Slide 1

A View of Life

Lecture 2

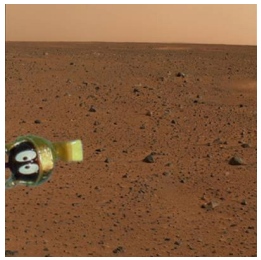
Slide 2

Learning Outcomes

- Characteristics of life
- Levels of Biological Organization
- Classification
- The Scientific Method
- Data
- Hypothesis v Theory

Slide 3

Life on Mars



- Searching for Life on other planets requires a definition of Life
- Presence of:
- water
- Carbon and organic molecules
- Methane
- Drake Equation
- 10000 planets capable of supporting intelligent life in our galaxy
- http://www.pbs.org/wgbh/nova/space/drake-equation.html

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Slide 4

Life on Earth

- Sun
- Ultimate source of Energy
  - Heat
  - Light
- Photosynthesis
- Energy used directly
  - Inorganic Carbon
  - CO_2
  - →Organic Carbon
- Stored Energy = Fuel
- Energy used indirectly
  - Food
  - Wood
  - Coal
  - Oil

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Slide 5

Characteristics of Life

- Metabolism
  - Acquire energy and nutrients
  - Change one form of energy into another
- Homeostasis
  - Maintain balanced internal environment
- Respond to External environment
  - Diurnal and seasonal behaviors
- Reproduction
- Adaptations to the environment
  - Natural selection

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Homeostasis

- Definition:
- Maintenance of normal internal conditions in a cell or organism by means of self regulating mechanisms
- Example-

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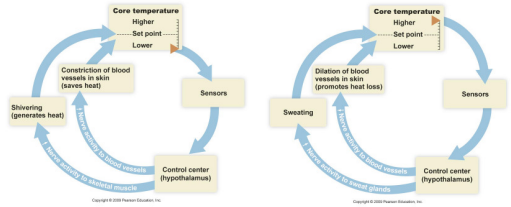
Regulating Core Temperature



Slide 8

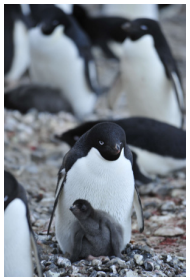
Responding to the Environment

- Non-living objects do not respond to changes in the external environment
- Living objects respond to stimuli such as…..

Slide 9

Reproduction

- Produce offspring
- May be asexual or sexual
- Ultimate Goal of life
- Evolutionary fitness (success) measured in number of surviving offspring produced



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Adaptation

- Physical or Physiological trait inherited from parents
- With SURVIVAL VALUE
- Selected by the environment
- If you lack adaptations to your environment you will not be around for very long

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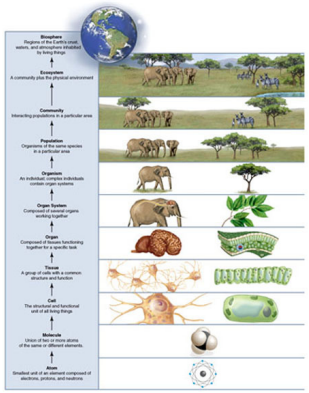

Levels of Biological Organization

2008

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Biological Classification

Felidae – Cat Family

Jaguar = *Panthera onca*

Leopard = *Panthera pardus*

- Taxonomy the study of the categorization of life
- Dumb — Domain
- Kids — Kingdom
- Playing — Phylum
- Catch — Class
- On — Order
- Freeways — Family
- Get — *Genus*
- Splatted — *species*

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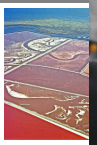
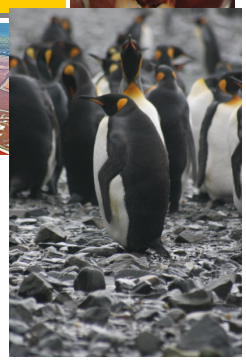
3 Domains of Life





- Bacteria
- *Streptococcus mutans*
  - Ferments sucrose → lactic acid
- Archaea
- *Halobacterium denitrificans*
  - South Bay Salt Ponds
- Eukarya
- Kingdoms:
  - Protista
  - Fungi
  - Plantae
  - Animalia

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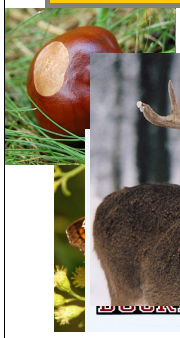
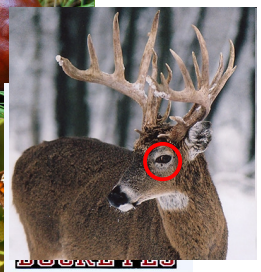
Scientific Names





- Grouping organisms into meaningful categories based upon characteristics
- Unambiguity in communication
- Common names have different meanings in different contexts
- "Buckeye"
- Why Latin?

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Genus species

- Genus
- capitalized
- species
- Lower case
- If handwritten underline
- If typed *Italics*
- *Rhinecanthus rectangulus*

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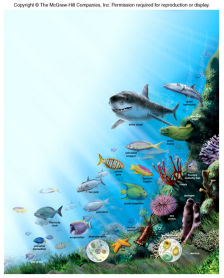
Ecosystem



- Definition:
- Biological community together with the associated abiotic (non-living) environment; characterized by the flow of energy and cycling of inorganic nutrients

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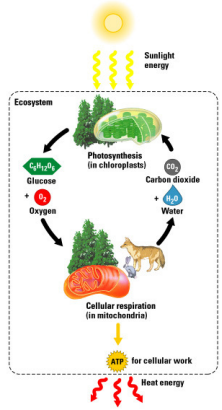

Energy Flow

- Energy continuously lost from ecosystem
- Ecosystem relies upon fresh inputs of energy
- Sun is ultimate source of energy
- Organisms directly (producers) or indirectly dependent (consumers) on sunlight
  - Examples…?
- Linear path through ecosystem

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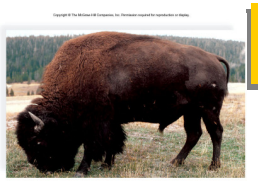

f.

Recycling Chemicals

- Chemicals cycle within intact ecosystems
- Inorganic pool
- Biological uptake
  - Organic forms
    - carbohydrates
- Decomposition
  - → Inorganic forms
    - → CO_2

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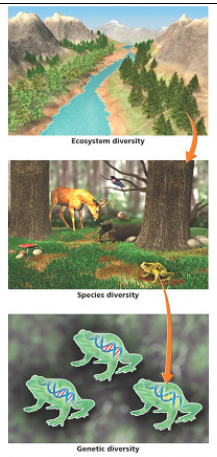

Biodiversity

- Definition:
  - Total number of species,
  - the variability of their genes
  - and the communities in which they live.
- Importance of Biodiversity
- Ecosystem function
- Nutrient cycling
- Hydrological Cycle
- Erosion control
- Medicines

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The Scientific Method

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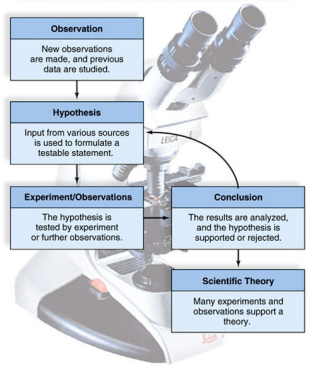

Data

- Objective Data
  - numbers
- Subjective Data
  - opinion

Correlation

- Two events occur at the same time
  - May or may not be linked
- Positive correlation
- Negative correlation

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Correlation v Causation

- Study suggested that children sleeping with lights on would later develop short-sightedness
- Second study showed that parents were short-sighted (genetic inheritance) and more likely to leave bedroom lights on..

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Hypothesis

- Definition:
  - Supposition established by reasoning after consideration of available evidence; it can be tested by obtaining more data, often by experimentation
- Must be a statement
- Does NOT contain 'because'

Hypothesis v Theory

- Once a hypothesis has been tested many times by different scientists it may be accepted as a Theory
- There is no such thing as a *"New Theory"*

Experimental Control

- Control group does NOT receive experimental treatment
- Provides basis for comparison
- Assess effects of experimental treatment