The ‘Big’ Five (multicellular animals at low magnifications)

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**Nematode**

- **Adaptations within moss**: All have a sticky-tail adaptation. Mouth parts indicate feeding approach, e.g., herbivore, carnivore, bacterivore. Curl up into a ball to reduce water loss. Migrate to rhizoids where there is moisture.

- **Ecological relevance**: Huge relative biomass globally: wild mammals (0.007 Gt C), nematodes (0.02 Gt C), humans (0.06 Gt C) For each human, there are 60 billion nematodes living in the soil.

- **Scientific knowns**: *Caenorhabditis elegans* is a model organism – one that scientists use in scientific research. First organism to have its genome and connectome sequenced. Has won three Nobel prizes, including death genes.

- **Scientific unknowns**: Live research on: aging, cell death, development, nerves. Human degenerative diseases, including Alzheimer’s, Parkinson’s, and Huntington’s diseases. Also used in experiments on the International Space Station.

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### Rotifer

**Adaptations within moss**
- All female; reproduces by laying eggs (parthenogenesis).
- Bdelloid (leech-like) rotifer common in moss.
- Causes currents to draw food into its mouth and filters water for food particles.
- Different modes – goes into a dormant state called anhydrobiosis when conditions get dry.

**Ecological relevance**
- Important food source in freshwater (and some salt) ecosystems.
- Climate indicators (ice cores, trophi).

**Scientific knowns**
- Used as biological indicators of freshwater.
- When in anhydrobiosis, they stop aging. [Siberian ice core – woke up after 24,000 years and reproduced.](https://www.casualwildness.org/longest-living-animal/)

**Scientific unknowns**
- Live research on:
  - [ISS surviving radiation](https://www.nature.com/articles/s41562-018-0233-5)
  - [Chemical ecology](https://www.nature.com/articles/s41562-018-0233-5)
  - [Jaw evolution and development](https://www.nature.com/articles/s41562-018-0233-5)

### Tardigrade

**Adaptations within moss**
- Mostly female, but males exist. Lays eggs inside or outside shed skin.
- Uses its claws to move around moss.
- Turns into a tun, when under environmental stress, that can survive extreme conditions.
- Two main groups: heterotardigrada (armoured) and eutardigrada (smooth).

**Ecological relevance**
- Exists in every biome.
- Model extremophiles – can survive high and low temperatures, high pressures, radiation, etc.
- Coevolution with mosses and lichens.

**Scientific knowns**
- Extremely resilient to environmental stress, e.g., UV, desiccation, radiation, temperatures, pressure.
- We are still learning how.

**Scientific unknowns**
- Live research on:
  - New species being found, e.g., [2018](https://www.nature.com/articles/s41562-018-0233-5)
  - Research on tardigrades themselves – [Bacon lab](https://www.nature.com/articles/s41562-018-0233-5).
### Mite

**Looks large and dark under the microscope. Eight legs; big body.**

When moving, it moves its legs like an insect.

Moss mites belong to the huge Oribatida family.

Hooks on the end of legs to move through moss stems.

Thick exoskeleton for protection and to slow drying out.

Often moves out of moss when the moss dries up or goes into a hibernation state called diapause.

Most species live in soil.

Extremely important decomposers in soils.

Plays dead when disturbed.

Most are herbivores or detritivores, but some are carnivorous.

Thousands of known species, estimated to be 100,000s in total.

They seem to be important in soil ecosystems.

Role in soil health is being investigated in agriculture.

Role is soil ecosystems.

### Gastrotrich

**Looks like a hairy flatworm. Known as hairy belly.**

Swims fast, darting around; uses cilia on the body to swim.

All have a sticky-tail adaptation.

Lays two types of egg – quick hatchers or delayed hatchers to cope with changing environments.

Have fast life cycles to tolerate change.

Some species form cysts to survive harsh environmental conditions.

They eat mainly bacteria by sucking bacteria into their mouths.

Some species have hooks and spines on their body to deter predators.

800 species known, many more to be discovered.

Very little is known about the diversity of gastrotriches and they are being studied.

Their reproduction is poorly understood.