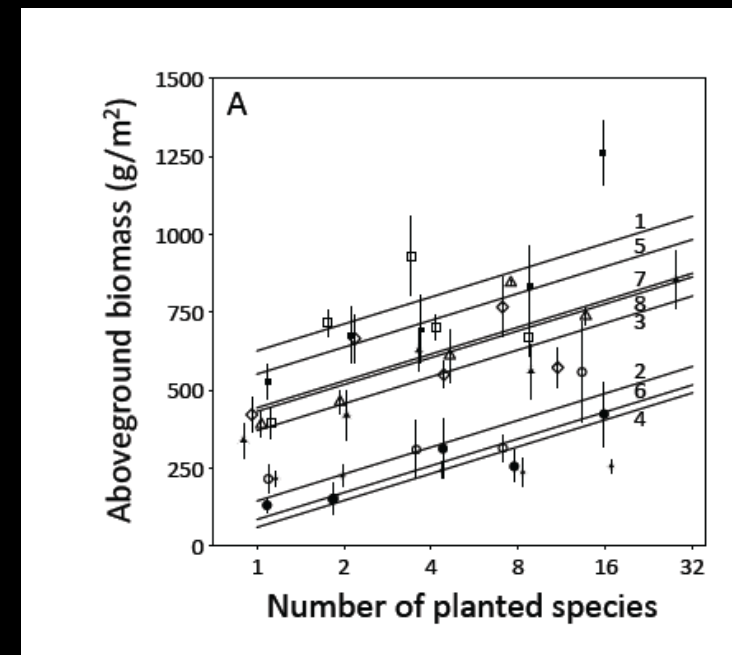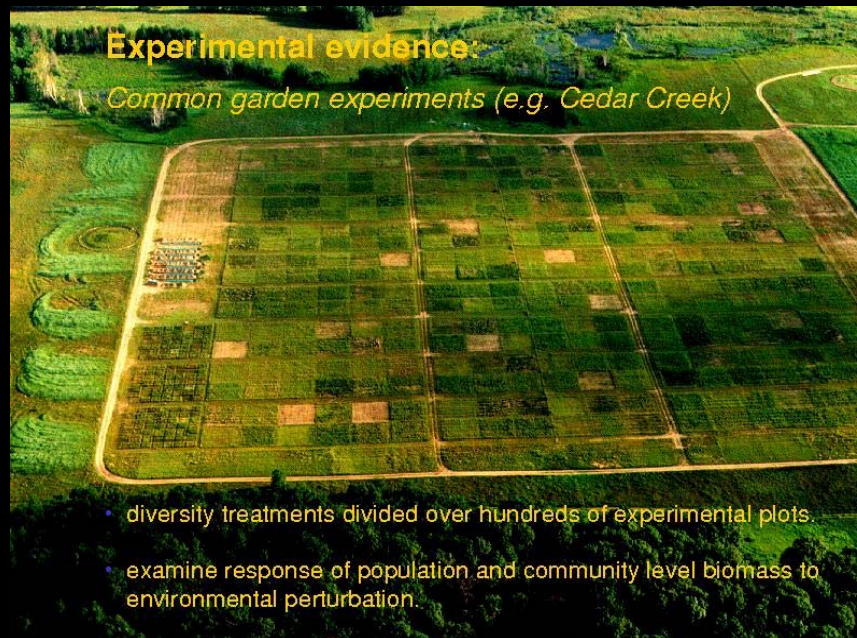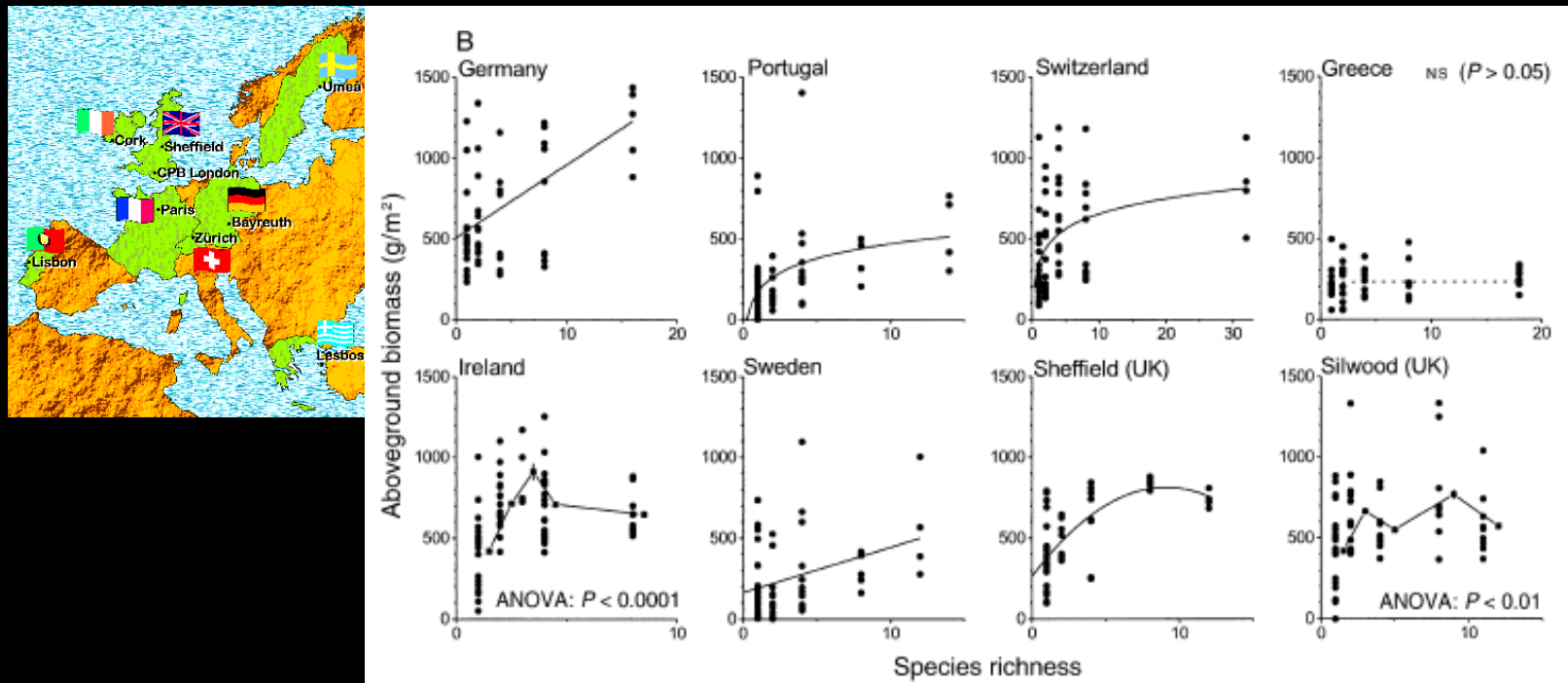# Productivity Influenced by Biodiversity in Grassland Ecosystems
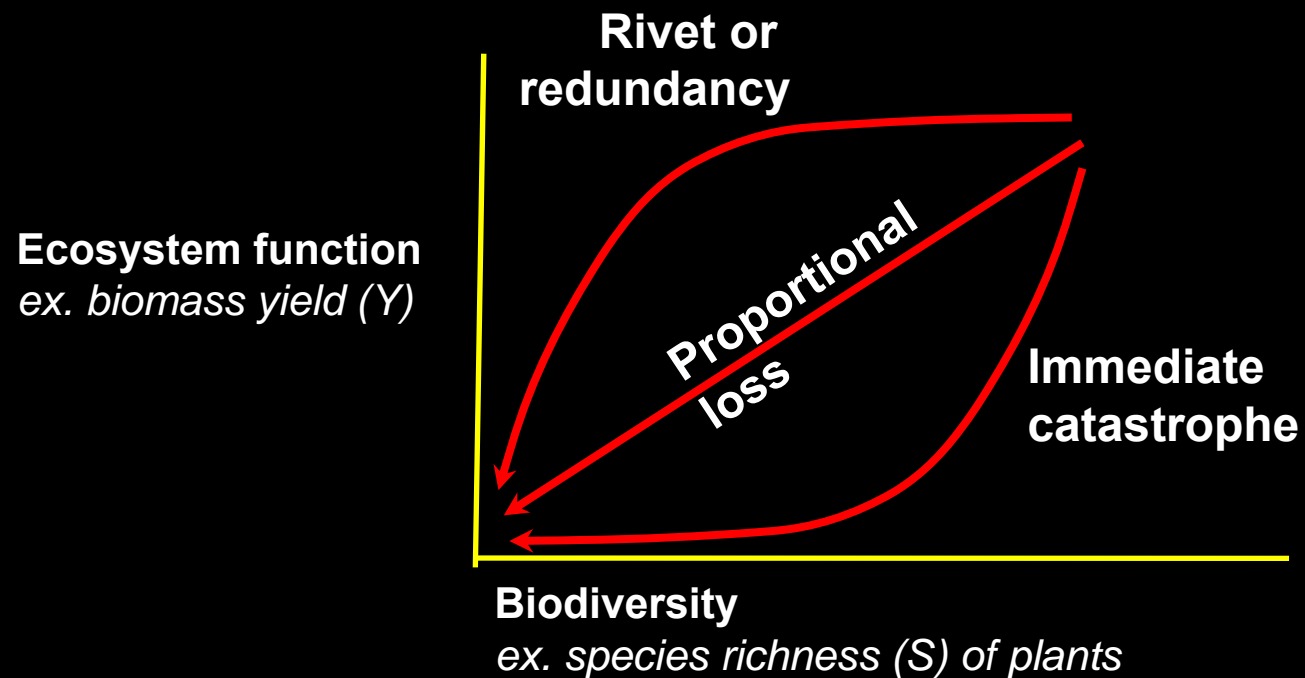
Randomly assembled plant communities

Across a larger spatial scale: the "Biodepth" experiment
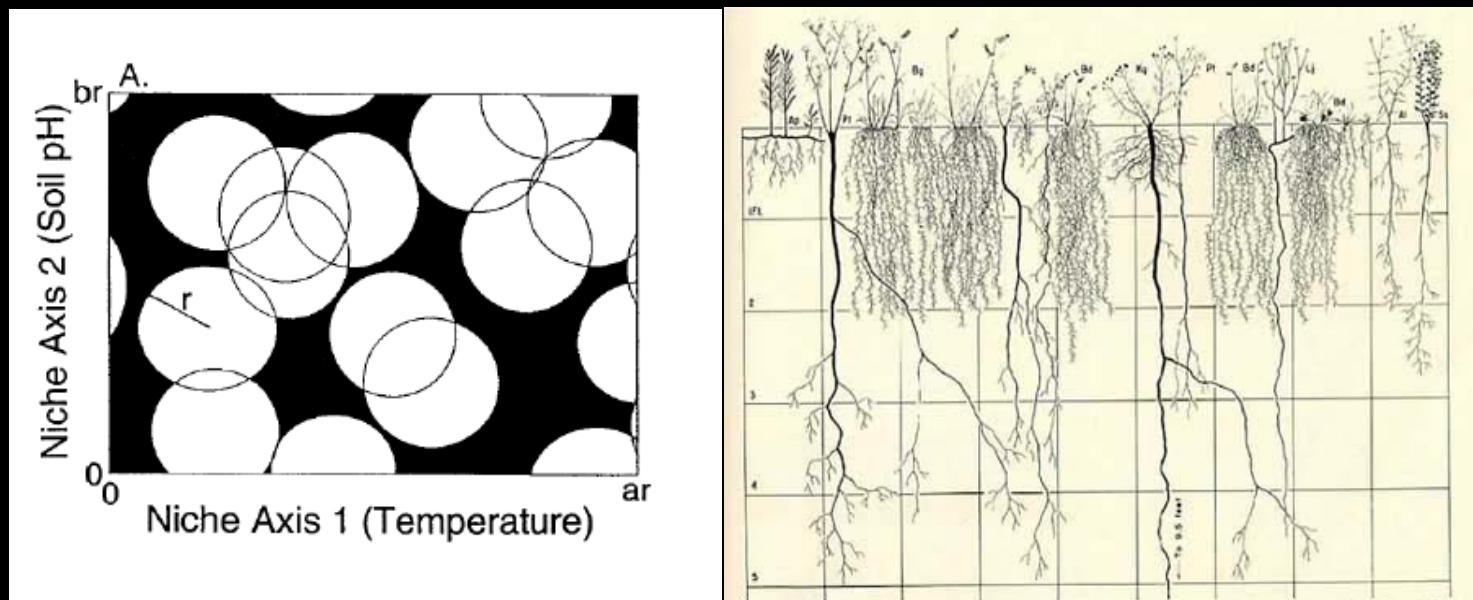
Pan-European grassland experiment

Hector et al. (2000) Science

What shape is the productivity richness relatonship in your data? Which model is it most consistent with?

What ecological processes might explain the relationship you observe in your data?

Biodiversity

The 1992 United Nations Earth Summit defined "biological diversity" as:

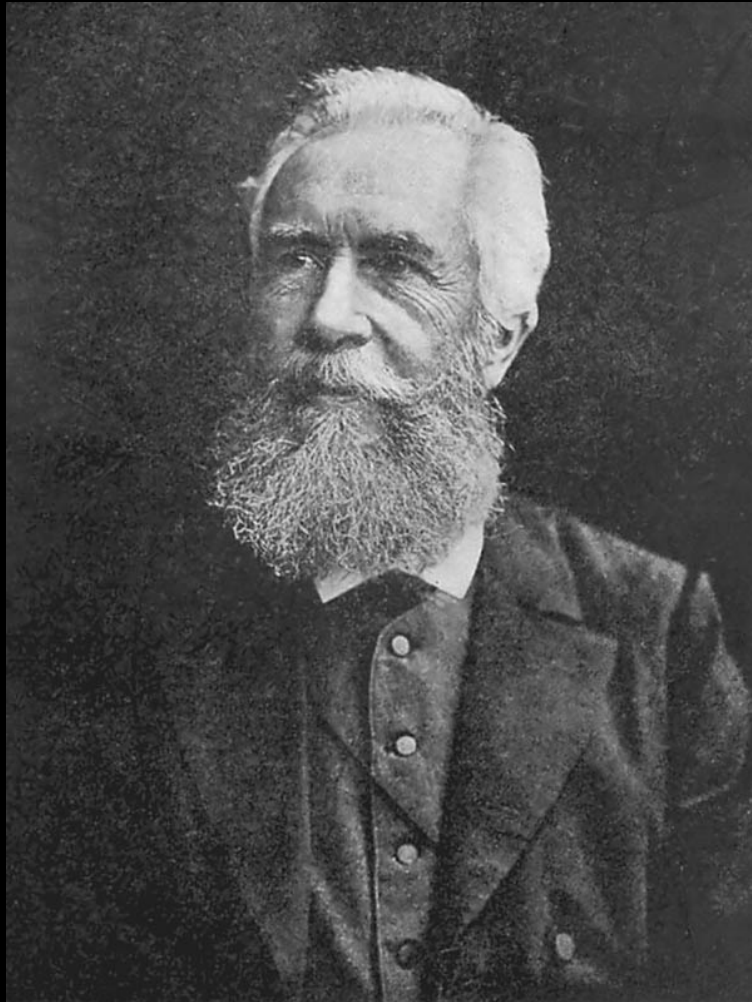 *"the variability among living organisms from all sources, including, inter alia, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part: this includes diversity within species, **between species** and of ecosystems".*

This definition is used in the United Nations Convention on Biological
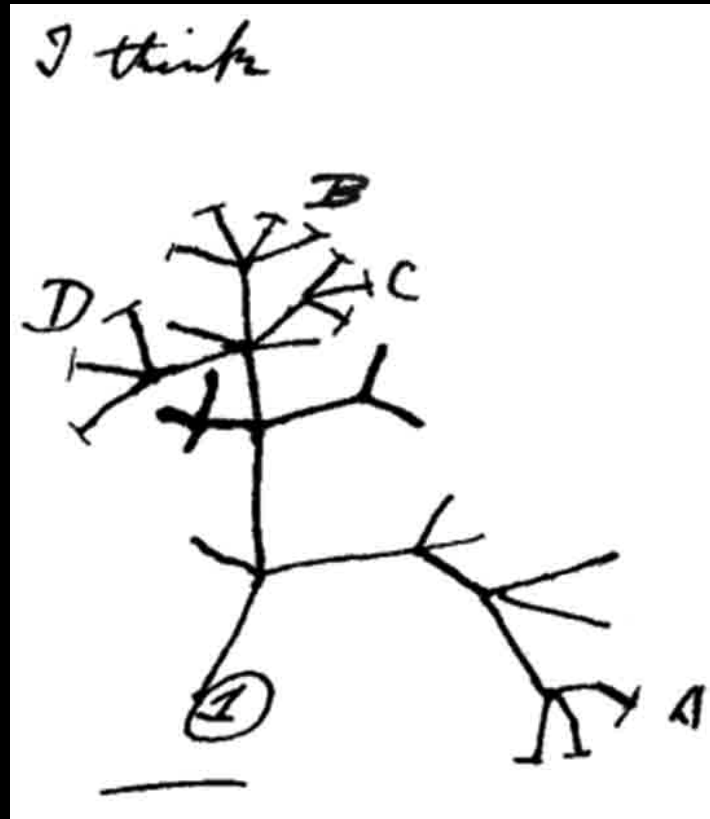
1837 Darwin started his "B" notebook
on *Transmutation of Species*

The Tree of Life

Ernst Haeckel 1834 – 1919

Monophyletischer Stammbaum der Organismen
entworfen und gezeichnet von
Ernst Haeckel. Jena, 1866.

Plantae — Protista — Animalia

Radix communis Organismorum — Moneres autogonum

I. Feld: p m n q (19 Stämme)
II. Feld: p x y q (3 Stämme)
III. Feld: p s t q (1 Stamm)
stellen 3 mögliche Fälle der universalen Genealogie dar
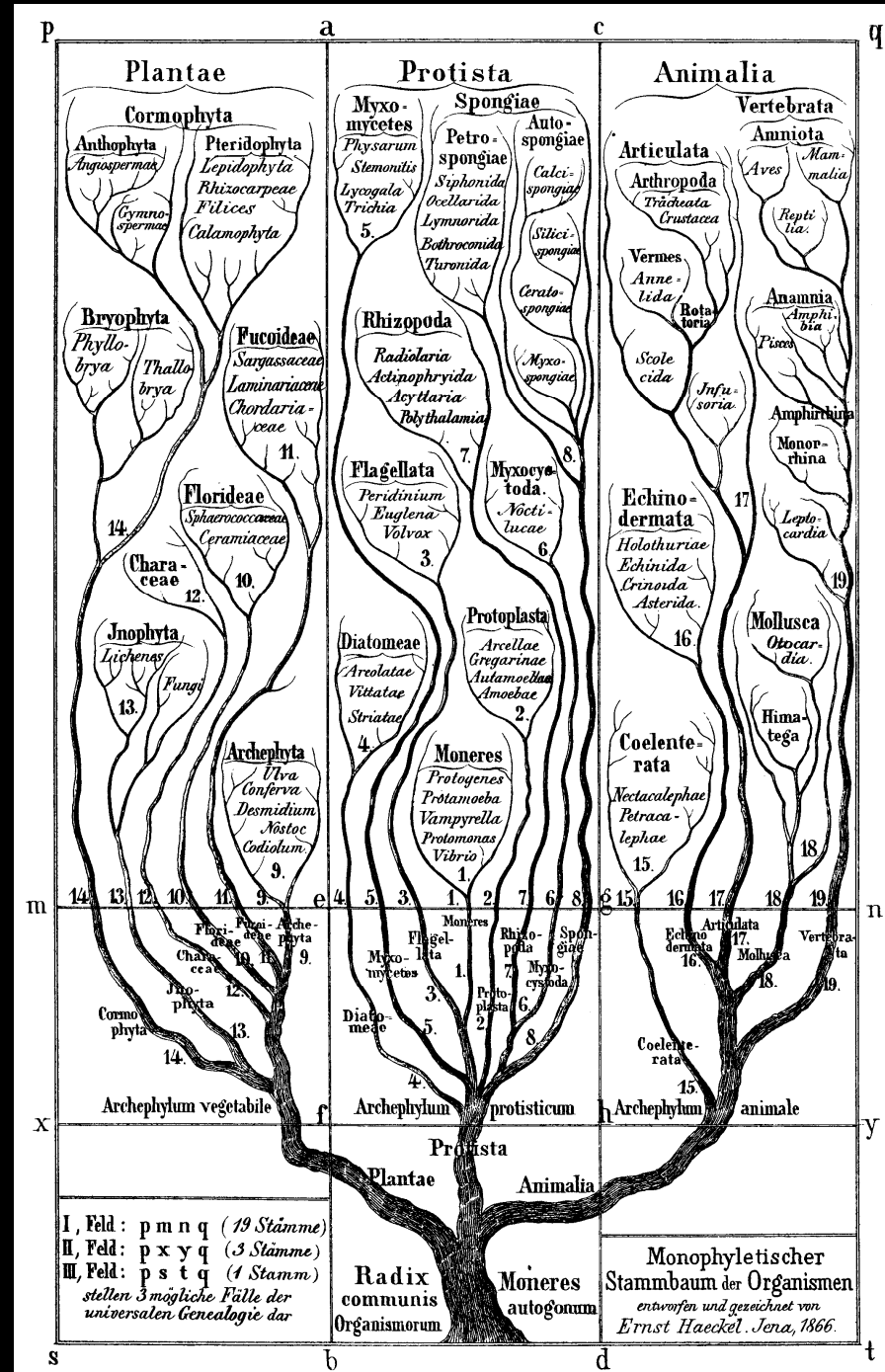
Similarity by descent

FIGURE 173. The feet of primates.

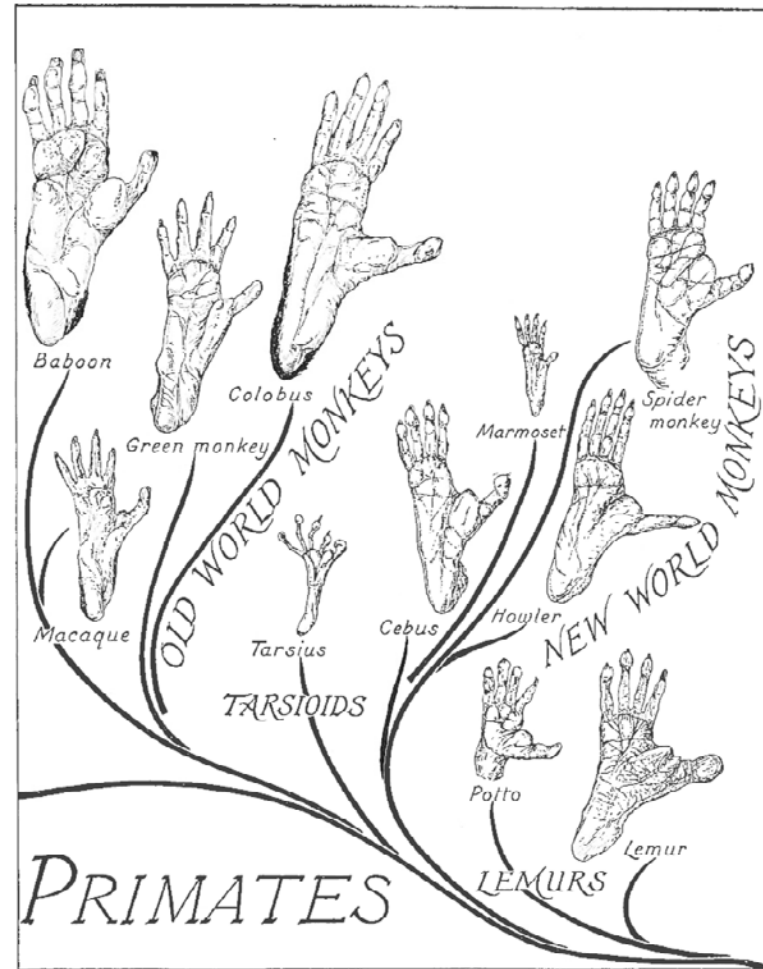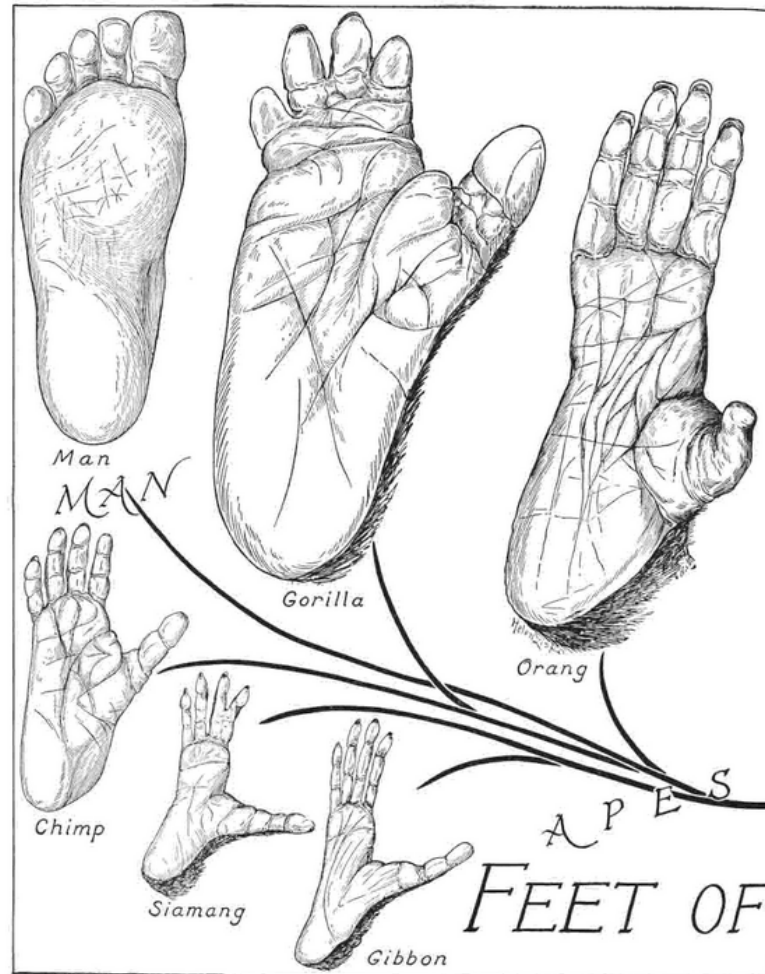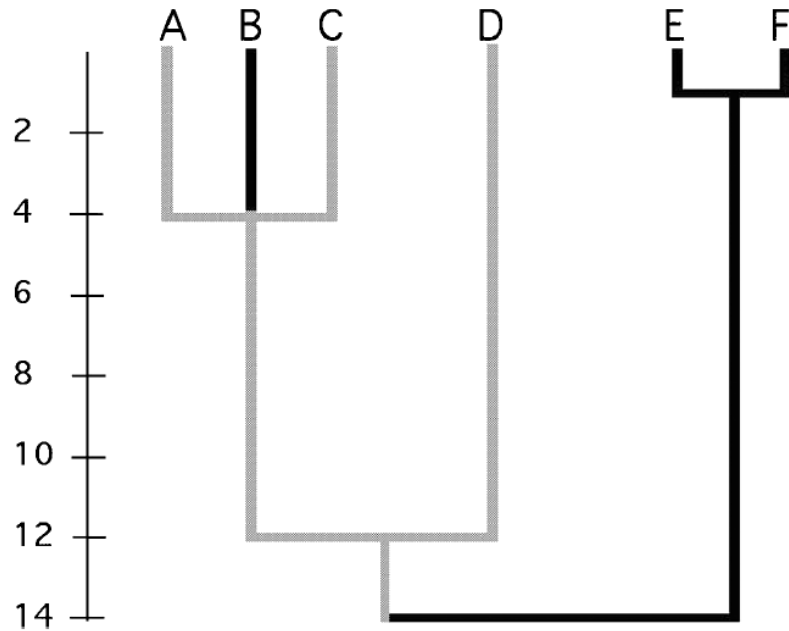Gregory, 1951, *Evolution Emerging: A Survey of Changing Patterns from Primeval Life to Man*, vol. 2, pp. 1006–1007; pl. 15.1; courtesy of Mary DeJong, Mai Qaraman, and the American Museum of Natural History. Used with permission.

Phylogenetic Diversity (PD)

a measure of evolutionary history calculated by summing the branches (edge lengths) on the phylogeny.
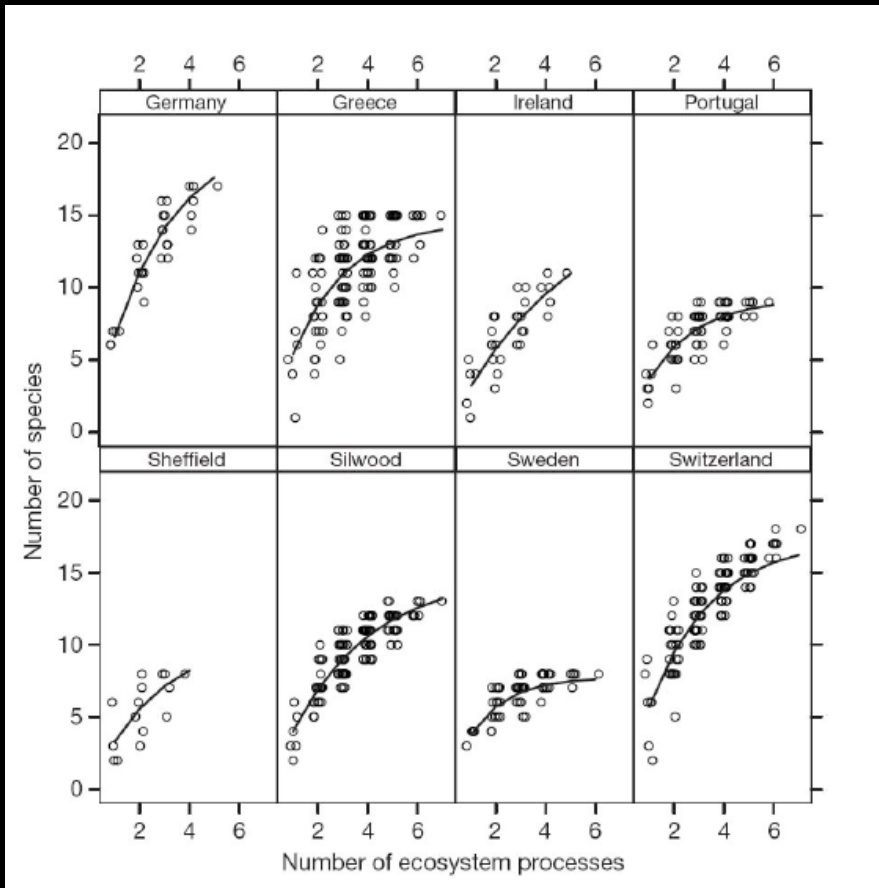
For this tree of six species, total PD = 49 my (million years), the sum of all the branch lengths of the tree.

The assemblage of species A, C, D (in grey) encompasses 30 my of PD.

Mooers et al. 2005

Phylogenetic Diversity (PD)

More species more function

More phylogenetic diversity more function

Hector & Bagchi 2007
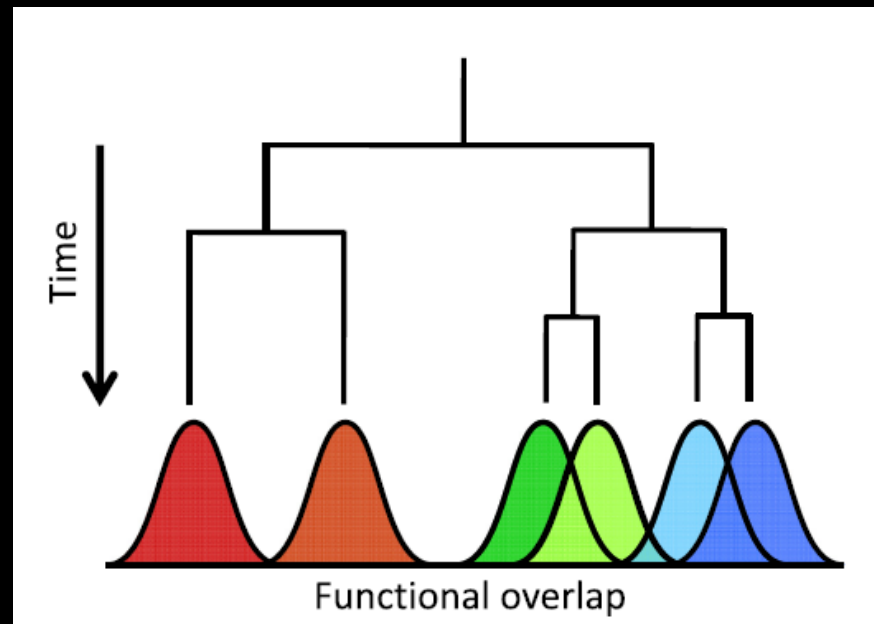
Davies et al. 2016

- Write R code to generate a scatter plot of PD against biomass with the plot data from last week and the phylogenetic tree downloaded from Canvas.

- Construct a linear model of PD against biomass and compare its fit (explanatory power) to the model of species richness against biomass.

- Transform the branch lengths of the phylogeny, and examine whether this improves model fit.

Written Report – both tutorials combined (10%)
Length 500-800 words

R code to generate linear model of species richness against biomass and scatter plot with regression line (3/5)

Description of richness – productivity relationship and generating model (1/5)
Describe shape of the observed relationship expectations from different possible mechanisms. What mechansims does your model support, how confident are you?

Written Report – both tutorials combined (10%)
Length 500-800 words

R code to generate linear model of species
richness against biomass and scatter plot with
regression line (3/5)

Discuss the likely **ecological** process(es) that you
think have shaped the observed richness-biomass
relationship (1/5)
Consider the alternatives and how you might test
your hypothesis.

Written Report – both tutorials combined (10%)
Length 500-800 words

R code to generate linear model of PD against biomass and scatter plot with regression line (3/5)

Discuss whether this is model is a better fit than the model with species richness (1/5)
What did you predict? Did the model support your predictions?

Written Report – both tutorials combined (10%)
Length 500-800 words

R code to generate linear model of PD against biomass and scatter plot with regression line (3/5)

How did transforming the branch lengths alter your Results? (1/5)
Discuss possible reasons why this phylogeny was a better/worse in explaining variation in biomass.