



السلام عليكم ورحمة الله



Do you think that
I am successful ?



Signs for success

- ✓ Large number of species
 - ✓ Large number of individuals
 - ✓ High distribution
- 

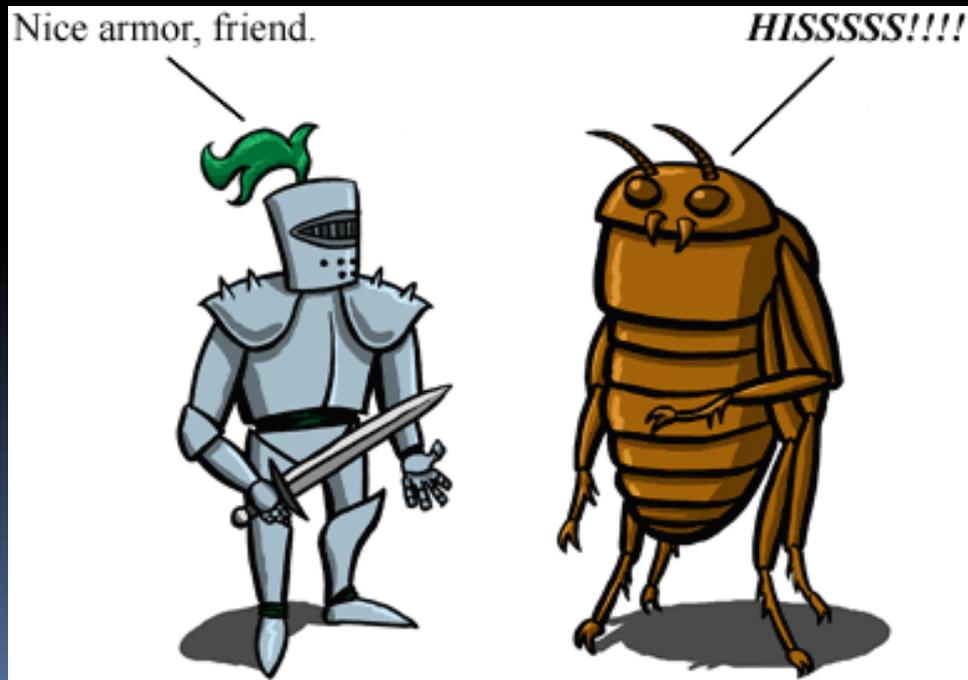
Reasons for Success



1- Exoskeleton (الهيكل الخارجي)

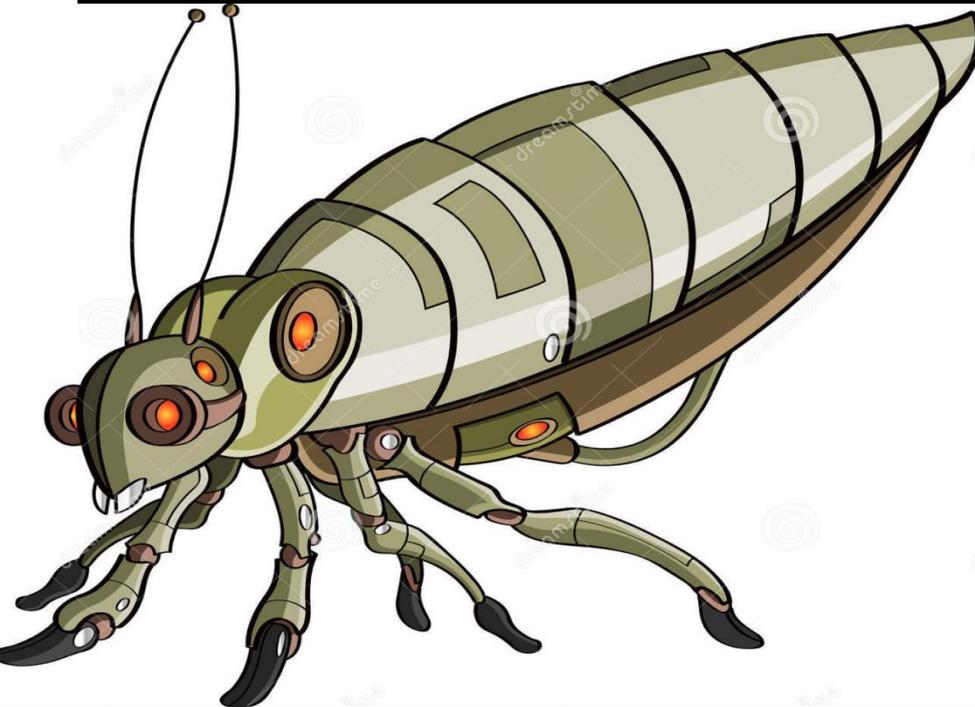
Exoskeleton

- Insect body has a hard exoskeleton protecting a soft interior
- Located on the outside of the body.



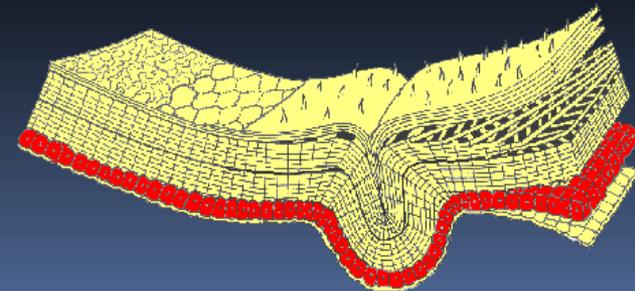
Exoskeleton

The exoskeleton gives shape and support to the body.



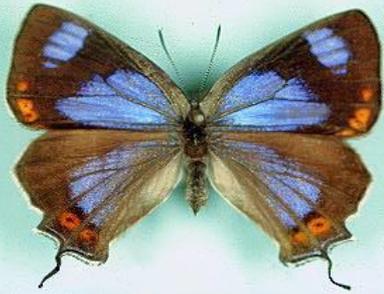
Exoskeleton

- It is covered by a layer of wax that prevents dehydration.
- It can resist both physical and chemical attack.



Exoskeleton

● It may be as elastic as rubber or rigid as some metals



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Exoskeleton

- Freedom of movement is ensured by membranes and joints



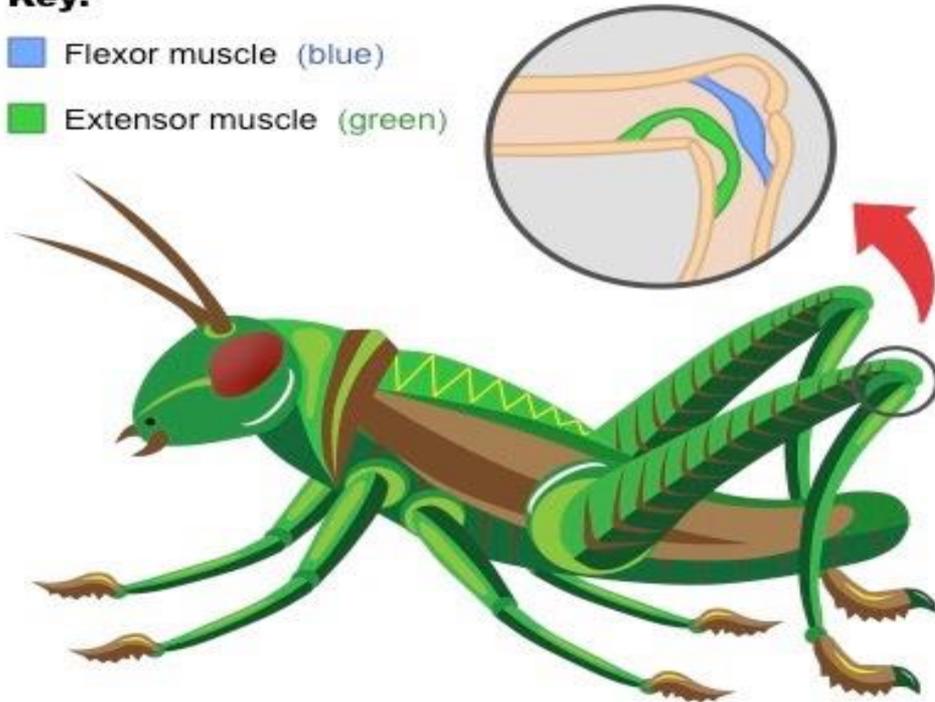
Exoskeleton

- Muscles that attach directly to the body wall have maximum strength.

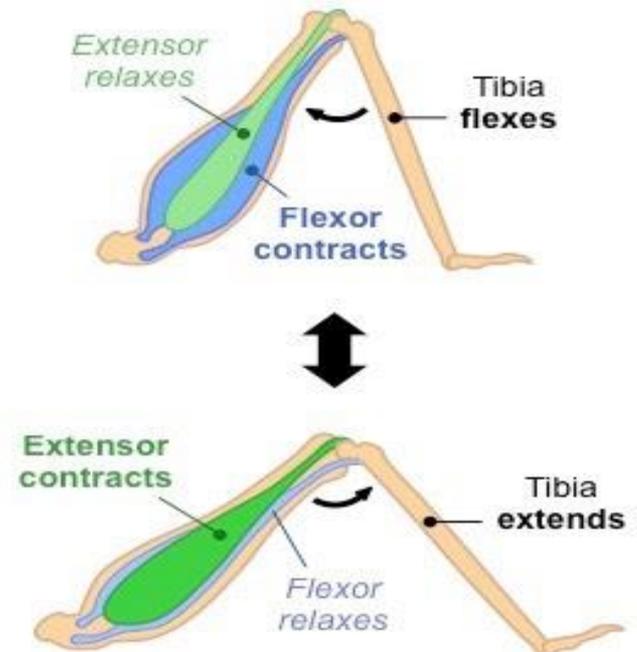
Grasshopper Leg Joint Anatomy

Key:

- Flexor muscle (blue)
- Extensor muscle (green)

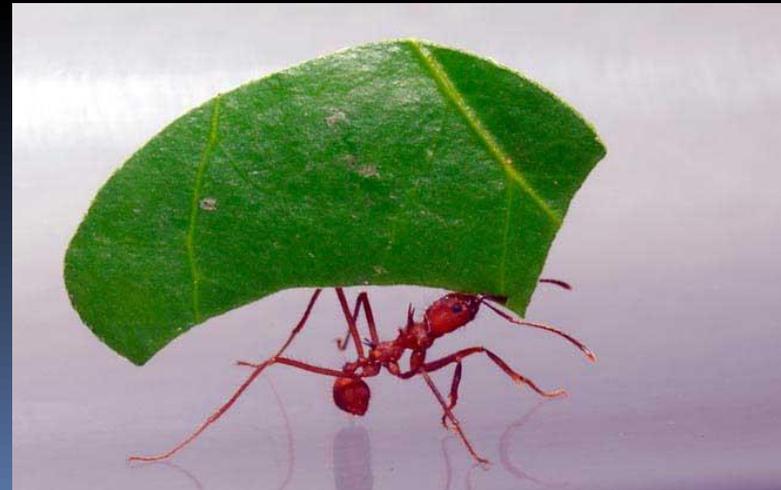
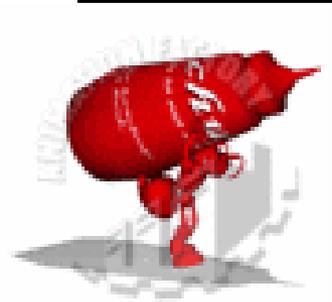


Antagonistic Muscle Pairs



Exoskeleton

- Insects are the world champions in many fields
- An ant, for example, can raise 50 times its own body weight.



Exoskeleton

- Exoskeleton is hard, non-living and prevents insect growth.
- Insects grow in size by shedding the exoskeleton (molting or ecdysis).
- The stages between molts are called instars or stages.



Ecdysis



صغر الحجم
Small Size

- Most insect species are between 2 and 20 mm in length.
- The smallest insect is a parasitic wasp of other insects' eggs





- Small size is a big advantage to insects due to the minimal resources needed for:

- Survival
- reproduction,
- avoid predation

- Small size, adaptations in shape and coloration, make many species virtually undetectable

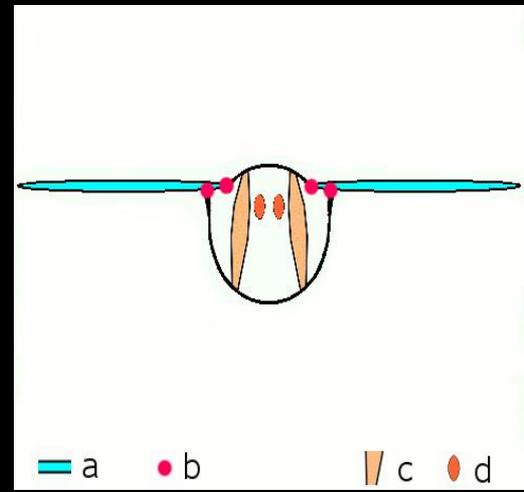


وجود
الأجنحة
Wings



وجود الأجنحة

Wings



- Insects are the only invertebrates that can fly



- Flight help insects to:
 - ❖ **Escape** from predators,
 - ❖ **Transport easily from place to another**
 - ❖ **Expand** into new habitats for new resources

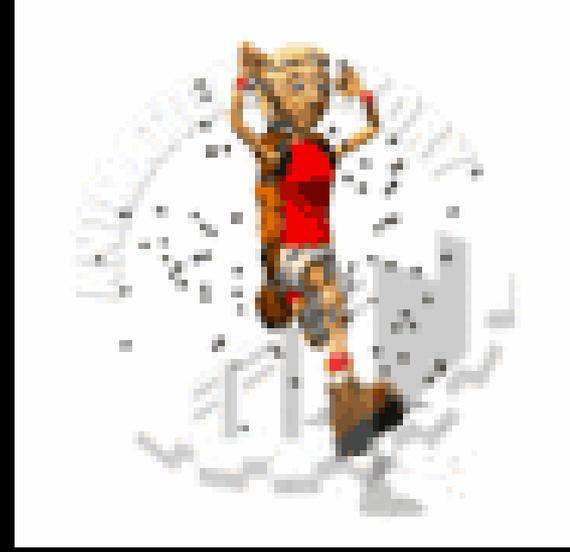


- Efficient use of energy allows some insects to travel great distances or remain airborne for long periods of time.



- Green darner dragonflies are able to fly while carrying a load up to 15 times their body weight.
- Some biting midges beat their wings 1000 times/ second

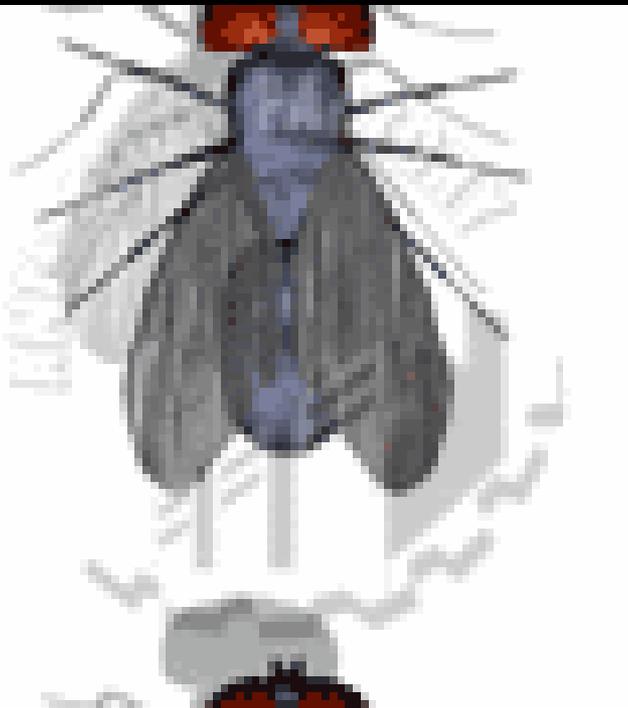




Reproductive Potential القدرة العالية على التكاثر



If we ignore all the limiting factors, in two years of continuous reproduction, a pair of some fly species would fill a ball nearly **8 million kilometers in diameter**. This helps explain sudden pest outbreaks





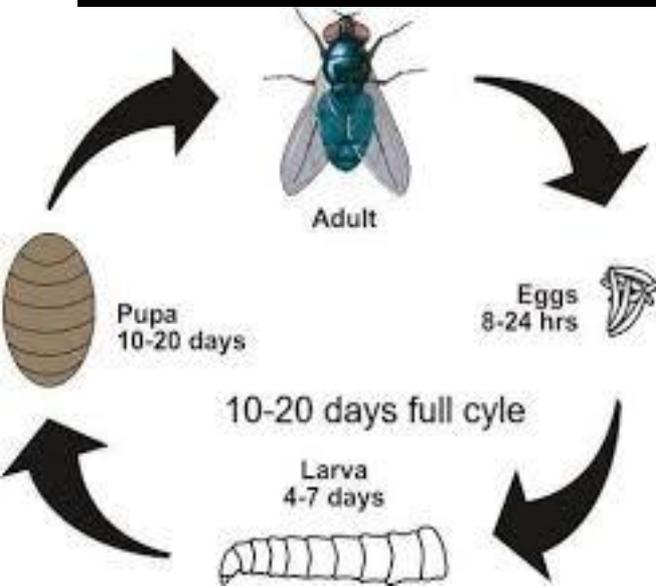
Swarms



- Females often produce large numbers of eggs
- (high fecundity)
- Most of insect`s eggs hatch (high fertility)



- The life cycle is relatively short
- Most females, can **store sperms** for months or years
- There are many insect species that **reproduce asexually**





Metamorphosis

التحول





Adaptation

التكيف

