees evolve as they take on different roles.

RESPONSIBILITIES

How did the paragraph say humans and insects are alike? THEIR ROLES CHANGE AS THEY AGE / DEVELOP

What's a synonym for a juvenile? TEEN, CHILD, YOUNGSTER, ADOLESCENT, etc.

If there was a responsibility that you wanted to take on, what would it be?

Social insects are known for their highly organized societies, which are often divided into different CASTES (roles). These castes typically include workers, soldiers, and reproductive individuals, such as queens and drones. The exact COMPOSITION and ORGANIZATION of these castes can vary between species, but the overall structure of social insect societies is often similar.

SPELL: TYPICALLY OVERALL STRUCTURE

We read that social insect societies are often divided into different ____ or roles.

CASTES
The exact ____ and organization of the castes can vary between species.

COMPOSITION
The overall structure of social insect societies is often ____.

SIMILAR
Name one of the social insect castes. WORKERS, SOLDIERS, REPRODUCTIVE INDIVIDUALS, QUEENS, DRONES

two types of reproductive individuals name one. QUEENS, DRONES

VAKT: Check out these origami insects:

<https://www.giladorigami.com/origami-Insects>

Workers are the most NUMEROUS caste in social insect societies and are responsible for a variety of tasks, including FORAGING (hunting or scavenging) for food, caring for the young, and maintaining the nest. In social insect groups such as ants, bees, and wasps, all of the workers are female. In a few species of ants, male workers can also take on tasks such as foraging for food or caring for the young. And in some species, workers are also capable of REPRODUCING, but they typically only do so when there is no queen. One thing is true of all the workers: they all work together to maintain the health and success of the colony.

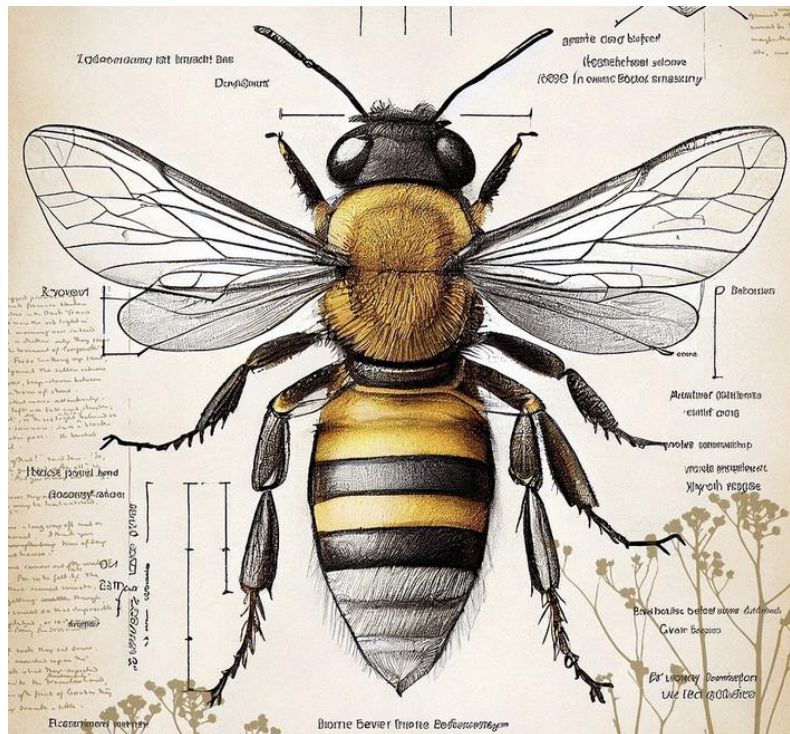
SPELL: NUMEROUS FORAGING TASKS
What are the most numerous castes in social insect societies? WORKERS
In social insect groups such as ants, bees, and wasps, all of the workers are ___ FEMALE
All workers work together to ___ the health and success of the colony.
MAINTAIN

Workers are responsible for a variety of tasks; name one task mentioned in the text. FORAGING FOR FOOD; CARING FOR THE YOUNG; MAINTAINING THE NEST
Foraging is defined as ___ for food. SCAVENGING, HUNTING
Name a group or place where you'd find only or primarily females. ALL GIRLS SCHOOL; SORORITY; GIRL SCOUTS, PTA

Soldiers are a specialized caste of workers that are adapted for DEFENSE and PROTECTION. They are larger and more heavily armed than other workers and are typically responsible for defending the colony from PREDATORS and invaders. In some species, soldiers also have the ability to plug up holes in the nest to prevent the escape of predators or PARASITES.

SPELL: ESCAPE PARASITES PROTECTION
Soldiers are a specialized caste of workers that are adapted for ___ and protection. DEFENSE
Soldiers are larger and more heavily ___ than other workers. ARMED
In some species, soldiers also have the ability to do what in the nest to prevent the escape of predators or parasites? PLUG UP HOLES
Soldiers are typically responsible for defending the colony from whom? PREDATORS; INVADERS

How would you describe a parasite?



Ai generated, Bee, Beekeeping image from www.pixabay.com

The queen is the most important individual in the colony and is responsible for REPRODUCTION. She lays eggs and is the mother of all the individuals in the colony. The queen is often larger and longer-lived than other members of the colony and is protected and cared for by the workers. In some species, there may be multiple queens in a colony, but in others, there is only a single queen.

SPELL: SINGLE LARGER MEMBERS

Who is the most important individual in the colony? QUEEN

The queen is responsible for _____. REPRODUCTION

The queen is the ____ of all the individuals in the colony. MOTHER

I read that the queen is often ____ than other members of the colony.

LARGER, LONGER LIVED

How many queens are in a colony? SOMETIMES ONE, SOMETIMES MULTIPLE QUEENS, ONE OR MULTIPLE, etc.

What adjective do you associate with the word "queen"?

VAKT: Trace the outline of the bee's wings with your finger.

DRONES are a name for the male insects. Their role is primarily for reproduction, and they are typically fewer in number than workers or soldiers. Their main function is to mate with queens and FERTILIZE their eggs. In some species, drones are short-lived and are only present in the colony during the reproductive season. In others, they may be present year-round and play a more active role in colony life.

SPELL: SEASON PRESENT FEWER

What is the name for the male insects? DRONES

Typically how many drones are there compared to workers or soldiers?

FEWER, LESS

The drone's main function is to do what? FERTILIZE THE QUEEN'S EGGS; MATE WITH THE QUEEN

In some species, drones are only present in the colony during the what? REPRODUCTIVE SEASON

In some species, drones play a more active role in colony life and may be present _____. YEAR-ROUND

Name something that operates seasonally versus year-round. SUMMER CAMP, ICE CREAM STANDS, PHOTOS WITH SANTA

What is a social insect?

In addition to the primary castes, some species of social insects also have other SPECIALIZED individuals that perform specific tasks. For example, in some ant species, there are individuals that are responsible for caring for the queen and her eggs, while in others, there are individuals that specialize in collecting food. These specialized individuals often have unique physical characteristics or behaviors that DISTINGUISH them from other members of the colony. In some social insects, such as termites, each worker develops from the egg to PUPAE into a specialized body type for their role. But in others, like the honeybee, the individuals take on different roles as they age. The specific role for a honeybee worker changes based on the needs of the colony, as well as an individual bee's age and PHYSIOLOGICAL (relating to the functions of living organisms) state. All workers work together to maintain the health and success of the colony.

SPELL: PHYSIOLOGICAL PHYSICAL DEPEND

Some species of social insects have what kind of individuals that perform specific tasks? SPECIALIZED

In some ant species, there are individuals that care for the queen and her eggs, while in others, there are individuals that specialize in what?

COLLECTING FOOD

Specialized individuals often have unique what? PHYSICAL CHARACTERISTICS, BEHAVIORS

What is one characteristic that distinguishes you from your peers?

In some social insects, each worker develops from the egg to ___ into a specialized body type for their role. PUPAE

What insect was mentioned, whose role can change as it ages?

HONEYBEE

What is a role a person might take on as they age?

I read that the specific roles that a honeybee worker takes on depend on three things. Name one. NEEDS OF THE COLONY, THE BEE'S AGE, BEE'S PHYSIOLOGICAL STATE

What's a synonym for everyone working together? SYNERGY, HARMONY, COOPERATION, COLLABORATION, UNITY, etc.

Over the years, many researchers have sought to understand the behavior of social insects and have developed several theories to explain it. One of the earliest theories was suggested in the late 19th century by the Swiss ENTOMOLOGIST (person who studies insects) AUGUSTE FOREL, who believed that each colony was a single organism and that the workers were simply its limbs. While noteworthy, Forel's ideas were criticized for being overly simplistic. Another important researcher of social insect behavior was American entomologist WILLIAM MORTON WHEELER. Wheeler proposed that the behavior of social insects was guided by their innate instincts and CHEMICAL signals, and was shaped by their experiences.

SPELL: LIMBS UNDERSTAND EXPLAIN

Many ___ have sought to understand the behavior of social insects.

RESEARCHERS, ENTOMOLOGISTS

Researchers have developed several ___ to explain social insect behavior. THEORIES

___ was a 19th century entomologist. AUGUSTE FOREL

What is an entomologist? SOMEONE WHO STUDIES INSECTS

Someone who's Swiss is from what country? SWITZERLAND

Forel believed that each colony was a single ___, and the workers were simply its limbs. ORGANISM

Forel's ideas were criticized for being overly ___. SIMPLISTIC

What is the name of the American entomologist? WILLIAM MORTON WHEELER

What did Wheeler propose about the behavior of social insects? GUIDED BY THEIR INSTINCTS / CHEMICAL SIGNALS, SHAPED BY THEIR EXPERIENCES

What are you interested in studying?

Wheeler's work paved the way for further research into the role of COMMUNICATION and learning in social insect behavior. In the 1970s, British ZOOLOGIST (one who studies animals) E. O. WILSON proposed that the behavior of individual insects was shaped by their social ENVIRONMENT, and that they were able to adapt to changes in their environment through learning. Wilson's theory has been widely accepted and has been the basis for much of the research in the field over the past few decades.

SPELL: PROPOSED WIDELY DECADES

Wheeler's work paved the way for further research into the role of ___ in social insect behavior. COMMUNICATION, LEARNING

Or Wheeler's work paved the way for further research into the role of ___ and learning in social insect behavior. COMMUNICATION

E.O. Wilson was a British ____. ZOOLOGIST

What is a zoologist? SOMEONE WHO STUDIES ANIMALS

What's the branch of zoology related to birds? ORNITHOLOGY

Wilson proposed that the behavior of individual insects was shaped by their social ____. ENVIRONMENT

Wilson also proposed that individual insects were able to ___ to changes in their environment through learning. ADAPT

How does communication help with learning?

What is one way you have learned to adapt to your environment?

The field of social insect behavior has also been influenced by the study of EVOLUTION and the concept of KIN SELECTION. Kin selection is the idea that individuals are more likely to help their close relatives because they share many of their GENES. This concept has been used to explain why social insects are so cooperative and why they are willing to sacrifice their own interests for the BENEFIT of the colony. Researchers have also used kin selection to explain why social insects are able to maintain stable and

well-functioning societies despite the presence of parasites and cheaters, like cuckoo bees who imitate other bees in order to invade their colonies.

SPELL: STABLE IMITATE PRESENCE

The field of social insect behavior has also been influenced by the study of ____ . EVOLUTION

It has also been influenced by the concept of ____ ____ . KIN SELECTION

According to kin selection, individuals are more likely to help their close ____ because they share many genes. RELATIVES

What is a homophone for genes? JEANS

Kin selection explains why social insects are willing to ____ their own interests for the benefit of the colony. SACRIFICE

Kin selection explains why social insects can maintain stable societies despite the presence of what? PARASITES, CHEATERS

____ are an example of a parasite/cheater from the text. CUCKOO BEES

VAKT: Watch bees hatch in this time lapse video:

<https://www.youtube.com/watch?v=f6mJ7e5YmnE>

The behavior of social insects has been the subject of research and study for over a century. Researchers have developed several theories to explain their behavior, including instincts, learning, self-organization, and kin selection. These theories have helped to shed light on the remarkable social STRUCTURES and BEHAVIORS of these insects. Despite the progress that has been made, there is still much to be learned about the behavior of social insects, and researchers continue to explore this fascinating and complex field.

SPELL: COMPLEX EXPLAIN SUBJECT

The behavior of social insects has been researched and studied for over a ____ . CENTURY

How many decades are in a century? 10

What was the year a century ago? $2023 - 100 = 1923$

From the paragraph, name one theory used to explain social insect behavior. INSTINCTS, LEARNING, KIN SELECTION, SELF-ORGANIZATION

Or From the paragraph, some theories used to explain social insect behavior include instincts, learning, kin selection, and what? SELF-ORGANIZATION

What's a word that means "to shed light on"? ILLUMINATE, EXPOSE, EXPLAIN, REVEAL

Creative writing:

In your opinion, what does it mean to be part of a social species?

What are some benefits and drawbacks of being part of a social species?

What would you say is something that contributes to a well-functioning society?

This lesson was adapted from text generated by ChatGPT.

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