

Insect Biology

THE YOUNG SCIENTIST PROGRAM

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WASHINGTON UNIVERSITY SCHOOL OF MEDICINE
ECOLOGY/EVOLUTION TEACHING TEAM

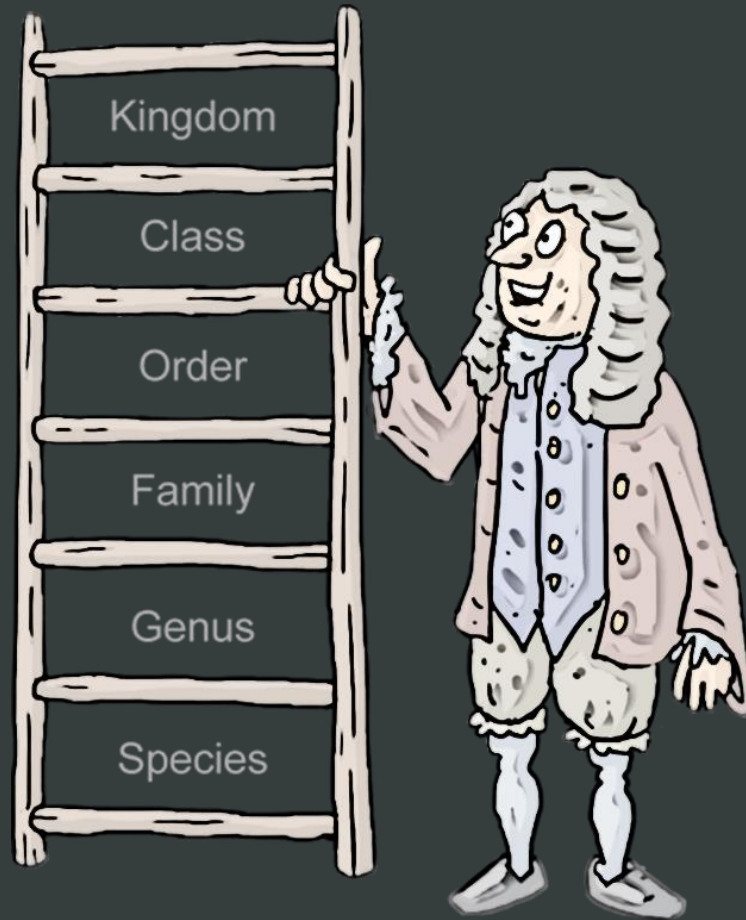


What is a living organism?

- Made up of one or more cells
- Different levels of organization
- Use energy
- Respond to their environment
- Maintains homeostasis
- Grow
- Reproduce
- Adapt to their environment



How do we classify organisms?



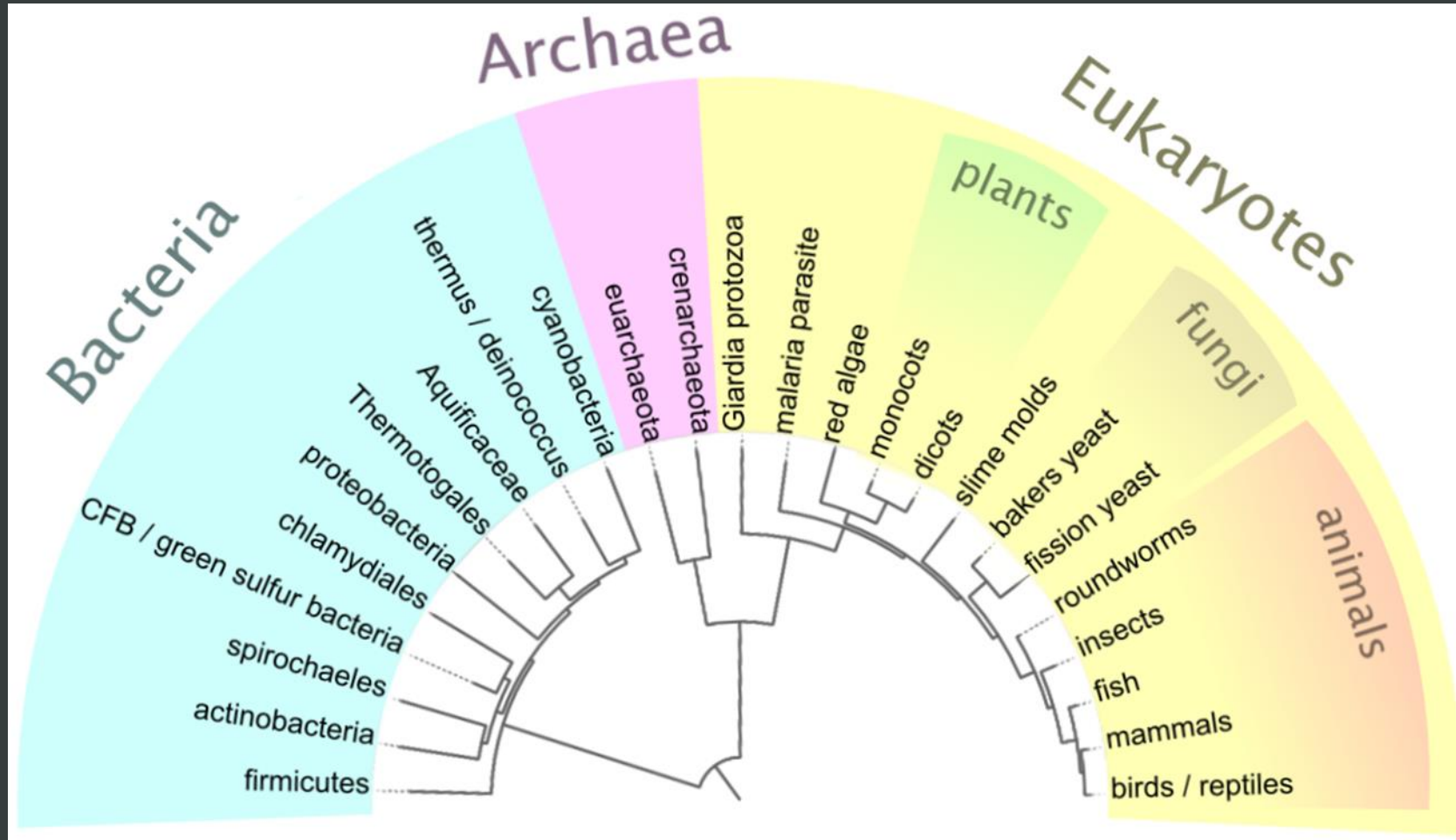
Very General



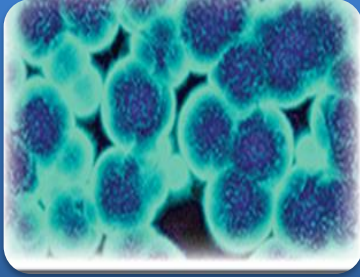
Very Specific

Kings Play Chess On Fat Green Stools

3 Domains of Life



3 Domains of Life



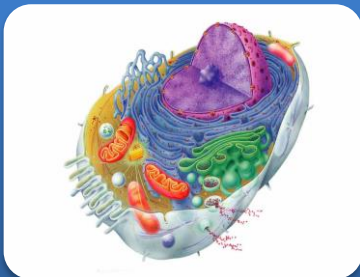
Archaea

- Prokaryotic cells
- Membranes have hydrocarbon chains attached to glycerol by ether linkages
- Cell walls have no peptidoglycan
- Live in extreme environments



Bacteria

- Prokaryotic cells
- Membranes composed of unbranched fatty acid chains attached to glycerol by ester linkages
- Cell walls have peptidoglycan



Eukarya

- Eukaryotic cells
- Membranes composed of unbranched fatty acid chains attached to glycerol by ester linkages
- Cell walls do not have peptidoglycan

4 Kingdoms in Eukarya



Protista

- Unicellular, very simple



Fungi

- Unicellular with cell walls
- No organized tissues
- Do not carry out photosynthesis
- Obtain nutrition through absorption



Plantae

- Multicellular
- Cells organized into tissues and have cell walls
- Obtain nutrients by photosynthesis and absorption

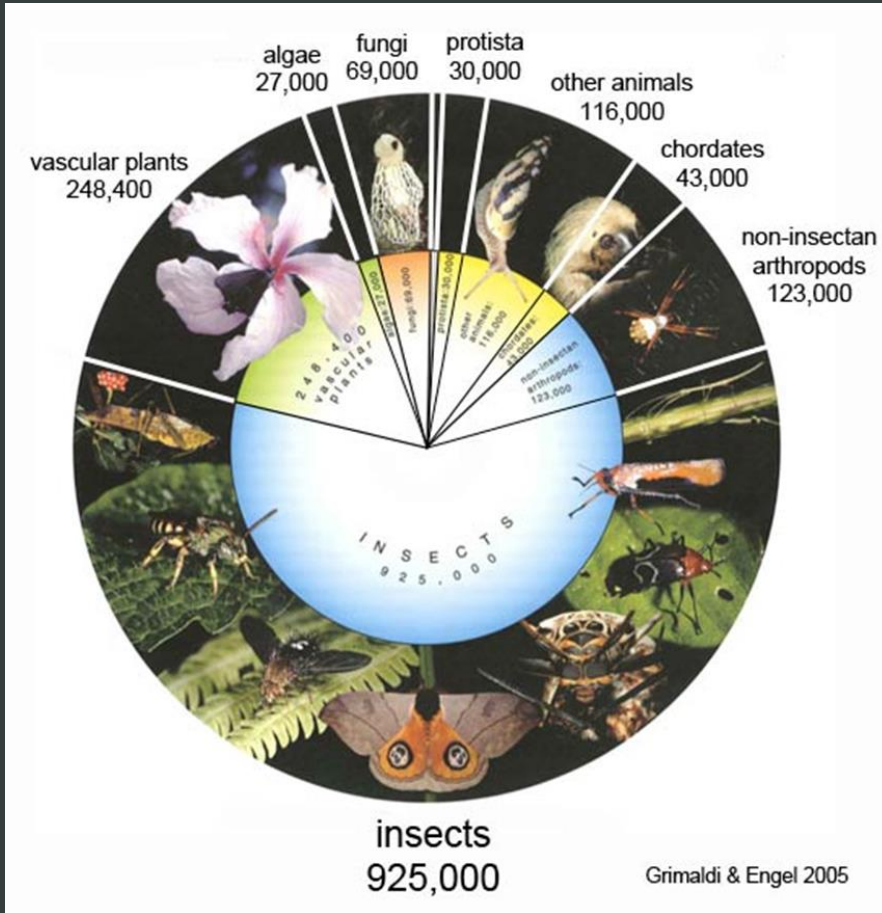


Animalia

- Multicellular
- Cells organized into tissues and **lack** cell walls
- Do not carry out photosynthesis and obtain nutrients through ingestion

Insects!!

Why study insects?

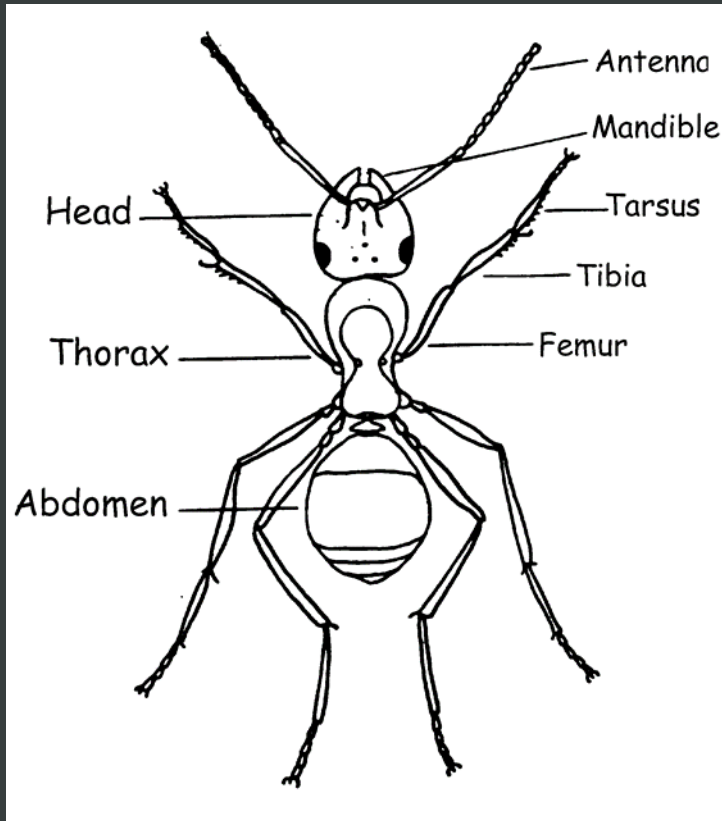


- Most diverse and abundant macro-organisms (75% of animals on earth)
- Filled nearly every niche on the plant
- Fascinating adaptations to the environment
- Ecological services
- Disease vectors
- Human's #1 competitor for food

Why study insects?



How can you spot an insect?

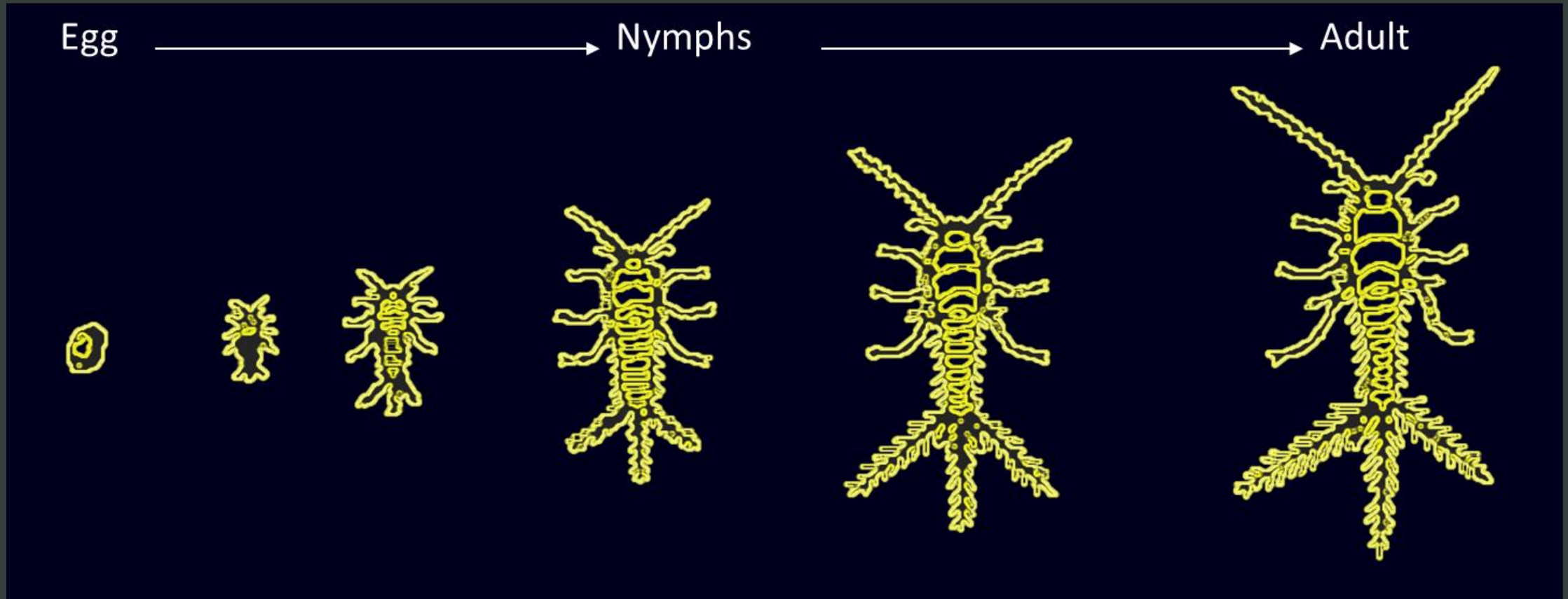


- Segmented bodies with jointed legs
- 3 major body sections: head, thorax and abdomen
- 6 legs
- 2 antennae

Life Cycles

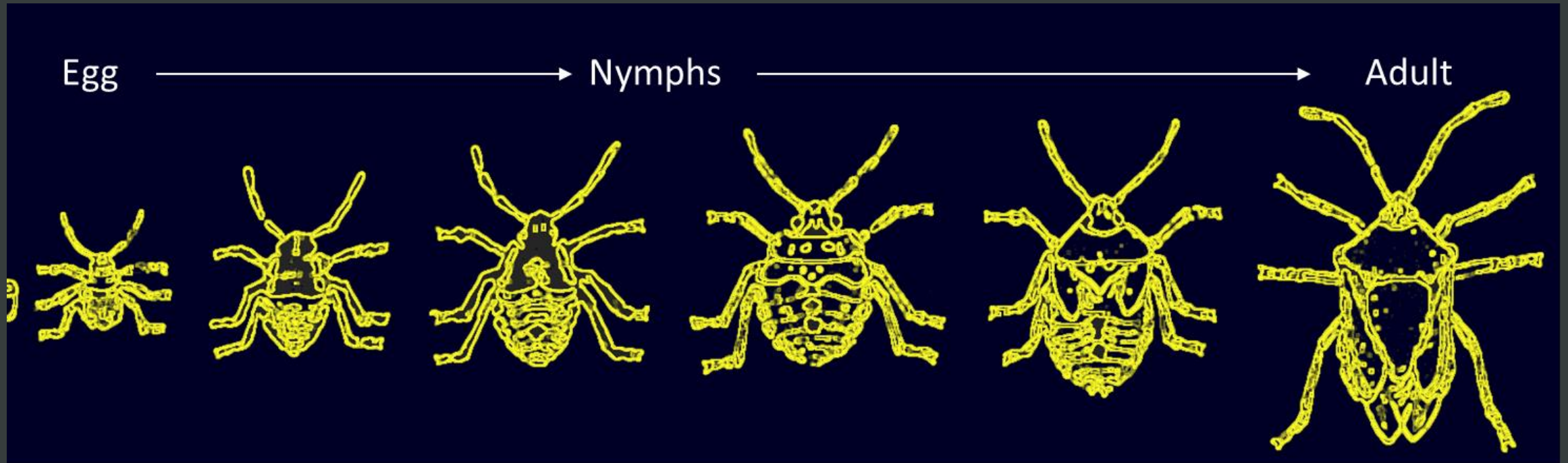
METAMORPHOSIS: CHANGE IN FORM/HABITS OF AN ANIMAL DURING NORMAL DEVELOPMENT

Without Metamorphosis (Ametabolous)



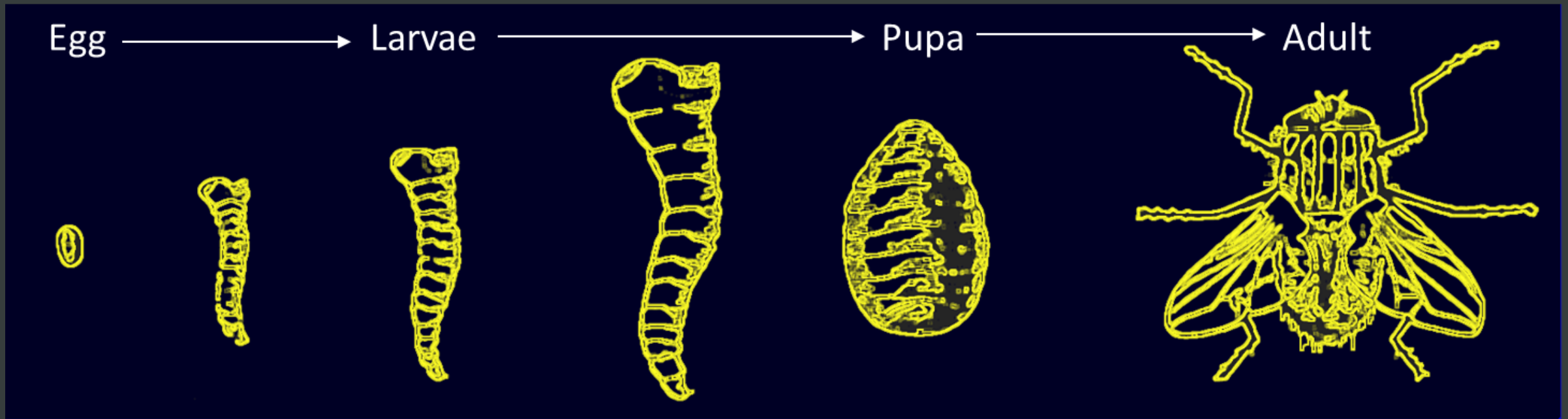
The young resemble adults except for size.

Incomplete Metamorphosis (Hemimetabolous)



Starts as an egg, but each growth, or nymphal stage looks similar, except it lacks wings and reproductive capacity that the adult possesses.

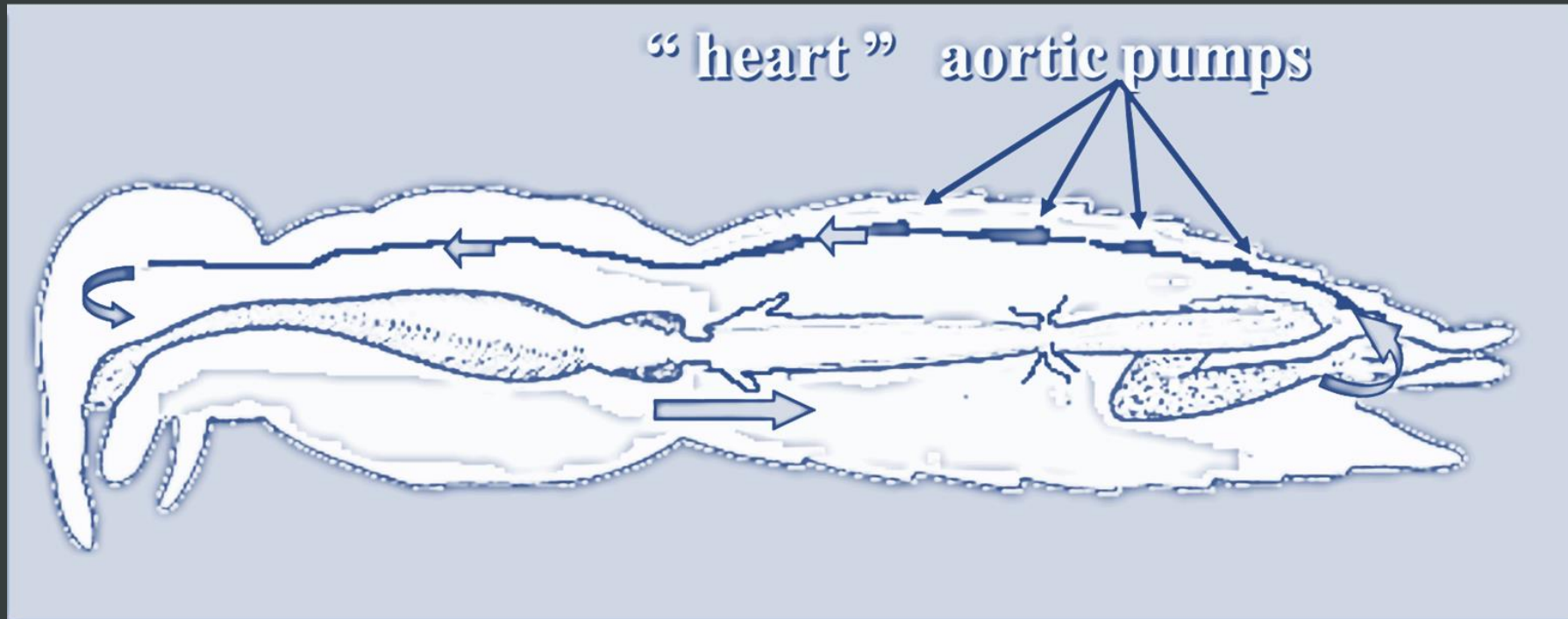
Complete Metamorphosis (Holometabolous)



This life cycle has 4 stages of egg, larva, pupa and adult and each stage is quite distinct.

Circulatory System

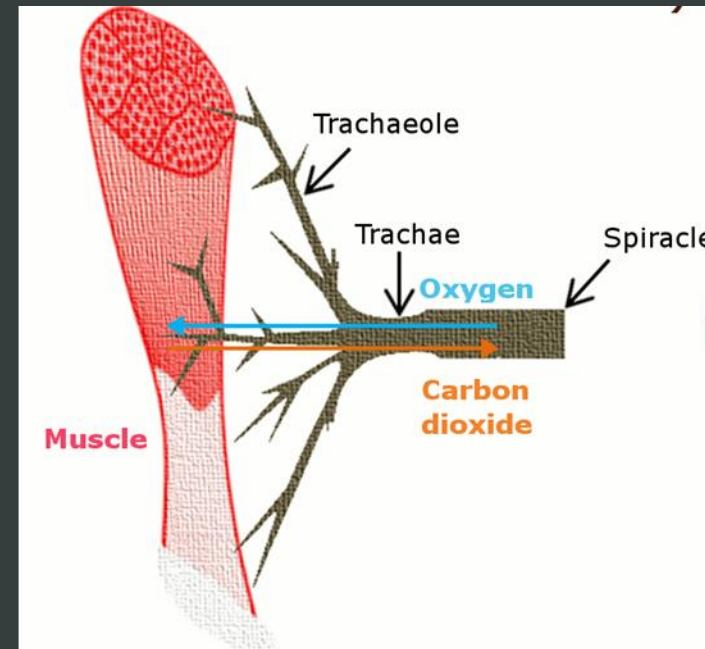
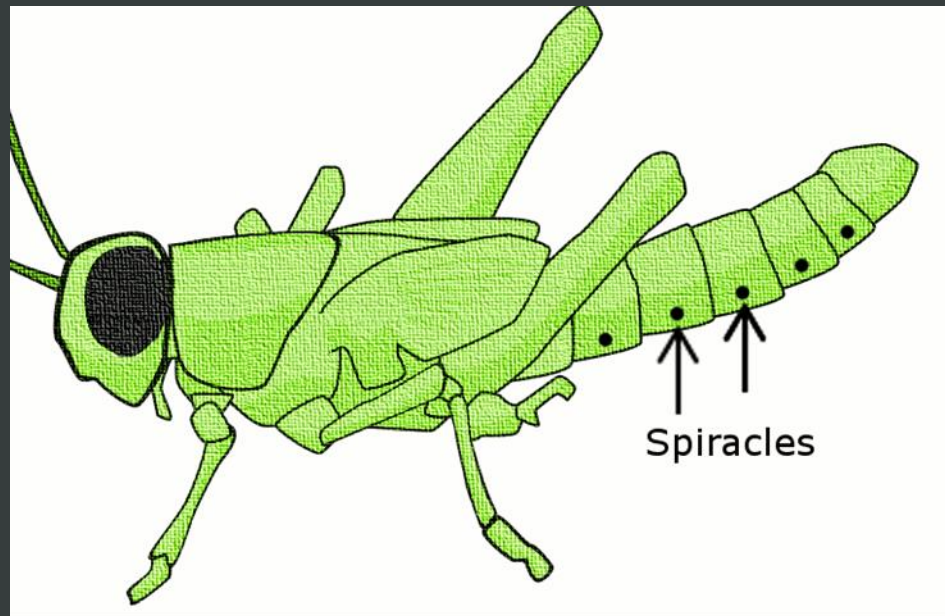
“Open” Circulatory System



Not composed of a central heart, veins or arteries which circulate blood cells and transport oxygen. The “heart” is a simple tube down the back which is open at both ends and slowly pulses body fluids and nutrients from the rear of the insect to the head.

Respiratory System

Respiratory System of Insects



Insects breathe through spiracles. Air enters the spiracle allowing oxygen to travel along a network of tubes called tracheae to reach the cells in the insects body.

What is a species?

THE LAST TAXON IS **SPECIES** WHICH IS A GROUP OF LIVING ORGANISMS CONSISTING OF SIMILAR INDIVIDUALS CAPABLE OF EXCHANGING GENES OR INTERBREEDING

How do species survive?



Species may be placed on the endangered list if the population size is negative and continues to decline due to breeding success rates.

Can species go extinct? **YES!!!!**



The Caribbean Monk Seal Nasal Mite went extinct since it specialized on Caribbean Monk Seals which also went extinct.

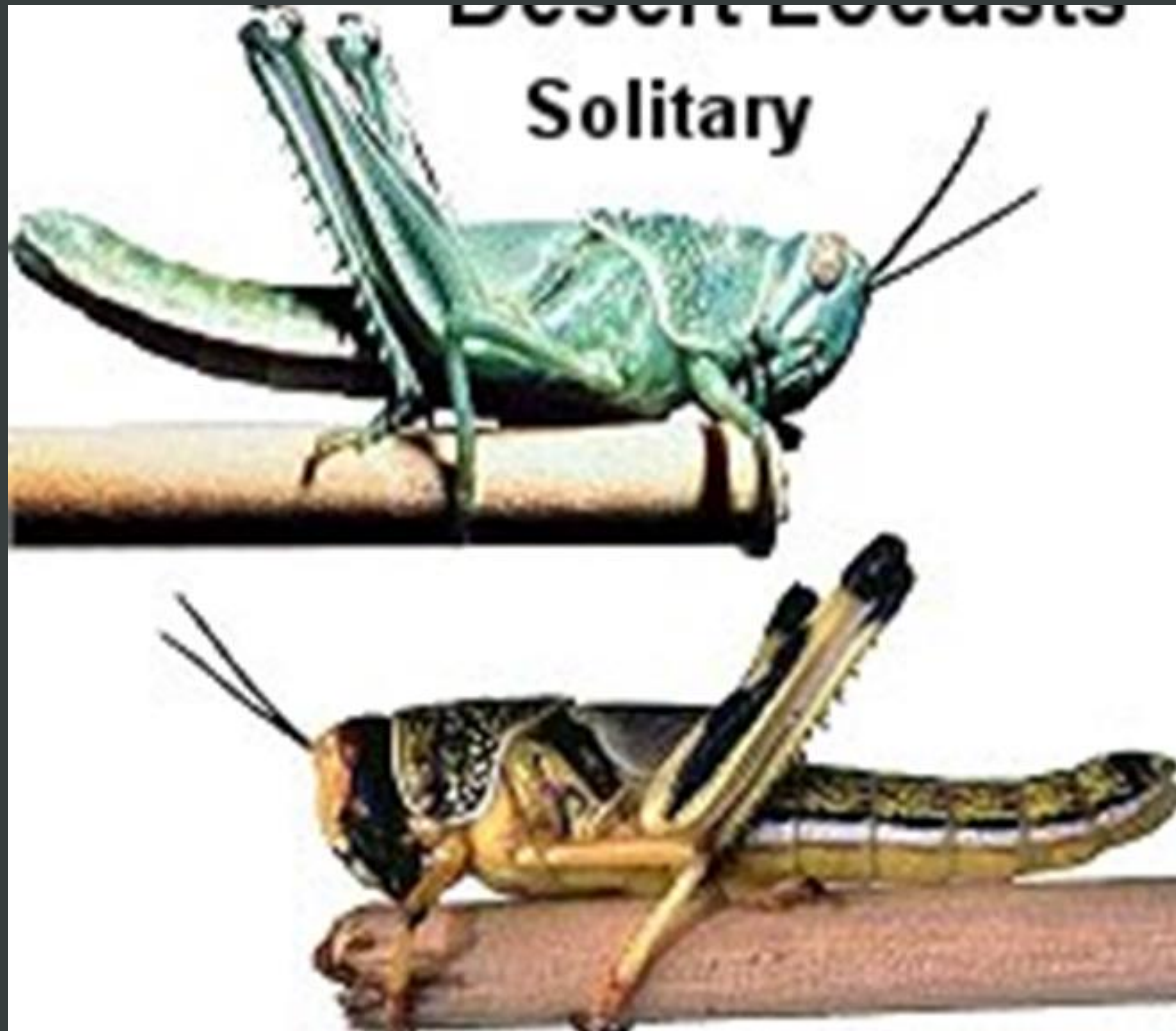
How can insects avoid extinction?

By adapting to the environment.



Light moths survive best in the rural area and dark moths in the polluted area.

Cool Insect Adaptations



Fastest Flying Insect

Desert Locusts can fly up to 21 mph.



Farthest migration

Monarch butterfly *Danaus plexippus* can fly up to 2,485 miles. The distance from California to North Carolina is 2,240 miles.



Largest Insect

Titanus giganteus can grow up to 16.7 cm.



Longest Insect

Phobaeticus serratipes can grow up to 555 cm long.



Longest adult life

Lasius niger queens can live up to 28.7 years in captivity.



Shortest generation time

Aphids *Rhopalosiphum prunifolia* can live as short as 4.7 days.



Fastest evolving insect

Laupala crickets produce 4.17 species per 1 million years.



Largest wings

The Atlas moth, *Attacus atlas*, has wings that are up to 400cm long.



Loudest insect

The African cicada *Brevisana brevis* can make sounds at 106.7 decibels at a distance of 50 m. A jackhammer is 100 decibels.

Make a dichotomous key

Dichotomous key

- A dichotomous key is a tool that scientists can use to help identify a particular specimen.
- In science, we use many helping aids to organize and easily retrieve information.
- The specimen could be a chemical that is identified by its physical properties, an insect identified by its markings and traits, or even a rock sample based on its different properties. The term dichotomous begins with the prefix of "di" which means two.
- The dichotomous key allows for the scientist to ask a series of questions with yes or no answers. Each question should be phrased so that the answer will either be yes or no.



The first step in the key will be organized the following way:

1. a. wings covered by an exoskeleton
- b. wings not covered by an exoskeleton



Next, the statements need to lead the observer to the next step to narrow the identification further:

1. a. wings covered by an exoskeleton go to step 2
- b. wings not covered by an exoskeleton go to step 3



Step 2 needs to consist of a pair of statements that will allow for the identification of the ladybug and the grasshopper:

2. a. body has a round shape **ladybug**
- b. wings not covered by an exoskeleton **grasshopper**



Step 3 needs to consist of a pair of statements that will allow for the identification of the housefly and dragonfly:

3. a. wings point out from the side of the body **dragonfly**
- b. wings point to the posterior of the body **housefly**

Now make your own!! 😊