resistance tradeoff theory.

- phenotypes of sexual and asexual individuals are different beyond their resistance alleles

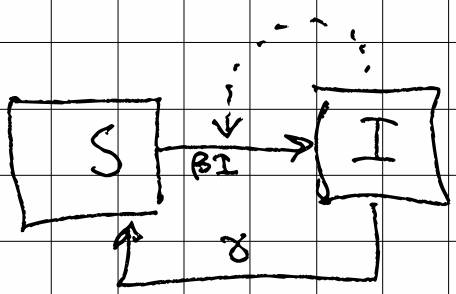
what if sexuals are just 'better' (e.g. invest more energy) at resisting parasites and asexuals are 'better' at competing?

Fisher. equal sex ratios?

frequency-dependence argument

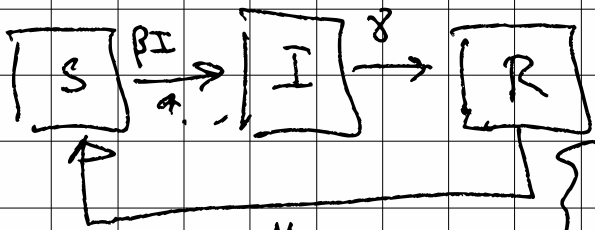
- every offspring has a ♂ and a ♀ parent
- therefore parents of the rarer sex get a higher prop of offspring.
  - ◇ evolutionarily stable strategy

SIS vs SIRS



$$\frac{dS}{dt} = -\beta SI + \gamma I$$

$$\frac{dI}{dt} = +\beta SI - \gamma I$$



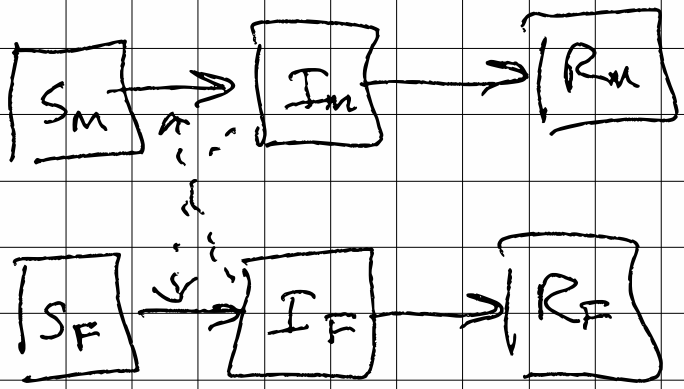
waning immunity

pathogen evolution

$$\frac{dS}{dt} \equiv -\beta SI + \mu R$$

$$\frac{dI}{dt} = +\beta SI - \gamma I$$

$$\frac{dR}{dt} = +\gamma I - \mu R$$



gamma (γ) = recovery rate

Mu (μ) = rate of waning immunity OR immunity loss

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estimating R_0

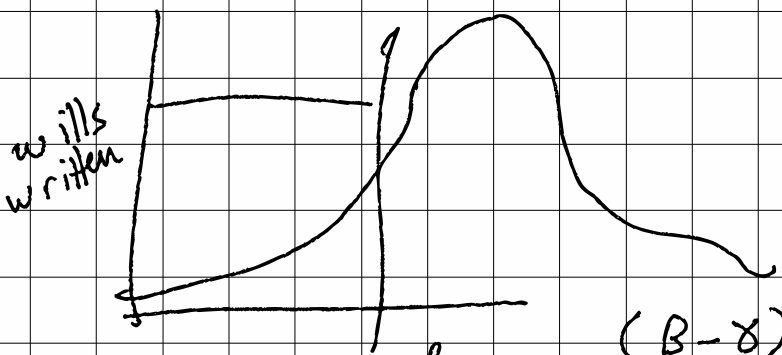
- measure exposure (find out how many indiv are S)
  - * serosurvey
  - * survey

(equilibrium/endemic)

$$R_0 \left(\frac{S^*}{N}\right) = 1$$

$$\rightarrow R_0 = \frac{N}{S^*} = \frac{1}{\left(\frac{S^*}{N}\right)}$$

measure rate of epidemic growth



exponential : $e^{(\beta-\gamma)t}$ ← r

$r, \gamma \longrightarrow \frac{\beta}{\gamma} = R_0$

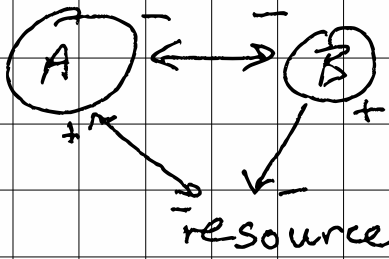
- may be able to get β directly
  (STDs) (or vector-borne) — γ — CONTACT TRACING

- age-structured seroprevalence

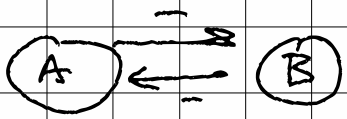
$\frac{1}{R_0} = \left(\frac{A}{L}\right)$ age at infection / lifespan

exploitation,
interference,
apparent
competition.

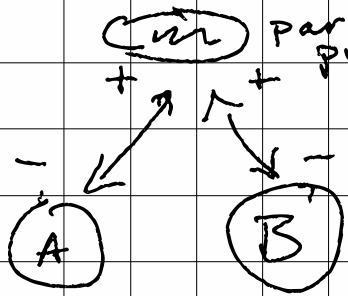
COMPETITION: negative/negative interaction



exploitation



interference



apparent