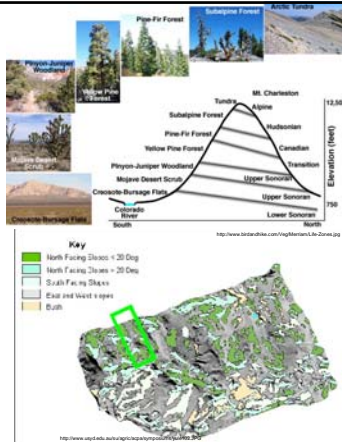


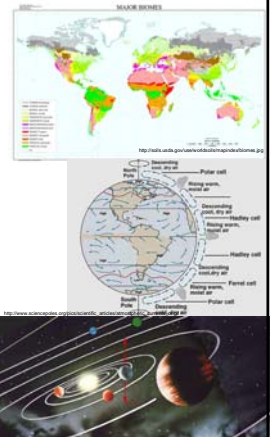
Know about these microclimate terms from the book:

- Altitude
- Aspect
- Vegetation
- Color of the ground



Macroclimate from the book (Chapters 2 & 3)

- Know about the major terrestrial and aquatic biomes
- Know about global patterns of temperature, atmospheric circulation, and precipitation, e.g.,
 - Why and where is it cold in the winter and warm in the summer?
 - Why is there more rain at the equator?



Ectotherms

- Thermal photograph of a frog in the hands of an endotherm
- Blue for cool, yellow and white for warm



In a very hot, sunny desert, which Bedouin would be hotter?

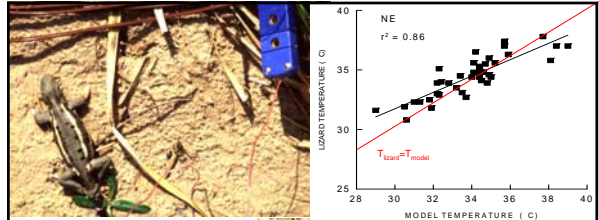
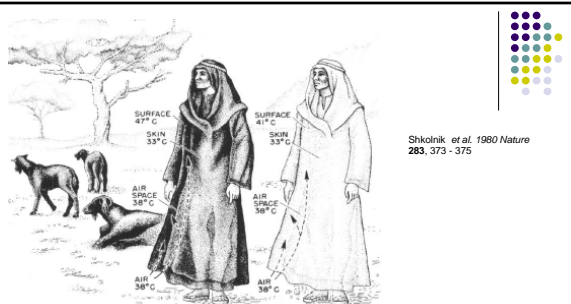


- The man in black
- The man in white
- They will be the same temperature
- Not enough information to tell

Be prepared to explain your answer

Ectotherms

- Black robes gain 2 or 3x more heat through radiation
- Yet temperature next to skin is the same
- Predicting temperatures from biophysical principles is very complicated



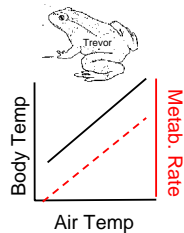
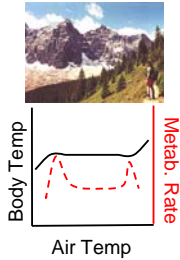
Dr. Niewiarowski's Research

Lizard thermal ecology
Using microhabitat to thermoregulate

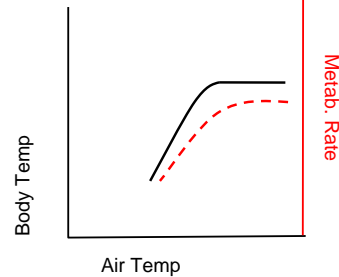


Endotherms vs. Exotherms

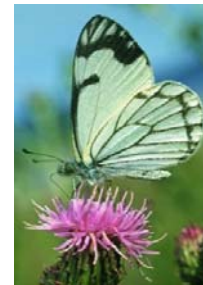
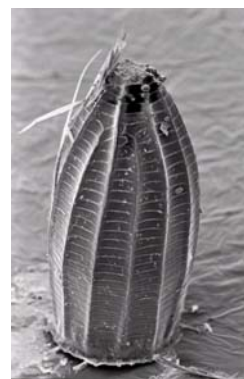
- Self-test
- Can you explain why these graphs are different?



Reduced Metabolic Rate



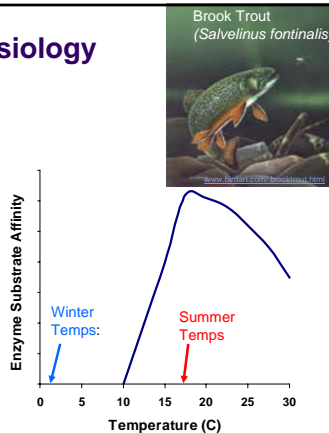
How have the butterflies of the Rockies dealt with low winter temperatures?



The alpine butterfly *Neophasia menapia* (the Pine White) overwinters as an egg

Connecting Physiology to Ecology

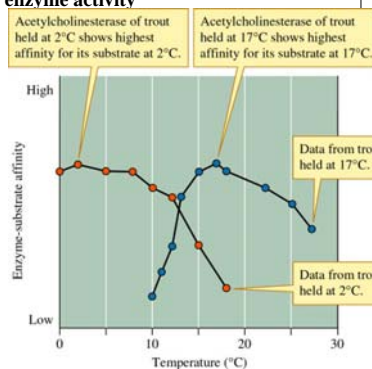
- Most Enzymes have narrow temperature tolerances
- Trout Experience a broad range of water temperatures
- How can Trout survive the winter?



Temperature and enzyme activity

Figure 4.8

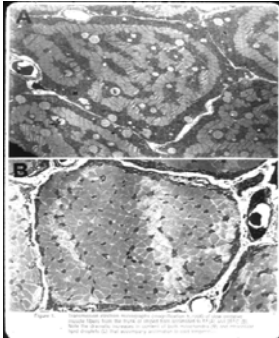
- Trout have two forms of many enzymes
 - One for hot
 - One for cold



4-6 Source: Baldwin and Hochachka 1970

Acclimation

- Short-term physiological adjustments
- Usually reversible
- In these fish:
 - More mitochondria and lipid droplets in the cold
 - More actin and myosin when warm



Striped Bass
5°C

Striped Bass
25°C



Figure 4.11

Temperature/population growth by antarctic bacterium

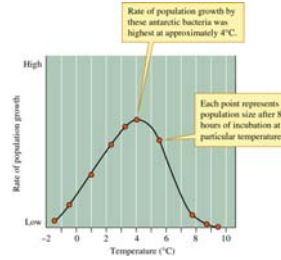
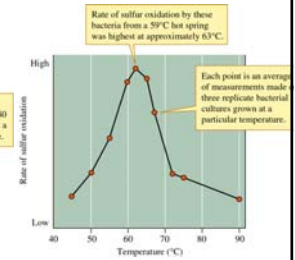
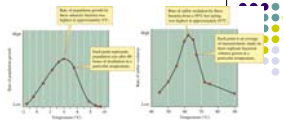


Figure 4.12

Temperature/activity of hotspring bacterium



Adaptations



These differences in temperature tolerance between species of bacteria are genetically fixed "adaptations"

- **Adaptations** are
 - Traits that increase the ability of a population to live in a particular environment
 - **Evolutionary** changes that arise over long periods of time (across generations)
- **"Acclimations"** are
 - Trait adjustments that allow an individual to live in a particular environment.
 - **Reversible** changes that occur within the life of an individual (within generations)

See pg 89, 185-186 4th ed
pg 198-199 3rd ed.

