Phylum Nematoda (Roundworms)

- Second in numbers only to insects.
- 10-500,000 species (depending on who you talk to.)
- 1/3 of the human population suffer from roundworm problems.
- 1 rotting apple can contain 90,000 roundworms
- $1m^3$ of garden soil: home to more than 1 million roundworms.
- most common worms of dogs and cats

Basics:

- Size: Microscopic to 1m in length
- Slender unsegmented worms
- Long/cylindrical body that is tapered on both ends
- Male is smaller than the female
- Bilatreally symmetrical
- Some are transparent
- Simplest animals with a tube like digestive system
- Most are free living, but some are parasitic and live within plants and other animals:
    - Free living nematodes: live in soil, salt flats, aquatic sediments, fresh and salt water and are found from polar regions to tropical regions.
    - Parasitic nematodes:have a cuticle that covers the entire exterior of the body- thick outer covering that protects it from being digested by the host.
- Develop 3 germ layers
- Pseudocoelomate: Have a partially lined body cavity between the endoderm and the mesoderm that is derived from the mesoderm
- Tube within a tube body plan:
    - Inner tube: digestive system
    - Outer tube: body wall
- Have a complete digestive system:
    - has 2 openings (mouth and anus)
    - food moves in one direction through the digestive tract
    - material that can not be digested exits through the anus
        - anus: posterior opening of the digestive tract
- No circulatory system

Reproduction

- Sexually
- Most species have separate sexes
- Have internal fertilization
    - Male deposits the sperm into the female's reproductive tract
- Parasitic nematodes have a life cycle that require 2-3 hosts or several organs within one host.

Response

- Have a simple nervous system
- Have several ganglia (mass of nerve tissue; mass of cells forming a simple "brain"
- Nerves extend from the ganglia through the length of the body.
- Nerves transmit sensory information and control movement.
- Some sense organs detect chemicals given off by prey or hosts.

Movement

- Muscles extend that length of the body
- Muscles and celoemic fluid function together as a hydrostatic skeleton
- Lack circular muscles so they have pairs of muscles that work in pairs
    - One contracts while the other relaxes
    - We view their movement as thrashing
- Aquatic nematodes move like snakes
- Soil-dwelling nematodes thrash around and push their way through soil.

Feeding

- Predaceous
- Most Soil/Aquatic nematodes eat algae/fungi and parts of decaying organic matter, others eat bacteria.

Respiration/Circulation/Excretion

- Exchange gases and excrete metabolic wastes through body walls.
- No internal transport system.
- Depend on diffusion to carry nutrients and wastes through their body.

Human disease

- Trichinosis causing worms, filarial worms, ascarid worms, hookworms
- ~50 species cause human disease
- Ascarid worms are the type that affect dogs, horses, cattle, pigs, chickens, cats and sometimes humans.
- Examples:
    - *Ascaris lumbricoides:*
        - Pig roundworm
        - Infect vertebrate animals
        - Causes malnutrition as they absorb food from the host's small intestine
        - Spread by: eating vegetables and other foods that are not washed properly.
        - They mature in the intestines of their host
        - They can grow to 50 cm in length
        - Pig roundworms leave the body through feces
        - Water and food that have eggs in or on them enter the host and hatch in the intestine where they burrow into the walls; the larvae travel through blood to the lungs where they spread to air passages and the throat which causes coughing and then they are swallowed and go back to the intestines to mature and start the cycle over again.
    - *Enterobius vermicularis:*
        - Pinworm
        - 30-60% of the US and Canada's populations have pinworm.
        - Signs: Itchiness in the anal region, insomnia, restlessness, loss of appetite, irritability
        - Infection is passed by toilet seats and scratching anal region followed by putting fingers in mouth
            - The eggs are often left behind on toilet seats or are transferred to mouth by fingers after scratching w/o washing.
            - Small children pass this around schools and playgroups quite often as they are not apt to wash hands after going to the bathroom or having their hands in their pants scratching their anal areas and then put their hands in their mouth and or handle foods that they share.

        - The eggs can survive up to 2 weeks on clothing, bedding, or other objects.
    - The itchiness is from the worms laying their eggs in the anal "crack"-- female pinworms leave the intestines through the anus and deposit eggs on the surrounding skin which causes a tickling or itchy feeling.

- *Necator americanus:*
    - Hookworm
    - Usually in warm climates with poor sanitation
    - ¼ of humans in the world are infected with hookworms
    - Cause the host to be weak and tired due to loss of blood
    - They develop in soil and use hooks and tooth like plates to burrow into the skin of unprotected feet; they then enter the bloodstream and travel to the lungs and then down to the intestine where they suck the blood of the host causing weakness and poor growth.
- *Trichinella spiralis:*
    - Not common in the USA
    - Common hosts are: rats, pigs
    - Humans get it from undercooked pork
    - These nematodes live and mate in the intestine of the host; females carrying fertilized eggs burrow into the intestinal walland release larvae; larvae travel in blood to burrow and infect other organs; this causes horrible pain; they become inactive in muscle tissue and complete its life cycle when another animal eats the muscle of infected organisms.
- *Wuchereria bancrofti and Brugia malayi*:
    - Filarial
    - Common in the tropics and Asia
    - Live in blood and lymph vessels of birds and mammals
    - Transferred through biting insects like mosquitoes
    - Large numbers of these worms can block fluid passages in lymph vessels causing elephantiasis.

Plant disease

- ~1200 species infect/cause diseases in plants.
- Some carry on symbiotic relationships with bacteria
- Examples:
    - *Anguillula aceti* –
        - Aka: Vinegar eel
        - Formerly known as: *Turbatrix aceti*
        - Found in the bottom of vinegar barrels
            - They feed on thebacteria and yeast that settle to the bottom.
    - *Caenorhabditis elegans* –
        - free living nemotode
        - eats rotting vegetation
        - was the first multicellular animal to have its DNA completely sequenced (97 million base pairs.)