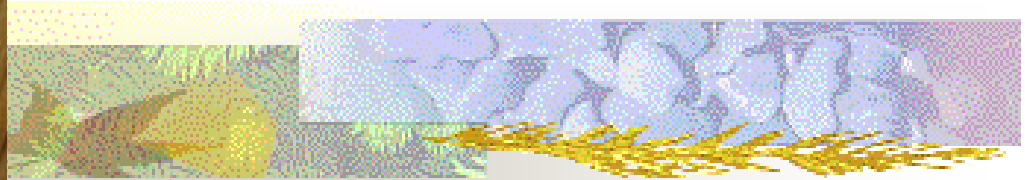


MICROBIAL INTERACTIONS



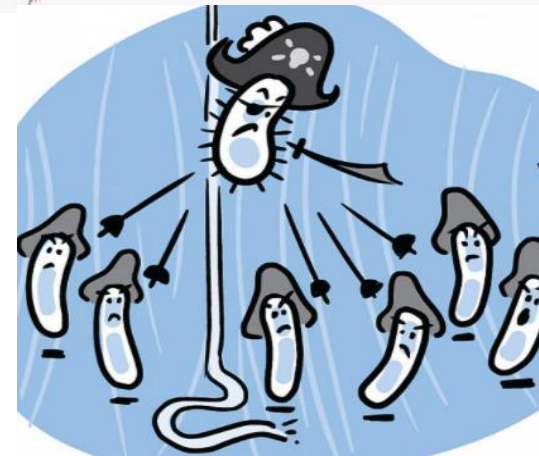
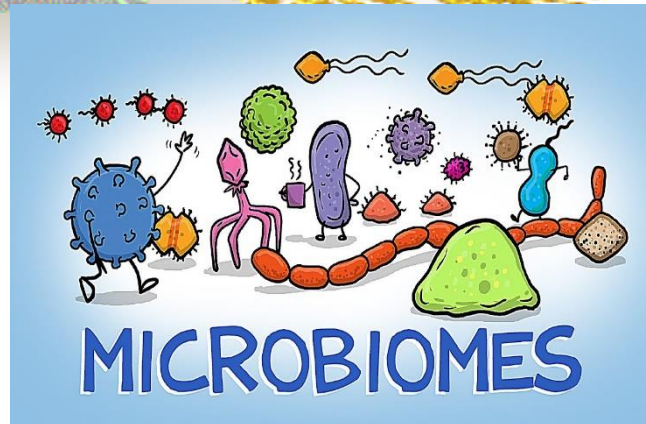
AQSE06 SOIL BIOLOGY
Oğuz Can TURGAY (Ph.D)
Department of Soil Science and Plant Nutrition

- The mutual relationship between various individuals or populations of soil organisms are known as **interaction**

- **Microorganisms** interacts with each other and can be physically associated with another organisms in a variety of ways.

- **Positive interactions;** stimulation of one or both of the organisms

- Negative interactions inhibition of one or both organisms

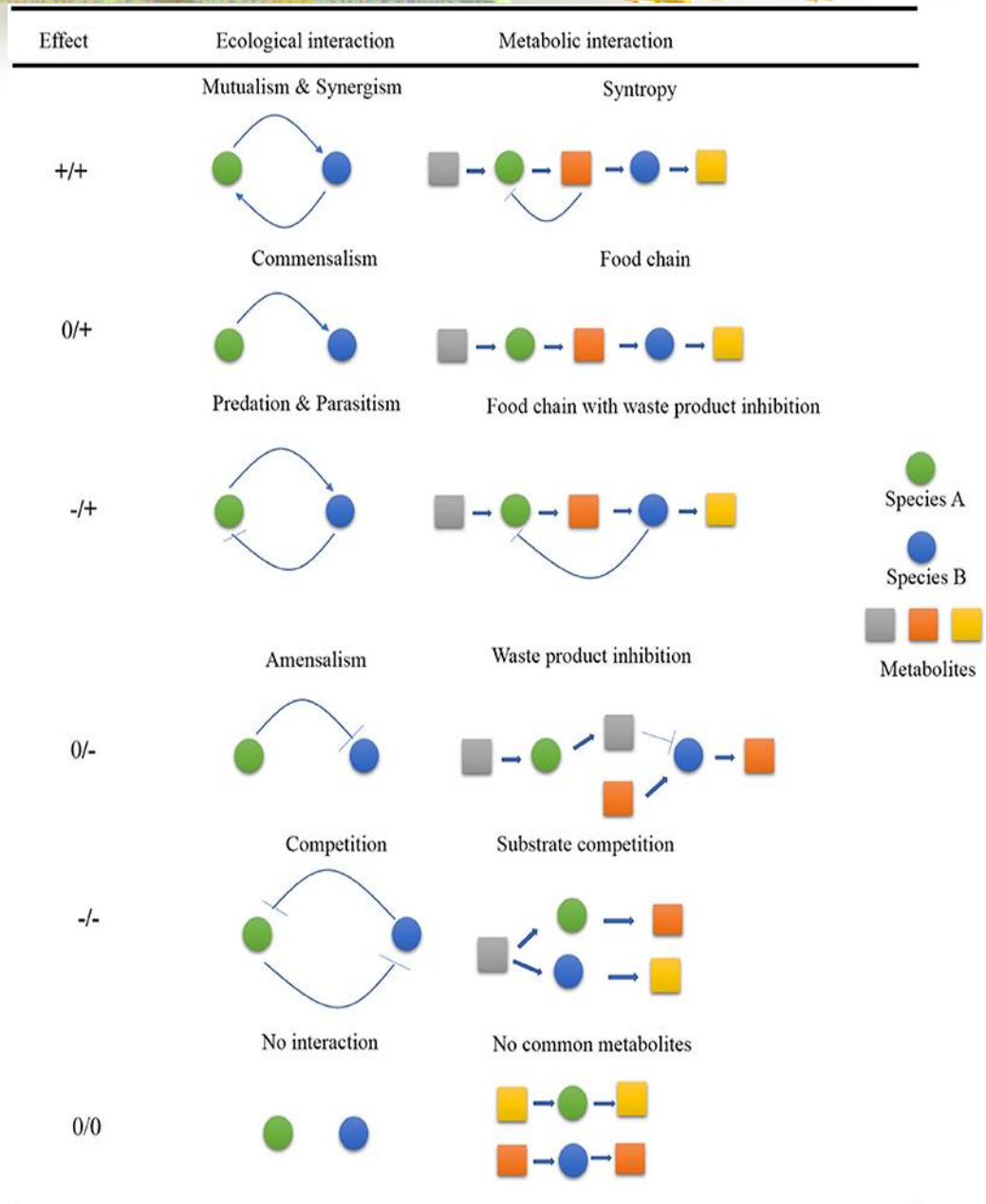


Negative Interactions

- Competition
- Predation
- Parasitism
- Ammensalisms

Positive interactions

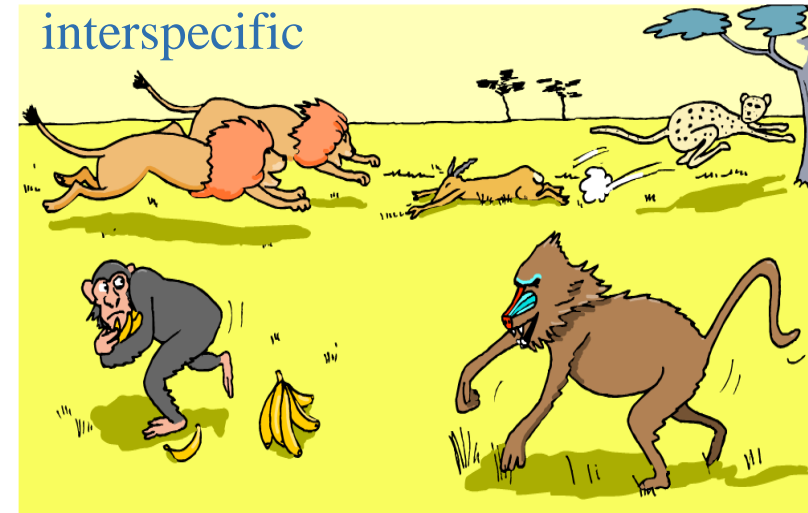
- Mutualisms,
- Symbiosis
- Commensalism
- Proto-cooperation



Negative Interactions

1. Competition

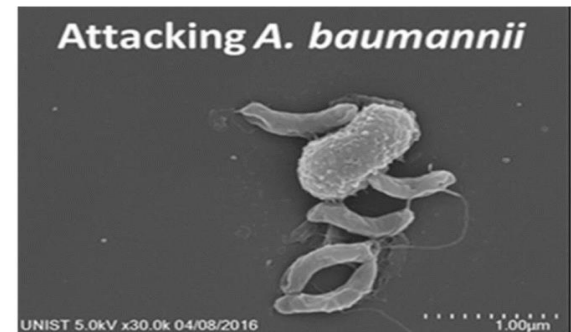
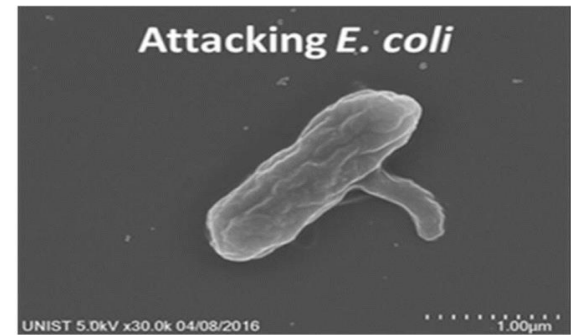
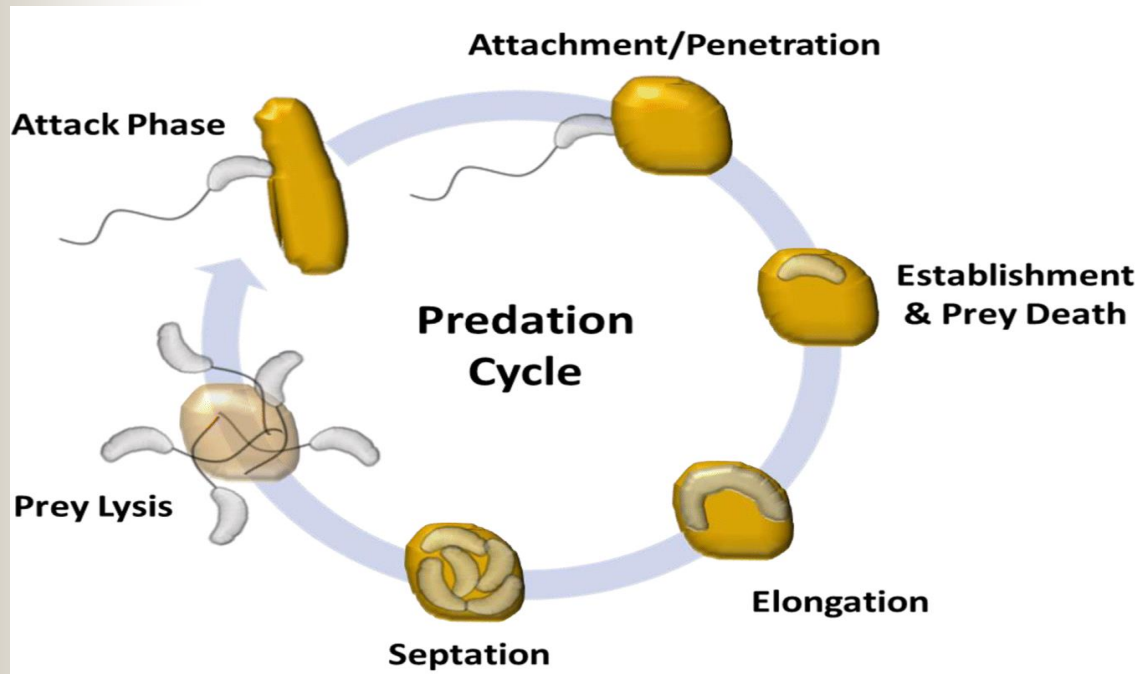
- Competition refers to the active behavior and desire of two or more organisms to provide a substance or condition.
- Competition for a substrate can exist among either
 - different microbial species (**interspecific**)
 - or
 - individuals or groups of same species (**intraspecific**)



intraspecific



Negative Interactions



2. Predation

- One organism is consumed by others as a source of energy and matter.
- This phenomenon is also known as microbial suppression, i.e. protozoa and nematodes (mesofauna) feed on bacteria and fungi in soil

Negative Interactions

3. Parasitism

- Parasitism differs from predation in the respect that an organism uses the other organism as both a substrate source and a habitat.



Ectoparasite

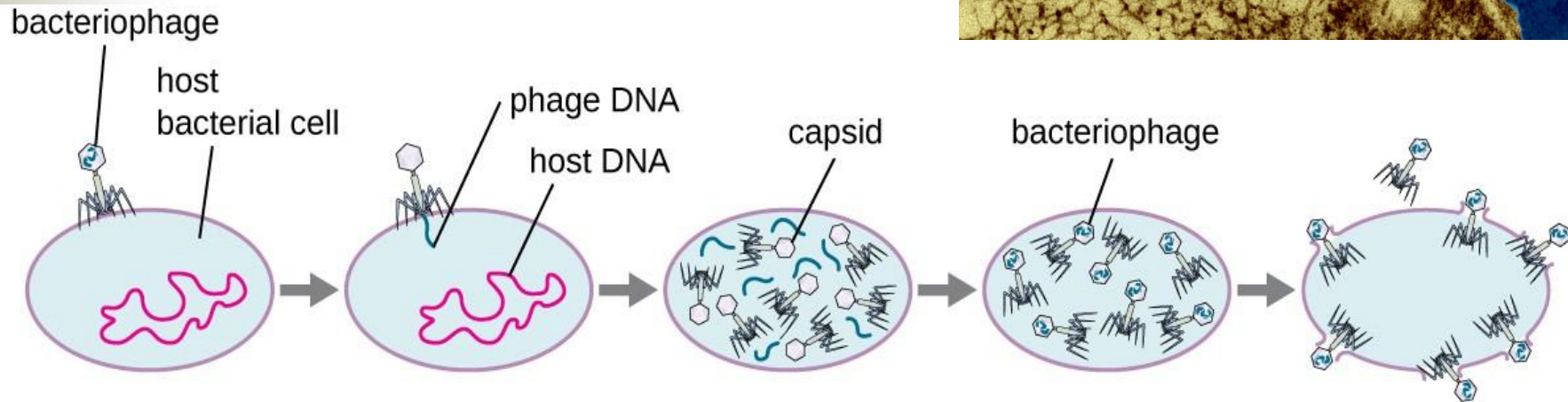
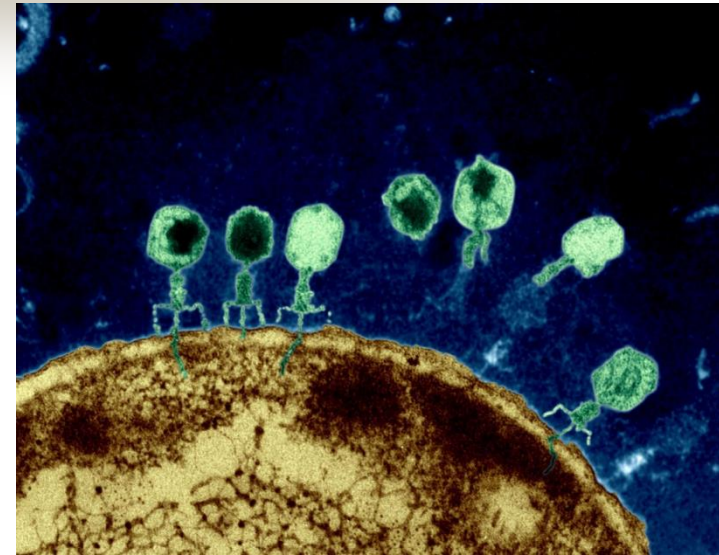


Endoparasite

Negative Interactions

3. Parasitism

- Bacteriophage (a virus that infects and replicates within bacteria and archaea) is a good example for parasitism



1 Attachment

The phage attaches to the surface of the host.

2 Penetration

The viral DNA enters the host cell.

3 Biosynthesis

Phage DNA replicates and phage proteins are made.

4 Maturation

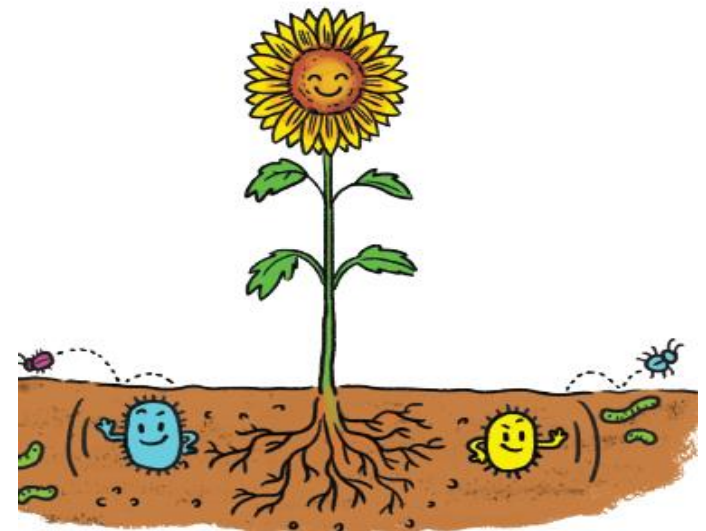
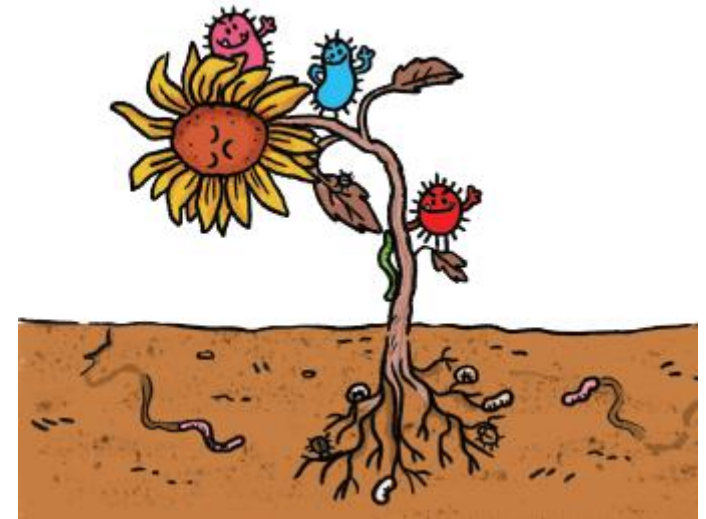
New phage particles are assembled.

5 Lysis

The cell lyses, releasing the newly made phages.

Why are negative interactions important in soil ?

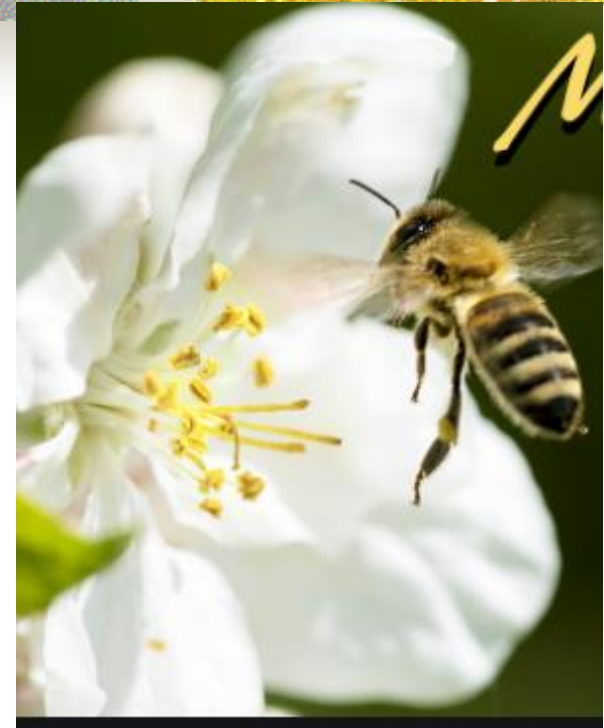
- **Microbial control in soil** means inhibition or prevention of growth of microorganisms by two basic ways: (1) killing microorganisms or (2) by inhibiting the growth of microorganisms
- This is the mechanisms creating soil biodiversity, selectivity and biocontrolling in the nature (e.g. **disease suppression**)
- **Plant growth promoting rhizobacteria (PGPR)** are the most well-known disease suppression mechanism over direct or indirect effect on soil-borne plant disease
 - Direct effects (plant hormone and antibiotic synthesis)
 - Indirect effects (Nitrogen fixation and P solubility)



Positive Interactions

1. Mutualism

- **Obligate mutualism:** Organisms cannot live without each other.
- **Facultative mutualism (Protocooperation):** both organisms can live on their own but may prefer to interact with each other beneficially.





A chemical substance on ants' feet tranquilise and subdue colonies of aphids, keeping them close by as a ready source of food



Rather than killing and eating the aphids themselves, the ants "milk" them



Here the aphids eat plants and excrete a sugary liquid the ants eat



The ants will actually carry the aphids from one location to another so they can have new and fresh veggies to eat...

Positive Interactions

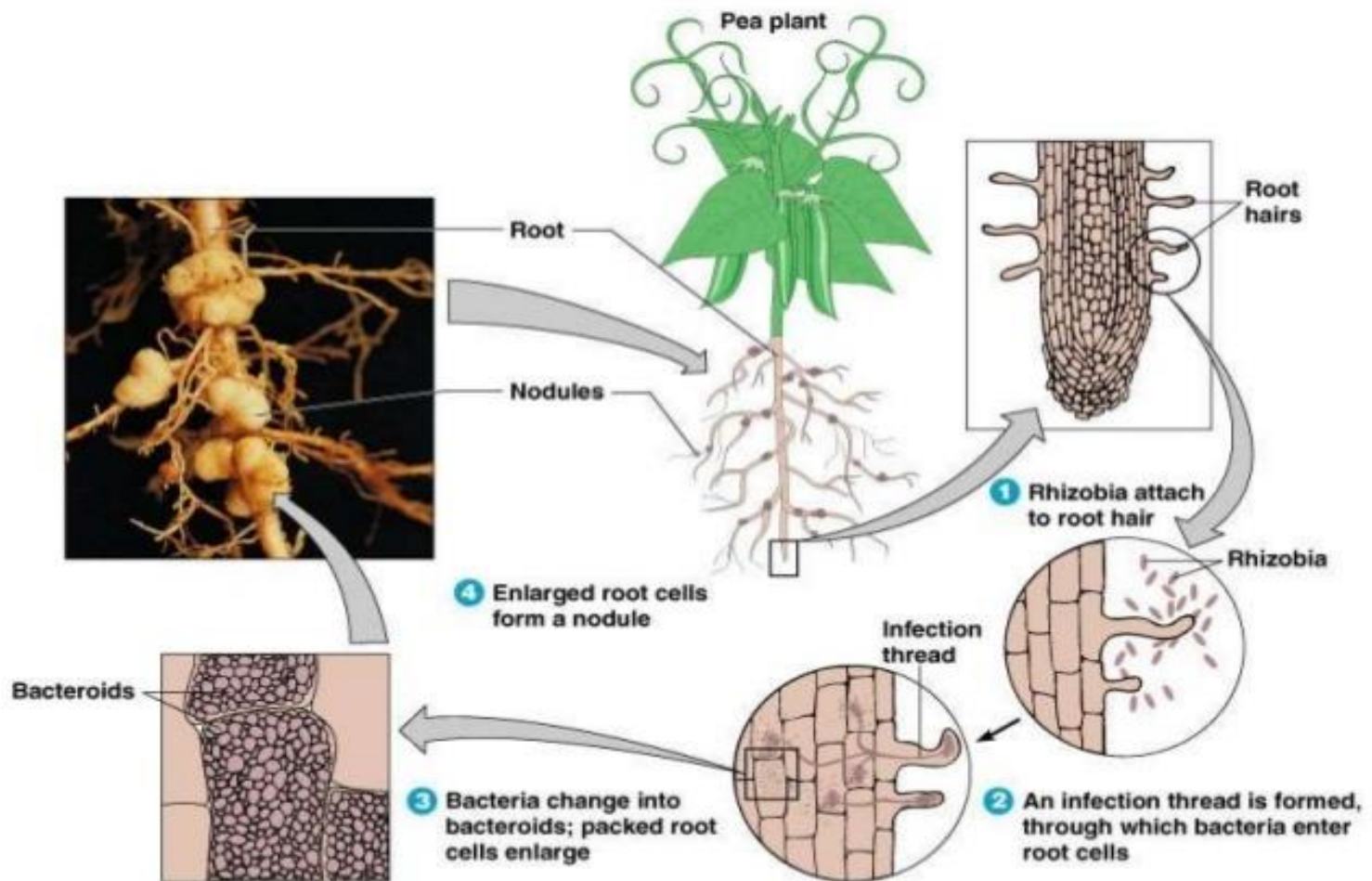
1. Symbiosis

- A temporal or permanent biological interaction between same or different organisms (without the necessity to always benefit each other)



1. Symbiosis (Simbiotic nitrogene fixation in soil)

Formation of a Root Nodule



Positive Interactions

2. Commensalism:

- A form of biological interaction generally observed between different species.
- In commensalism, although one species may gain benefits, the other one does not have to.
- A commensal organism benefits from its host as shelter or food supplies or even just transporter



Orchids belong to a family of flowering plants that form a commensal relationship with the trees. It is a well-known epiphytic plant that grows on the branches or trunks of other trees

(benefitting by getting adequate sunlight and nutrition. The orchids do not grow to a large size, and thus the host tree is not harmed in any way.