

# Nematodes: everything you wanted to know but were afraid to ask

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# What is a nematode ?

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- Simple, colorless, unsegmented, roundworms, lacking appendages
- They range from 0.3 mm to over 8 m



*Meloidogyne* spp.



*Strongyloides* spp.



*Radopholus similis*

# Functional nematode groups

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**Saprophytic nematodes**

**Predaceous nematodes**

nematodes

insects

**Parasitic nematodes**

animals

humans

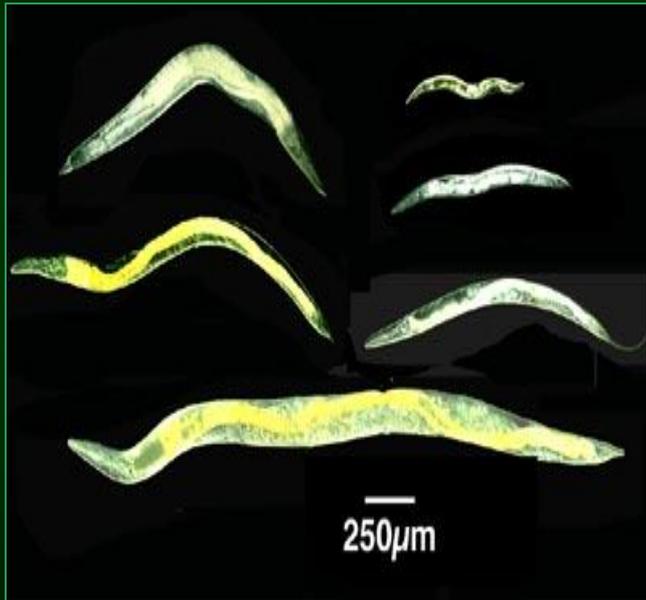
plants

# Nematode phylogeny

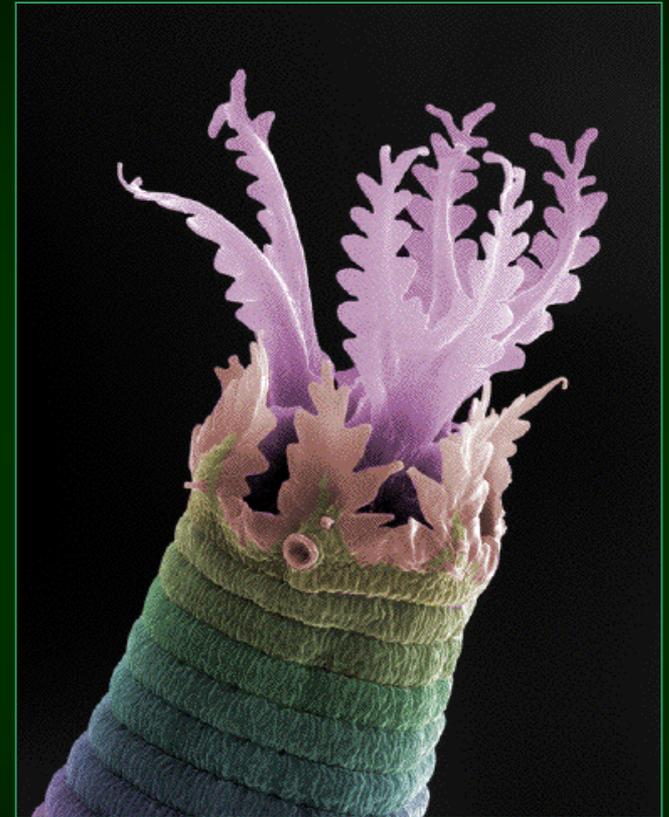


# Saprophytic nematodes

- Most abundant nematode group
- Decomposers: recycle organic matter
- Biodegradation of toxic compounds
- Bacterial and fungal feeders



Top to bottom, left: *Oscheius fijiensis*,  
*Pellioditis mediterranea*, *Pellioditis marina*,  
Top to bottom, right: *Acrobeloides nanus*,  
*Oscheius heikei*, *Rhabditella octopleura*



*Acrobeles complexus*

# Predacious nematodes



*Mononchus* spp.



Elaphonema-Bacterial feeding



Fungal feeding nematode

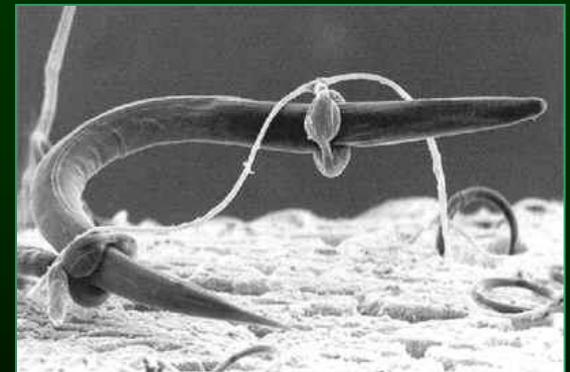
Feed on other organisms including nematodes, bacteria, fungi, insects



Nematode eating nematode



*Mermithidae* in mosquito



... but nature fights back !

# Steinernema spp. and Heterorhabditis spp.

- Parasitic on insects
- 200 species of insects from several orders
- mutuality association with bacteria of the genus *Xenorhabdus*
- Cause up to 100% mortality in a short time

Infective juvenile



Host penetration



Bacterium in vesicle

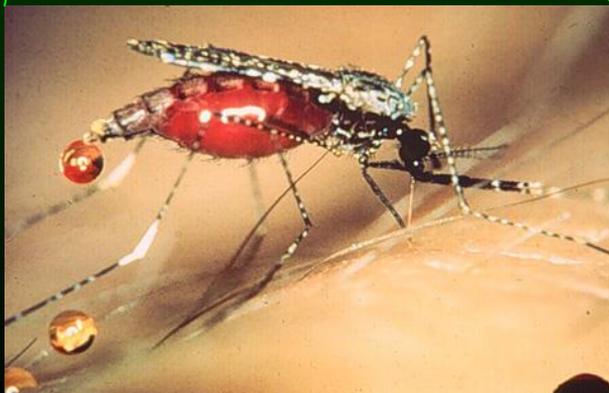
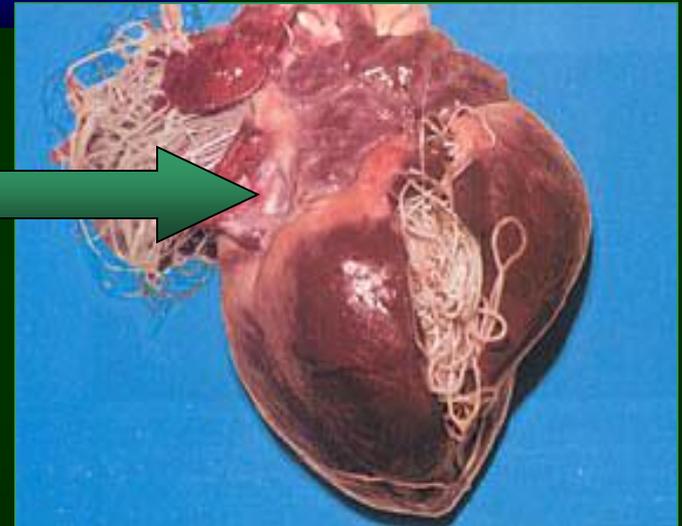
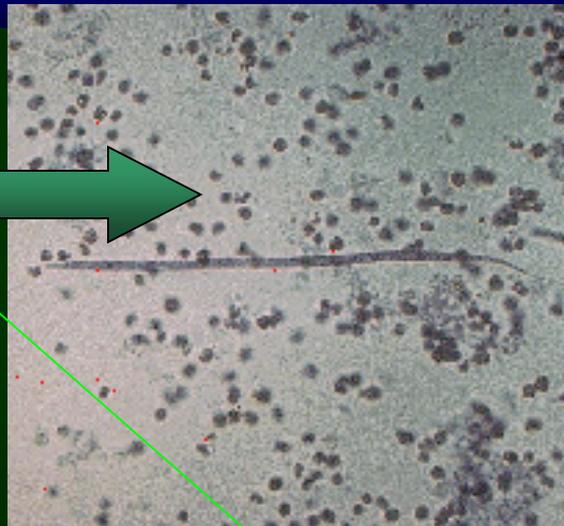
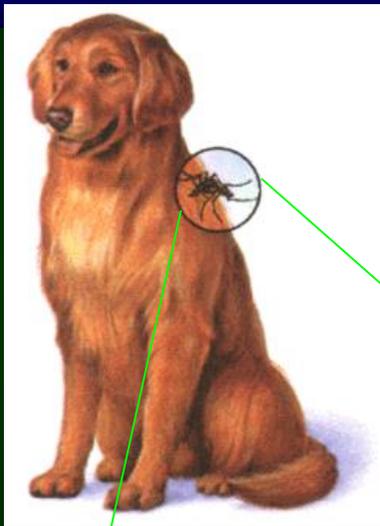
Nematodes emerge



# Parasitic nematodes: animals

- 5,000 species described as parasites of vertebrates
- Part of "helminths"

*Dirofilaria immitis* : heartworm in dogs

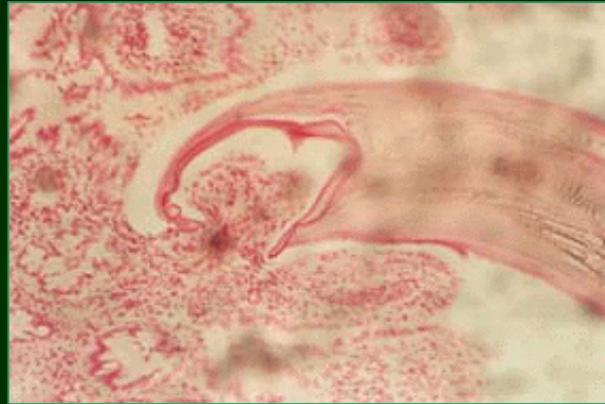


# Parasitic nematodes: humans

- 50 species described as human parasites
- Human parasites without intermediate host
- Examples include pin worm, roundworm and hookworms



Enterobius vermicularis(Pinworm)



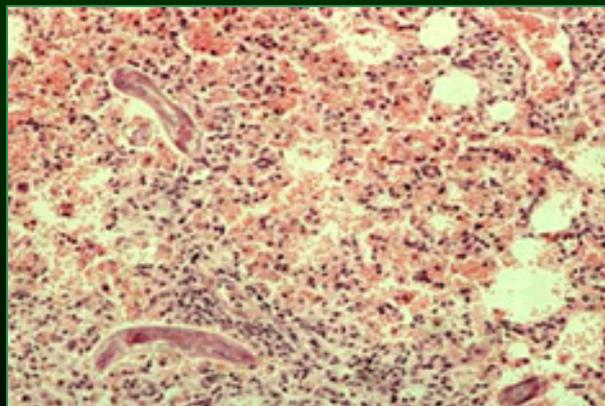
N.Americanus attached to intestine



Hook worm



Ascaris lumbricoides



Ascaris migrate in lung tissue

# Parasitic nematodes: humans



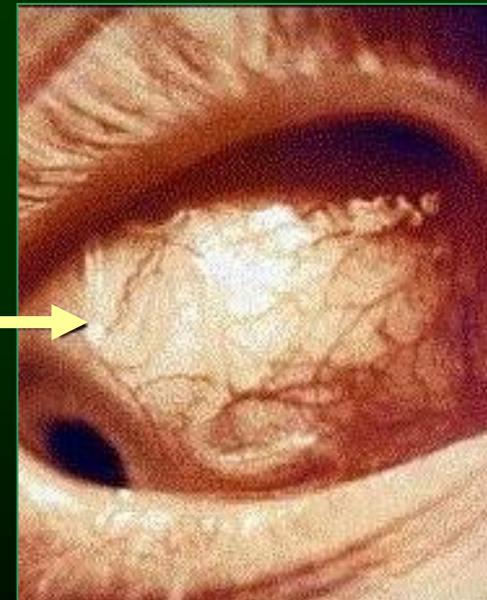
*Wucheria bancrofti*



*Microfilaria of W. bancrofti*



*Aedes feeds*

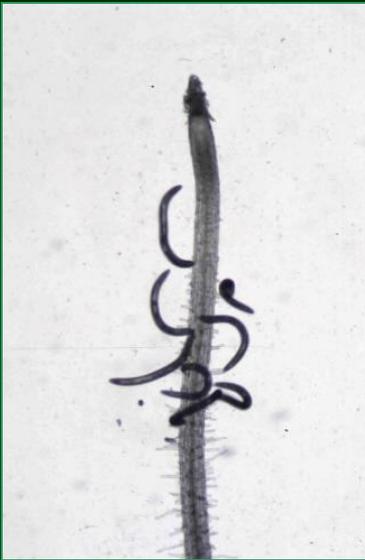


*Onchocerca volvulus*

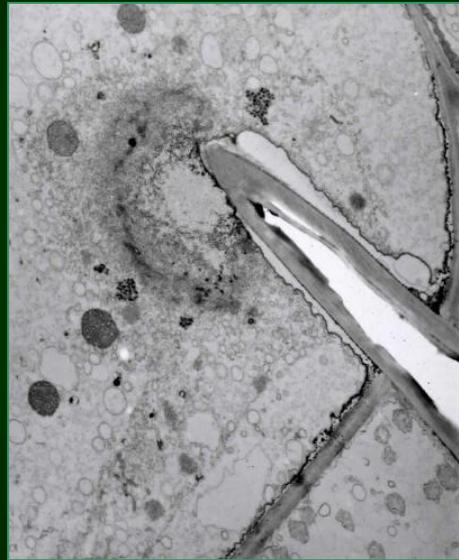
- Filariosis affects 250mn People
- Spread by insects (Aedes & Black fly)

# Migratory ectoparasitic nematodes:

- Ring nematodes
- Mostly migratory
- Include family Criconematoidea



*Mesocriconema* spp.



*M. Xenoplax* in plant cell

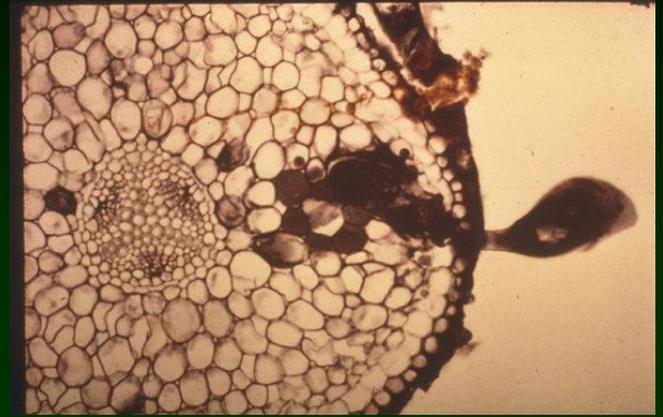


Sting nematode tip in root

# Sedentary ectoparasites



*Tyelanchus semipenetrans*



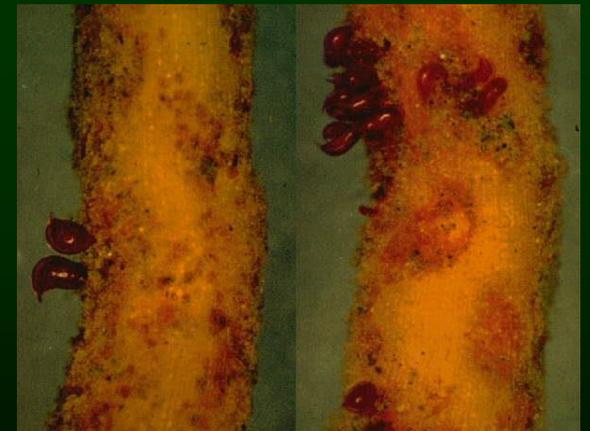
Head near pericycle



*T.Semipentrans* head in root



*T.S* with eggs



Nematodes on root surfaces

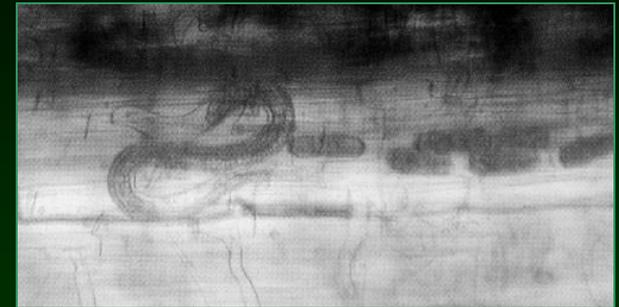
# Migratory endoparasites



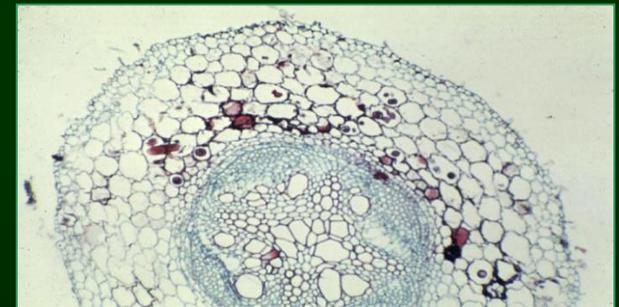
*Pratylenchus* spp.



*Pratylenchus* spp. L. Section



*Pratylenchus* spp. In root tissue

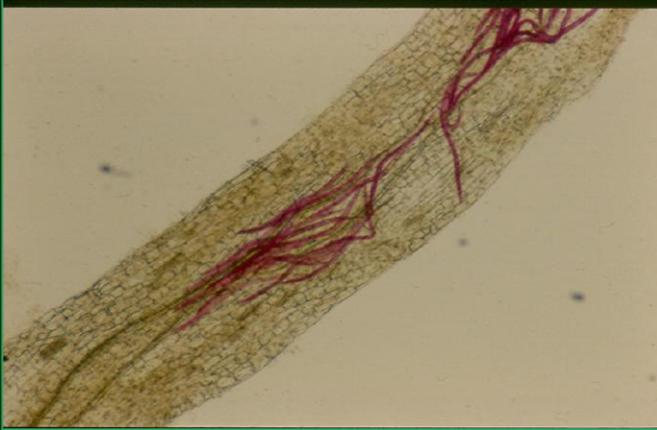


Cross section of nematode mass

- Retain motility within a feeding site
- Cumulative extensive damage of roots

# Sedentary endoparasites

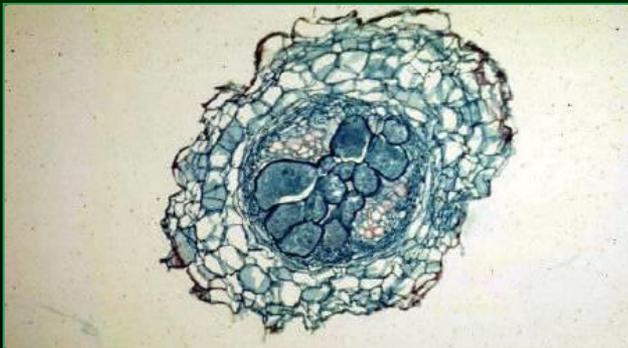
- feed from highly modified cells
- Adults Loose mobility completely



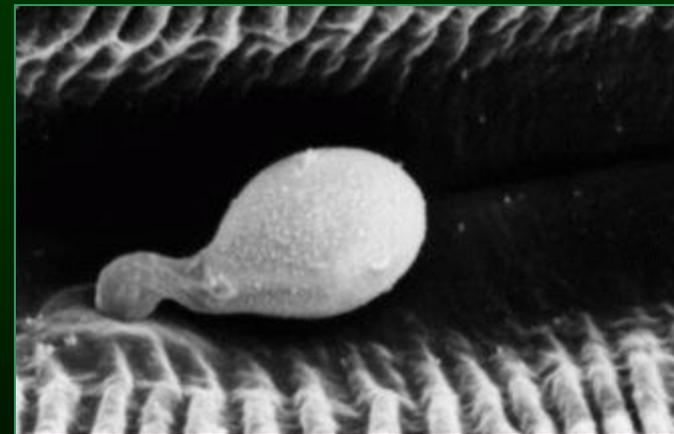
*Meloidogyne juveniles in root tissue*



*Meloidogyne female with egg mass*



*Melo feeding sites (giant cells)*



*Globodera inside vascular bundle*

"If all the matter in the universe except nematodes were swept away, would our world still be recognizable?

If we could then investigate it, we should find its mountains, hills, valleys, rivers, lakes, and oceans represented by a film of nematodes."

*Nathan A. Cobb*