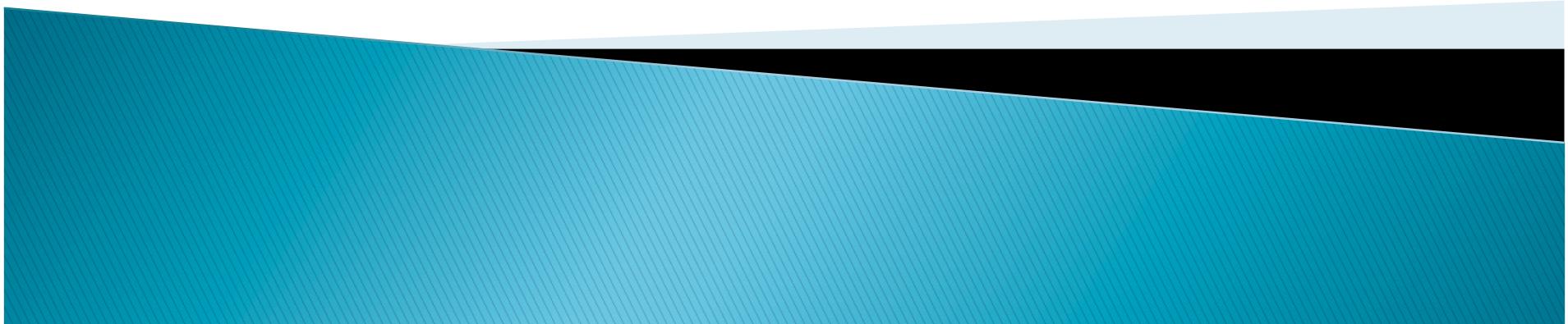


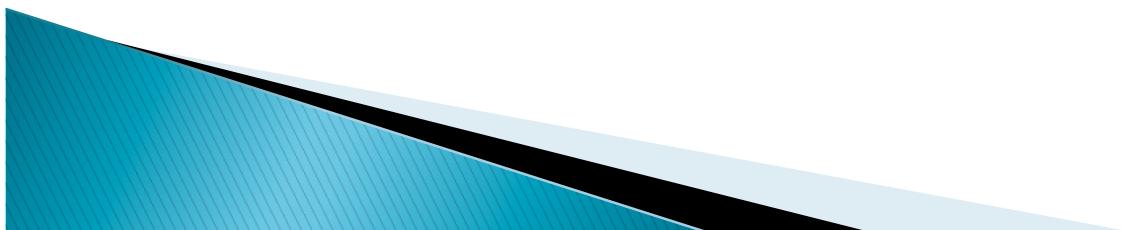
# A Very Brief Overview of the History of Ecology

Jake Dittel and Chris Moore  
Bio 322: Experimental Field Ecology  
29 May 2013



# Ecology

- ▶ Ecology *is not* synonymous with environmentalism, natural history, or environmental science.
- ▶ Ecology is the study of the relationships that living organisms have with respect to each other and their natural environment.



# Environmentalism

- ▶ Broad philosophy, ideology, and social movement concerning the preservation and conservation and health of the environment.



# Natural History

- ▶ The study of natural objects especially in the field from an amateur or popular point of view (not scientific).
- ▶ Observational study of plants or animals.
  - Can also include photography, painting, and other art forms

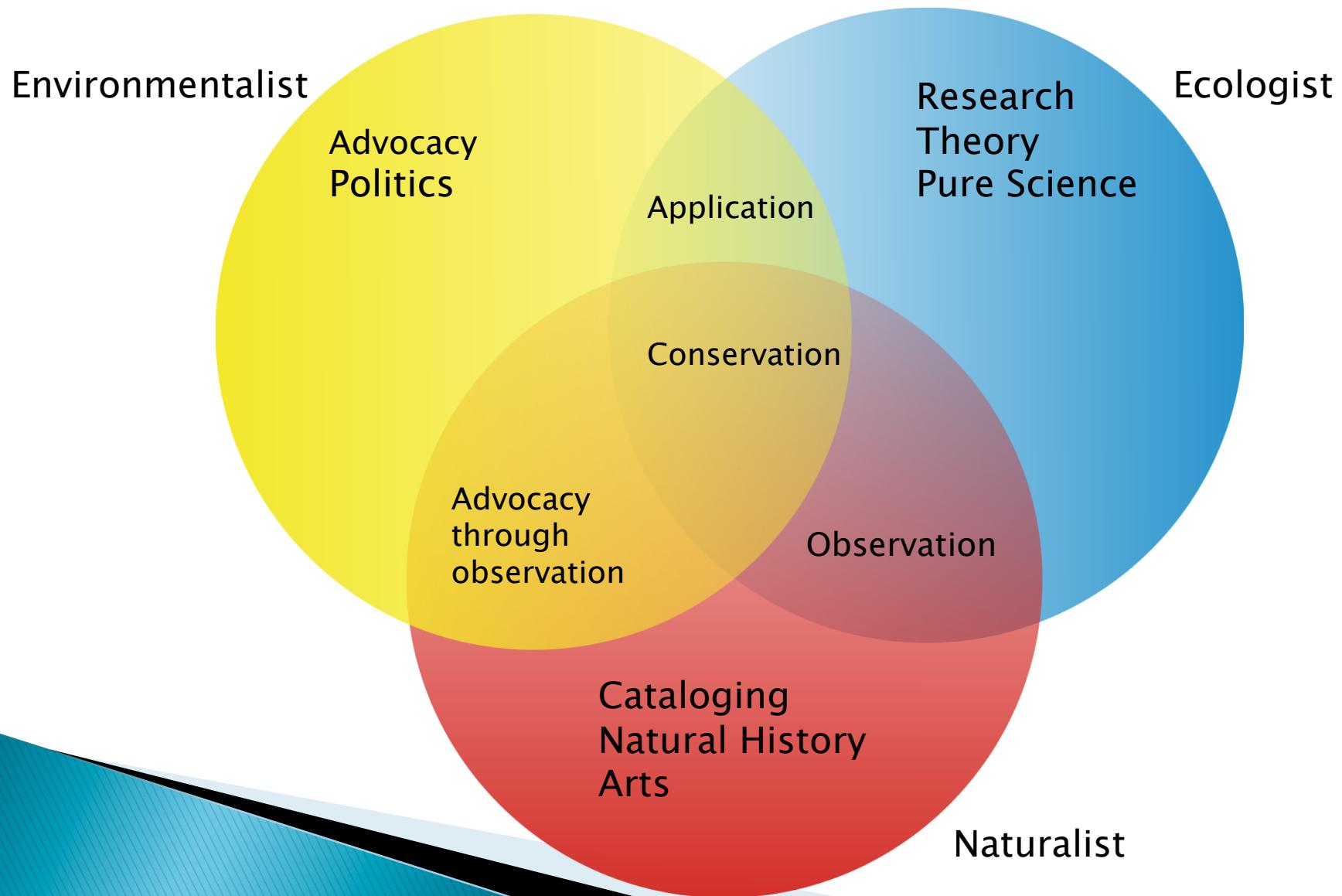


# Environmental Science

- ▶ Interdisciplinary field that includes ecology, physics, chemistry, biology, soil science, geology, atmospheric science, and geography.



# What it looks like



# History of Ecology

- ▶ Stemmed from natural history
- ▶ Term ecology was coined in 1866 by Ernst Haeckel.
- ▶ The first “true” ecologist was Alexander von Humboldt.



# Humboldt

- ▶ “Father” of ecology
- ▶ Botanist
- ▶ First to study the relationship between organisms and their environment.



# Natural Historians

- ▶ Mainly discovered and described species
  - 1700 = 20,000 plants
  - 1800 = 40,000 plants
  - Current = 320,000 plants
- ▶ Described patterns important to modern ecology without fully realizing implications



# Natural Historians

- ▶ Darwin
  - Competition, Theory of Natural Selection
- ▶ Wallace/Möbius
  - Ecosystems and communities
- ▶ Bates
  - Mimicry
- ▶ Grinnel
  - Conservation
  - Predator/Prey relationships



# Population Ecology

- ▶ Still more descriptive than experimental
- ▶ Ecologists were interested in the traits and quality of populations
- ▶ Mark–Recapture was important tool



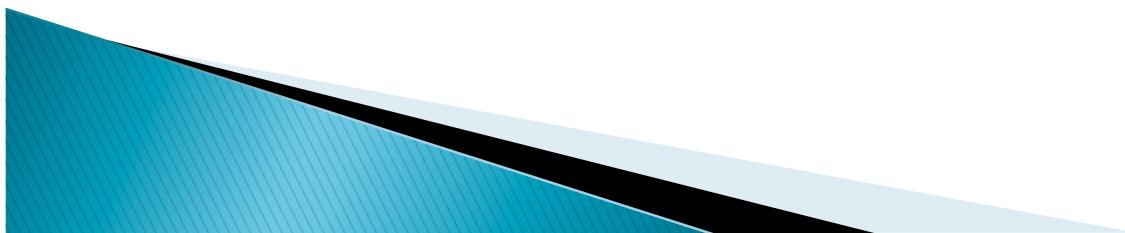
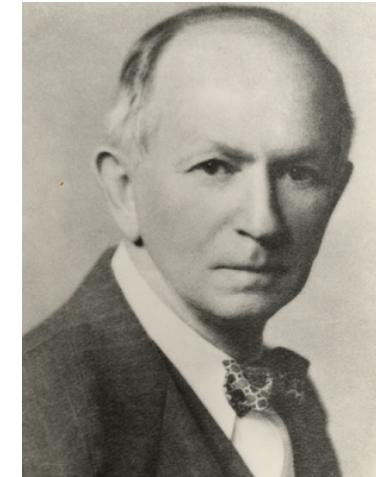
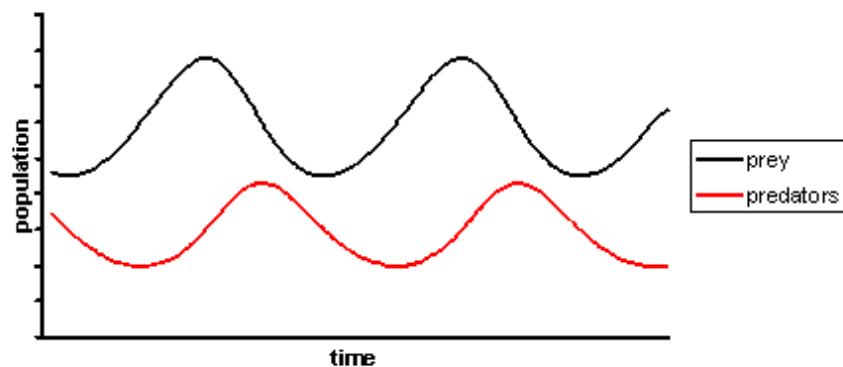
# Population Ecology

- ▶ Thomas Malthus created exponential law of population growth
  - Late 18<sup>th</sup> century
  - Concerned with human population
- ▶ Early development based on demography and life tables
  - Mortality, fecundity, survival rates



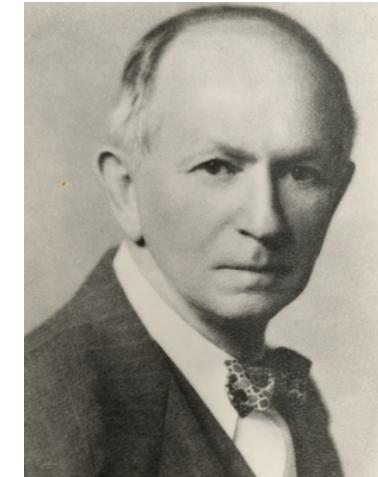
# Population Ecology

- Lotka–Volterra equation
  - 1920 & 1926
  - Used to describe predator – prey interactions



# Population Ecology

- Lotka–Volterra equation
  - Isle Royale
  - 50 year study of moose and wolves



# Population Ecology

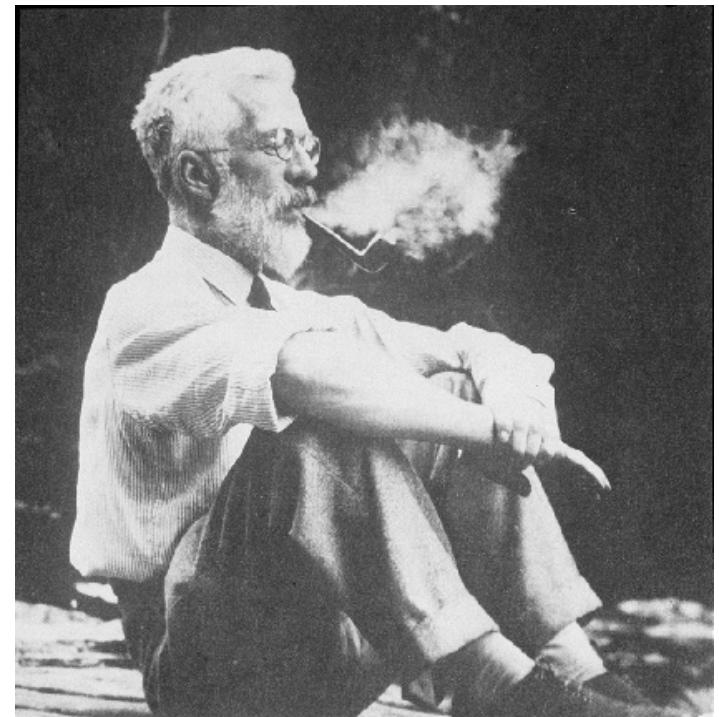
- Green world hypothesis (HSS)
  - Predators are why the world is green
- Bottom-up hypothesis
  - Nutrients control predators



# Ecology and Math

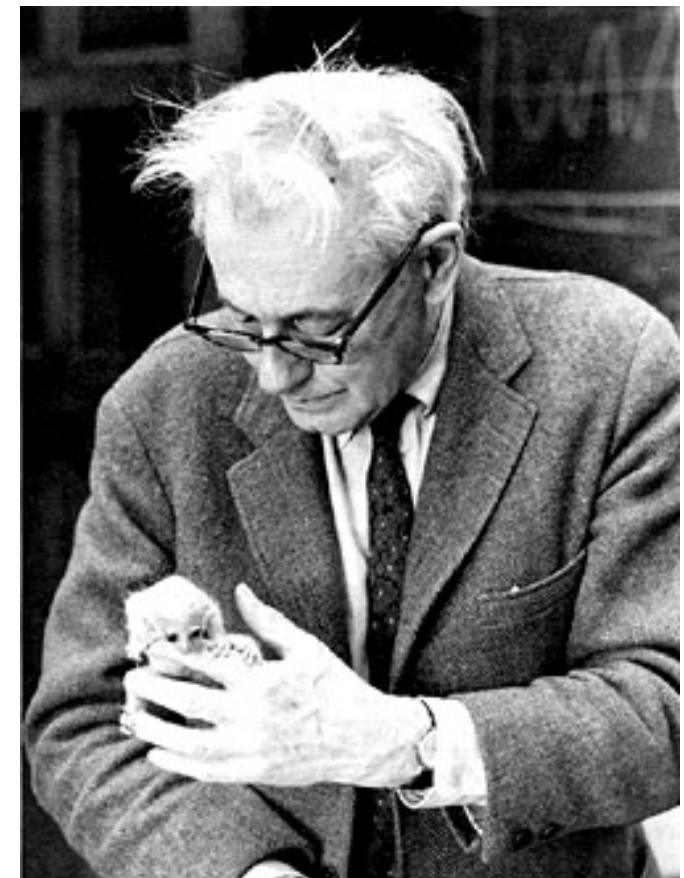
## ► Ronald Fischer

- Design of Experiments (1935)
  - Null hypothesis
- Analysis of Variance (ANOVA)
- Quantitative and population genetics



# Modern Ecology

- G. Evelyn Hutchinson
  - “Father” of modern ecology
  - Pioneered limnology
  - Wrote about everything ecological
  - Understood the importance of all levels of ecology



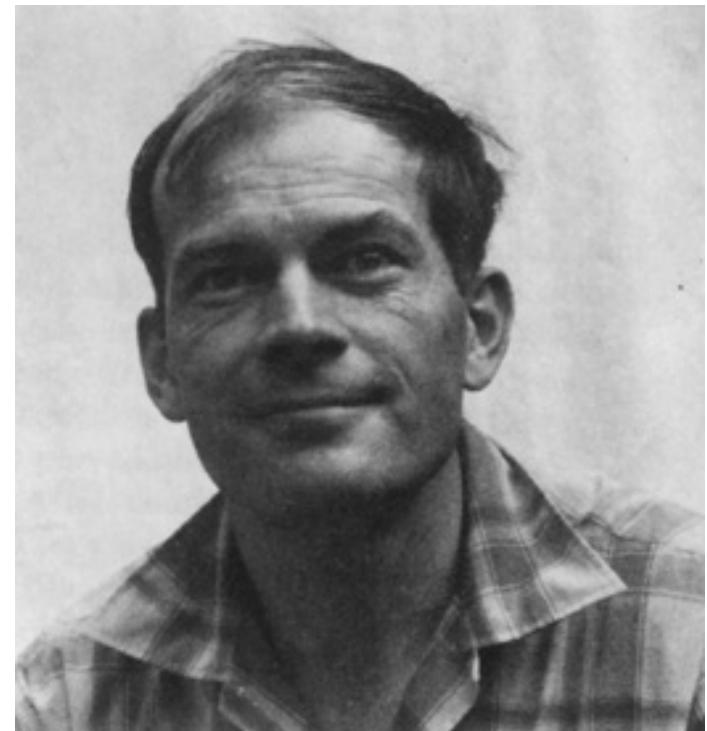
# Modern Ecology

- In the ‘60s and ‘70s ecology started focusing on the community/ecosystem levels and evolution.
  - Ecologists started exploring competition and mutualism more in depth.
- Community thinking influenced by the Clements/Gleason debate.
  - Gleason = individualist view
  - Clements = holistic view

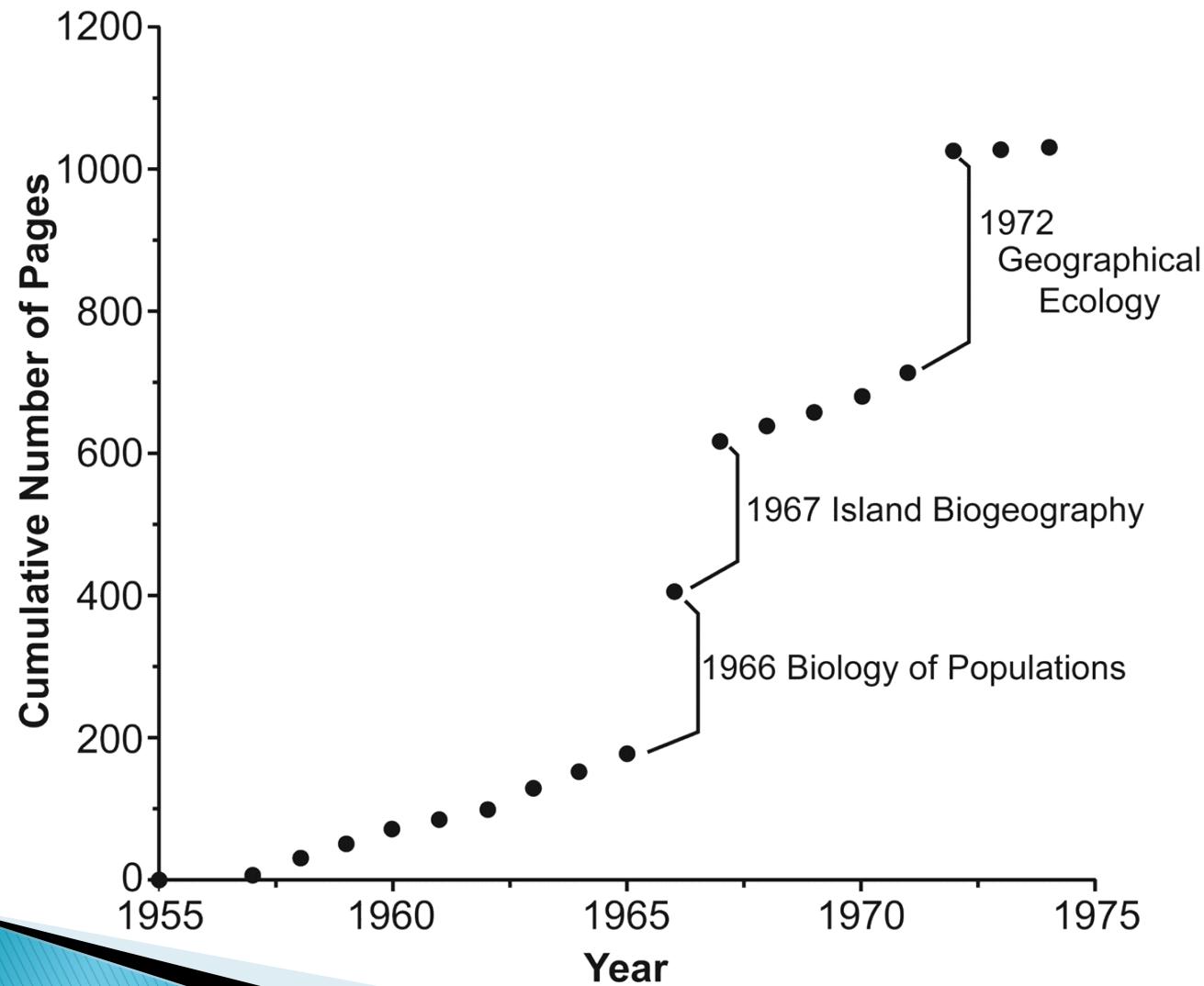


# Robert MacArthur

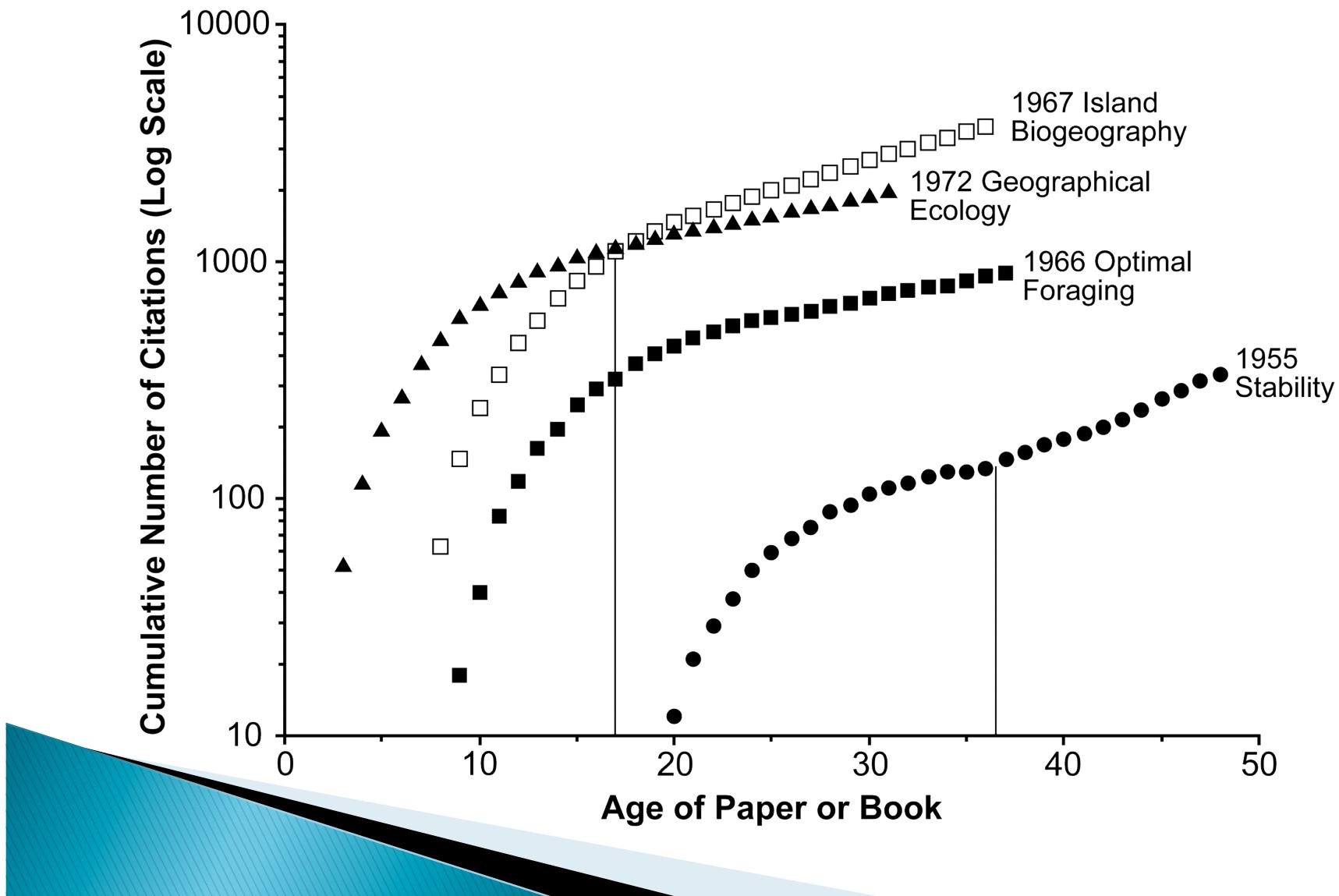
- ▶ Student of Hutchinson
- ▶ Changed ecology from a descriptive field to an experimental field.
- ▶ Changed or developed:
  - Biogeography
  - Community ecology
  - Landscape ecology



# Robert MacArthur

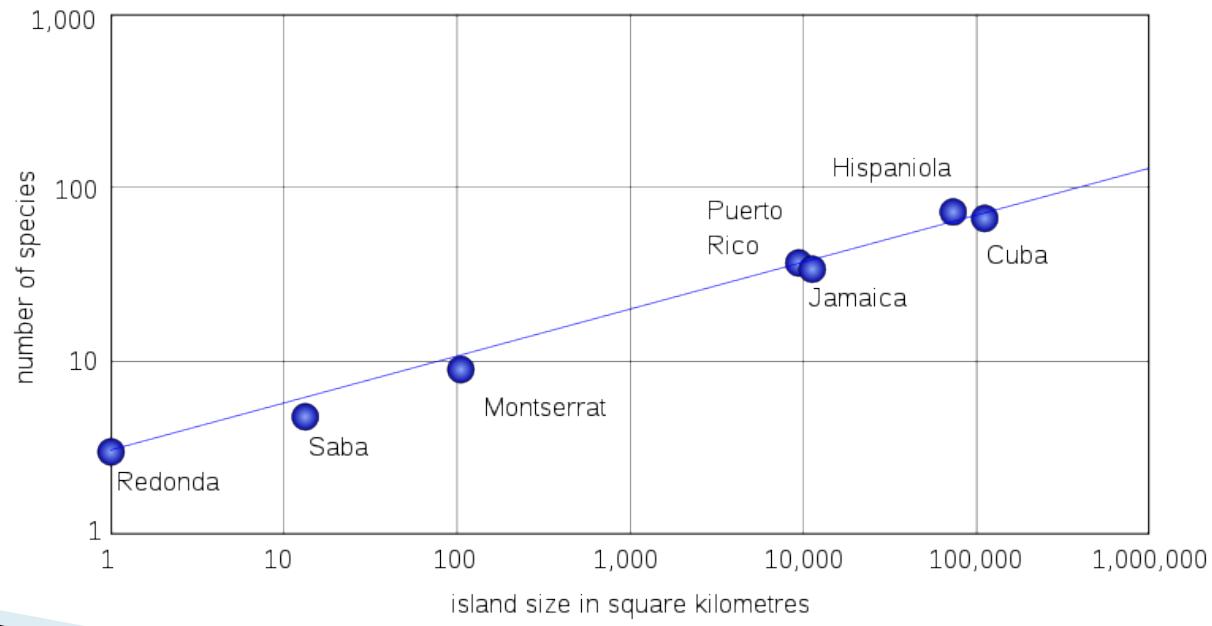


# Robert MacArthur



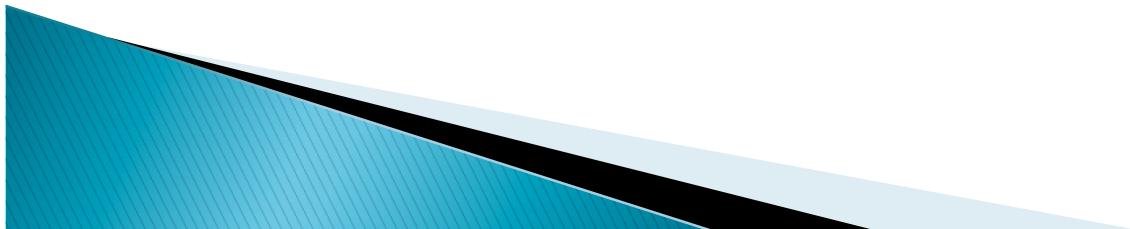
# Modern Ecology

- Island Biogeography (1967)
  - MacArthur and E.O. Wilson (early 1960's)
  - SLOSS debate
  - Jared Diamond (1976)



# Modern Ecology

- Metapopulations
  - Richard Levins (1970)
  - “Population of populations”
  - Source–sink dynamics
- Specialization of species
- Ecological “grain”
- Qualitative modeling
  - Signed digraphs
- Fitness Sets



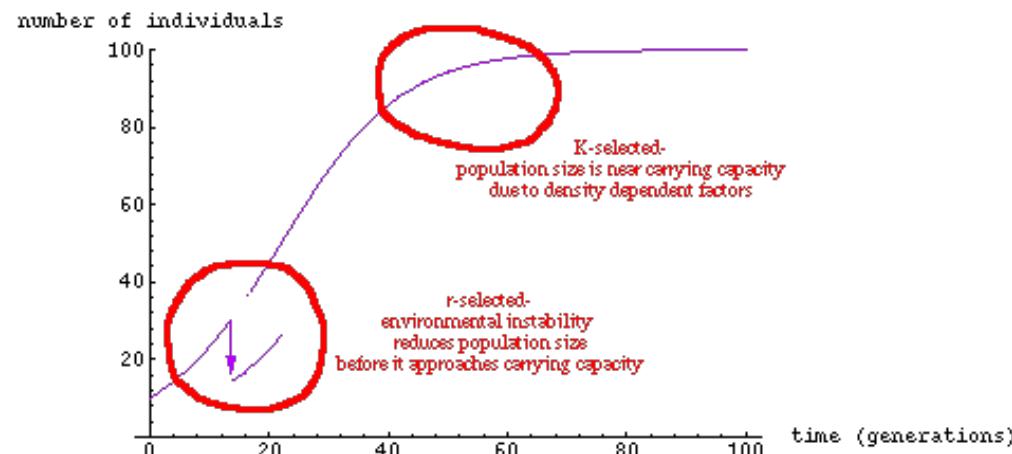
# Modern Ecology

- ▶ Jared Diamond
  - Assembly rules for communities (1975)
  - Based on competition
  - “Forbidden” pairs
- ▶ Conner and Simberloff
  - Communities didn’t differ from null model (1979)
  - Random assemblage
  - Observational vs. experimental



# Modern Ecology

- r/K selection
  - MacArthur and E.O. Wilson (1967)
  - Extremely popular in 70s and 80s
  - Very hard to support experimentally
  - Replaced by life-history theory



# Modern Ecology

- Optimal foraging
  - MacArthur and Pianka (1966)
  - Theoretical and empirical work in 70s & 80s
  - 4 functional classes of predators
    - True predator
    - Grazers
    - Parasites
    - Parasitoids



# Modern Era

- ▶ Molecular ecology
  - Gene flow within populations
  - Hybridization
- ▶ Landscape ecology
  - Island biogeography and metapopulations
  - How spatial structure affects organismal abundance at landscape level



# Modern Era

## ▶ Conservation Ecology

- Protecting current ecosystems from loss
- Preserving current species from extinction
- Coexistence between people and “nature”
- Utilize multiple fields of ecology



# Modern Era

- We're still trying to answer questions proposed by past ecologists
  - New technology: GIS, molecular technology, “better” statistics.
- ▶ Ecologists today are standing on the shoulders of giants.

