

# Pathways – Branching out!



**Reptile  
Encounters**  
wildlife up close

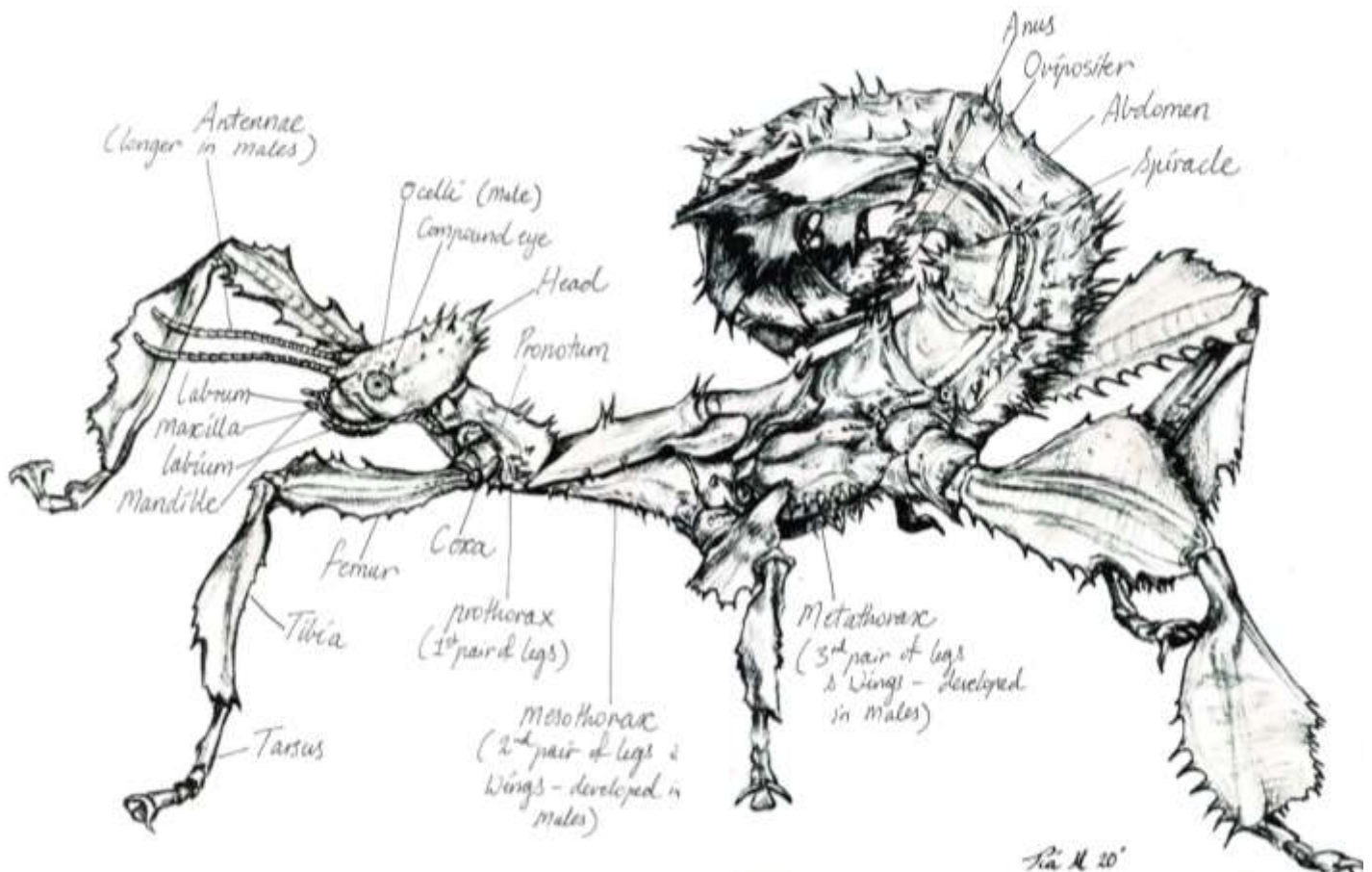
## Week 8 - Inside Insects

Today we are going to learn all about Stick Insect anatomy - both outside and inside features- learning how their insides work, as they are quite different than ours.

So, put on Tia's video, and have a print out of the stick insect diagram at hand, so that you can label it as you go along.

<https://www.youtube.com/watch?v=6cOubDJDzsM&feature=youtu.be>

Bring your stickies along too, so that you can have a look at the real thing as we go along.



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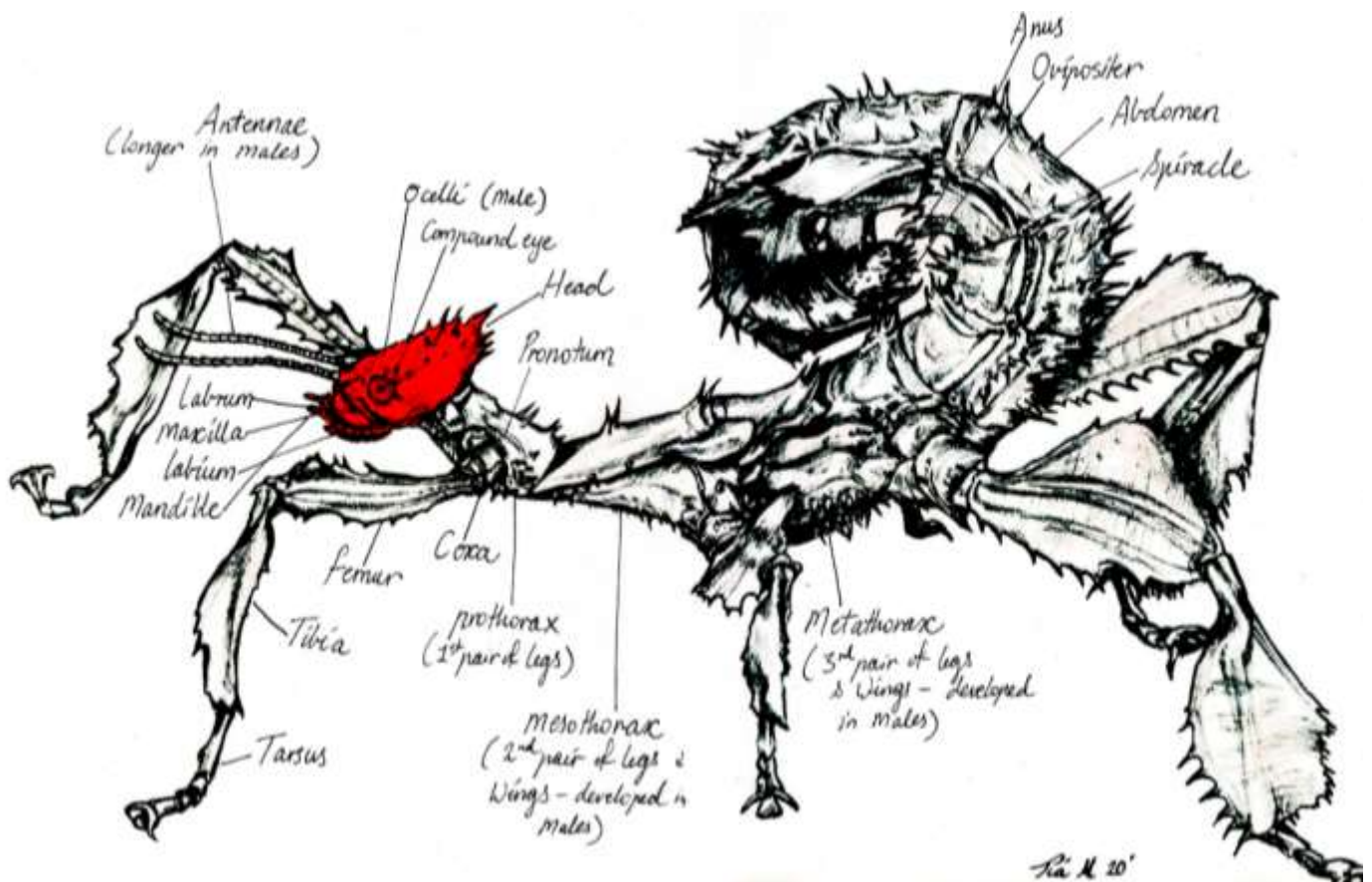


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## Basic External Structure

Insects have 3 body parts, and 6 jointed legs. The 3 body parts are the head, the thorax and the abdomen.

### 1. The head



The head looks very different in males and females. They both have **compound eyes**, but the males have the extra set of eyes called **ocelli**. The head also holds the antennae, which are much longer in males than in females.

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Most insects have very complex mouthparts. Let's take a close look at these:



Firstly, we have the **labium** (bottom bit) and the **labrum** (top bit), and the powerful **mandibles** which make up the jaw.



Then we have the **maxilla**, which are used to hold on to the leaves while the stick insect uses its powerful jaws to chomp down.



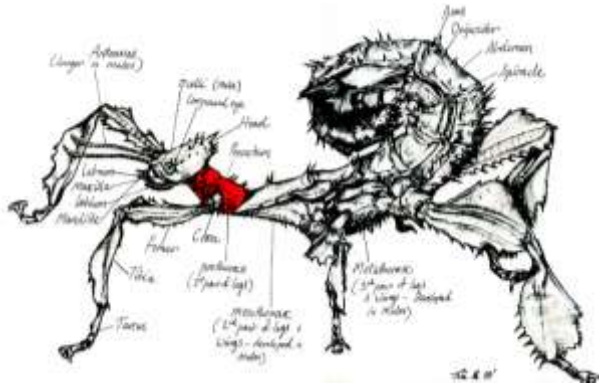
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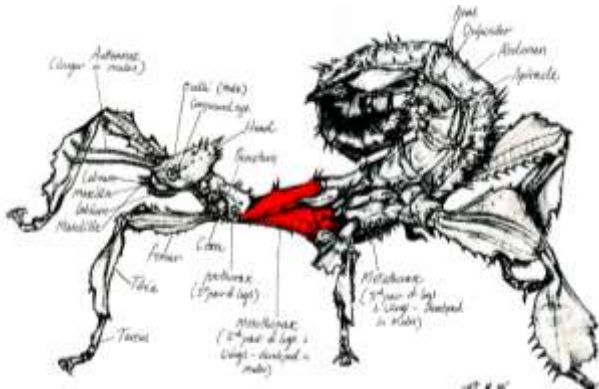
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## 2. The thorax

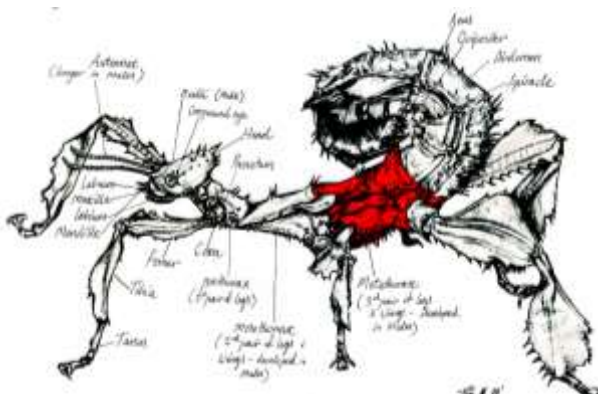
The thorax is divided into 3 sections: the prothorax, the mesothorax and the metathorax.



The **prothorax** holds the first set of legs



The **mesothorax** holds the second pair of legs and the wings.



The **metathorax** hold the third pair of legs and the wings.

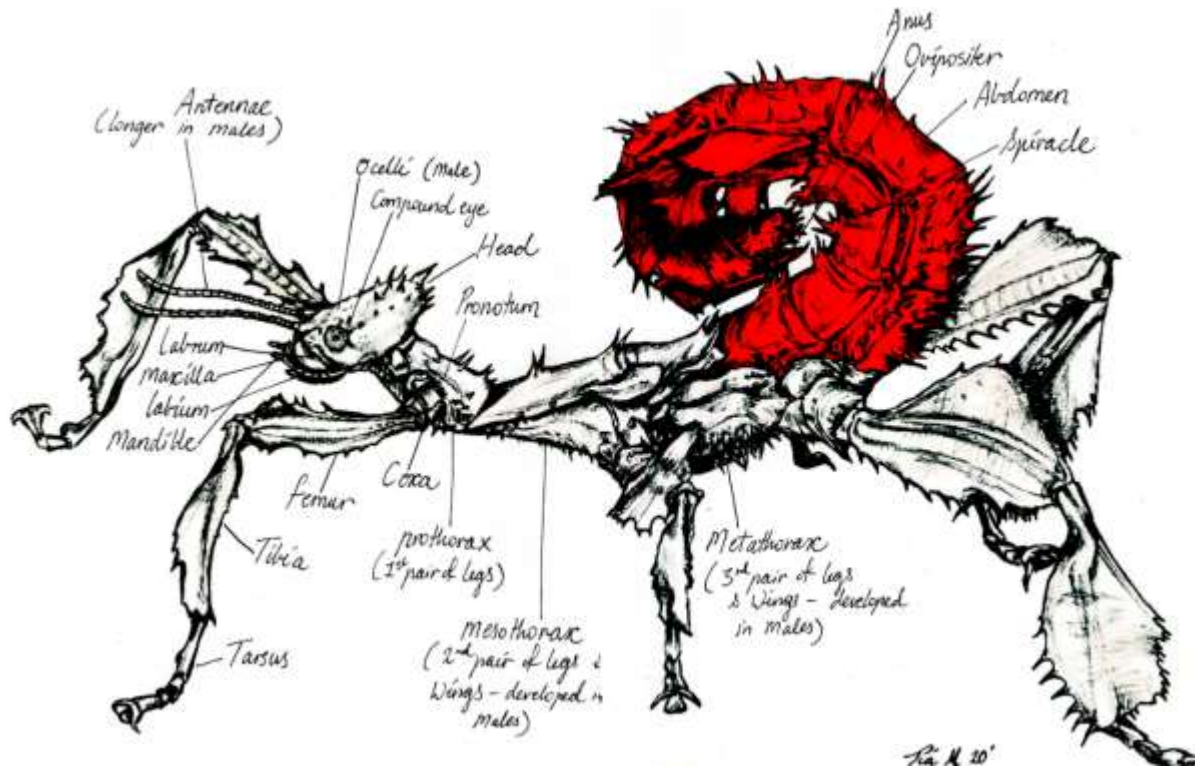
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## 3. The abdomen

In females, the abdomen is nice and thick to hold lots of eggs and has an **ovipositor**, which helps deposit the eggs. The **anus** is also located here.



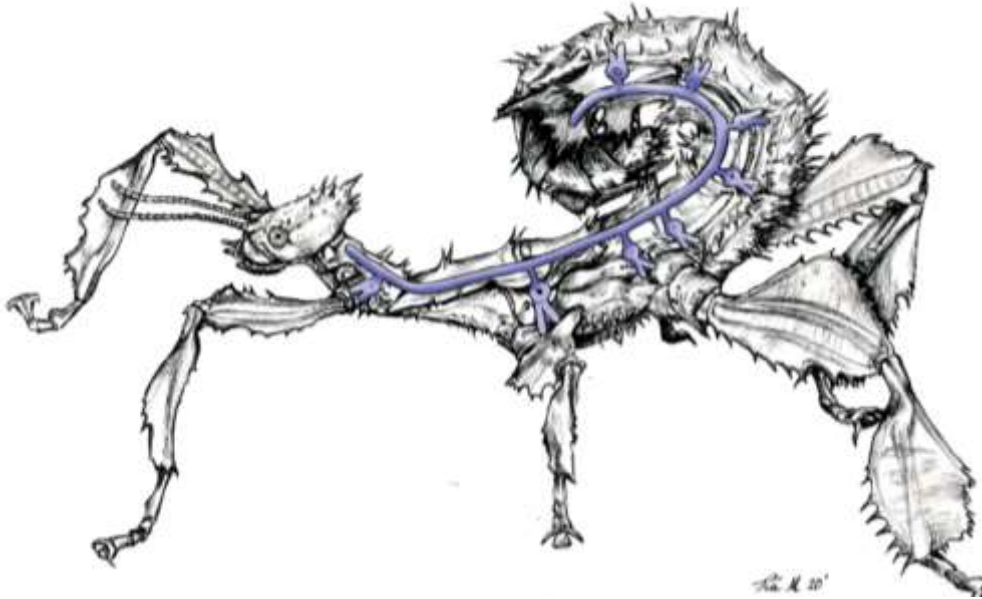
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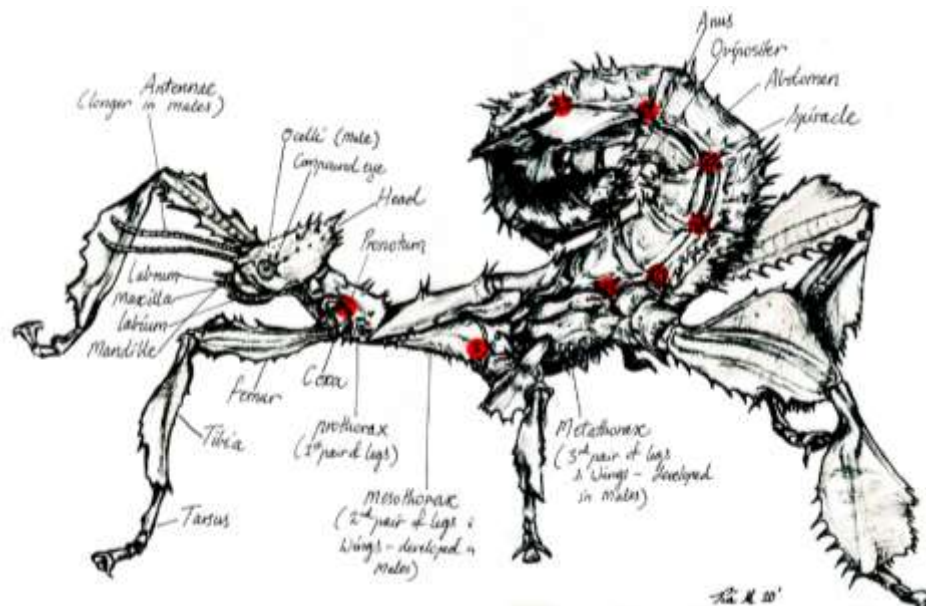
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## Insect Organ Systems

### 1. The Respiratory System - How do stick insects breathe?



Stick insects don't have lungs like us. They use little holes or pores along their body, called **spiracles**.



The spiracles are connected to **trachea** - tubes within the insect's body. Air enters the trachea via the spiracles and the oxygen then diffuses into the insect's body.

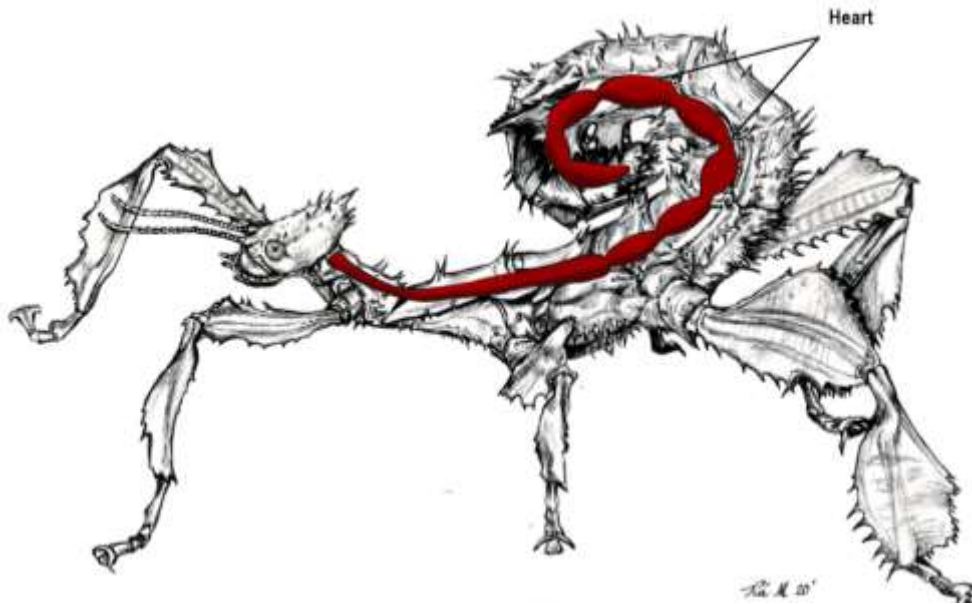
Insect blood, haemolymph, is not used to transfer oxygen around the body of the insect, as the oxygen diffuses straight into the parts where it is needed.

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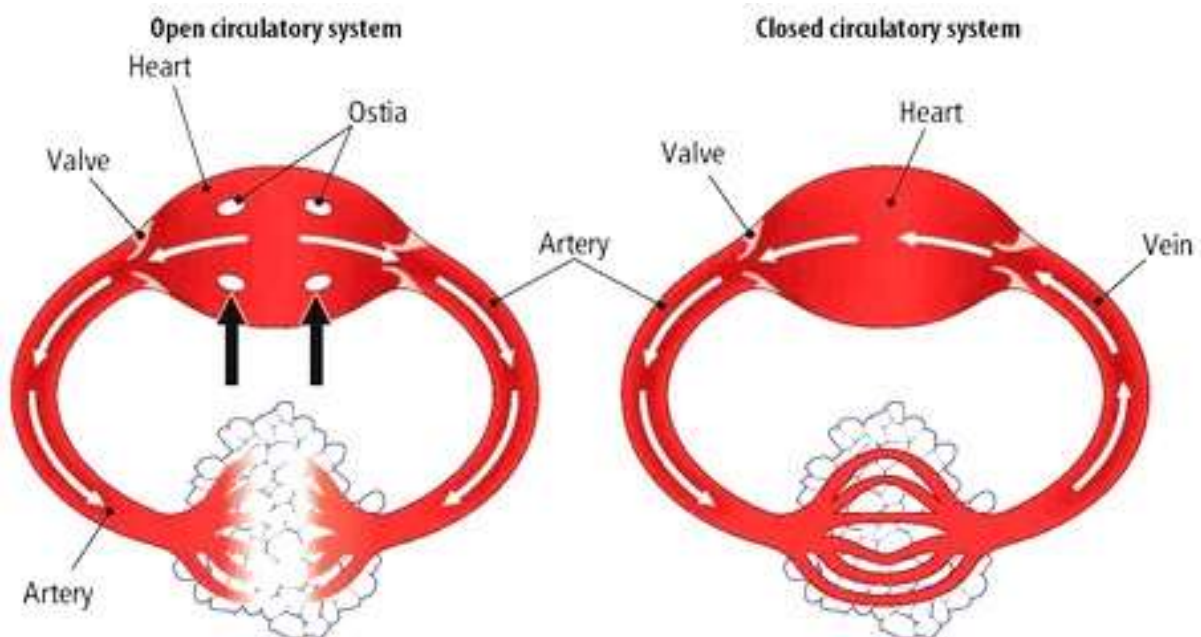


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## 2. Insect Circulatory Systems



Insects have what is known as an **open circulatory system**. Open circulatory systems are systems where blood (or haemolymph in this case), rather than being sealed tight in arteries and veins, suffuses the body and may be directly open to the environment at places such as the digestive tract. This is of course unlike human circulatory system where the blood never leaves the blood vessels.

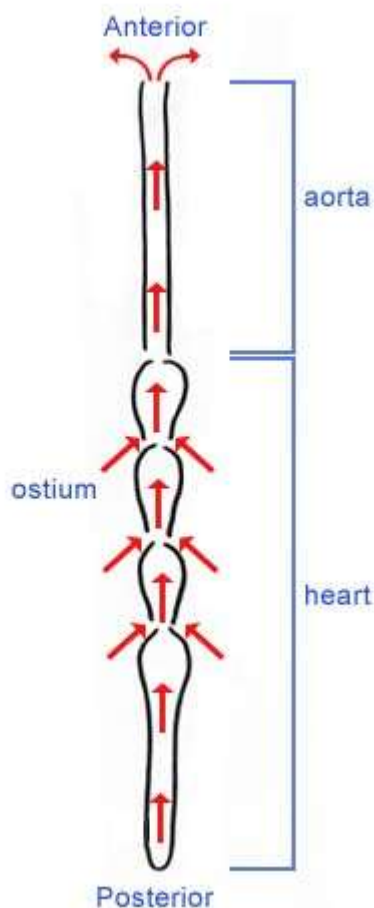


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As mentioned earlier, insects don't have blood. They have a substance called **haemolymph**, which is either green or yellowish. It does not contain red blood cells, like the blood of vertebrates. Hemolymph is mostly water, but it also contains ions, carbohydrates, lipids, glycerol, amino acids, hormones, some cells and pigments.

The hemolymph is the major transport medium for the exchange of materials between cells, such as hormones, waste materials, and nutrients, so it serves a similar function to our blood.

DORSAL VESSEL (HEART) OF INSECT



Hemolymph is forced to circulate by specialized organs known as the **dorsal vessel**. Interestingly, this seemingly tubular structure is considered as the insect's heart.

Branching from the "heart" are the blood vessels that deliver the fluid to various locations in the insect's body.

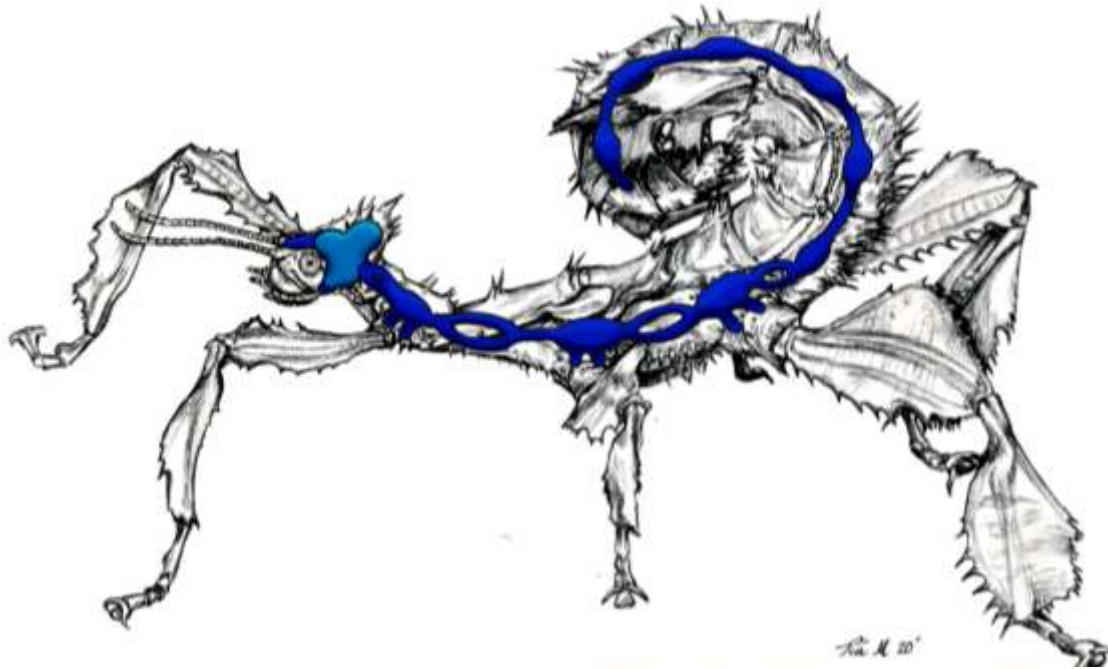
To get the nutrients all the way to their beautiful long legs, stick insects need to dance around to encourage the flow of the haemolymph.

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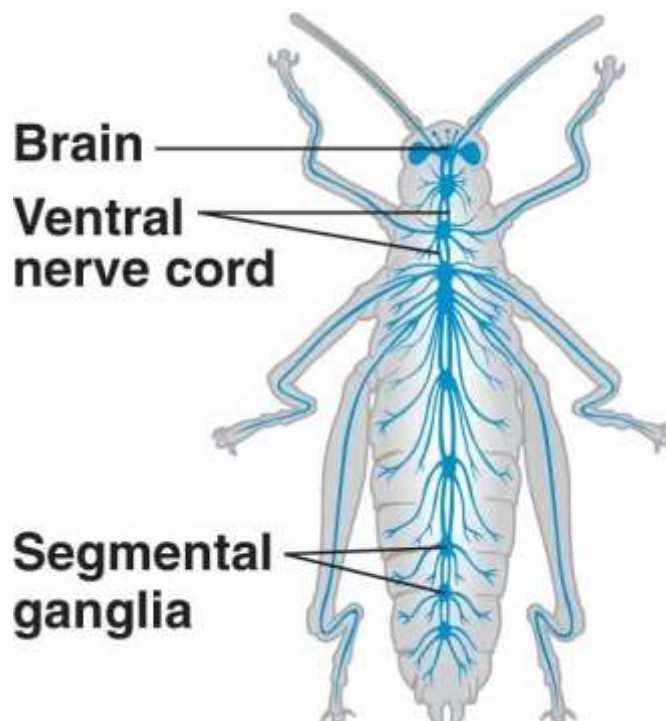
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## 3. Insect Nervous System



Insect “brains” are much simpler than ours. They consist of a fusion of 3 **ganglia**, or nerve cell clusters.

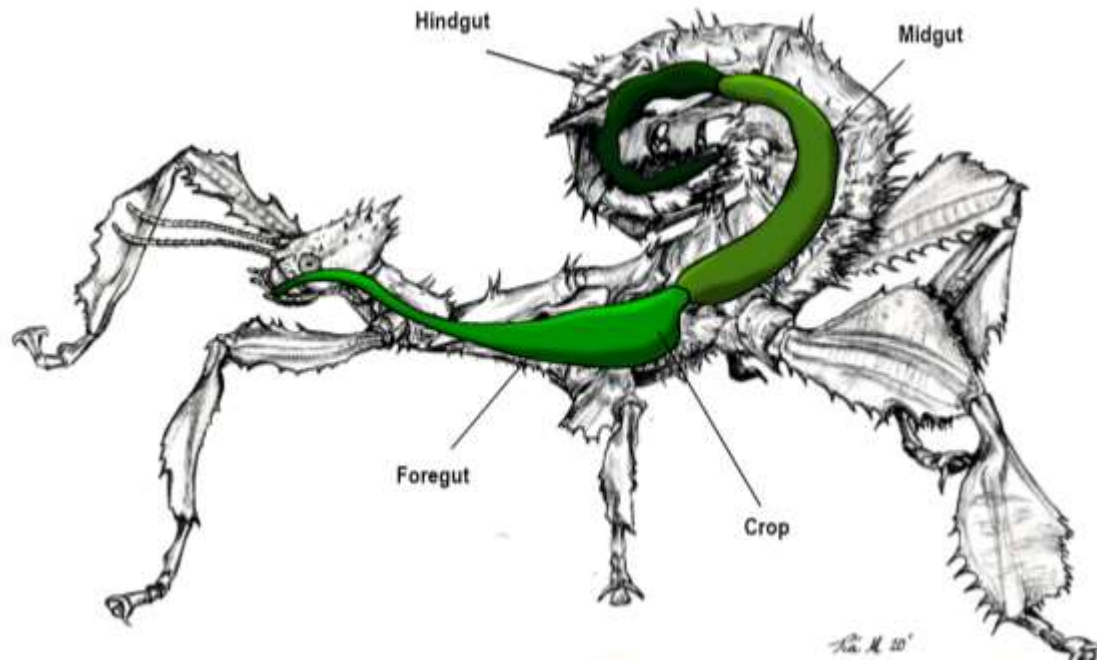
One controls the antennae, the second controls the eyes and the third controls everything else.



The 3 ganglia in their head, are connected to the rest of the body by a **nerve chord** (not a spinal chord like in vertebrates). Each body segment has its own ganglia, that control different body parts. Like min-brains in their entire body.



## 4. The Digestive System



Stick Insects in particular, are constantly eating. They are grazers, just like cows for instance. Because of this, they have an organ called a **crop**, which stores the food until the body is ready to digest it.

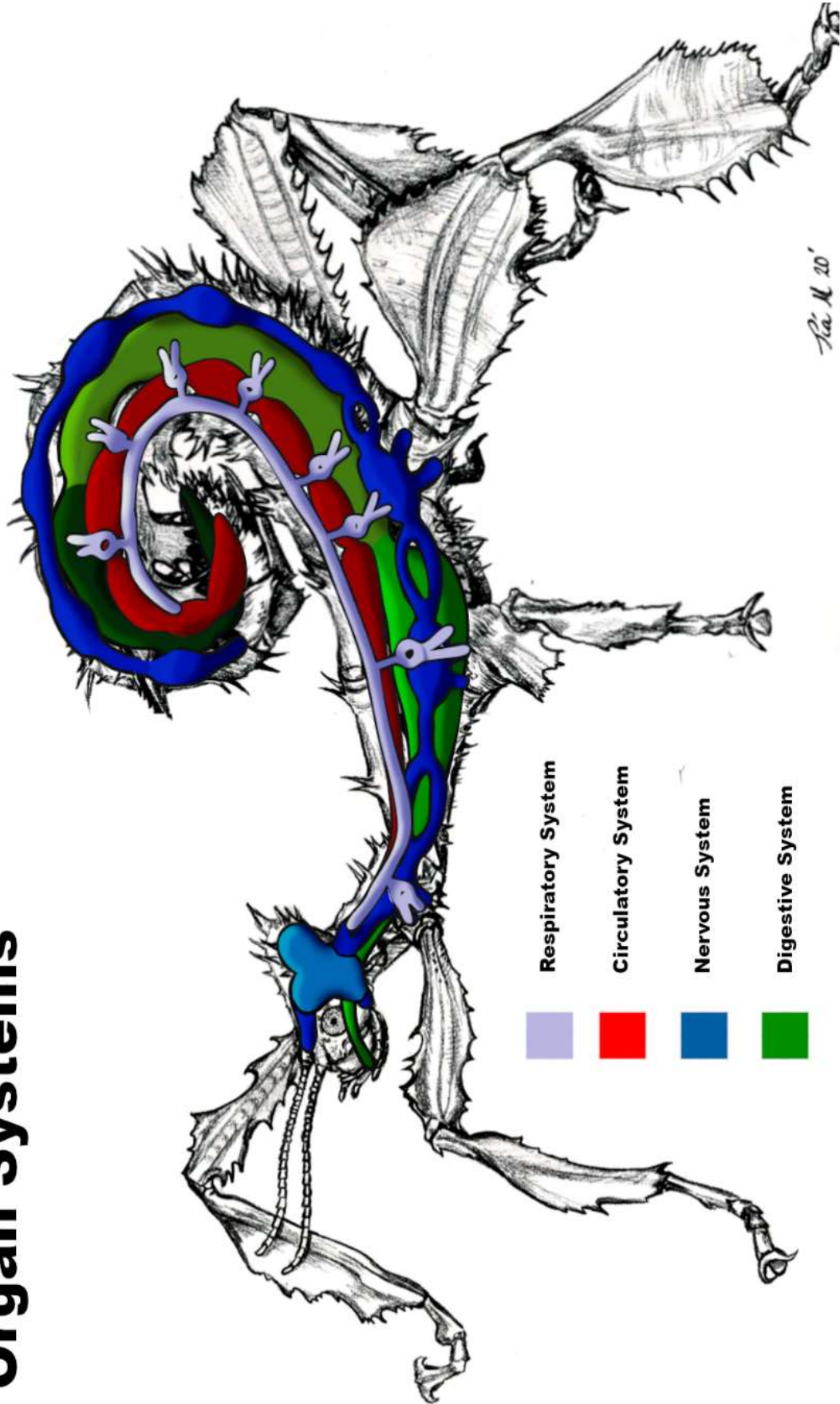
The digestive system starts in the mouth and then has 3 parts, the **foregut** that houses the crop, the **midgut** and the **hindgut**. Very creative naming.

Digestion begins in the foregut, and most of the absorption of nutrients into the haemolymph happens in the midgut. The hindgut is responsible for most of the water re-absorption to eventually create the lovely little poop pellets, which are passed through the anus.

On the next page you can see how all the body systems fit in together.



## Stick Insect Body Organ Systems



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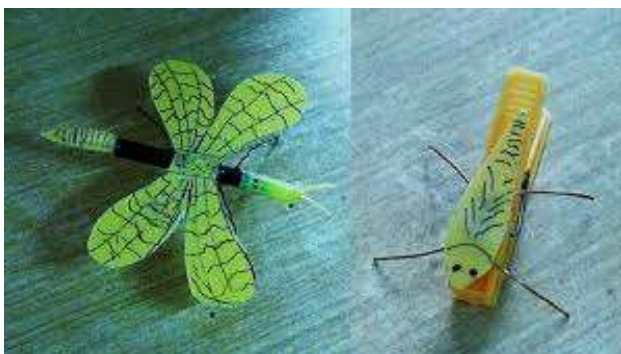
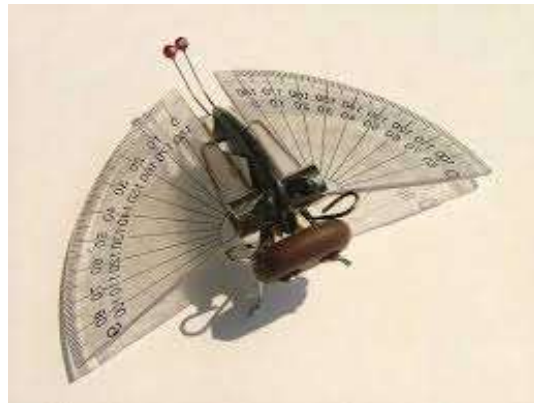
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**Task 1:** Complete the labels on your stick insect diagram (or draw your own).

**Task 2:** Build your own, anatomically correct, insect. Use anything you can find in the house for example egg cartons, newspaper, pipe cleaners, wire etc. Make sure your insect has 3 body parts and that the segmented legs and wings are attached to the right body parts. It can be an existing insect or a fantasy one.

Don't forget to post your creation on the Facebook Group!!

Here are some ideas:



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**Task 3:** Complete the table comparing human and stick insect organ systems. This task is suited for high school students and you may need to use the internet to research the answers.

	Human	Insect
Type of eyes		
Type of Circulatory System		
Name of body fluid that transports nutrients		
Breathing apparatus		
Parts of the Digestive System		
Parts of the Nervous System		

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Answers for Task 3:

	<b>Human</b>	<b>Insect</b>
<b>Type of eyes</b>	Simple	Compound
<b>Type of Circulatory System</b>	Closed	Open
<b>Name of body fluid that transports nutrients</b>	Blood	Haemolymph
<b>Breathing apparatus</b>	Lungs	Spiracles
<b>Parts of the Digestive System</b>	Mouth, oesophagus, stomach, small intestine(duodenum, jejunum, ileum),cecum, large intestine (colon&rectum)	Mouth, foregut (crop), midgut, hindgut (anus)
<b>Parts of the Nervous System</b>	Central Nervous System (brain&spinal cord), Pheripheral Nervous System (neurons, ganglia and connecting nerves), Autonomic Nervous System (nerves that connect CNS to internal organs)	Brain (3 ganglia), ventral nerve cord, segmental ganglia