Lecture 9

Phylum Cnidaria:
Hydroids, jellyfish, anemones, corals.

Historical Remarks

Aristotle (384-322 BC)
a. Classified different groups according to body type.
b. Identified the “radiate animals” as distinct from the “bilateral animals.”
**Historical Remarks**

**Jean-Baptiste Lamarck**
(1744-1829)

a. Coined term *Radiata.*
b. Based on radial symmetry (following Aristotle).
c. However, we will see that body symmetry can be somewhat misleading.

**Historical Remarks**

**Coelenterata**

3. More recent, but no longer used, although Conway Morris suggests that this term is still meaningful.

**Phylum Cnidaria**

The characteristics of the Phylum Cnidaria:

1. Nematocyst stings with strobilation and an exocutullum armed to a pentalactis, extra- 
    usually annual and organized to form a nature
2. The mesoglea, a thin gelatinous membrane
3. The gastrovascular cavity, a single hollow cavity
4. The body cavity, a fluid-filled space
5. The nervous system, a complex network
6. The sense organs, a sensory array
7. The reproductive system, a complex array
8. The classification of cnidarians, based on their body form

The following is a list of characteristics:

- Nematocysts
- Strobilation
- Exocutullum
- Pentalactis
- Mesoglea
- Gastrovascular cavity
- Body cavity
- Nervous system
- Sense organs
- Reproductive system
**Cnidarian Morphology**

a. Body wall characteristic of Cnidaria:
   1. Diploblastic
      1. two cell layers - epidermis, gasterodermis
         a. epidermis - columnar cells
      2. thin layer of mesolamella (mesoglea if cellular)

b. Sensory, muscular structures associated with food capture, contraction, extension.

c. *gasterodermis* - inner digestive cells
   1. mucous, digestive, absorptive cells
   2. some contain *zoochlorellae* - photosynthetic algae.

c. Mesoglea - inner gel-like material.
   1. Provides support, transport.
   2. No distinct internal organs; a nerve net; no coelom
Cnidarian Rhopalium

Cnidarian Morphology

For the Characteristics of the Phylum Cnidaria:

1. Diphyletic ancestor with hydrozoan and scyphozoan ancestry, leading to a phylogenetically distinct subphylum

2. Biphasic life cycle with asexual and sexual reproduction

3. Radial symmetry

4. Stomach cavity lined with endodermal cells

5. Siphonoglyphous coenenchymal tissue

6. Hydrozoan life history

7. Hydromedusa stage

8. Bilateral symmetry

9. Cnidarian touch sense

10. Cnidarian nervous system

11. Cnidarian tentacles

12. Cnidarian stinging cells

13. Cnidarian nematocysts

14. Cnidarian endoskeleton

15. Cnidarian exoskeleton

16. Cnidarian axopodium

17. Cnidarian mesoglea

18. Cnidarian gastrovascular cavity

19. Cnidarian mesenchyme

20. Cnidarian mesoderm
**Cnidarian Morphology**

b. Tentaculate with radial symmetry around mouth.

1. Note that radial symmetry **persists in different life stages**.
2. May be modified as biradial, quadriradial or septiradial symmetry.

**Cnidocytes**

1. Cnidocytes - eversible cells, primarily on tentacles.
   a. Trigger, nerves, cause discharge from tactile, coordinated or chemical stimulus.
   b. Operculum pops off, inner nematocyst explodes out.
   c. Barbed or with toxin, paralyzes, immobilizes prey.
Cubozoan Cnidae

Cnidarian Morphology

Gastrovascular Cavity (GVC)

a. Central cavity for digestion, transport of materials.

b. Relatively thin tissues permits efficient nutrition, waste removal.
Cnidarian Morphology

The characteristics of the Phylum Cnidaria:

1. Tripoliate form with radicles and an acorn head in a simple manner, radially symmetric, and a gastrovascular cavity.
2. Body flexible, soft, and transparent or translucent, without a hard skeleton.
3. Feeding occurs by the radicles, which capture food particles, and the gastrovascular cavity, which absorbs nutrients.
4. Tentacles surrounding the mouth, which are used for feeding and defense.
5. The mesenterial (gonadal) cavity is the site of gamete production.
6. The digestive system is saclike, with a mouth at one end and an opening at the other.
7. Cnidarians can have stinging cells called nematocysts, which are used for defense and capturing prey.
8. Typically have a simple life cycle, with asexual and sexual reproduction.
**Metagenesis**

Polymorphic body forms associated with life cycle.

**Polyps**

1. Polyp - sessile form, often vegetative.
**Polyps**

1. largely sessile - some can creep, somersault, etc.
2. Have a *longitudinal* axis
   a. Oral end
   b. Aboral end
   c. Tentacles surrounding the mouth

**Medusa**

Medusa means "sovereign female wisdom."

In Sanskrit it's Medha, Greek Metis.

**Medusa**

Was one of the Gorgons; sisters that caused men to turn to stone.

Perseus slew Medusa and used her head as a weapon.
Medusae

Medusa - motile form, often sexual.
1. specialized for swimming - some are more or less attached.

Medusae

2. have a shorter longitudinal axis
   a. mouth often with oral arms.
3. body wall also diploblastic
   a. highly thickened meosglea - forms bell.

Medusae

4. GVC is divided into radial canals.
5. Tentacles oriented around the bell
6. sensory, muscular system associated with swimming.
Medusae

a. Contraction around bell margin
   1. velum - structure associated with rapid swimming
   2. present or absent in different groups.

Cubozoan Velarium

Medusae

b. Rhopalia
   a. statocysts - maintain balance in water
   b. ocelli - light sensitive organs
A Cnidarian Phylogeny

1. Four main classes (even though most sources consider 3)
   a. stem group - possess basic structural organization of other more advanced metazoa
   b. have radiated into many habitats - yet body plan has been retained.