4. Introduction

PROF JOE BLOGGS

Today's lecture outcomes

1. Explain the significance of soil organisms to plant growth and global ecosystem services.

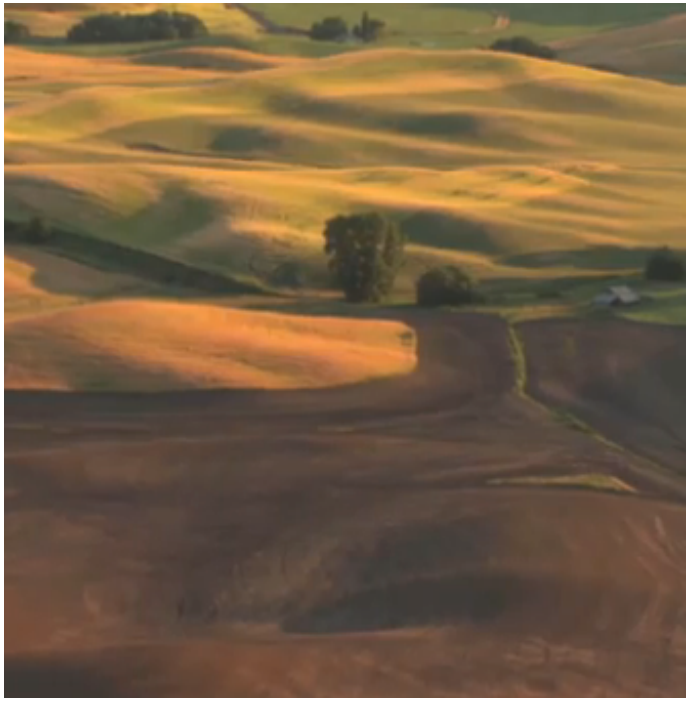
2. For each of the main groups of soil organisms:
    1. Describe their position in the "Tree of Life"
    2. Give examples of each
    3. Know their size relative to soil pores and particles
    4. Describe their abundance and biomass relative to other soil organisms and
    5. Describe their location in the soil matrix

Soil Biology Movies

Symphony of the Soil

- Symphony of the Soil is a 104-minute documentary feature film that explores the complexity and mystery of soil.

- Filmed on four continents and sharing the voices of some of the world's most esteemed soil scientists, farmers and activists, the film portrays soil as a protagonist of our planetary story



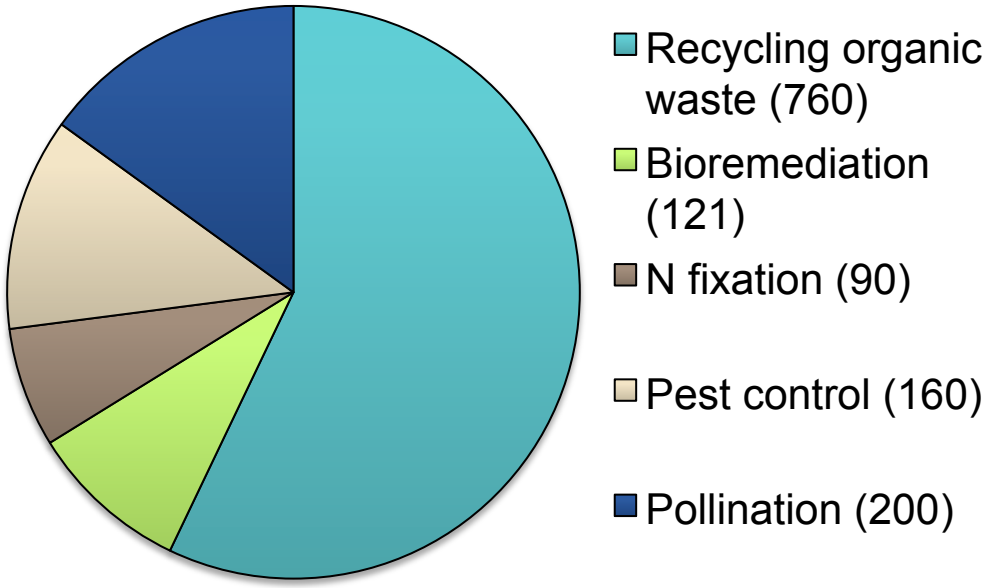
Symphony of the Soil trailer

Why study soil biology?

- *Ecosystem services – goods and services provided by ecosystems to humans (useful materials and actions)*

- Every year soil organisms provide ecosystem services worth US$1.3 trillion
  - ~4% ecosystem services provided globally
  - ~11% services from terrestrial habitats

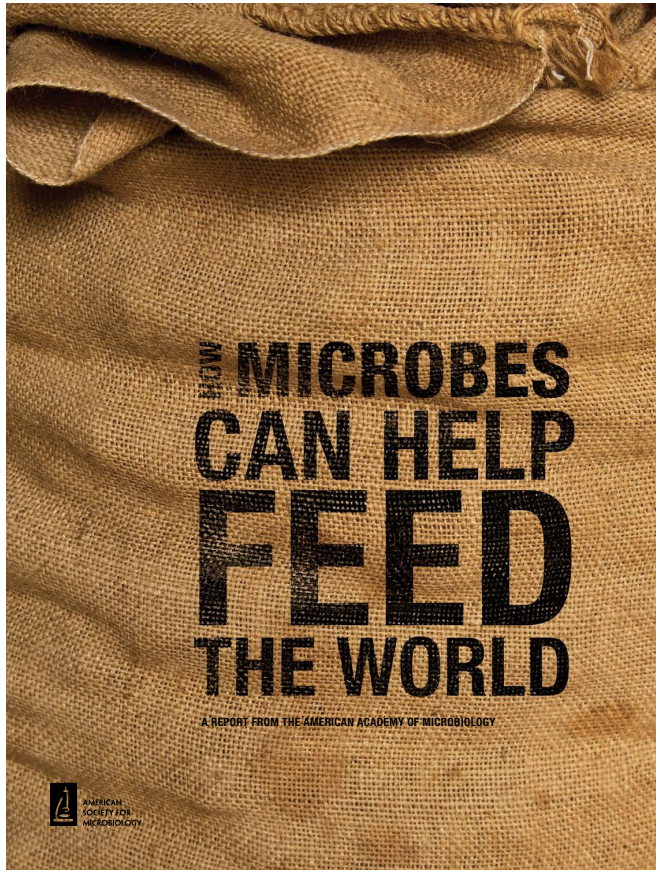
Contribution of ecosystem services to the total provided by soil organisms per year (US$billion)



Soil Biology in the Media

How Microbes Can Help Feed the World

- Report by the American Society for Microbiology 2013
- Answers the question: “How plant microbe interactions can be employed to boost agricultural productivity in an environmentally and economically responsible way?”
- Microbes support plant health:
  - Increasing availability of nutrients
  - Enhancing plant root growth
  - Neutralising toxic compounds
  - Deterring pathogens and predators



Am Soc Micro (2013). “How Microbes Can Help Feed the World”

Organisms that live in soil

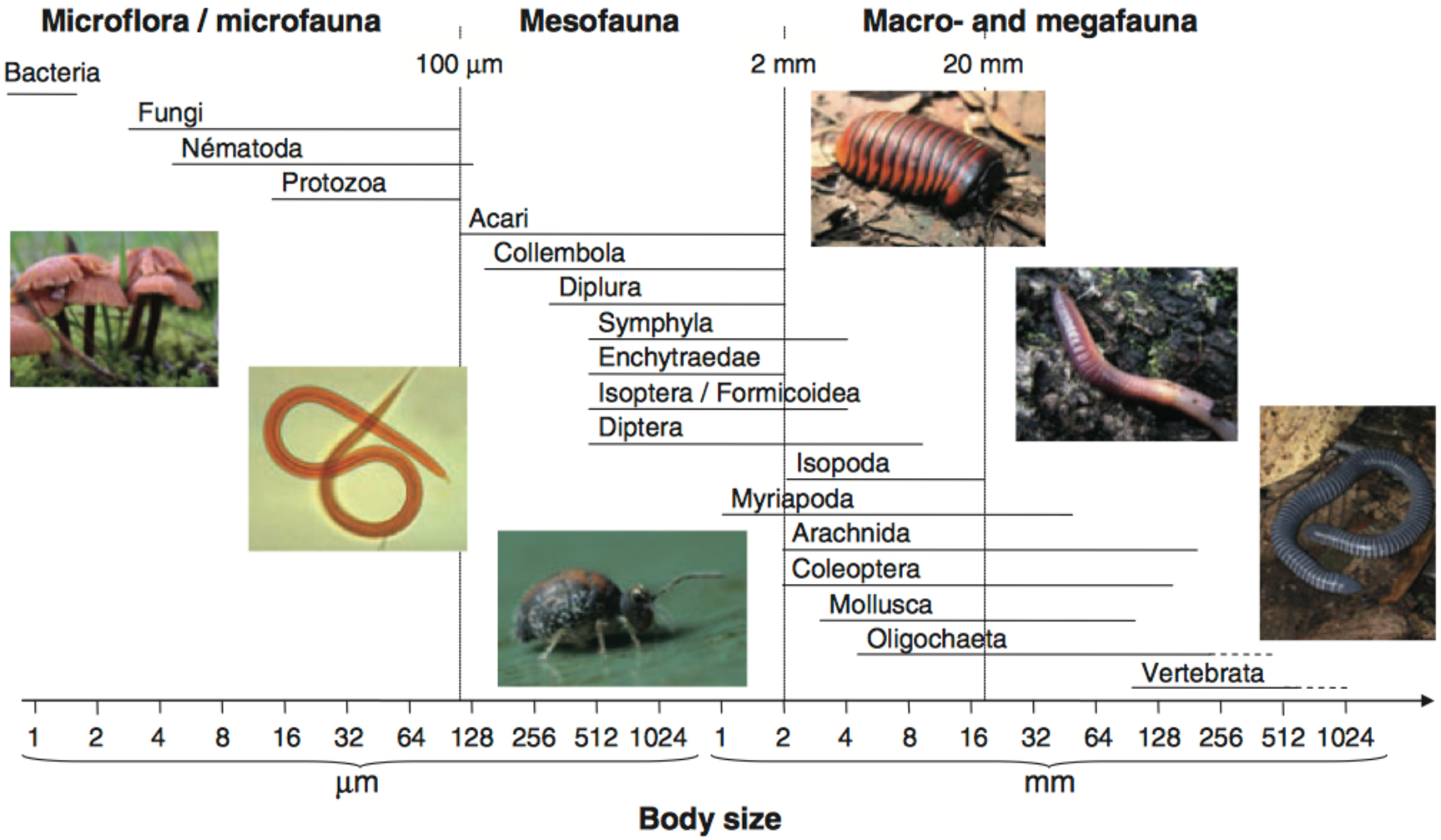


Fig 1, Decaens (2010). Global Ecology and Biogeography, 19, 287–302

Soil Biology Movies

Introduction to Soil Organisms

- Soil Fauna
  - Macro; Meso; Micro
- Soil Microorganisms
  - Fungi; Bacteria; Archaea; Protists
- Microbes account for ~50% of all biomass on Earth *(Whitman et al. 1998)*
- They are ubiquitous on the surface and deep within the earth

Soil Biology with Terry Tollefson

Whitman et al. (1998). Proc Nat Acad Sci 95: 6578–6583

Soil as a habitat

"In soil, biological communities survive, reproduce and die in a complex 3D, physical framework which has variable geometry, composition and stability over spatial scales of several orders of magnitude, from nanometres upwards."

(Young & Ritz, 1998. Soil Biol & Biochem 30: 1229-32)

Picture: Reganold (1990). Sci Am 262: 112-120