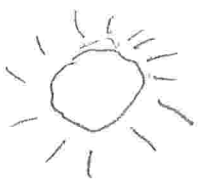
BIO 120: TROPHIC ECOLOGY

20161130

WHO EATS WHAT ?



TROPHIC LEVELS

PRIMARY PRODUCERS

PLANTS

PRIMARY CONSUMERS

HERBIVORE

SECONDARY CONSUMERS

CARNIVORES

TERTIARY CONSUMERS

DETRIVORES

TROPHIC CONNECTIONS CAN BE STUDIED USING GRAPH THEORY

HOWEVER, NO GOOD DATA FOR GOOD NETWORK ANALYSIS

HIGH DIVERSITY

GOVERNED BEETLES SUPRESSED

HAIRSTON, SMITH, SLOBODKIN (1960):

TROPHIC CASCADES.

⊕ THE WORLD IS GREEN

THERE ARE LEAVES.

⇒ ∃ LIMITING FACTOR OF HERBIVORE POPULATIONS

↳ CARNIVORES

EXAMPLE OF INDIRECT EFFECT! ONE TROPHIC LEVEL EXERTS INFLUENCE ON A SECOND BY AFFECTING THE THIRD.

DIFFICULTIES OF HERBIVORY:

- ANIMAL TISSUE CONVERSION IS EASY
  EXAMPLE OF SCIENCE
- CELLULOSE AND LIGNIN ARE TOUGH
- PLANT TISSUES HAVE BIOCHEMICAL DEFENCE MECHANISM

MILKWEED AND MONARCH BUTTERFLIES

IS AN EXAMPLE OF A TROPHIC ADAPTATION (SPECIALIST)

MANY DEFENSIVE CHEMICALS, INCLUDING ABOUT 10 000 ALKALOIDS, HAVE A POTENT BIOLOGICAL ACTIVITY.

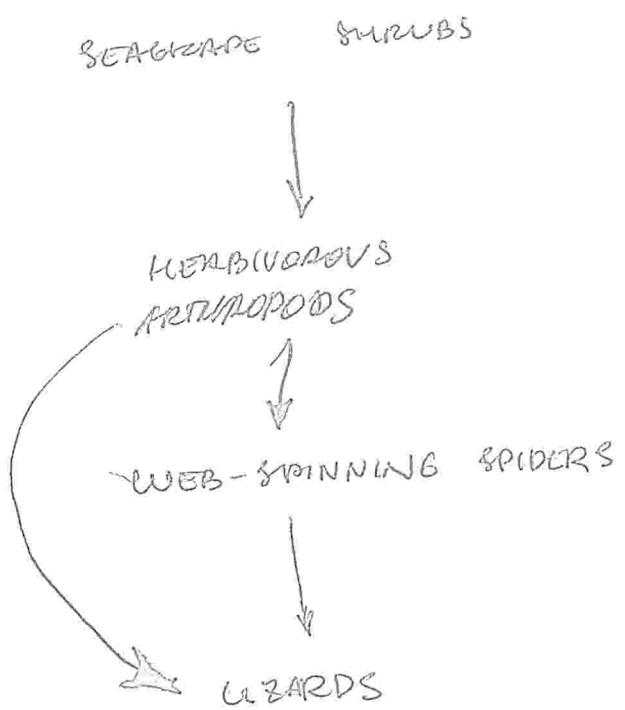
GRAMINOIDS & HERBIVORS

↳ GRAMINOIDS ARE DEFENDED BY SILICA

↳ SOME DETOX BY MICROBES IN

↳ GRINDING MOLARS

EXAMPLE: -



IF LIZARDS ARE REMOVED, SHRUBS — THE DEFENSIVE ARTHROPODS.

- KEYSTONE CONSUMERS CAN SHIFT COMMUNITIES BETWEEN ALTERNATIVE STATES.
- OUTCOMES DEPEND ON INTERACTION STRENGTHS.
  ↳ EXPERIMENTS ARE NEEDED.

VERATRUM, CYCLOPAMINE, SHEEP, AND SKELETAL CANCER

TOXINS ARE EVEN MORE IMPORTANT FOR PLANTS

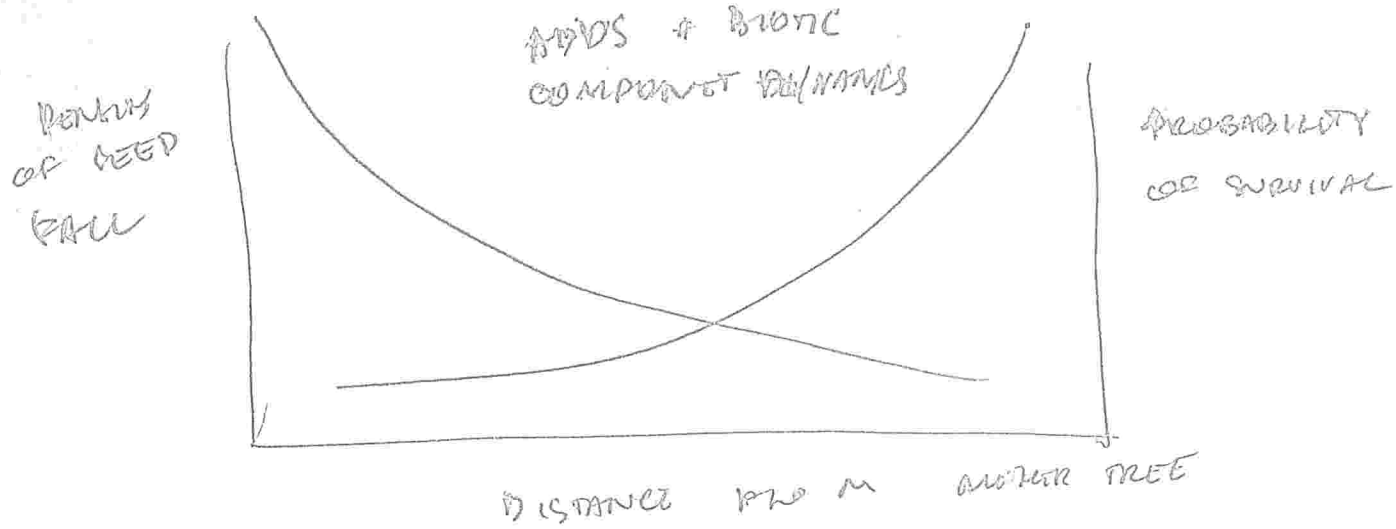
PLANTS MANIPULATE TOXIN LEVELS AND PRESERVE CHEMICAL WEAPONS

TOXIC PHENOLICS BOUND BROWN OUTER WALLS OF STORAGE.

Janzen-Connell Hypothesis

Why is plant species diversity in rainforests so phenomenal?

- PERHAPS DARWIN DUE TO UNBIOTIC ATTACK FROM SPECIALIST INSECTS AND FUNGI
- SEEDLINGS HAVE LOW CHANCE OF SURVIVAL.



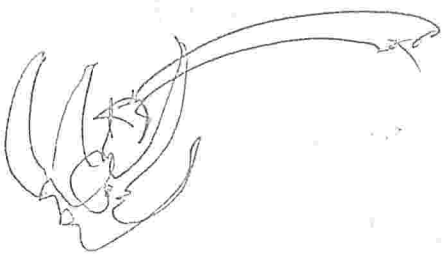
IF DIVERSITY IS DRIVEN BY BIOTIC PRESSURES,

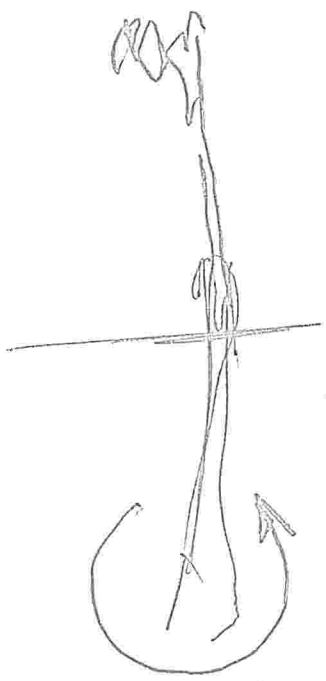
IT IS MORE COMPLEX.

SPECIES INTERACTIONS IN SUBALPINE MEADOWS

- DISTRIBUTION & ABUNDANCE

GLACIER LILY



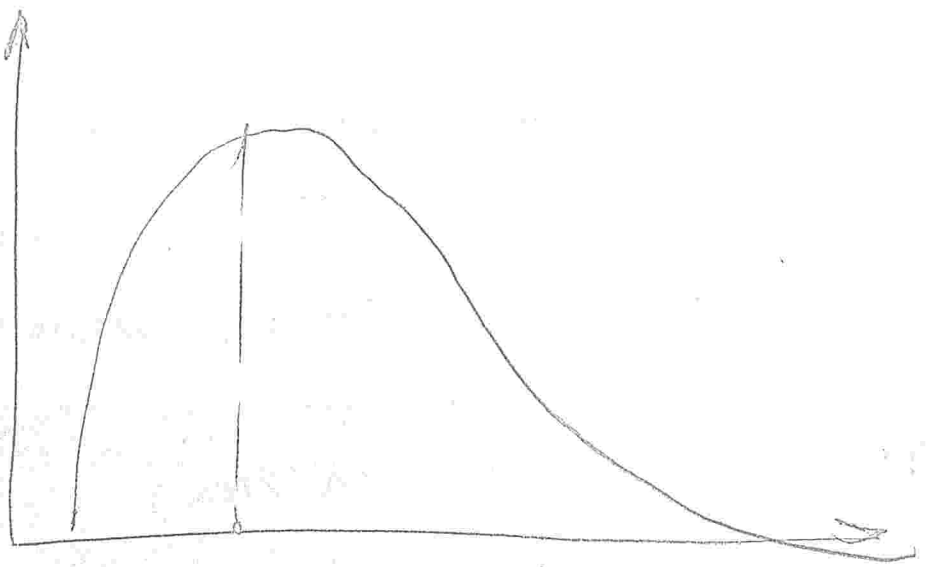


PERENNIAL PLANT

DISPERSAL EXP.

f

PRIMARY DISPERSAL



SECONDARY DISPERSAL

- NO ELAIOSOME IN THIS SPECIES
- IN CAFETERIA EXPERIMENTS, ANTS ARE NOT INTERESTED

SEED GERMINATION EXPERIMENTS

- 4 TREATMENT COMBOS, FACTORIAL DESIGN

BURIED - ORGANIC	
EXPOSED, ORGANIC	X
BURIED, GRAVEL	X
EXPOSED, ORGANIC	X

SUMMARY

- LONG-LIVED, PERENNIAL; GROWS AS A VEGETATIVE PLANT FOR YEARS
- RESOURCES ARE STORED UNDERGROUND
- SEEDS ARE UNABLE TO DESICCATION UNLESS IN MOIST CONDITIONS
- SEED DISPERSAL IS MINIMAL

SET UP STUDY PLOTS (16×16, 2m SPACE)

- FLOWERING PLANTS
- VEGETATIVE PLANTS
- SEEDLINGS
- SOIL MOISTURE
- ROCKINESS
- PREDATION RISK

HOW TO QUANTIFY GOPHER ACTIVITIES

→ MEASURE THE LEVELS OF GOPHER BACKLANDS

FLOWERING PLANTS AND SEEDLINGS WERE FOUND TO BE PREFERRED,

→ "ROCK-REFUGE" HYPOTHESIS

MOST OF THE PLOTS ARE PLACED IN THE ROCKY AREAS, WHERE WEEDS ARE LIKELY TO PROLIFERATE,

GOPHERS, HOWEVER, KILL

MOST LILIES IN THE NON-KOREA SOIL.

=> LILIES ARE MORE LIKELY TO GROW ON ROCKY AREAS.

Moreover territory favours the stay-home hypotheses.

The similar factors play a role in the dispersal of aspens.

NOTES - ON CLIMATE CHANGE

- GREENHOUSE GASES ↑ ⟶ more heat ⟶ more water trapped
- Hadley cells get bigger:
  deserts belts shift poleward beyond 30°
- LOCAL CLIMATE CHANGES ARE AFFECTING ORGANISMS
- GEOGRAPHICAL RANGES ARE SHIFTING TO MATCH RANGES OF TOLERANCE