

Insect Sociality



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Objectives

1. Describe the characteristics of subsocial and eusocial insect behavior.
2. Compare and contrast the life histories of ants and termites.
3. Define trophallaxis, pseudergate, caste, haplodiploid
4. Explain superorganism and how social insects are so successful.



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Introduction

Social behavior involves cooperation between individuals of the same species and the degree of that cooperation defines the type of sociality that species demonstrates. Of all the insects in the world, only about **two percent** are considered to be **truly social**.

Sociality



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Eusocial versus Subsocial

sub=below
eu=true

Insects interact with each other, even if it is just to reproduce. The degree of their interaction places them in a category of social behavior. The two categories we will focus on in this unit are eusocial and subsocial behavior.

If you ...

1. Aggregate
or
2. Have a division of labor
or
3. Care for eggs or young after egg laying

... YOU are **subsocial**

If you have ...

1. Cooperative brood care (daycare) and
2. Overlapping generations and
3. Reproductive division of labor (castes)

... YOU are **eusocial**

Examples of Social Insects

| Subsocial – some species of: | Eusocial |
|------------------------------|----------|
| cockroaches | termites |
| crickets | bees |
| earwigs | wasps |
| mantids | ants |
| webspinners | |
| plant lice | |
| thrips | |
| true bugs (9 families) | |
| beetles (13 families) | |
| certain bees and wasps | |



Giant Water Bug - Female oviposits on male dorsum and the male tends the eggs.



Assassin Bugs - Adults guard early instar nymphs to protect them from parasitism.

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Vocabulary

You have just learned some examples of subsocial and eusocial insects. Here are some additional divisions you may come across in your readings.

Solitary—showing none of the three traits of sociality

Subsocial—adults show some care for young

Communal—members of the same generation use the same nest without cooperative brood care (examples - Andrenidae and Megachilidae)

Quasisocial—members of the same generation use the same nest with cooperative brood care (example - *Euglossa* (orchid pollinators))

Semisocial—quasisocial, plus reproductive division of labor (example - Halictidae)

Eusocial—cooperative brood care, overlapping generations, reproductive division of labor (polyethism)

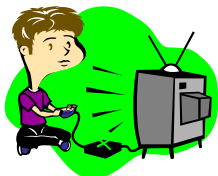
Note: Some solitary insects, like the Monarch butterfly, do aggregate.

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Eusociality

Before we get to your readings, lets think. How did eusocial behavior get started? What is its benefit? We need to get back to the basics and review "The Game of Life."

The objective of "The Game of Life" is easy, reproduce at all costs. Ok, but does eusociality fit in with that objective?

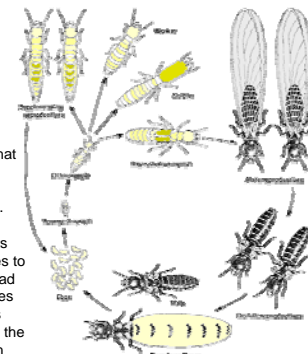


This termite SIM sure is difficult. 7

Termites



Evolutionarily speaking it is thought that termites developed from wood eating cockroaches. Termites have gut microbes that digest cellulose (wood). Without these microbes, termites couldn't digest their food. The parents must be able to supply these microbes to their new offspring, so generations had to remain together so that the microbes could be passed down. The microbes are in the hindgut which is molted, so the microbes must be replaced after each molt.

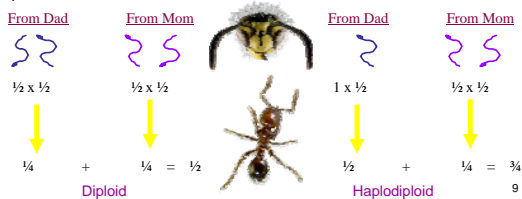


Daly et al. 1998, p 159

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Hymenoptera

Parent and offspring normally share only 1/2 of their genes (Diploid). Hymenopterans are not diploid, they are **haplodiploid** and the sisters share 3/4 of their genes instead of the 1/2 they would normally share. This happens because the males are haploid (one set of chromosomes) from an unfertilized egg, and females are diploid (two sets of chromosomes) from a fertilized egg. So, the bottom line is that the sisters share more genes than they would share with their daughters. This supports the game of life because workers invest more in their sisters than in producing their own young. This gives a genetic disposition to eusocial behavior.

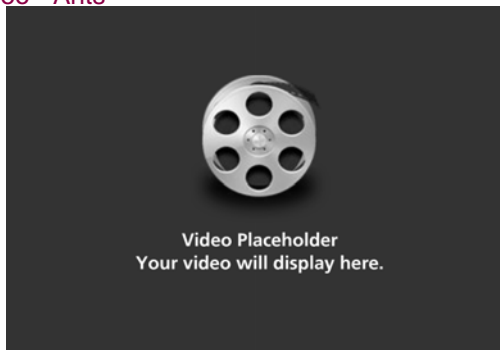


Activities

Ok, are you an expert on social behavior yet? The main bulk of information from this unit will be presented through a series of video clips and readings. You should complete the activities on the table below, and answer the questions on your study guide as you go.

| Activity | Study Guide Assignment |
|---|------------------------|
| Video - "Ants" | Questions |
| Video - "Termites: Long Live the Queen" | Questions |
| Video - "Tropical Termitesphere" | Questions |

Video - Ants

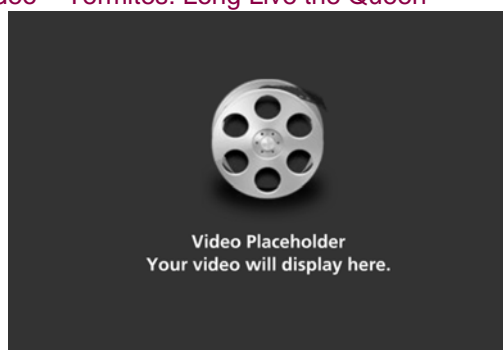


IMPORTANT NOTE:

Throughout the course units, you will be asked to view short video clips. Please understand that many of these video clips are copyrighted and are NOT to be used outside of this class and only may be used for this semester. **Please do not copy or distribute these clips.**

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Video - Termites: Long Live the Queen

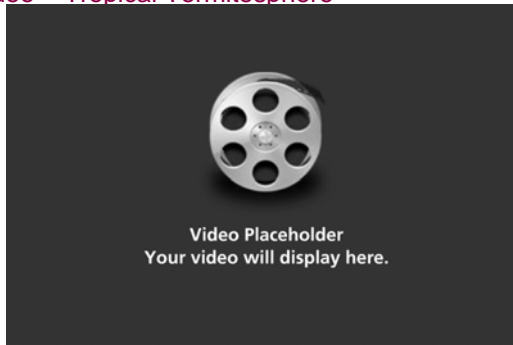


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Video – Tropical Termitosphere



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Learning Game Placeholder

Learning Game: Choices

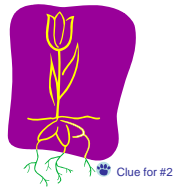
Title: Review Quiz

Conclusion - Assignment

If you have completed the activities and filled out your study guide, you should be familiar with social insects. In lieu of a conclusion, use your "social skills" and answer the following questions.

Question #1 - Compare human and social insect societies. How are they similar and how are they different.

Question #2 - How are ant or termite colonies like a living plant? Please give examples of behaviors or structures that support your conclusion.



ASSIGNMENT

Please record the answers to these questions in your journal.

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