A glimpse below…
The soil food web

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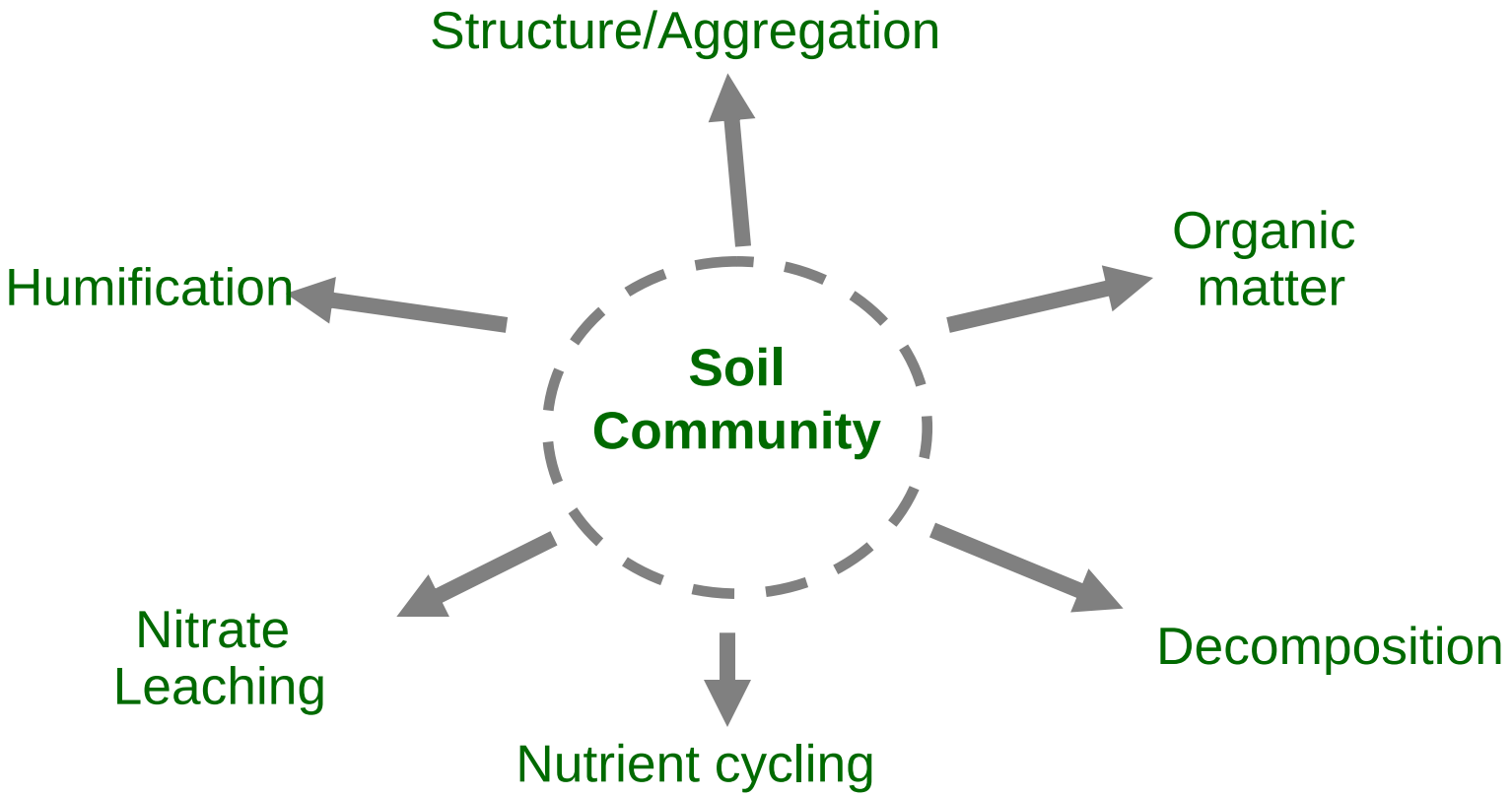
What is soil biology?

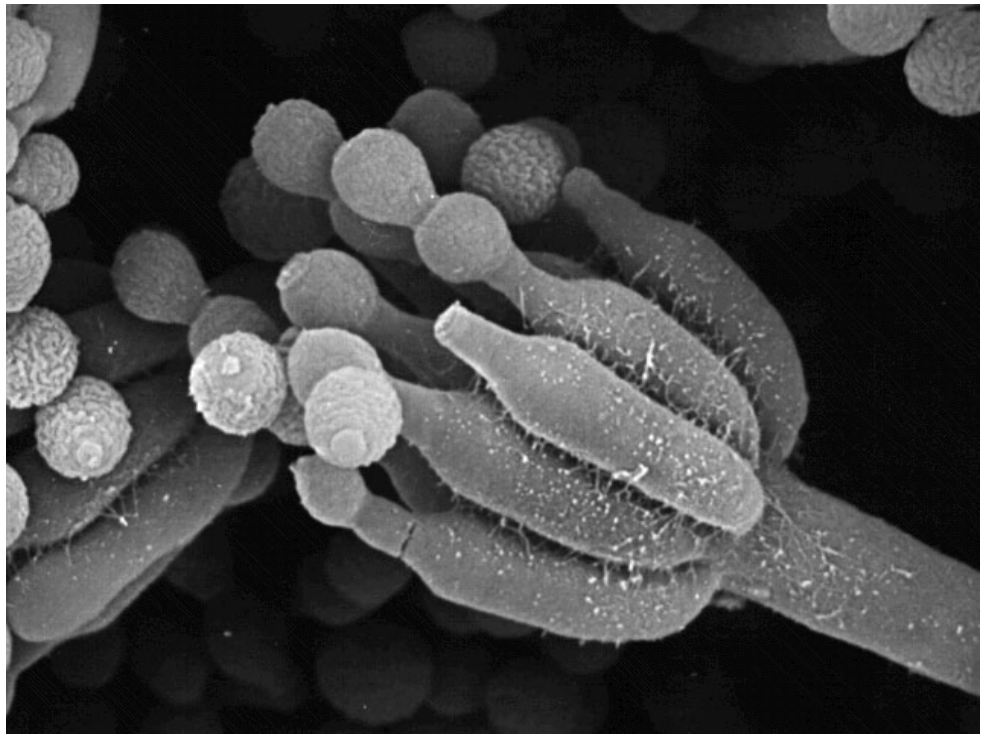
What role does it play in soil quality?

Soil organisms are involved in nearly every aspect of soil quality

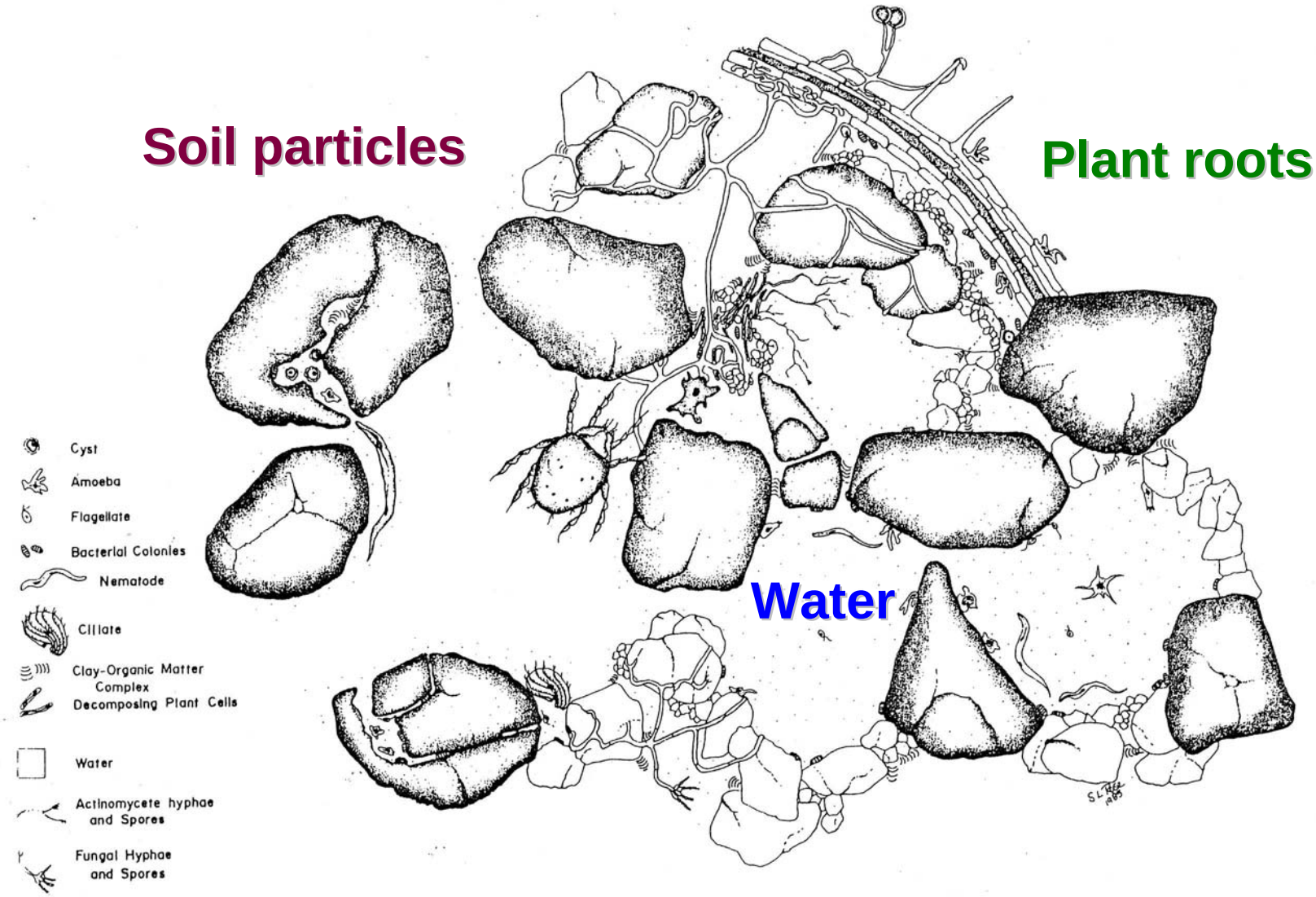


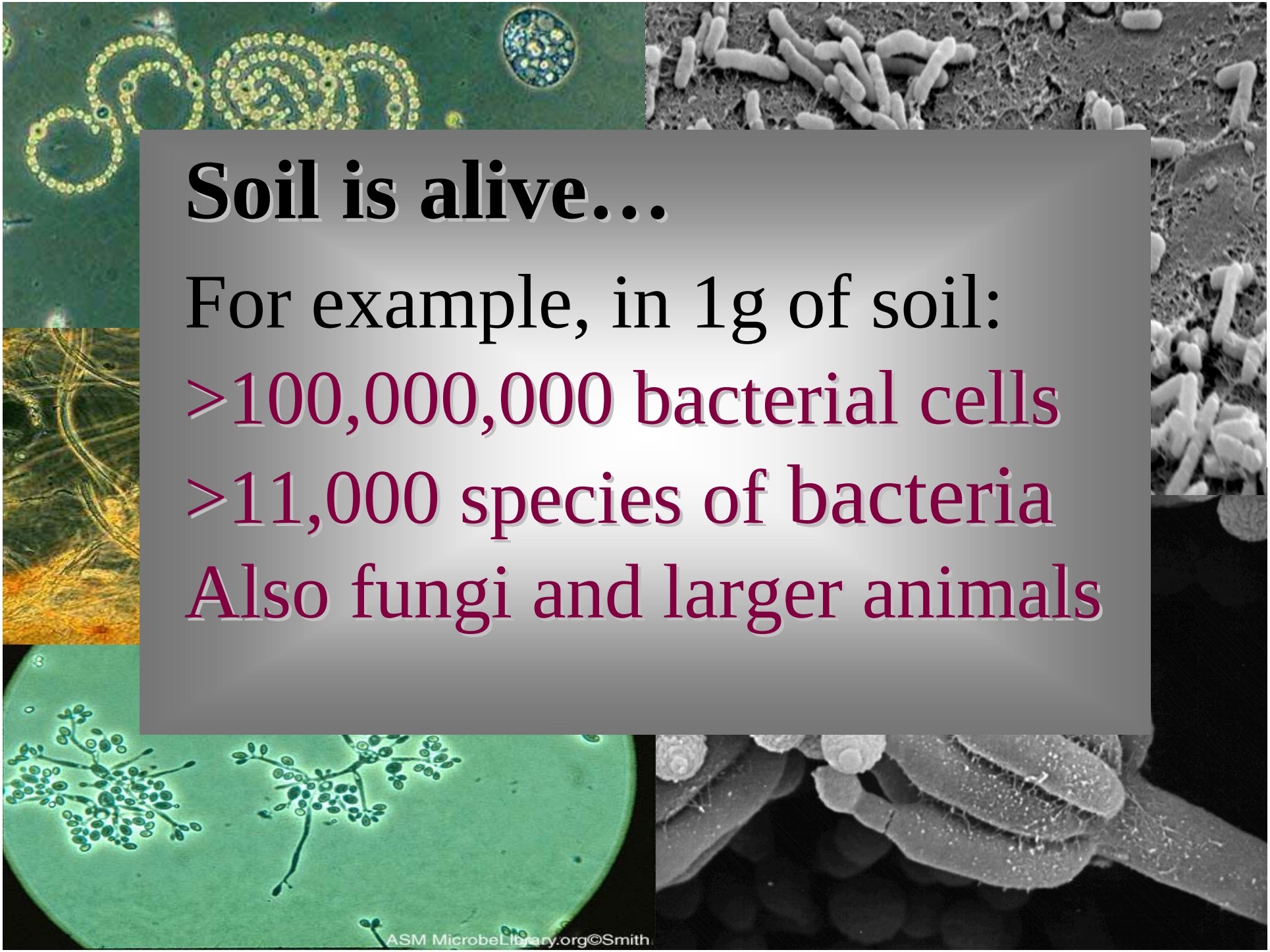
In order to understand how biology affects our soils - we need to understand a little about the organisms who live there

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.



Soil is a habitat





Soil is alive…

For example, in 1g of soil:

>100,000,000 bacterial cells

>11,000 species of bacteria

Also fungi and larger animals

Who's there?

Macrofauna: Soil 'Engineers'

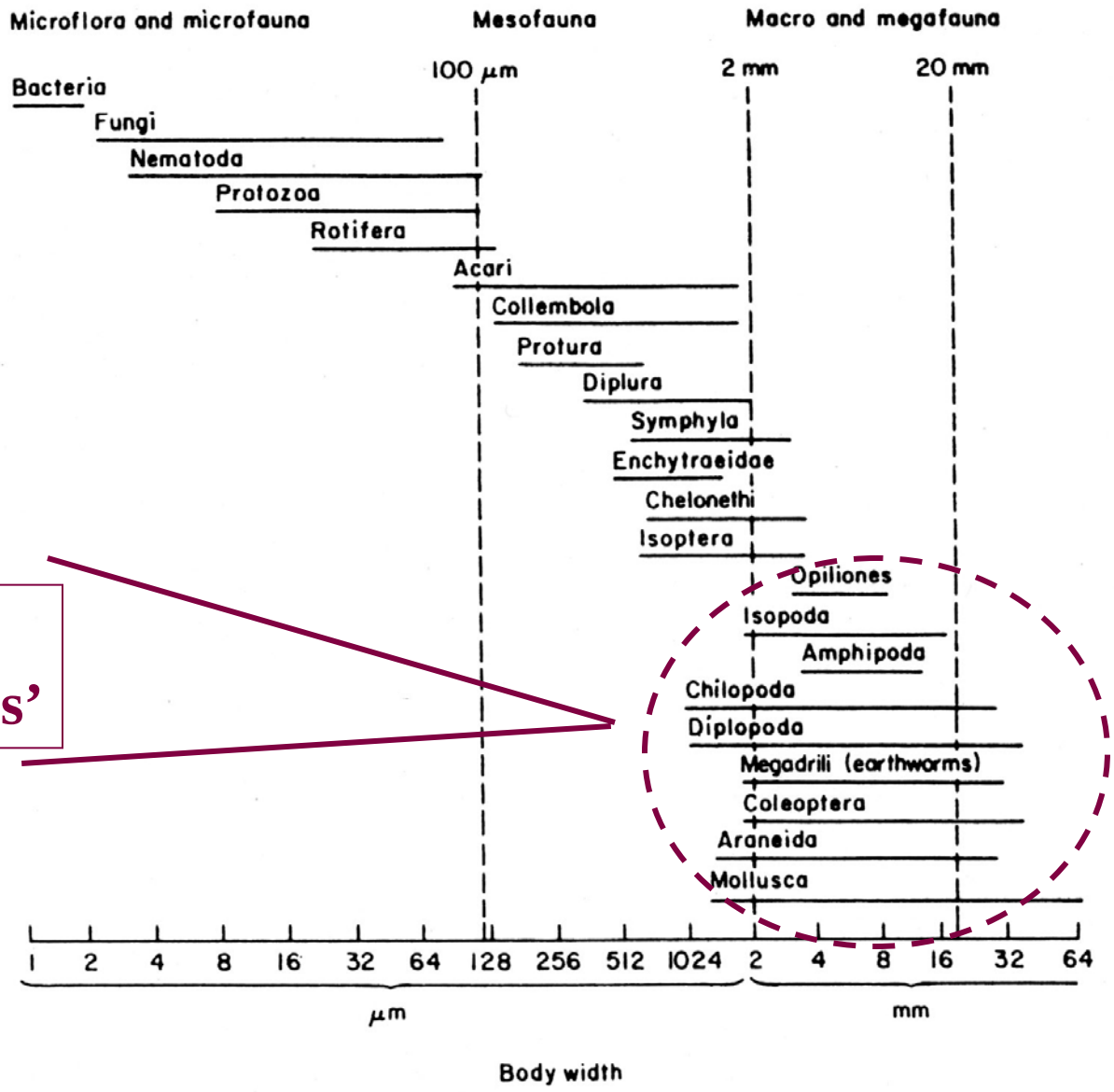
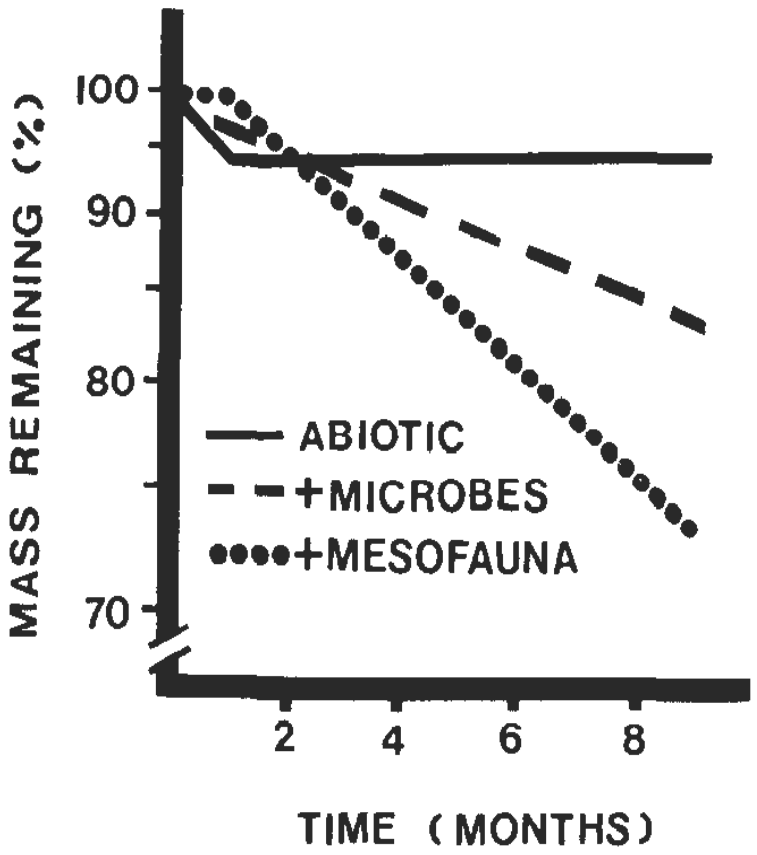


FIGURE 4.3 Size classification of organisms in decomposer food webs by body width (Swift *et al.*, 1979).

Soil Animals

Soil animals are important for



1. **Decomposition (shredding residues)**
2. **Mixing soil (aeration)**

Decomposition rate of blue grama *(Bouteloua gracilis)*

Who's there?

Mesofauna:
Soil predators, pathogens, herbivores

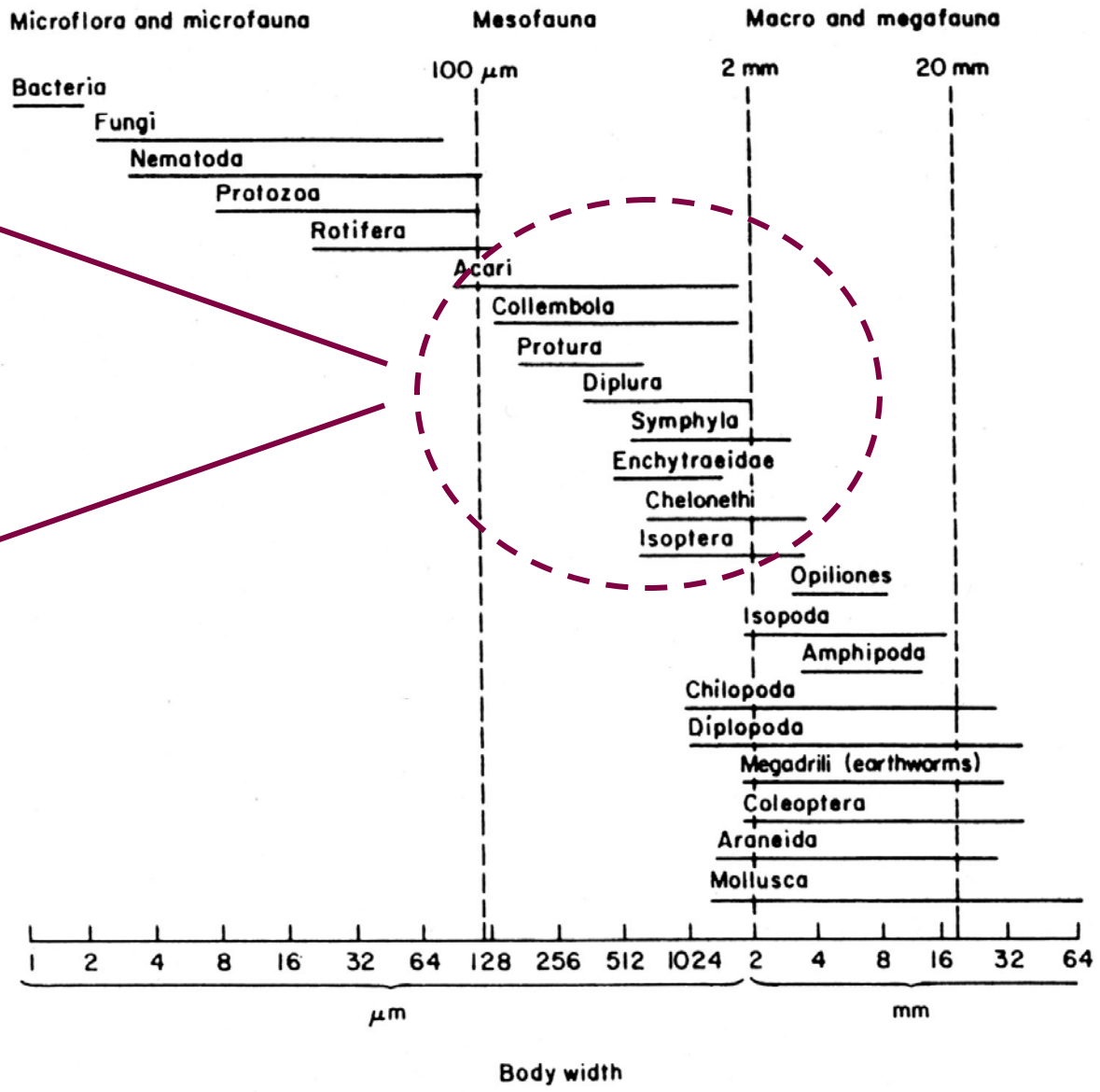
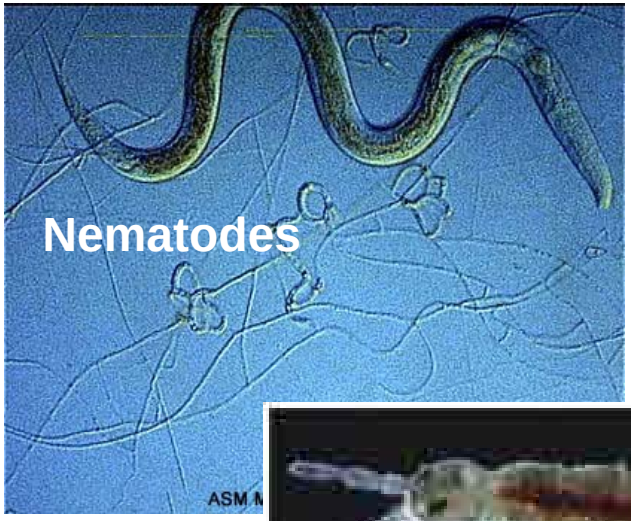
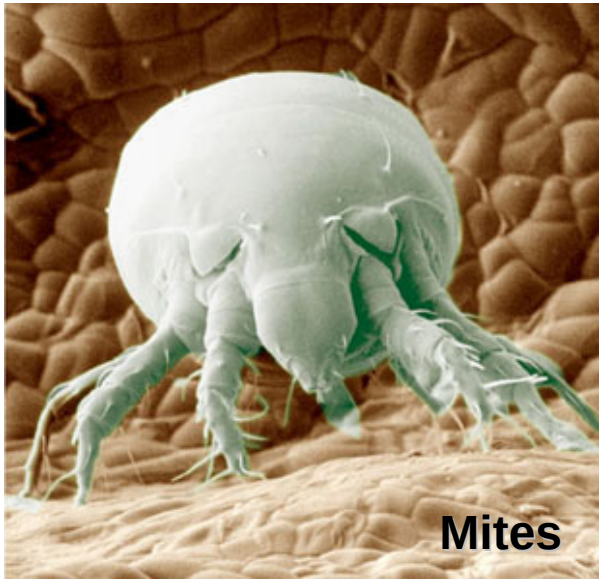


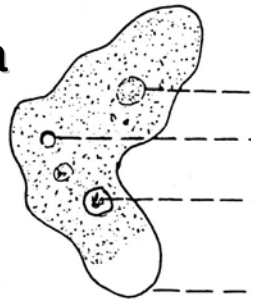
FIGURE 4.3 Size classification of organisms in decomposer food webs by body width (Swift *et al.*, 1979).

Soil mesofauna





Protozoa



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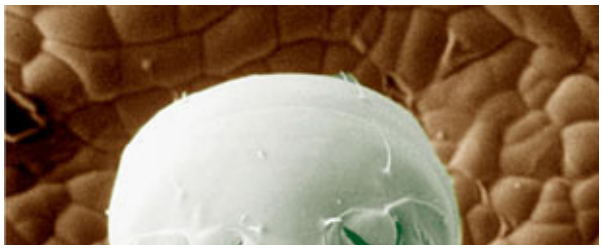
Soil mesofauna



Soil mesofauna are important for

1. Residue decomposition
2. Predation
3. Pathogenesis

Protozoa

QuickTime™ and a
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Microorganisms: Soil process controllers

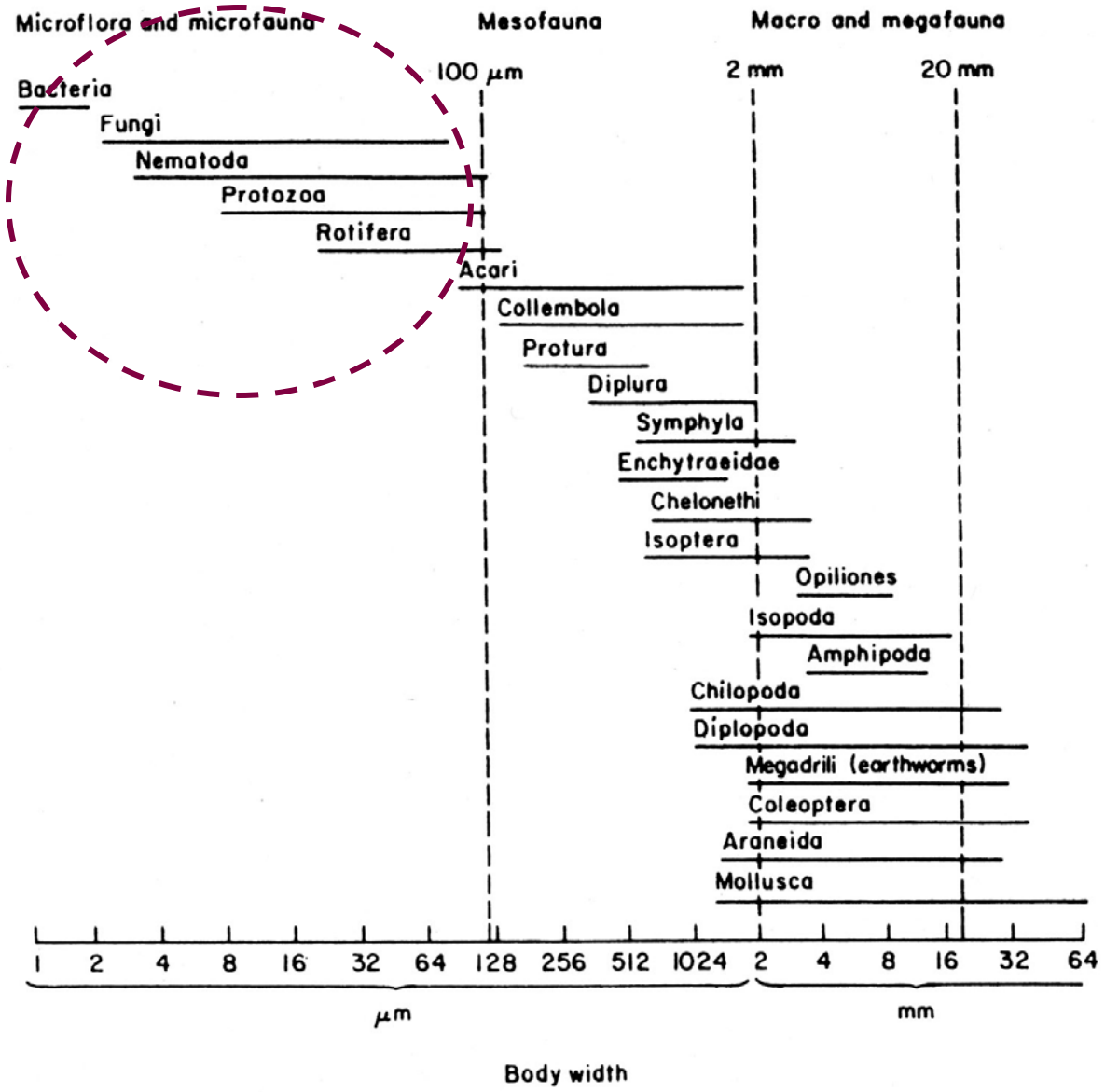
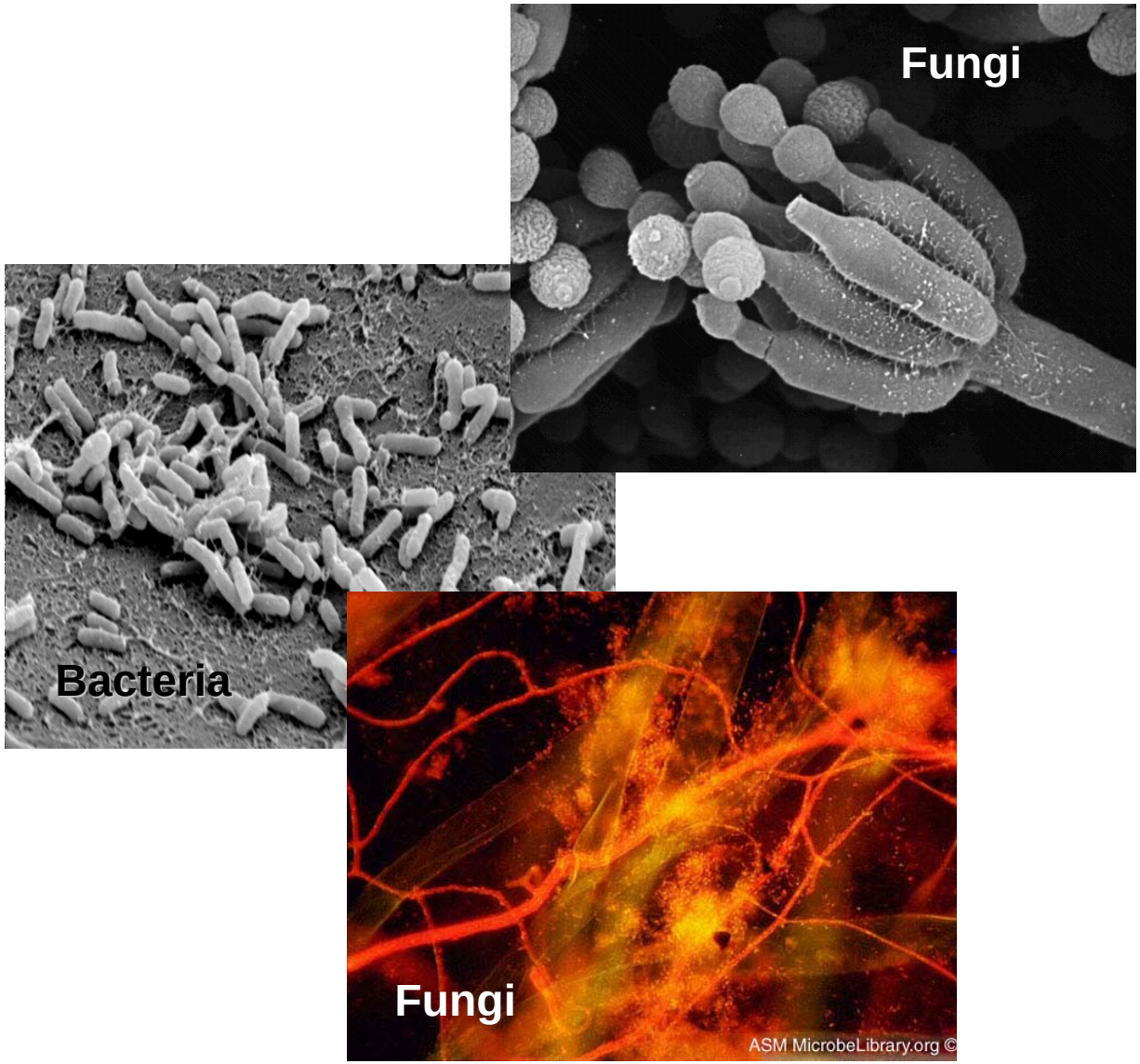


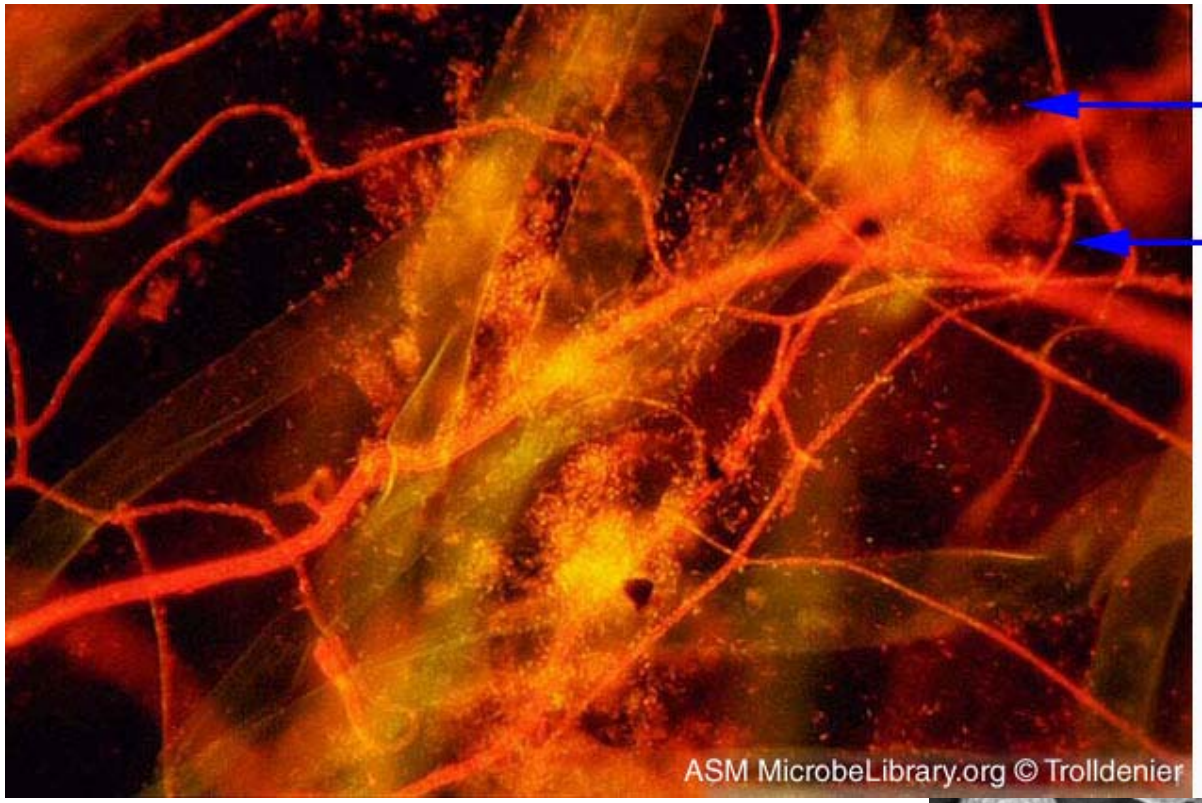
FIGURE 4.3 Size classification of organisms in decomposer food webs by body width (Swift *et al.*, 1979).

Soil microorganisms



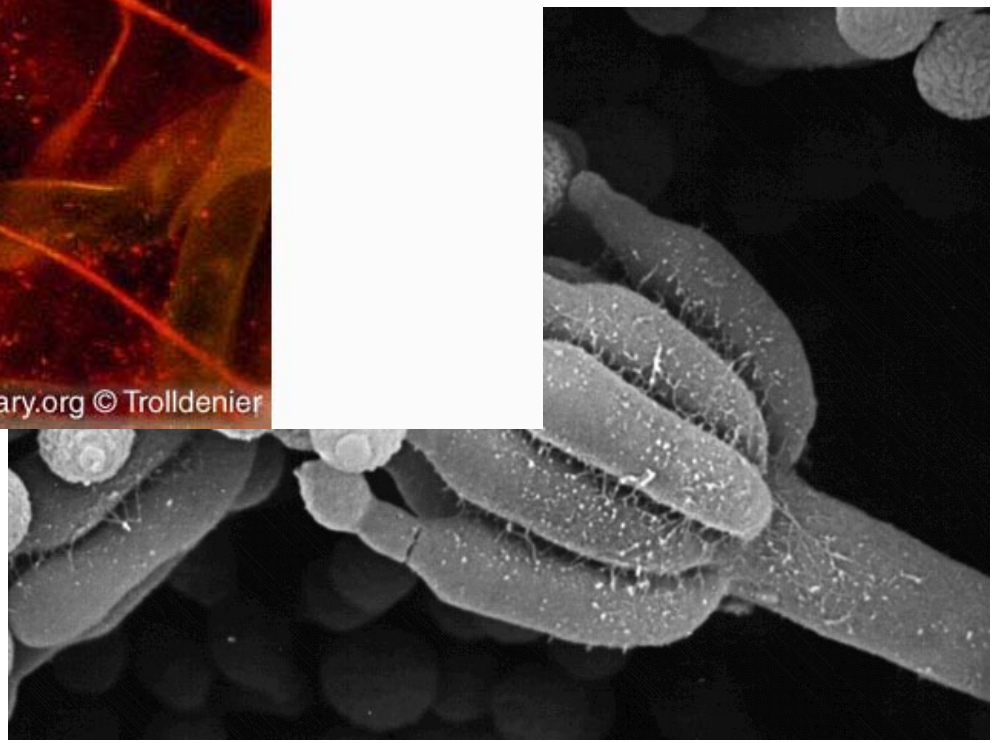
Fungi

- Filamentous growth



Bacteria (orange dot)

Fungal filaments



What are the advantages of filamentous habit?

Fungi

- Filamentous growth
- Functionally critical!

QuickTime™ and a
TIFF (LZW) decompressor
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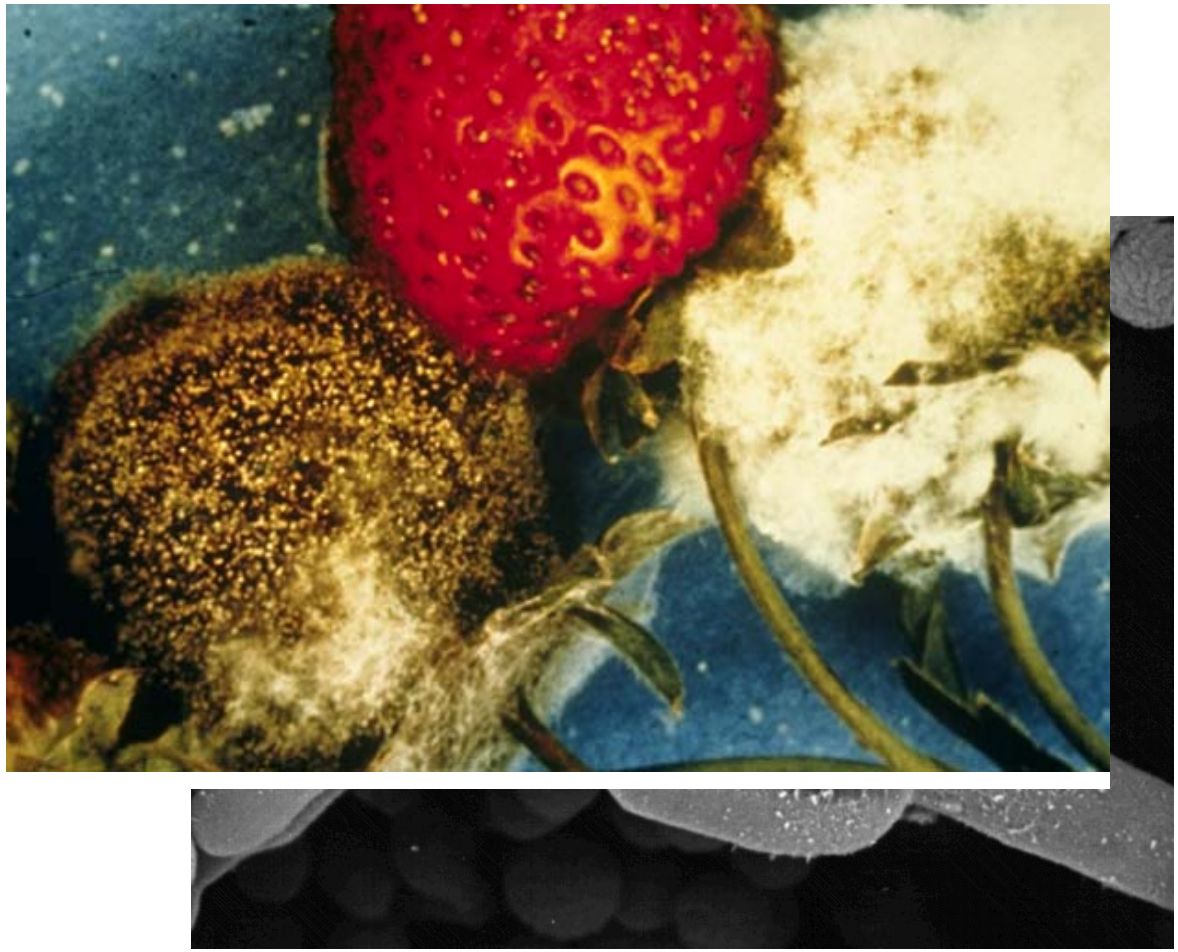
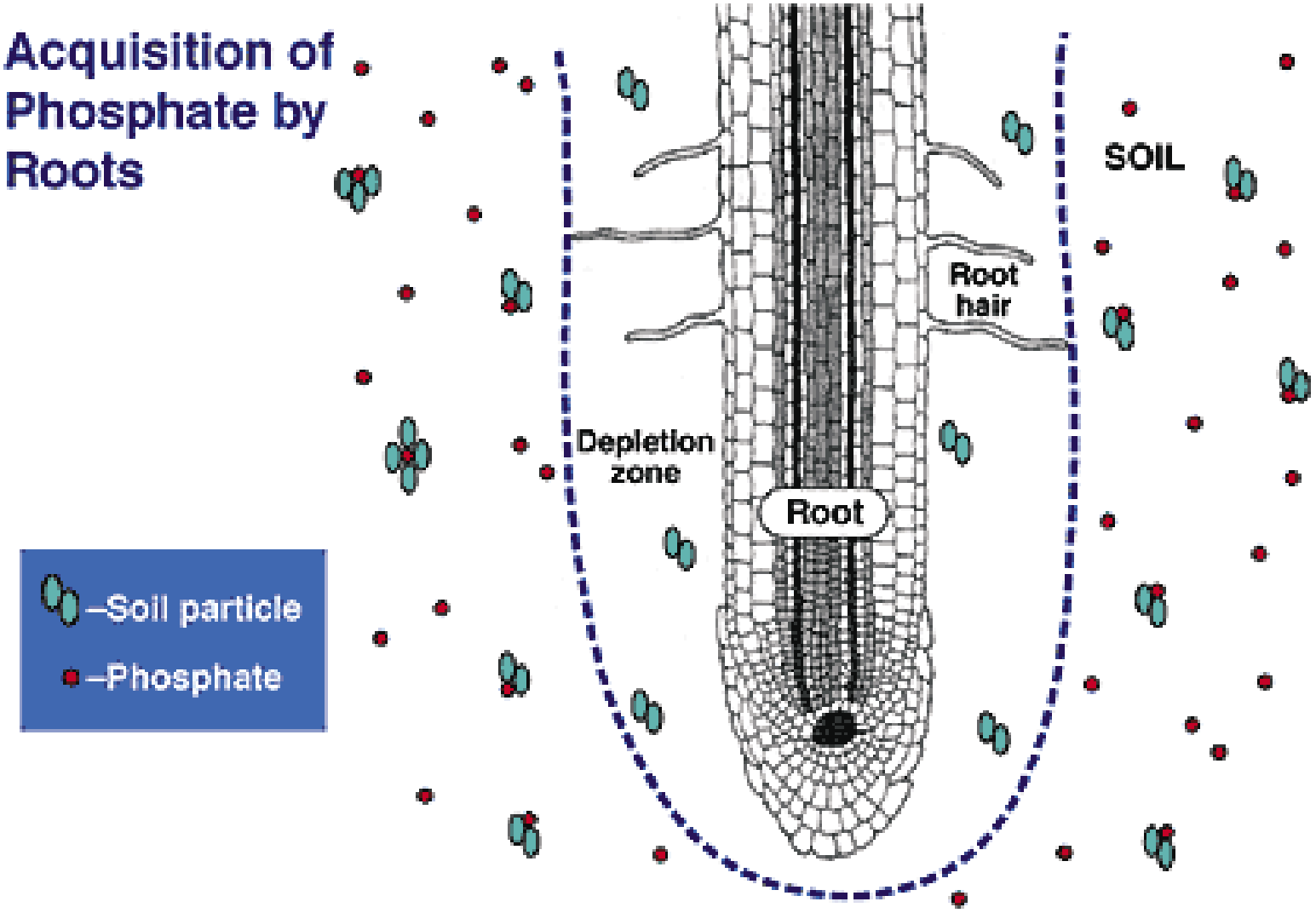
-Wood degrading
-Mycorrhizal association

•*myco* (fungus) +
rhiza (root)

(Symbiotic structure
formed by a fungus
plus a plant)

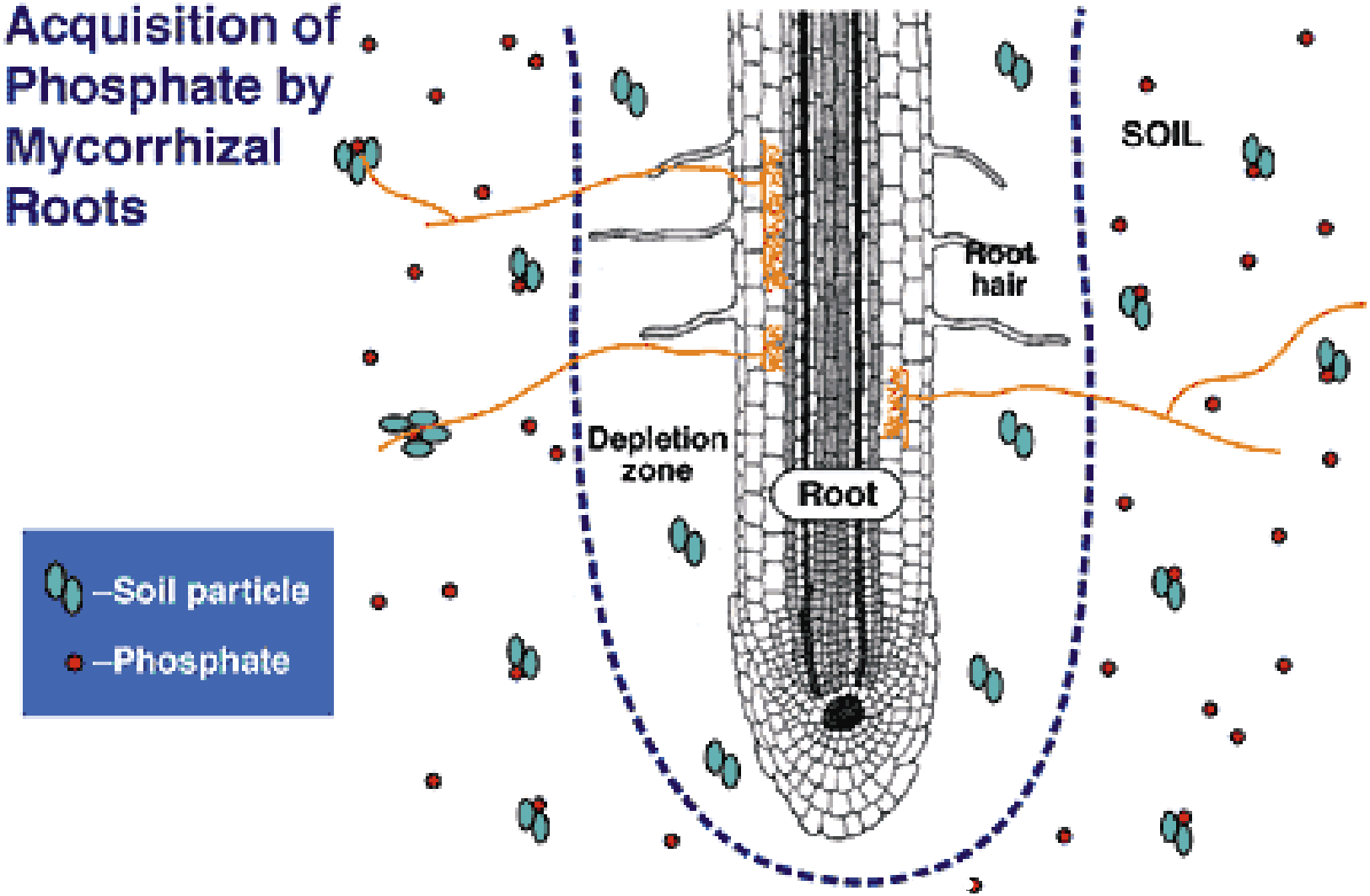


Acquisition of Phosphate by Roots



Source: Harrison et al 1999

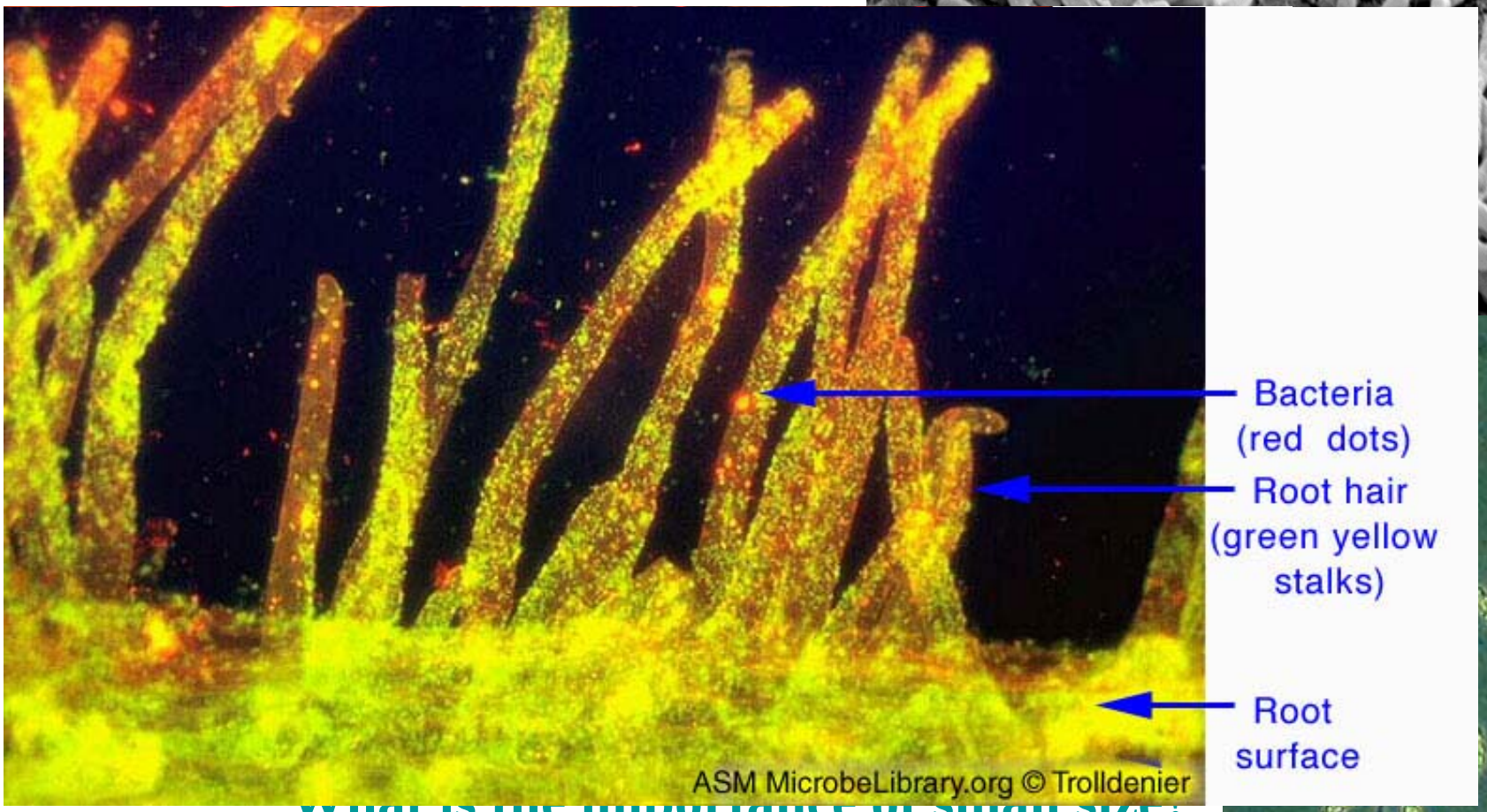
Acquisition of Phosphate by Mycorrhizal Roots

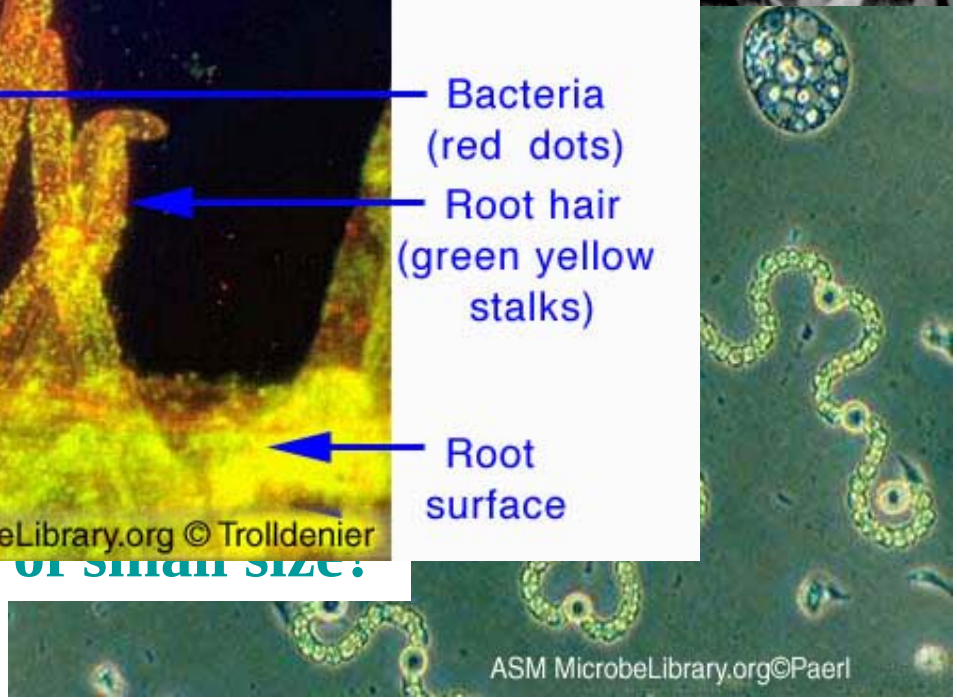


Source: Harrison et al 1999

Bacteria

- Small, single celled
  ~2µm





What is the importance of small size?

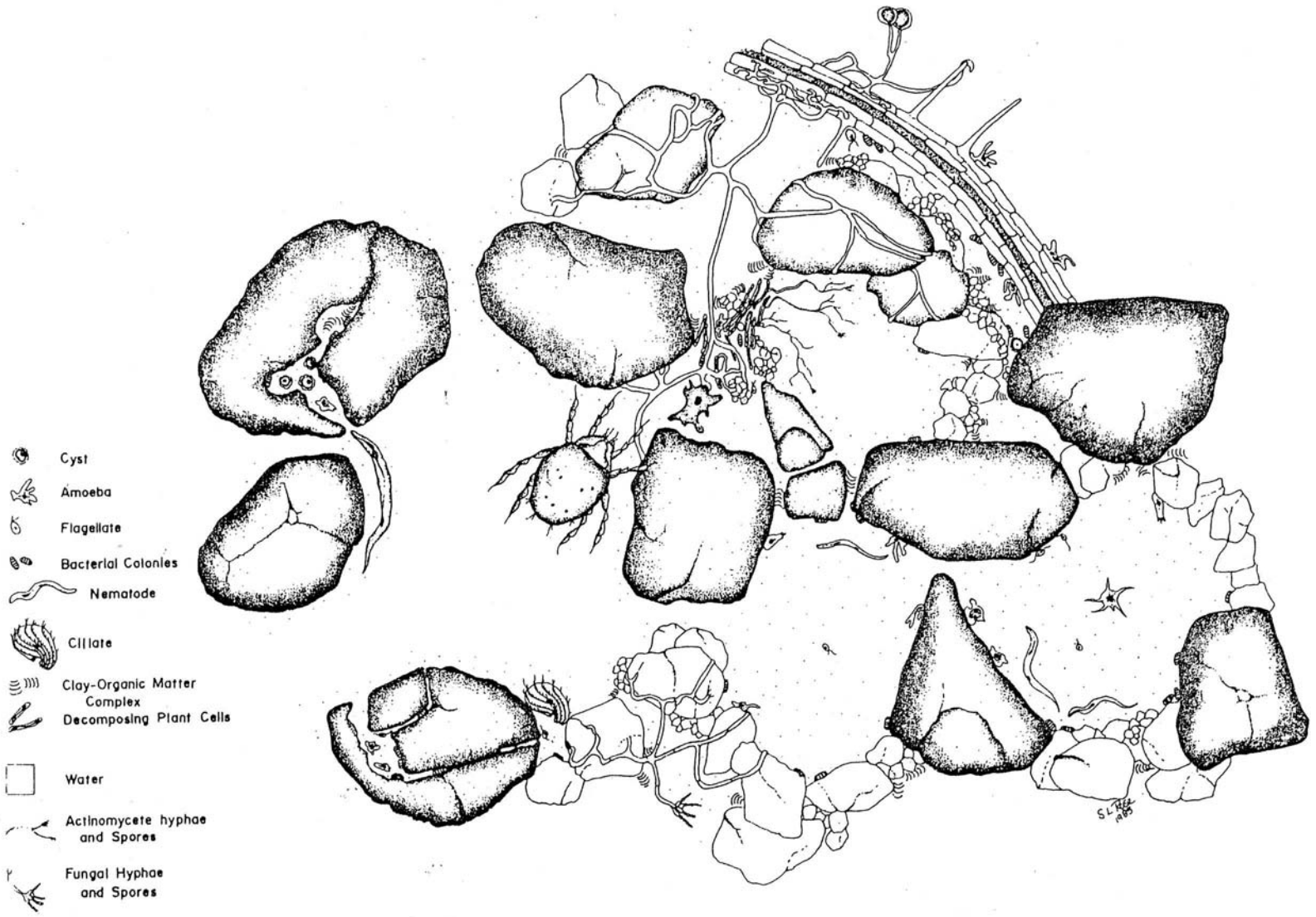
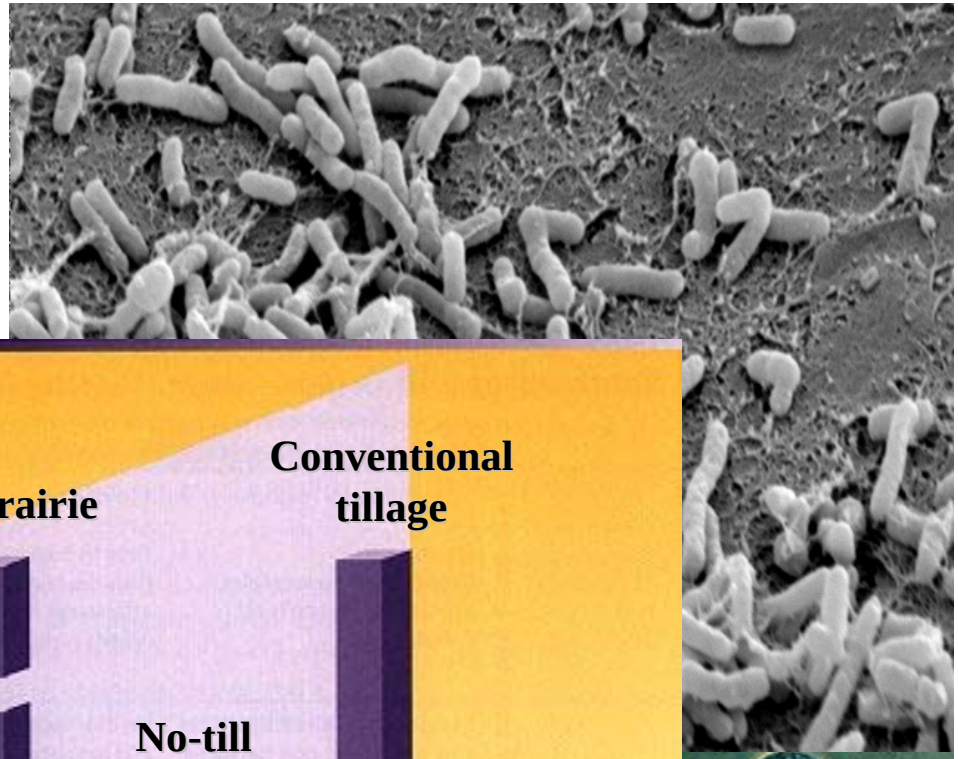
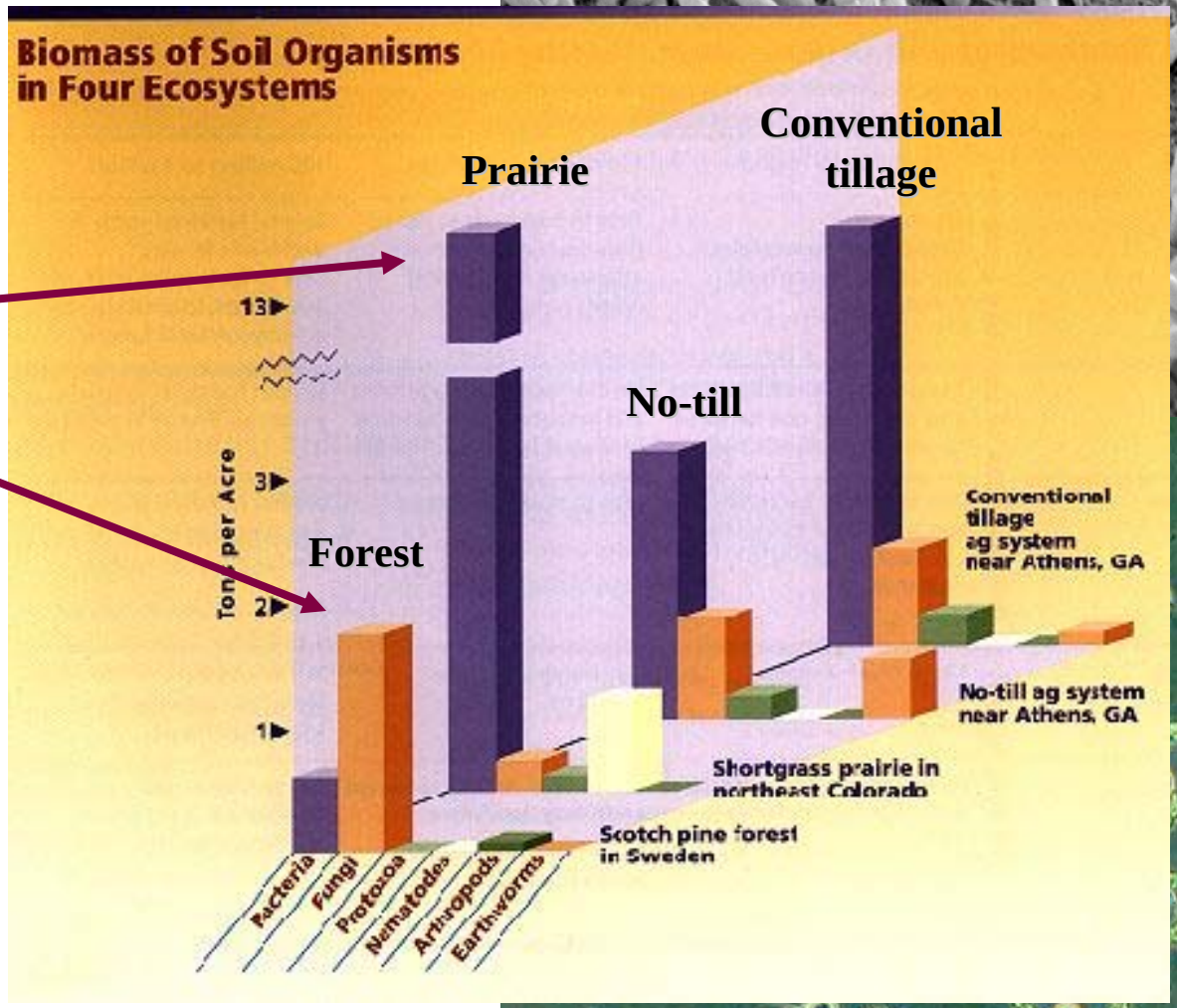


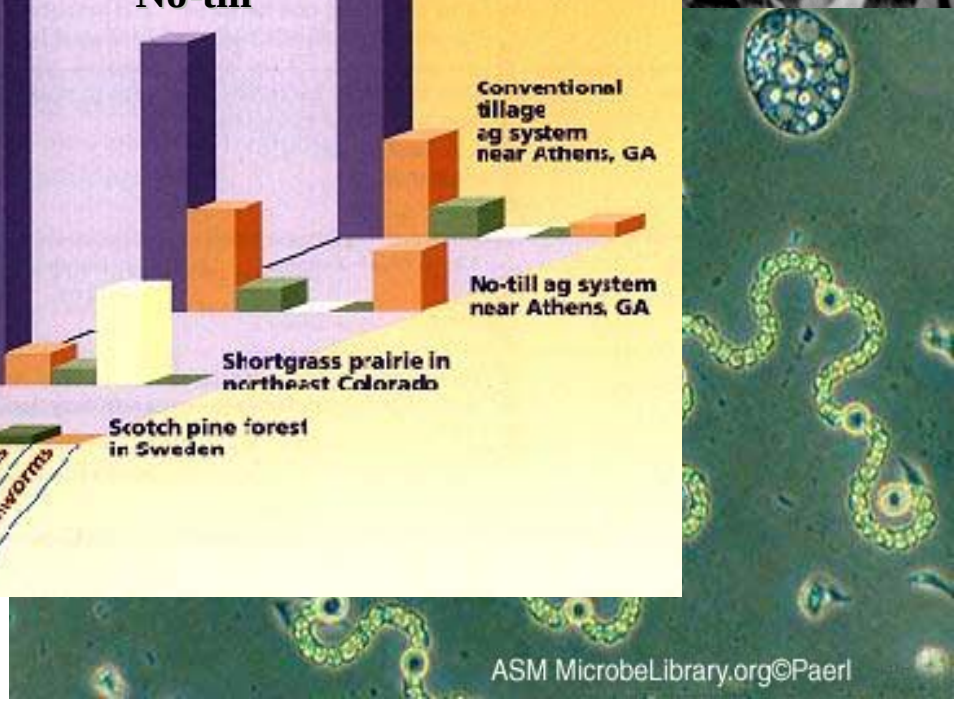
Figure 5.2. Trophic relationships among different groups of soil organisms are controlled by accessibility to their resources. This illustration represents approximately 1 cm^2 of a highly structured microzone in the surface horizon of a grassland soil. Courtesy of S. Rose and T. Elliott, personal communication.)

Bacteria

- Small, single celled
- Abundant

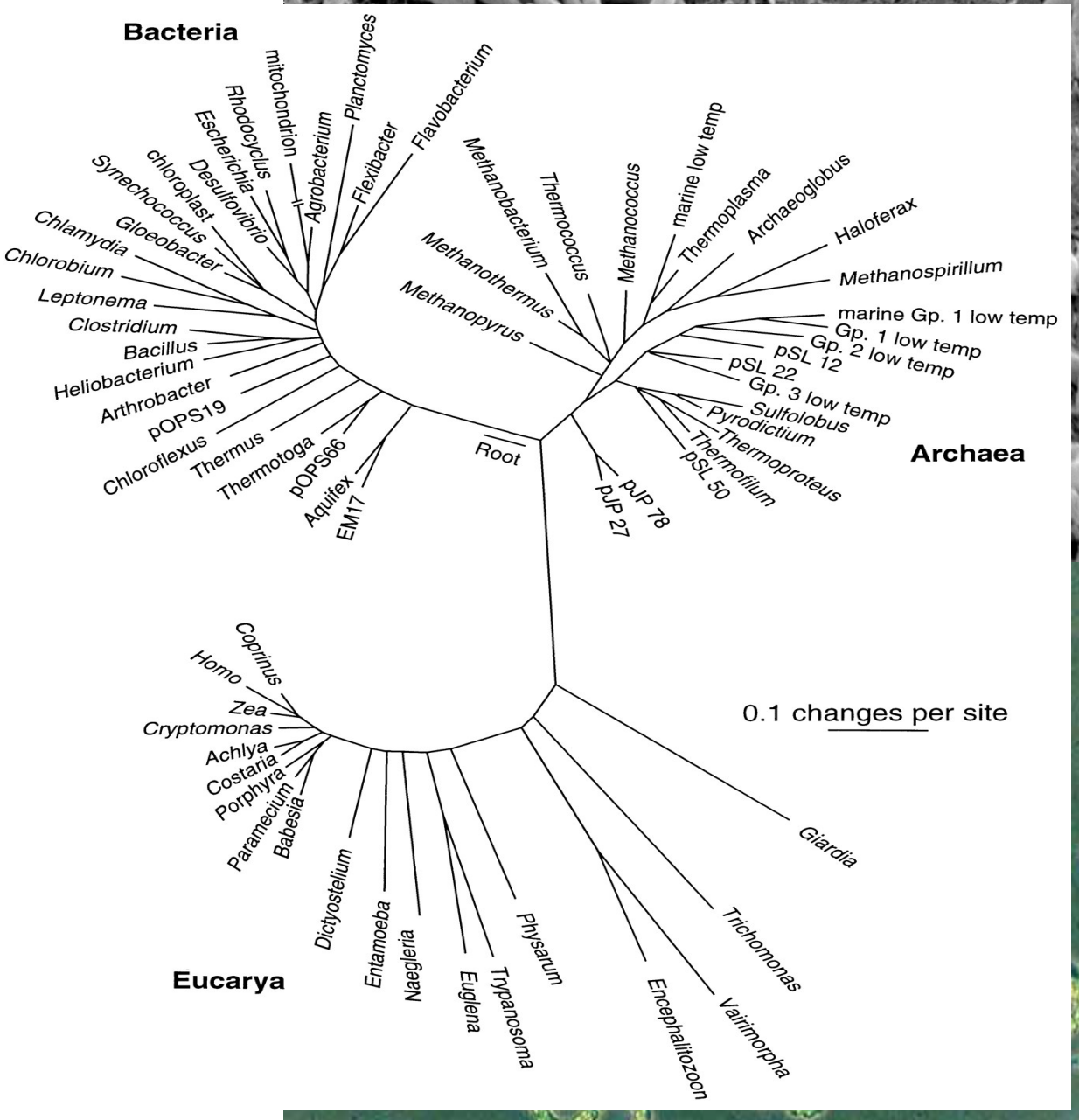




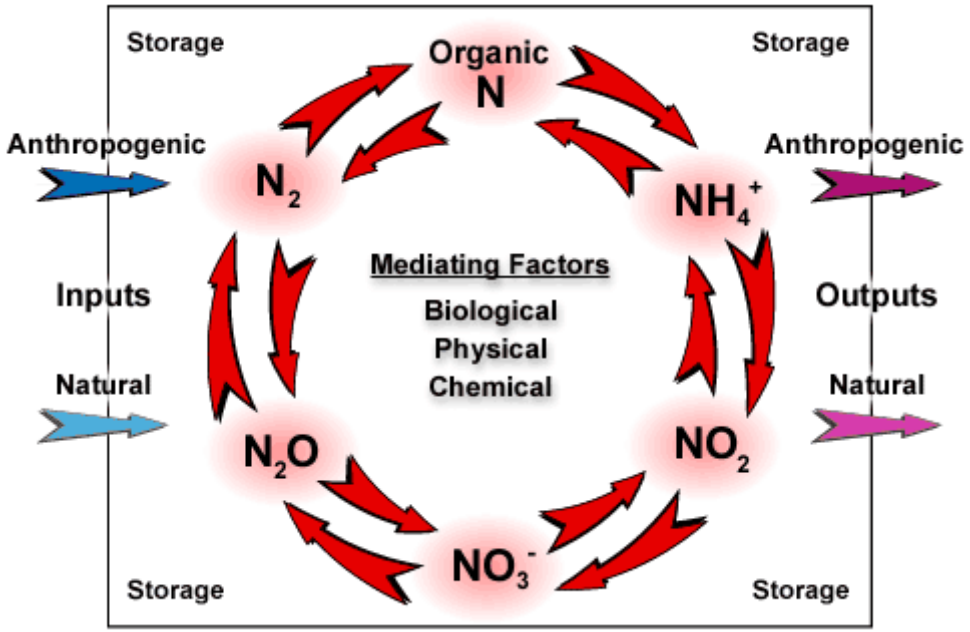


Bacteria

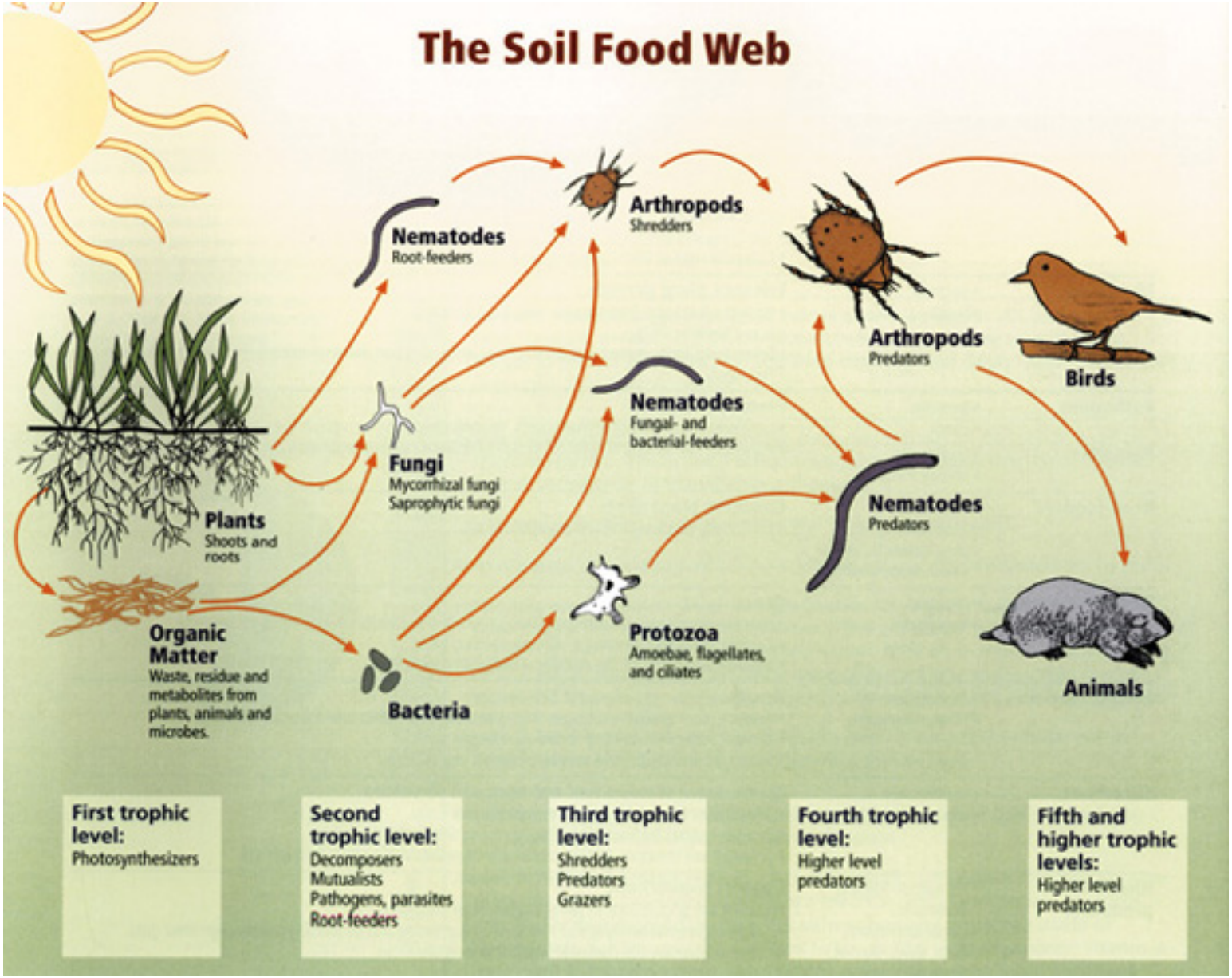
- Small, single celled
- Abundant
- Diverse - taxonomically and functionally!



Diversity in soil is important for nitrogen cycling.



Relationship to soil quality?



Diversity may be important in response to management

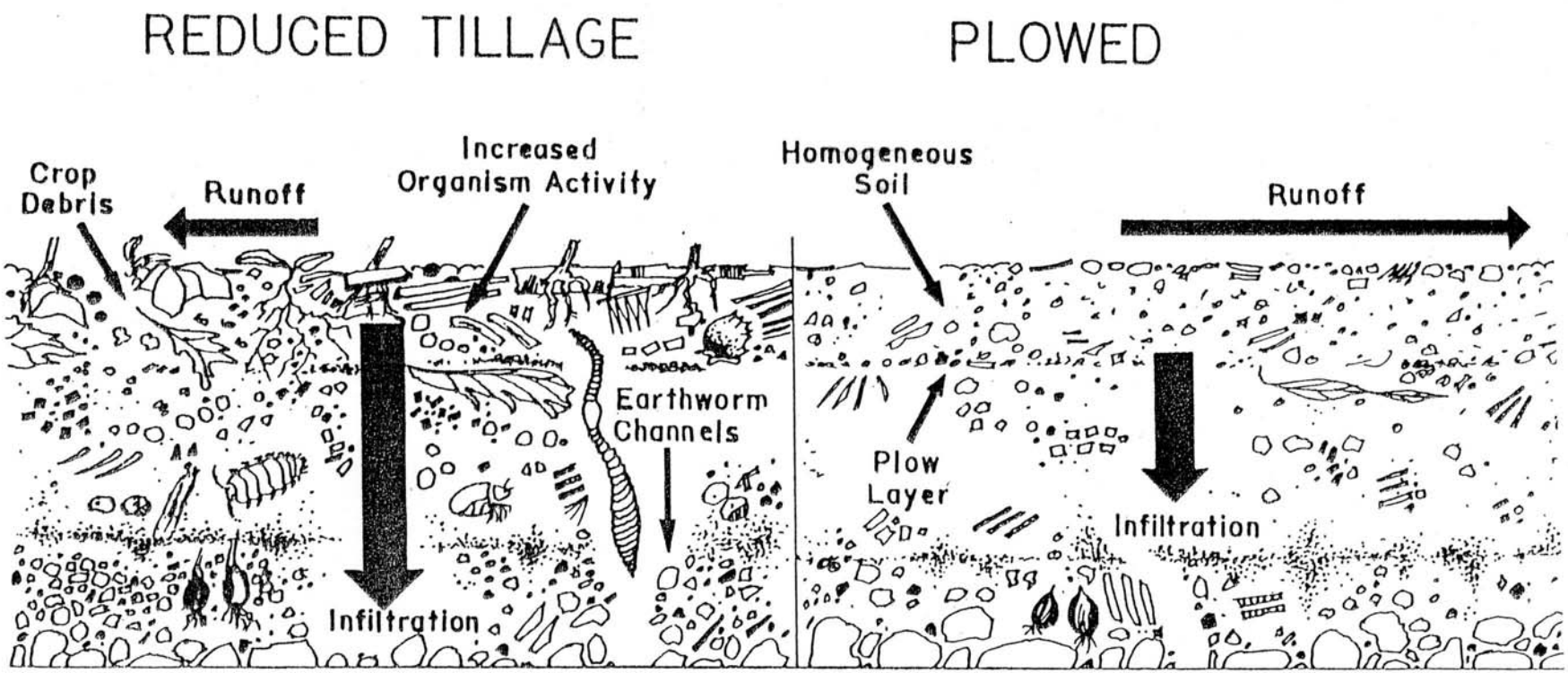
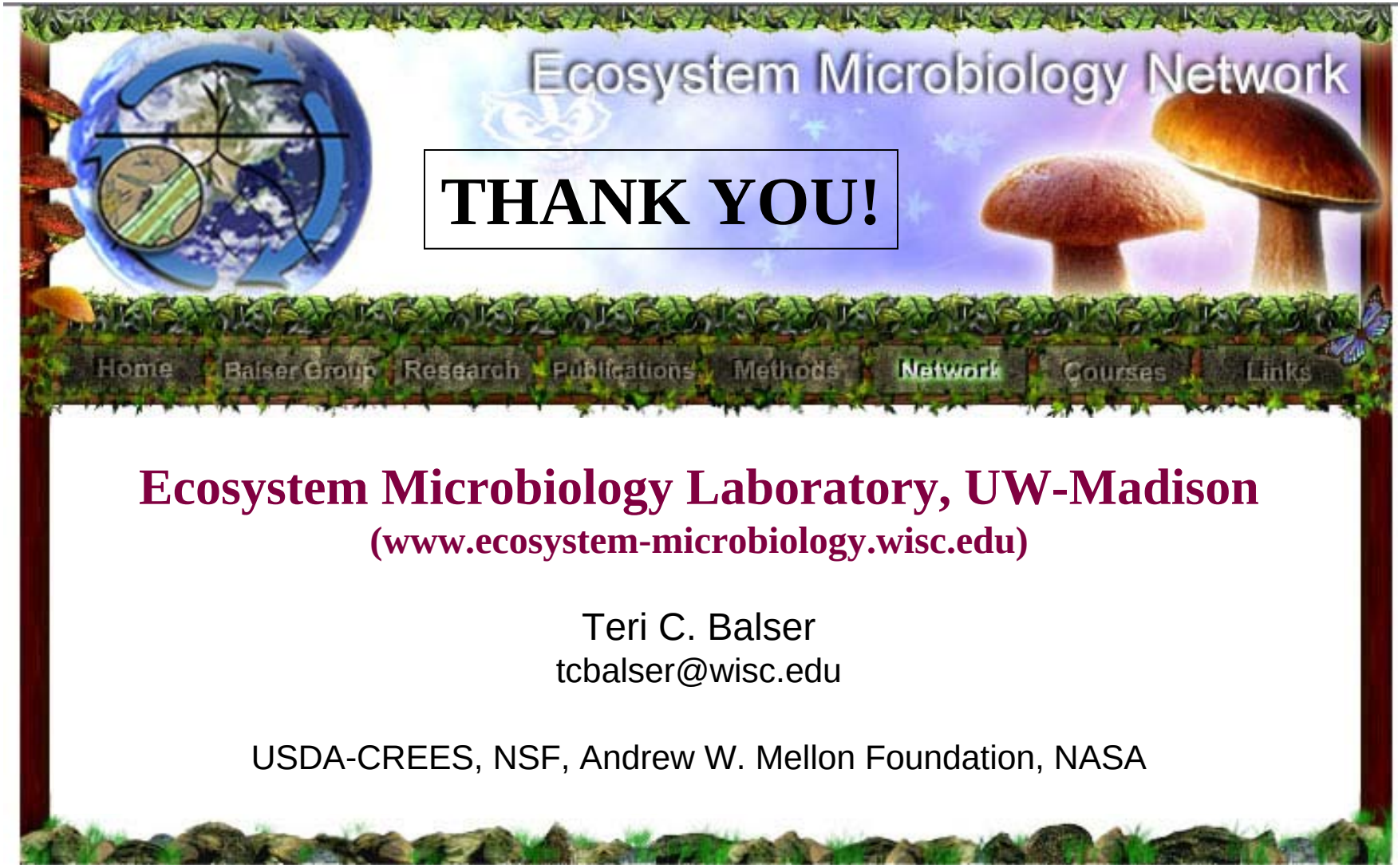


Figure 2. A comparison of biological, physical, and chemical properties of minimum tillage and plowed soils (from Stinner and Stinner, 1989).



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