The slide features a green background with a pattern of overlapping hexagons. A white rectangular area on the right contains the text. At the top of this white area is a solid dark grey rectangle. The text 'A.P. Biology' is written in a large, green, sans-serif font. Below it, the subtitle '“Big Ideas” and Concepts' is written in a smaller, black, sans-serif font. A thick green horizontal line is positioned at the bottom of the white area.

A.P. Biology

“Big Ideas” and Concepts

“Big Idea”

- overarching theme in biology that applies throughout curriculum



Big Idea 1:

- The process of **evolution** drives the diversity and unity of life.
- “Nothing in biology makes sense except in the light of evolution.”

Evolution:

- Definition: A generation to generation change over time (descent w modification)
- Charles Darwin: *The Origin of Species*
- **Natural Selection:**
 - Organisms with traits that make them more suitable for their environment are more likely to survive and reproduce (passing on advantageous genes). Over generations, a higher proportion of the population will have advantageous traits.
 - The environment **selects** for certain traits in the population.
 - Sea horses Marine Iguana

unity and diversity

- Evolution explains:
 - the unity and diversity we see in the natural world.
 - The match between organisms and their environment



(a) A flower mantid in Malaysia

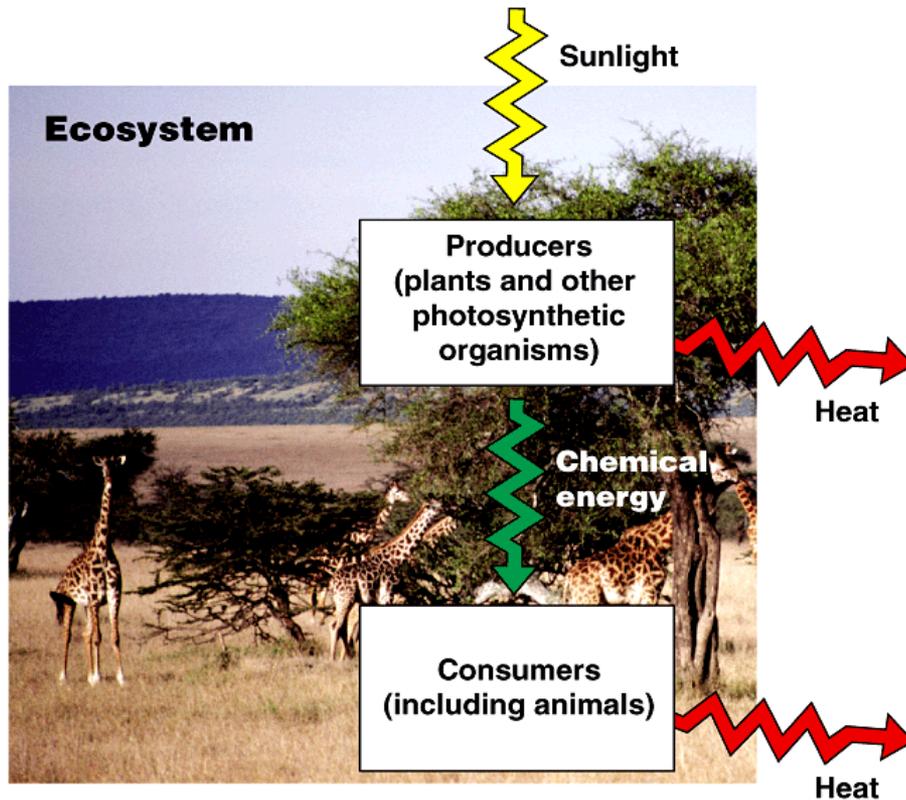


(b) A leaf mantid in Borneo

Big Idea 2:

- Biological systems utilize **free energy** and **molecular building blocks** to grow, to reproduce, and to maintain dynamic **homeostasis**.

Organisms acquire energy and building blocks from their environment.



- Dynamics of an ecosystem include 2 major processes:
 - nutrient cycling
 - the flow of energy

Life requires energy transfer and transformation

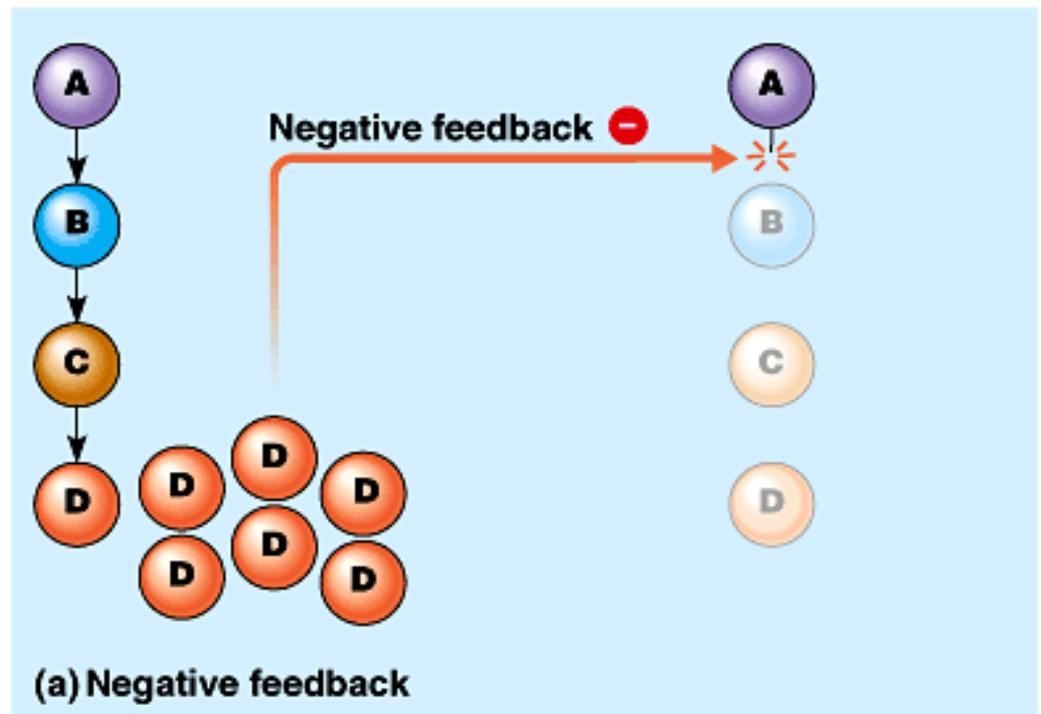
- Organisms use energy to carry out life's activities.
- Organisms transfer one form of energy into another.



Feedback mechanisms regulate biological systems

- **Negative feedback**: accumulation of product slows or shuts down the process.

- animation

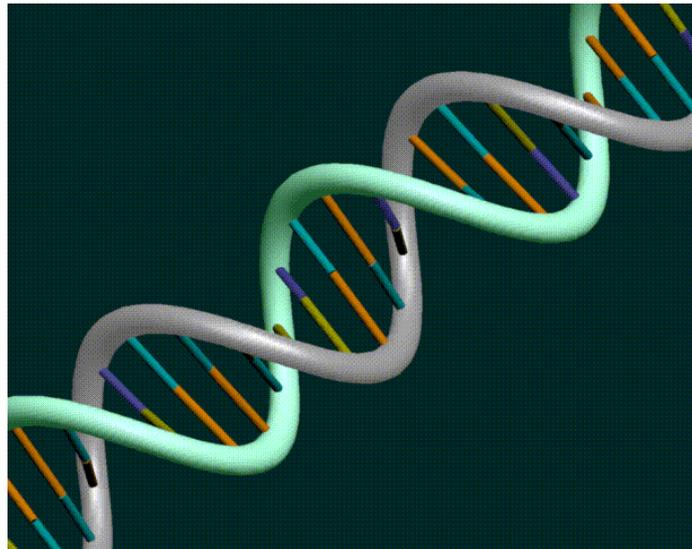


Big Idea 3:

- Living systems **store, retrieve, transmit**, and **respond** to **information** essential to life processes.

heritable information

- A gene is a sequence of DNA that codes for a protein.
- **Gene expression** is the process by which our bodies proteins (traits) are created.
- Genes are passed down from parent to offspring.
- All life shares a unifying genetic code.

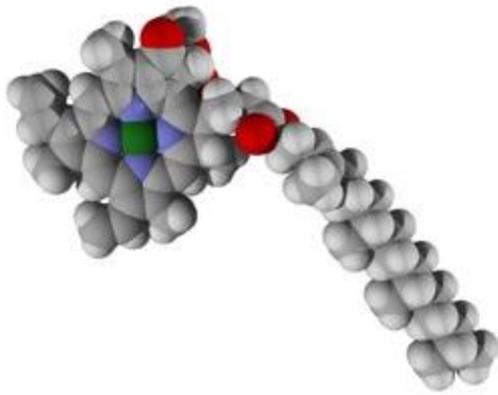


Big Idea 4:

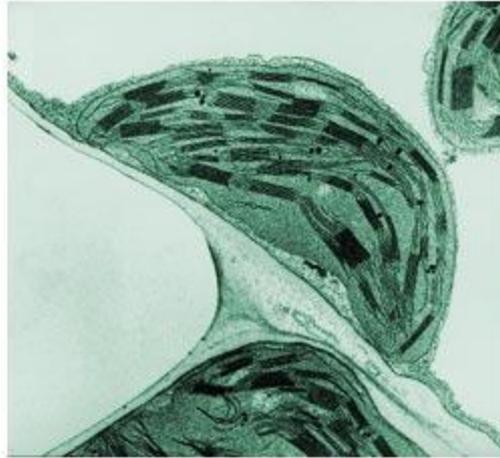
- **Biological systems interact**, and these systems and their interactions possess complex **properties**.

hierarchy of organization

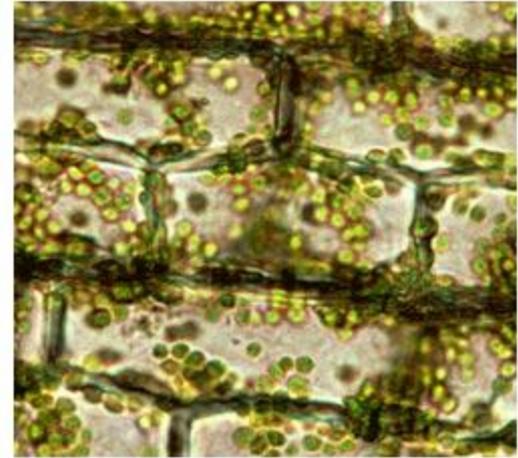
- **Systems Biology** models the dynamics of a system by examining the interactions of its individual parts.
- **Reductionism** breaks a complex system down into simpler components.
- Biological Systems follow a hierarchy of organization.
 - atoms-molecules-organelles-cells-tissue-organs-organ systems-organism-population-community-ecosystem



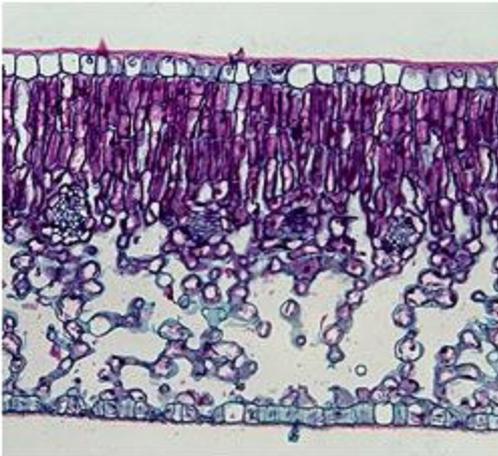
Molecule



Organelle



Cells



Tissues



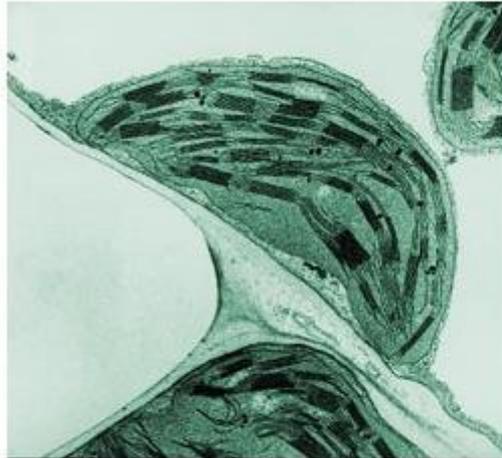
Organ



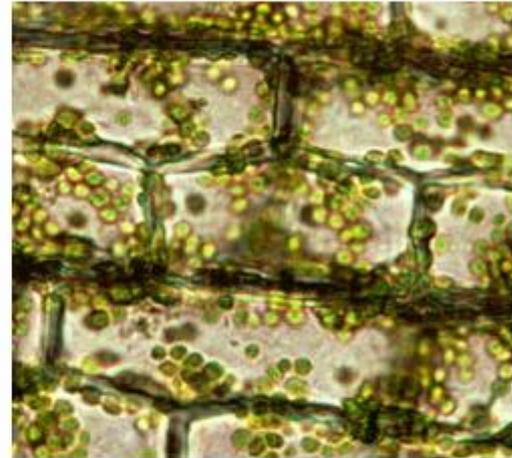
Community

emergent properties

- Each level of organization has specific properties that make it function uniquely.
- E.P.'s are due to the arrangement and interactions of parts as complexity increases.



Organelle



Cells

Structure and function are correlated at all levels of organization.



- Flying Hawk

Scientists make observations and then form and test hypotheses.

- **Inquiry**: a search for information.
 - **Data**: Recorded observations.
 - Inductive reasoning: deriving generalizations from a larger number of observations.
 - **Hypothesis**: a tentative answer to a well-framed question.
 - **Deductive reasoning**: Goes from the general to the specific.
 - Induction is used to form a hypothesis. Deduction is used after the hypothesis.
- Controlled experiments utilize **control groups** for accuracy and need to be repeatable.
- A **theory** is much broader in scope than a hypothesis

*snake experimentation on pg. 22

Experiments

Most mammals, like those who attacked the artificial snake shown in the figure below, cannot see color. With this idea in mind, choose the experiment that would best test whether the color of the artificial snakes were important.



(a) Artificial kingsnake



(b) Brown artificial snake that has been attacked

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