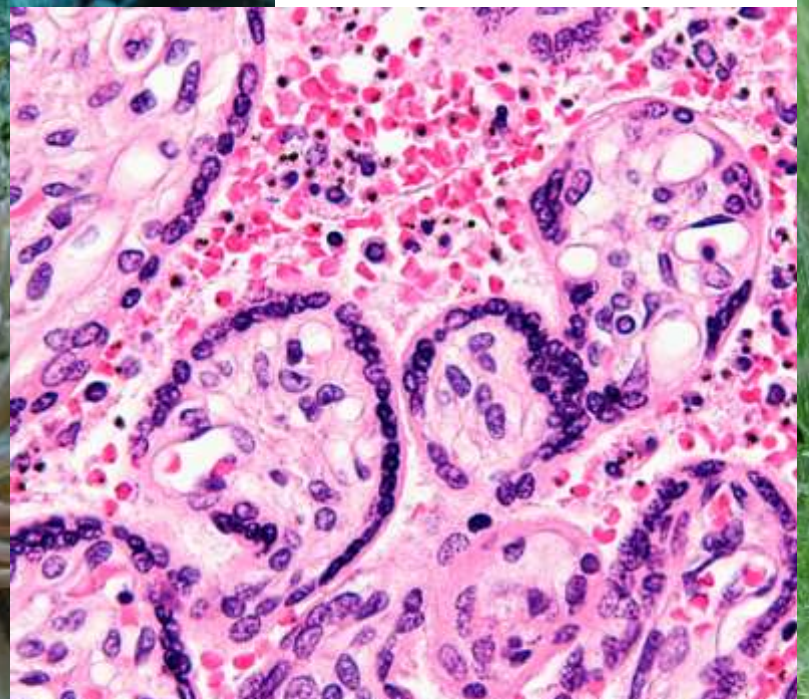
Symbiosis

Objectives

- Define symbiosis and three subtypes.
- Describe the relationship between microalgae and their host cnidarians, and why some sea anemones are good models for studying some aspects of coral-microalgae symbioses.
- Define coral bleaching and communicate why the changing climate is affecting coral reef ecosystems.

What is symbiosis?

- an intimate, long-term relationship between two or more different organisms where at least one partner benefits from the interaction.



How do we classify symbiotic relationships?

Mutualism

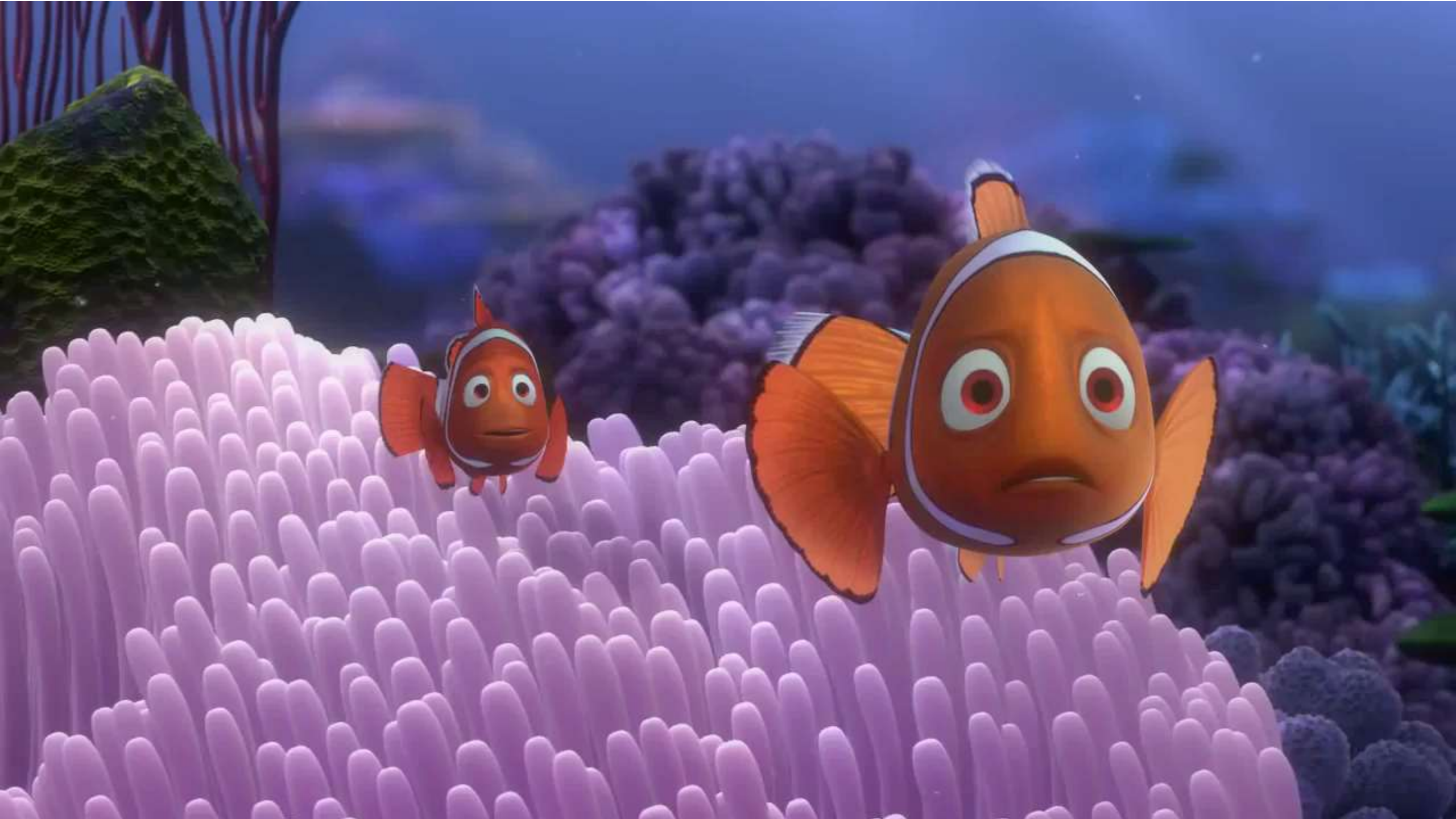
A symbiotic relationship in which both partners benefit from the interaction.

Commensalism

A symbiotic relationship in which one partner benefits while the other is unaffected.

Parasitism

A symbiotic relationship in which one partner benefits while the other is harmed.

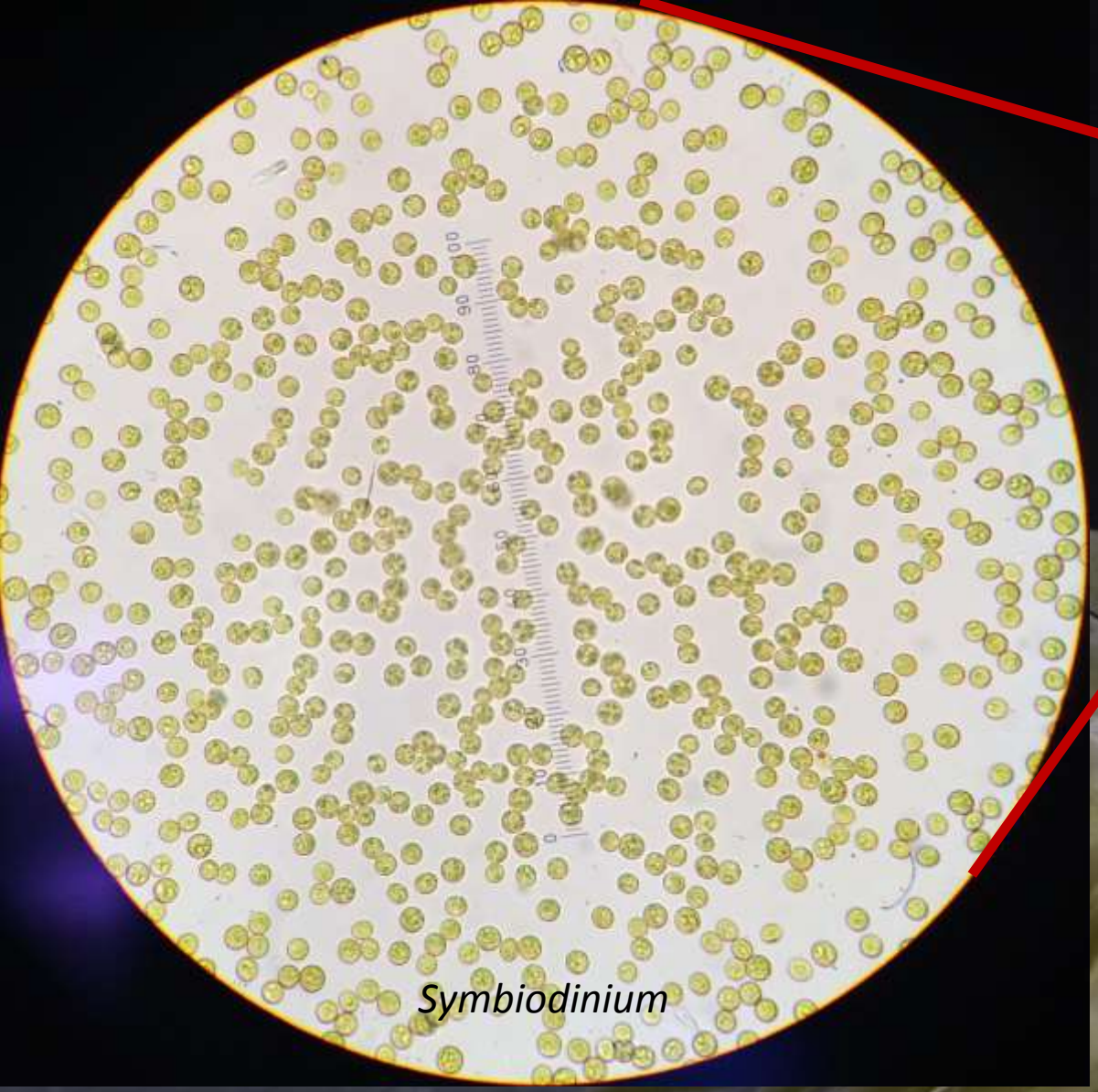


How might the relationship between the bird and cow change?

MUTUALISM

CNIDARIANS

- Radially symmetrical
- Two tissue layers
- One body opening
- Jelly-like
- Nerve net
- Digestive cavity that forms main body



Symbiodinium

What is traded in this relationship?

- Microalgae pass photosynthate to the anemone
- The anemone provides a place for the microalgae to live
- The anemone passes inorganic carbon and nitrogenous waste to the microalgae

Microalgae: microscopic algae that live in the water column, in the sediment, or on other organisms. Microalgae can live in freshwater or saltwater, and are important primary producers.

"…coral reefs provide economic services — jobs, food and tourism — estimated to be worth as much as $375 billion each year."

- NOAA, 2010

What is climate change?

Australian Government

Great Barrier Reef
Marine Park Authority

www.gbrmpa.gov.au

Sea Anemones

- No calcium carbonate skeleton
- Easy to find and collect
- Reproduce very quickly via asexual reproduction
- Easy to care for in the laboratory
- Can be maintained in a bleached state for years

Corals

- Endangered and protected
- Difficult to find and expensive permits needed
- Need specific water chemistry, optimal temperature, and high light
- Difficult to care for in the laboratory
- Cannot be maintained in a bleached state for a long time
- Most corals only spawn annually

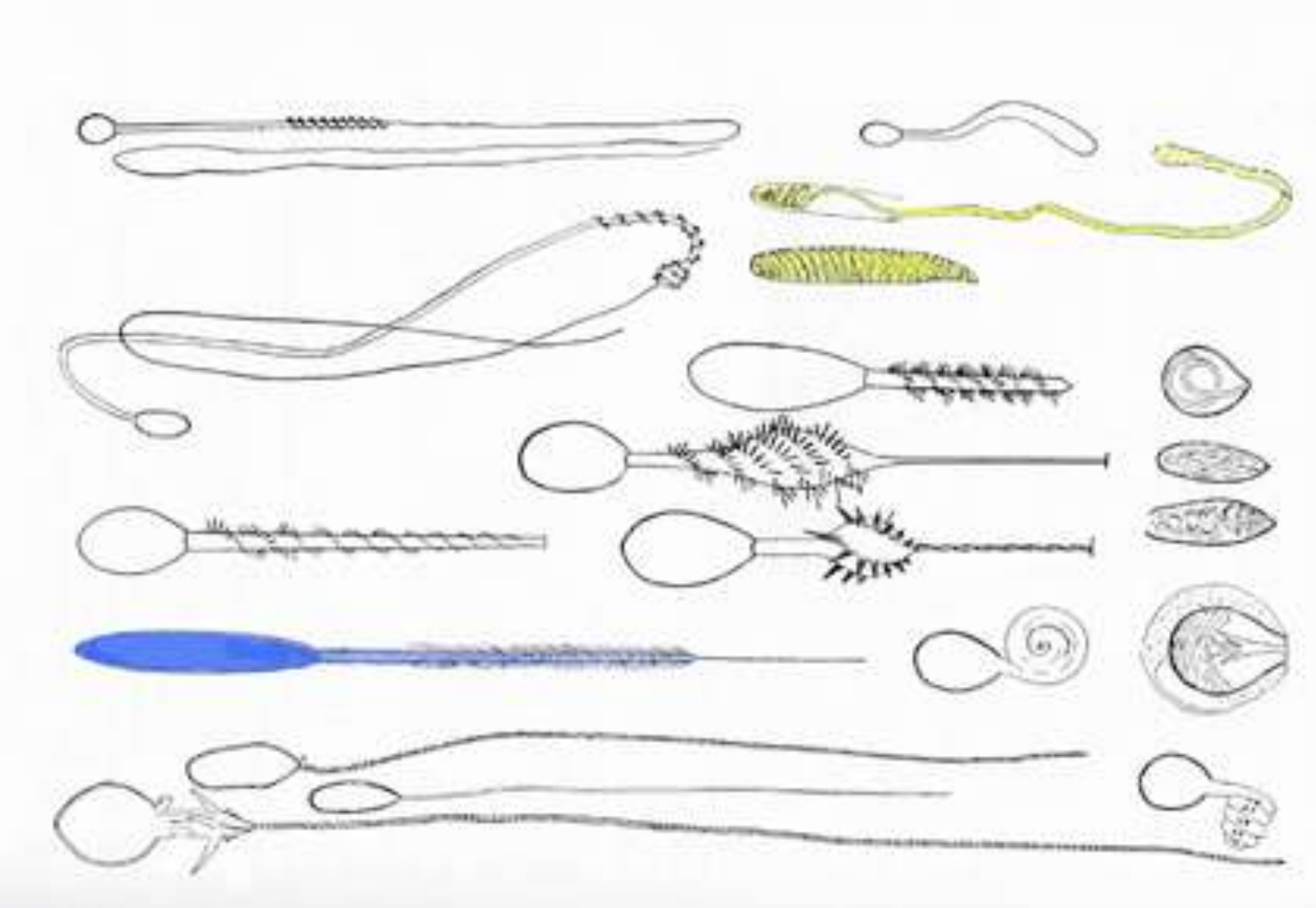
Activity 1: Viewing and feeding anemones

- Hypothesize what the anemones will do when exposed to light.
  - I hypothesize _____ because _____.
- Examine response to light.
- Why do the anemones respond like this?
- Feed your anemone!
- How are anemones and other cnidarians able to capture food with their tentacles? What makes the tentacles sticky?

Nematocysts

Location matters

Function of nematocysts

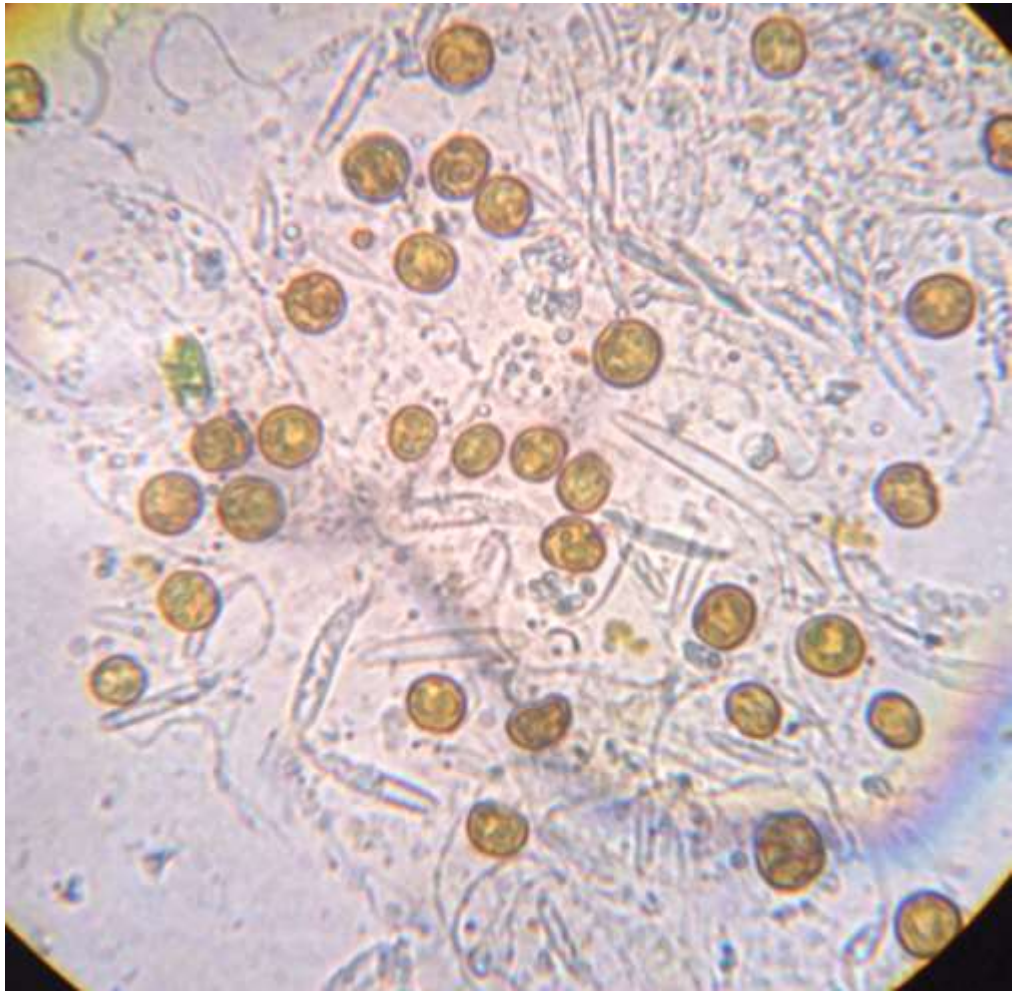


Nematocysts are used for:

- Defense
- Attachment
- Prey capture

Nematocysts come in a wide variety of shapes and sizes. Even the morphology of the harpoon is highly diverse among different species of cnidarians.

Activity 2: Observing symbionts…



…and nematocysts

Discussion

- Why would vinegar cause nematocysts to fire? The vinegar is not a physical contact force that would typically trigger a nematocyst like a prey item might.
- Symbiosis is a long-term relationship. What are two examples of symbiotic relationships that have become permanent? How do these relationships relate to your everyday life? What about the life of a symbiotic sea anemone?
- How do nematocysts relate to cnidarian feeding mode, lifestyle, and defense?
- What role do microalgae play in cnidarian nutrition?