Biomass by diameter

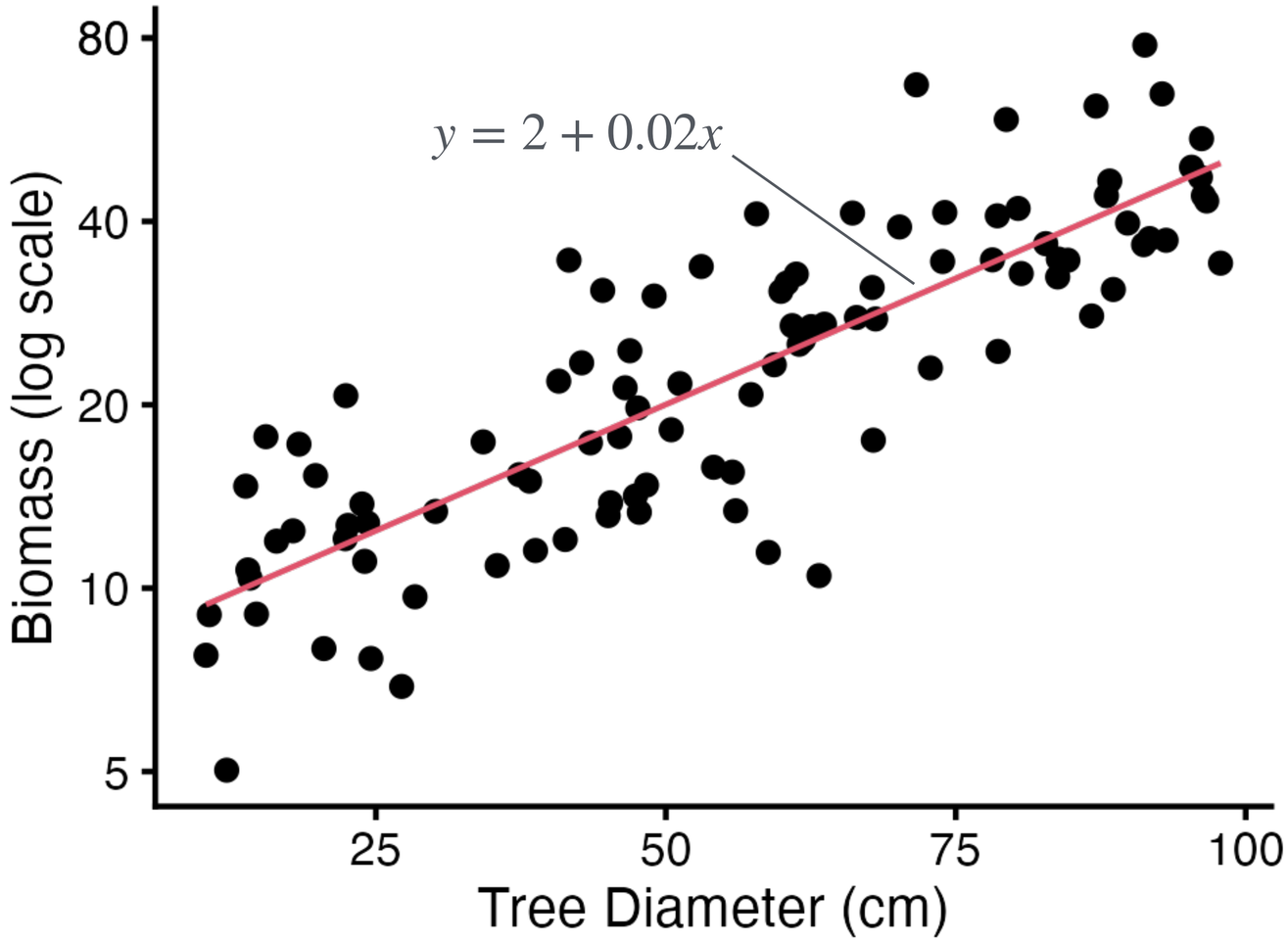
Example of non-linear relation

Option 1: log-transform y

```
df = data.frame(diameter, biomass)
stan_fit = stan_glm(log(biomass) ~ diameter,
                    data = df)
```

Option A: Assign y a log-normal likelihood

```
rt_fit = ulam(alist(
            biomass ~ lognormal(mu, sigma),
            mu <- a + b*diameter,
            a ~ normal(0, 2),
            b ~ normal(0, 1),
            sigma ~ exponential(1)),
        data = df, chains = 4, cores = 4)
```



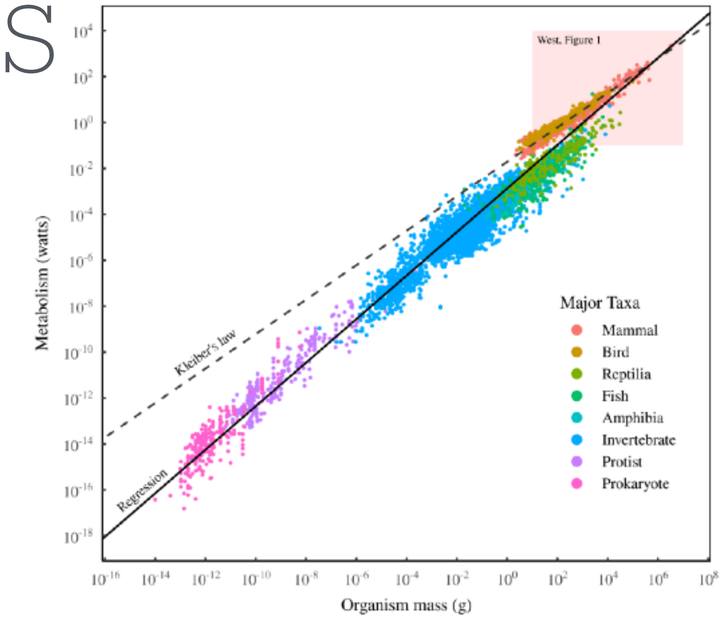
Power-law relations

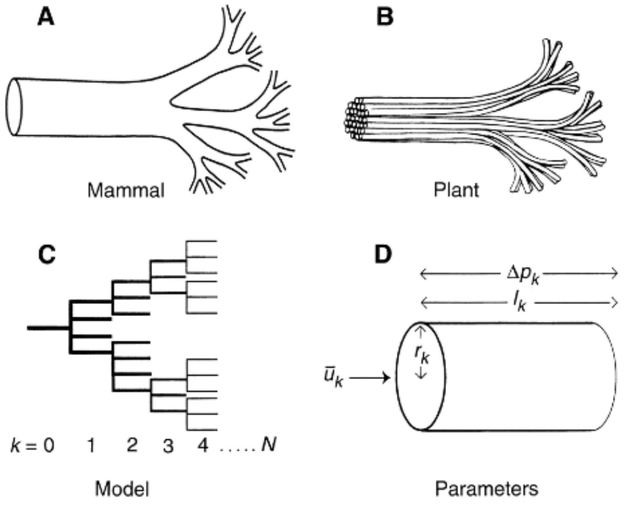
Log-log regressions

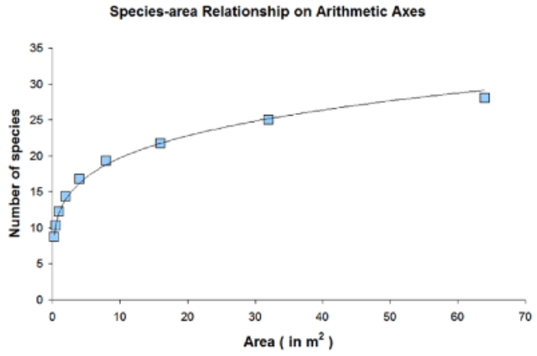
- Several biological relations take the form of power-law relations

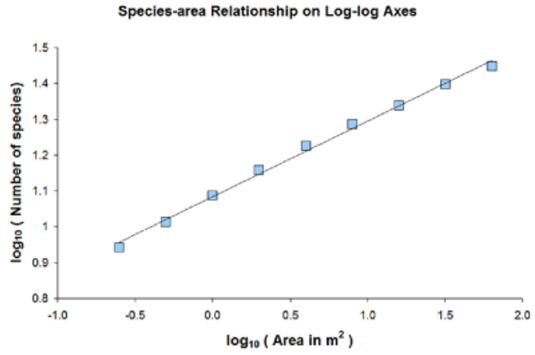
$$y \propto ax^b$$

- These appear for different reasons:
  - West et al. (1997) attempt to link scaling laws to fractal relations at different scales
  - Every time a proportional increase leads to a consistent proportional change (like in species-area relations)









West, G. B., Brown, J. H. & Enquist, B. J. A general model for the origin of allometric scaling laws in biology. *Science* **276**, 122–126 (1997).