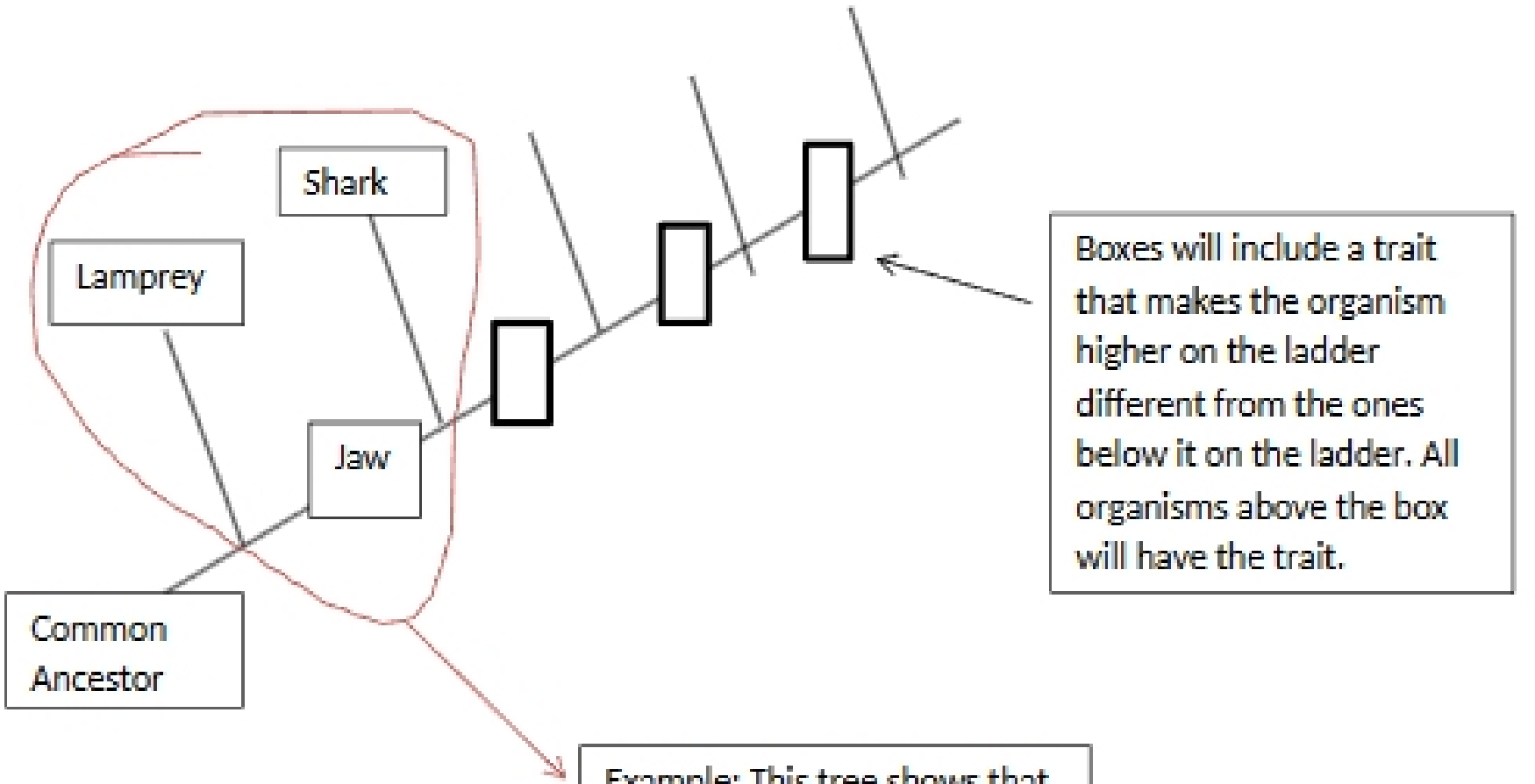
Phylogenies

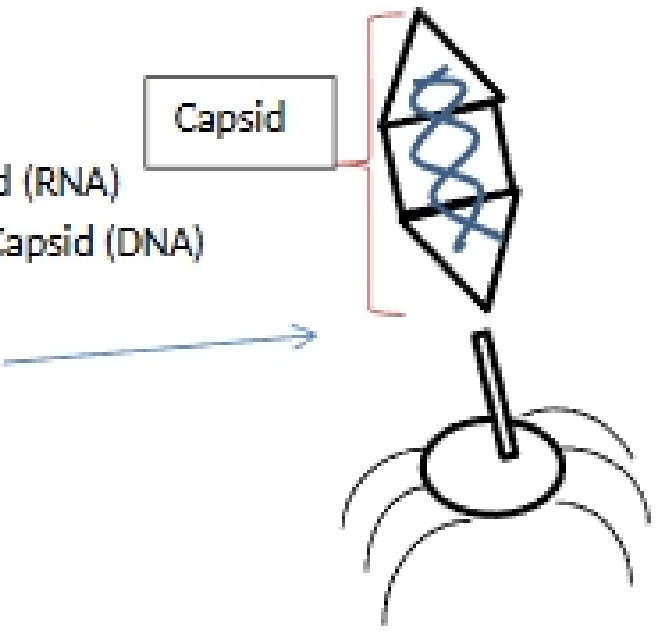
- Phylogenetics- technique/tool for reconstructing evolutionary history or relaitonships based upon common ancestry
    - Fossil record, shared internal/external characteristics, gene sequence
- Represented by phylogenetic tree/cladograms
- Example of a phylogenetic tree



CHAPTER 27

Viruses

- Very small, very diverse morphology
- Characteristics all viruses have
    1) All contain either RNA or DNA (genetic material)
    2) All possess a **capsid**
        a. Outer protein covering encasing genetic material



   b. Example: Helical Capsid (RNA)
   c. Example: Icosahedral Capsid (DNA)
- Bacterial Virus= bacteriophage (DNA)
   - Infects bacteria
   - Icosahedral head
   - Helical Tail
- Classic Flu Virus
   - Genetic material: RNA
   - Capsid
   - Envelope→ studded with antigens used to recognize and enter appropriate host cell or to exit cell
- Animal Virus (influenza)
   - Helical capsid with envelope

<u>Bacteriophages</u>

1) Lytic cycle
   a. Replication
2) Lysogenic cycle
   a. Resting stage

<u>Lytic Cycle</u>

1) Attachment
   a. Host recognition
2) Penetration
   a. Penetrate cell wall/membrane- inject DNA into cell
3) Synthesis
   a. Viral DNA hijacks the cellular replication machinery of bacterium
4) Assembly
   a. New virions are put together from pieces and parts of newly synthesized material
5) Release
   a. Cell lysis- ruptures and new virions are released

<u>Lysogenic Cycle</u>

- Complex set of cues tells it to go into the lysogenic cycle

1) Integration
   a. Viral DNA integrates into bacterial genome→ prophage
2) Propagation
   a. Viral DNA replicated along with genome
   b. Something happens to move it back into the lytic cycle
3) Induction

a. Viral DNA become active and goes into lytic cycle
b. Examples of triggers: Cell stress (starvation, toxins, environment)

Phage Conversion

- Bacterial cell/host becomes virulent/infectious/toxic following bacteriophage infection
- Lysogenic cycle
    - Some portion of viral DNA is expressed
        - Production of toxin
            - Becomes an infectious bacteria
            - Examples: Salmonella and Diphtheria

Vibrio Cholerae

- When not infected by virus the bacteria is harmless, has no toxin, and is not infectious
- When it goes through phage conversion it becomes infectious and toxic
    - Cholera toxin= degrade toxin
- Bacteria replicate rapidly and colonize the small intestine
- Causes diarrhea, vomiting, dehydration, and death

Phage Therapy

- Flood infected organism with bacteria infected by viruses
    - The new infected bacteria will kill the bad bacteria
- Also done through "lysin therapy"
    - Enzymes derived from viruses that break down bacterial cell walls