

THE TAXONOMIC HIERARCHY

1. The basic premise: Biological diversity shows complex patterns of relationships.
2. Individuals that are closely related are classified into a species
3. In other cases, we see individuals that share many, some, or hardly any similarities.
4. We deal with varying degrees of similarities by setting up a hierarchical classification
5. A few points about species:
 - a. Species are typically defined by reproductive isolation.
 - b. In some groups (plants, fungi), determining reproductive isolation can be problematic.
 - c. In other groups (bacteria), the species concept is debatable.

THE TAXONOMIC HIERARCHY II

6. Biologists use an eight level system to express varying levels of biological diversity

Domain
Kingdom
Phylum
Class
Order
Family
Genus
Species

7. Classification is created by humans; can undergo changes over time

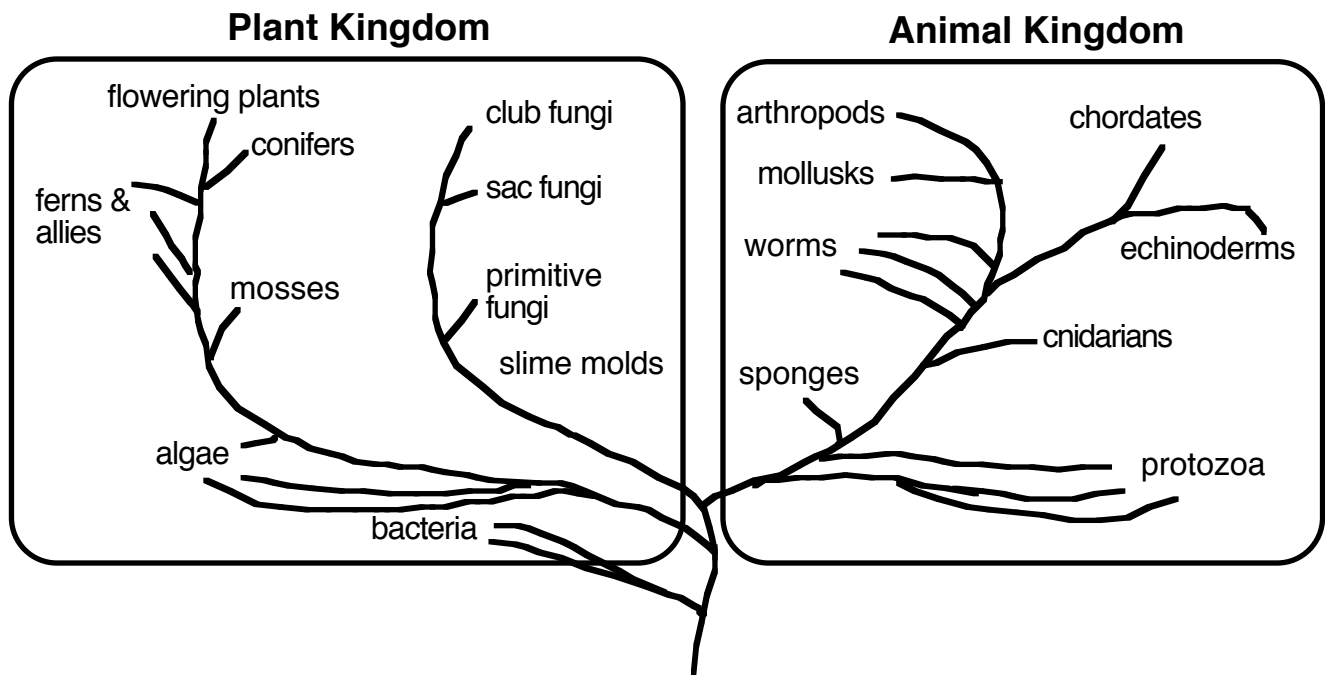
8. Sometimes we insert intermediate categories: sub, super

9. Example of the hierarchy for two species.

<u>Rank</u>	<u>Human</u>	<u>Corn</u>
Domain	Eukaryota	Eukaryota
Kingdom	Animalia	Plantae
Phylum	Chordata	Anthophyta
Class	Mammalia	Monocotyledones
Order	Primates	Poales
Family	Hominidae	Poaceae
Genus	<i>Homo</i>	<i>Zea</i>
Species	<i>Homo sapiens</i>	<i>Zea mays</i>

Approaches to Organismal Classification

2-Kingdom System

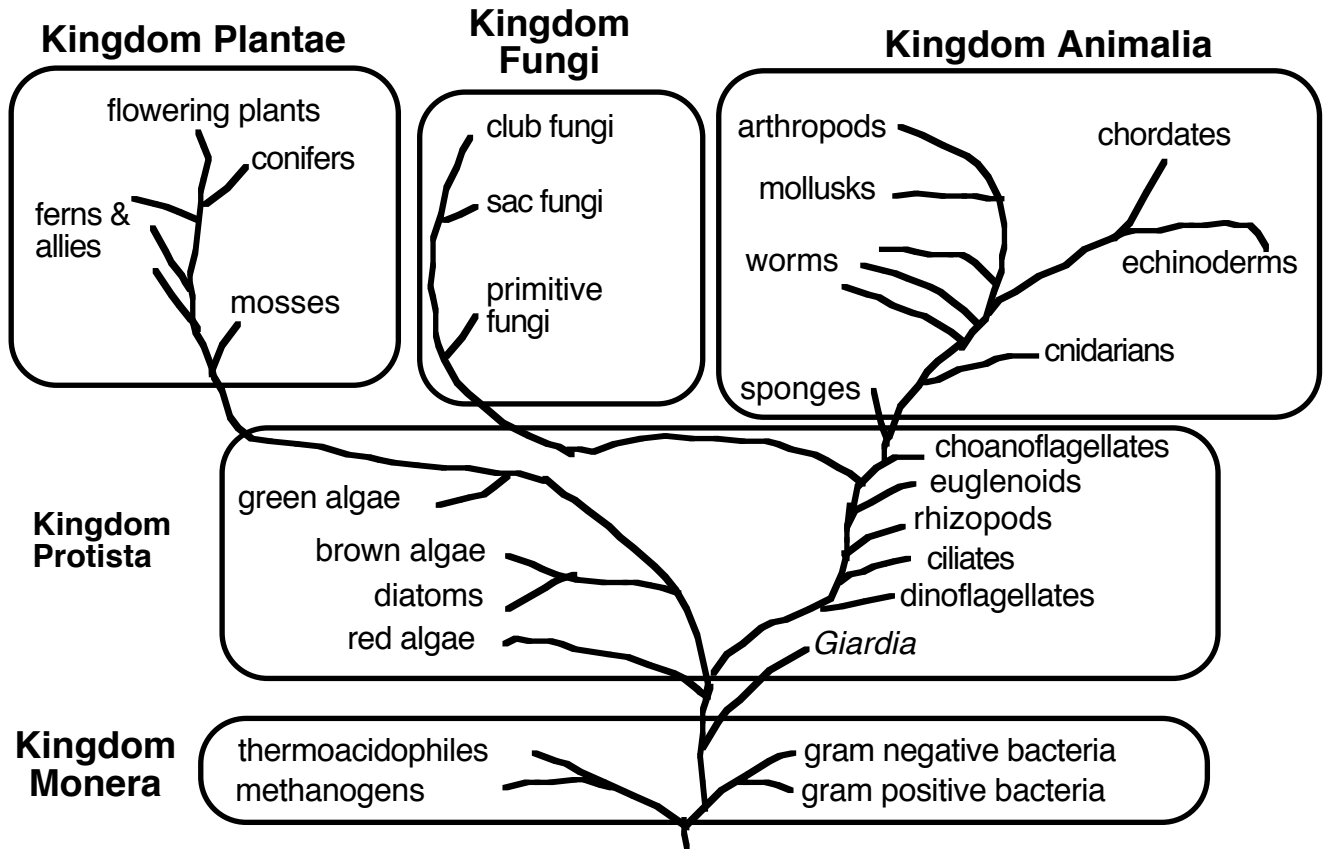


Features of Each

<u>Characteristic</u>	<u>Plant Kingdom</u>	<u>Animal Kingdom</u>
Typical body parts	Stem, leaves, roots	Arms, legs, wings
Nutrition	Autotrophy	Heterotrophy
Typical color	Usually green	Usually not green
Cell wall	Present	Absent
Nervous system	Absent	Present
Capacity for movement	Usually none	Usually well

Approaches to Organismal Classification

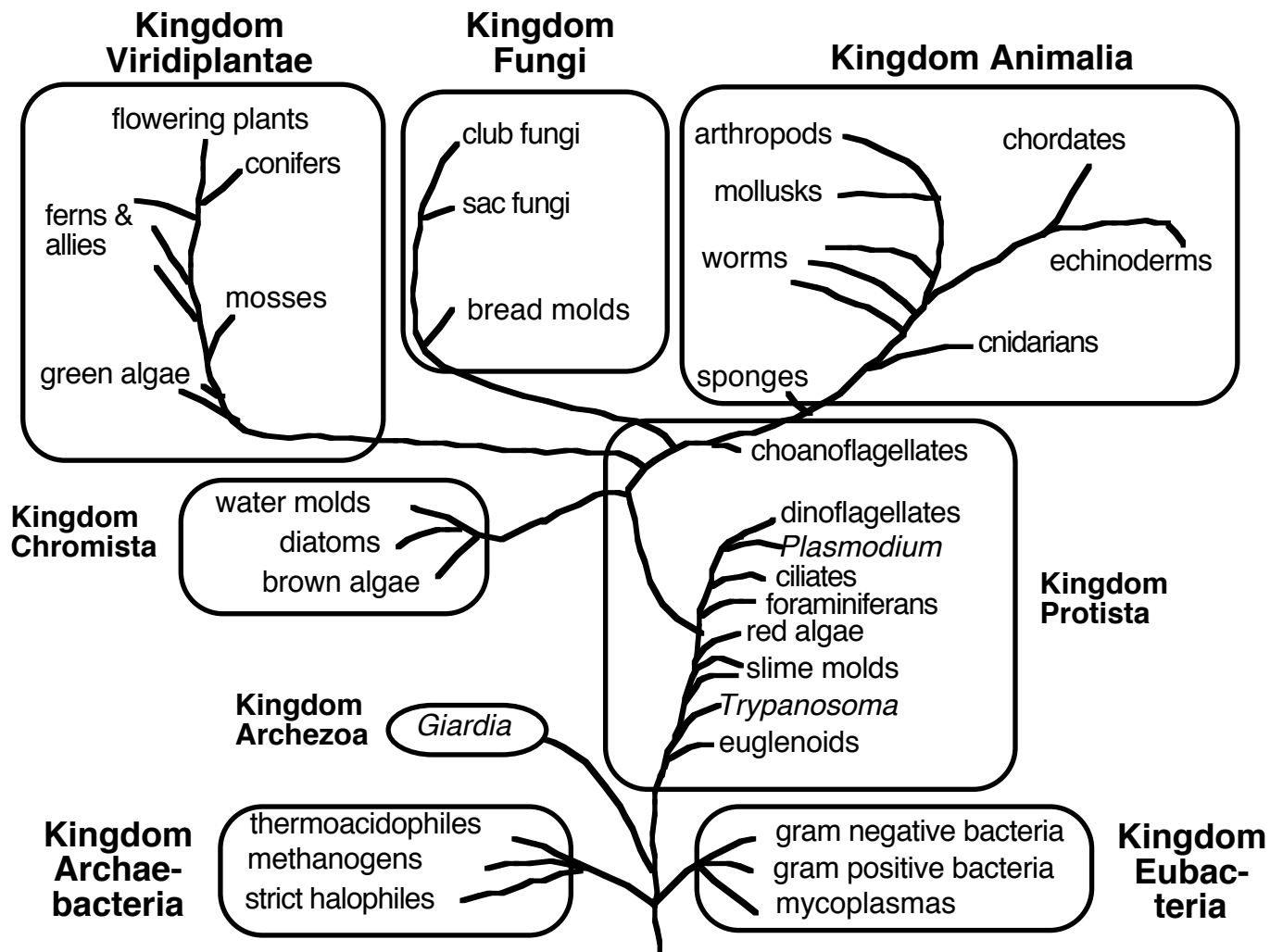
R.H. Whittaker's 5-Kingdom System



Kingdom	Cell type	Nutrition	Body type	Cell wall
Monera	Prokaryotic	Autotrophy & heterotrophy	Unicellular and colonial	Peptidoglycan
Protista	Eukaryotic	Autotrophy & heterotrophy	Unicellular and multicellular	Variable
Fungi	Eukaryotic	Heterotrophy (absorption)	Filamentous	Chitin
Animalia	Eukaryotic	Heterotrophy (ingestion)	Multicellular	None
Plantae	Eukaryotic	Autotrophy (photosynthesis)	Multicellular	Cellulose

Approaches to Organismal Classification

An 8-Kingdom System



Kingdom Summary

Eubacteria - "Typical" prokaryotes including gram negatives and gram positives

Archeobacteria - Prokaryotes differing from eubacteria in physiology, cell wall, and membrane chars.

Archezoa - Unicellular eukaryotes that lack mitochondria

Protista - Eukaryotes; mostly unicellular and heterotrophic, some with chloroplasts

Chromists - Heterokont eukaryotes (have two dissimilar flagella)

Animalia - Multicellular, heterotrophic eukaryotes that ingest their food

Fungi - Unicellular or filamentous, heterotrophic eukaryotes that absorb their food

Plantae - Multicellular, photosynthetic eukaryotes with distinct alternation of generations

Approaches to Organismal Classification

D. Some current approaches

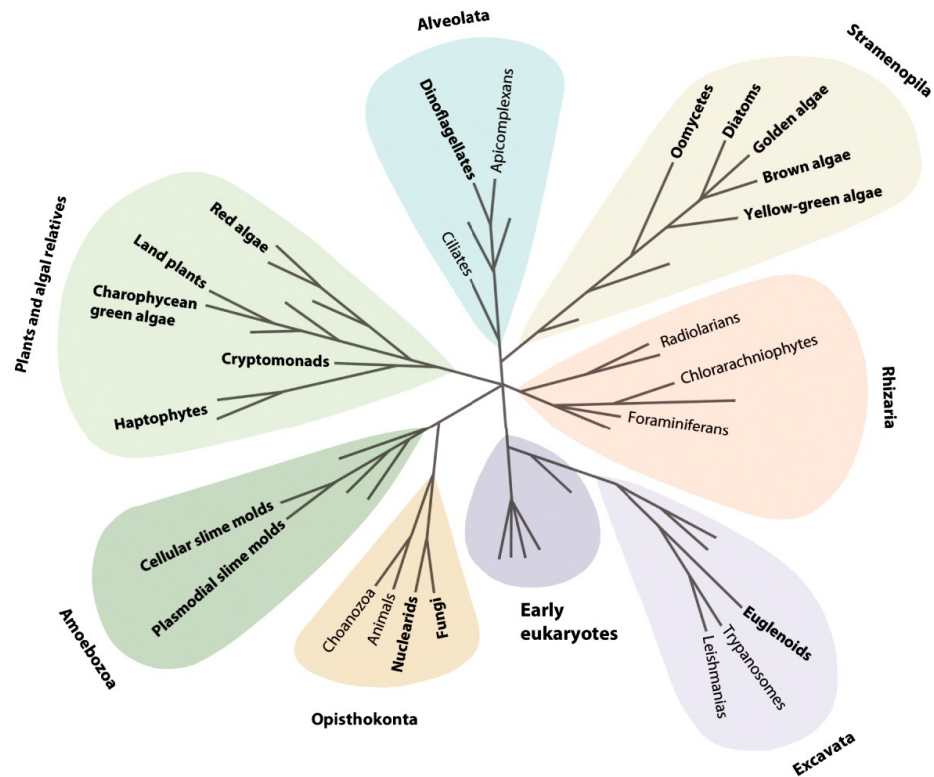
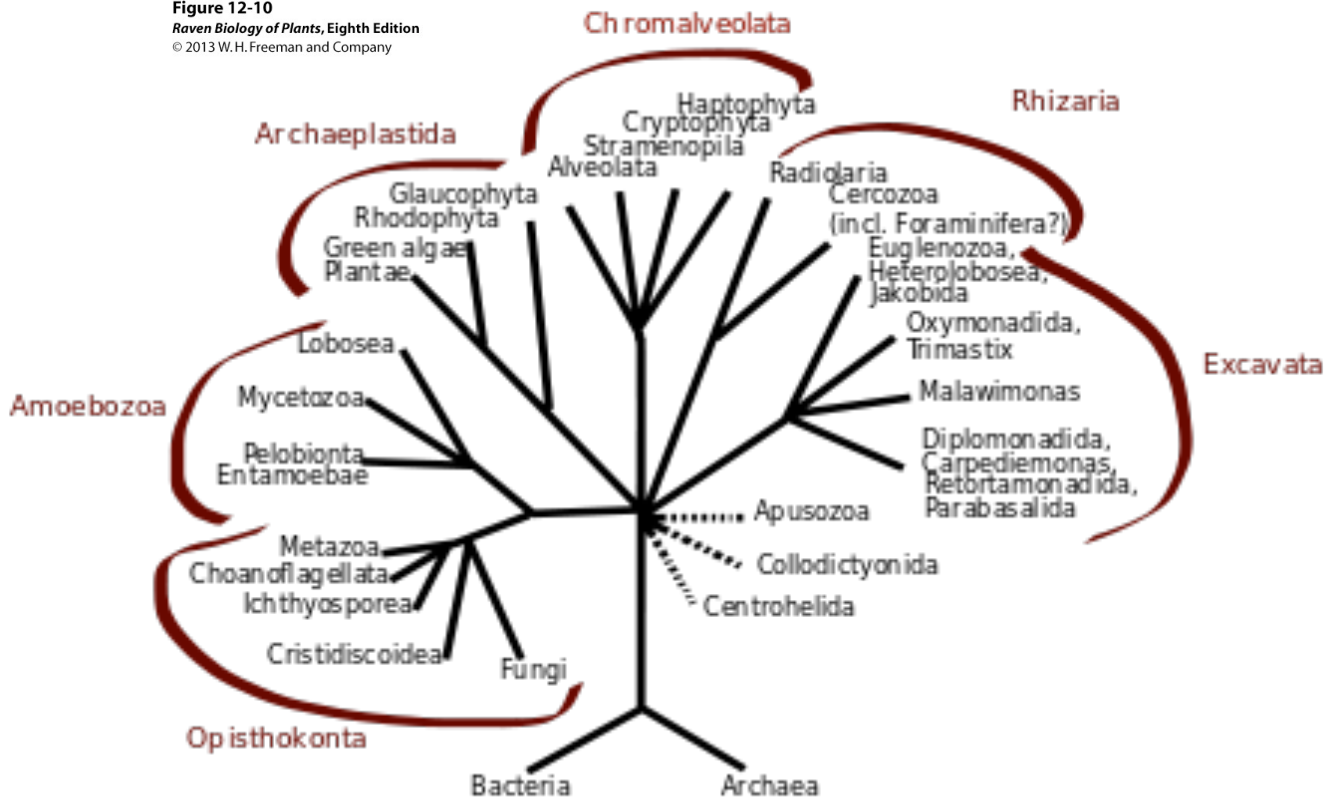
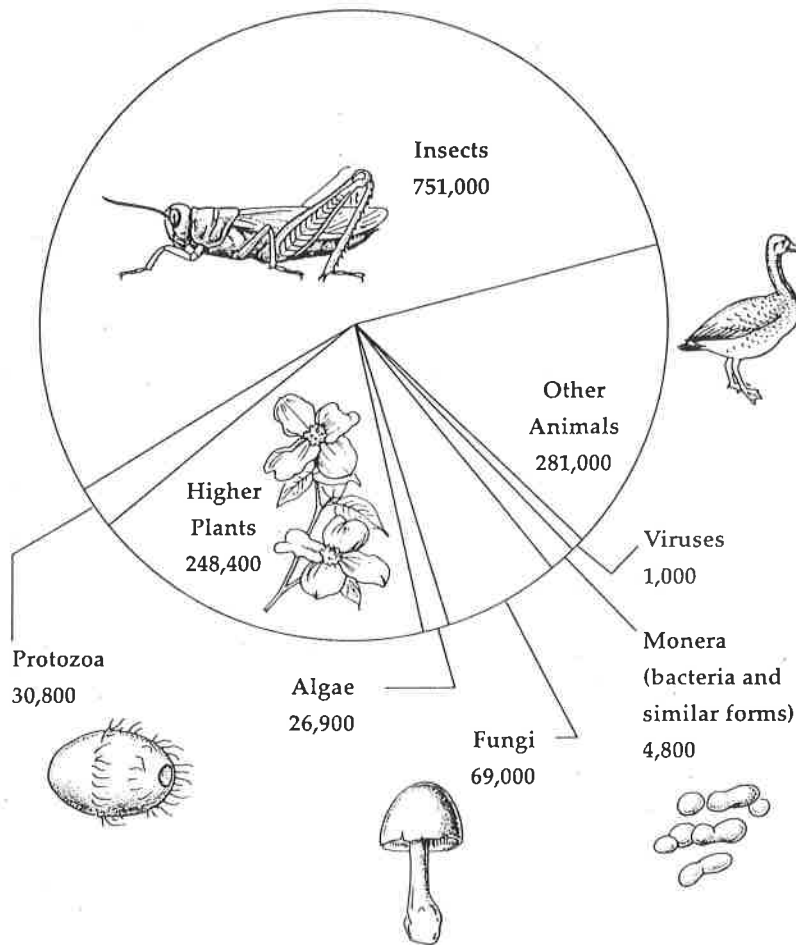


Figure 12-10
Raven Biology of Plants, Eighth Edition
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Number of Living Species of All Kinds of Organisms Currently Known (According to Major Group)

ALL ORGANISMS: TOTAL SPECIES, 1,413,000

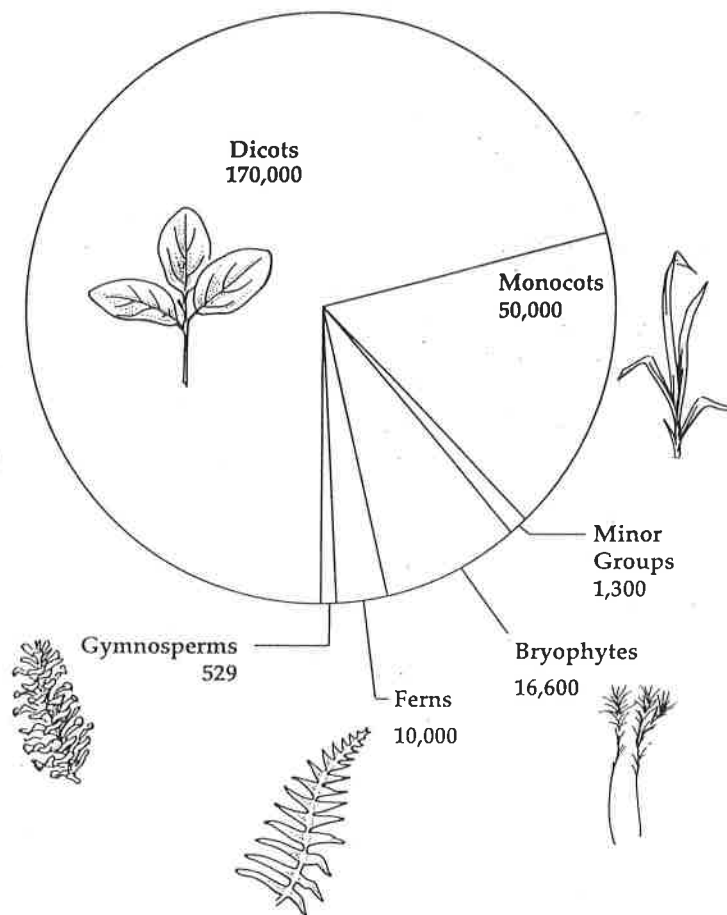


Insects and higher plants dominate the diversity of living organisms known to date, but vast arrays of species remain to be discovered in the bacteria, fungi, and other poorly studied groups. The grand total for all life falls somewhere between 10 and 100 million species.

From Wilson, E.O. (1992) *Diversity of Life*.

**Number of Living Species of Higher Plants
Currently Known
(According to Major Group)**

HIGHER PLANTS: TOTAL SPECIES, 248,000



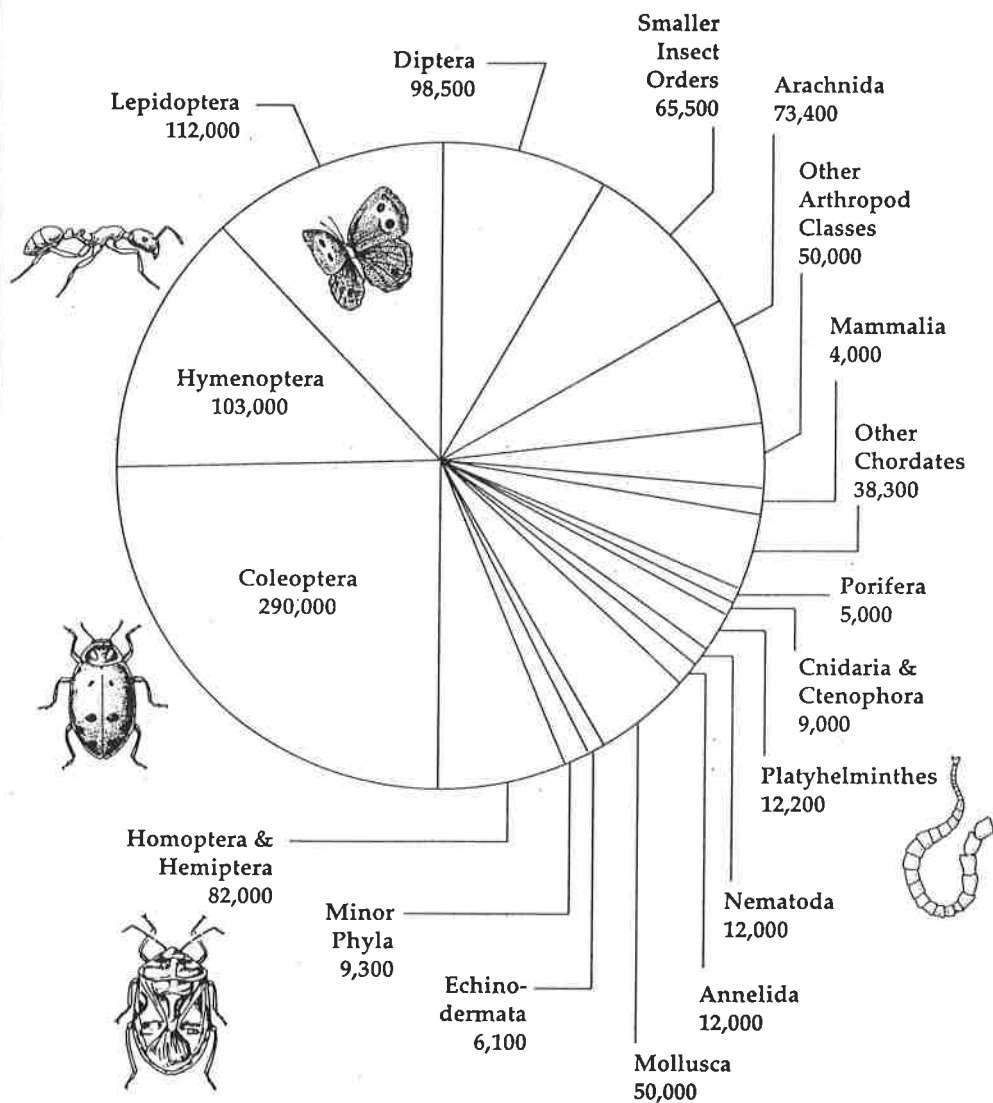
The plant diversity of the world consists primarily of angiosperms (flowering plants), which in turn make up grasses and other monocots and a huge variety of dicots, from magnolias to asters and roses. Most flowering plants live on the land; algae (26,900 known species) prevail in the sea.

From Wilson, E.O. (1992) *Diversity of Life*.

Number of Living Animal Species Currently Known

(According to Major Group)

ANIMALS: TOTAL SPECIES, 1,032,000



Among animals known to science, the insects are overwhelming in number. Because of this imbalance, most animal species live on the land; but most phyla (Echinodermata, etc.), the highest units of classification, are found in the sea.

From Wilson, E.O. (1992) *Diversity of Life*.