

# SPIDERS

ALIVE & DEADLY

Secondary  
Education  
Kit



AUSTRALIAN MUSEUM

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## Book an Educator-led Program!

Students can engage with the Museum's collections and a Museum educator at the Museum.

### YEARS 7-10

- Fascinating Fossils
- Australia's Ancient Past
- Climate Change and Australian Animals
- Aboriginal Art Workshop
- Gallery Experiences (First Australians and Australia's First Scientists tours)

### BIOLOGY

- The Human Story
- Learning from Fossils
- Evolution of Australia Biota Study Days

### EARTH AND ENVIRONMENTAL SCIENCE

- E and ES Fossils

Go to <http://australianmuseum.net.au/museum-educator-led-programs>

## How to Book

For information about Booking and Risk Assessment information go to:

<http://australianmuseum.net.au/booking-an-education-group>

# Notes about the Museum

## Briefing

On arrival at the Museum the students will be met and briefed about the Museum. Please ensure all students and accompanying adults attend this short briefing.

## Bag Storage

Museum staff will securely store the students' bags.

## Exhibitions

Outside of any educator-led sessions, students and teachers may explore the Museum's exhibitions. Some special exhibitions incur an extra charge. We suggest that you divide the students into small groups to prevent overcrowding. **Please note that the Long Gallery (Ground level), Planet of Minerals (Level 1), and Birds and Insects (Level 2) are closed for renovations until mid to late 2017 (see map on page 34 for details).**

## Lunch

We recommend that students bring their recess and lunch and eat it in Hyde Park. Alternative locations will be provided in wet weather.

## Photography

Students are welcome to bring mobile devices to record their excursion. There may be some photography restrictions for special exhibitions.

## Free Wi-fi at the Museum

The Museum offers free Wi-fi for onsite visitors. It is available in 30 minute sessions. Students and teachers can log on for more than one session.

## Photocopying

Please photocopy the following materials for students and accompanying adults:

- Student Activity sheets on pages 17-31.
- Spiders Exhibition Floorplan on pages 32-33.

## Student Cameras and Mobile Devices

Students can take photos using their own mobile device.

## Pre-visit student activities

To make the most of your visit to the exhibition we recommend that you prepare your students by completing the suggested pre-visit activities on page 10.

## Post-visit student activities

After your visit your students will be full of enthusiasm and ideas. We recommend some post-visit activities to harness their interest on page 13.

## Onsite organisation

It is recommended that students explore all aspects of the exhibition.

# About the Exhibition

*Spiders* will bring you face-to-face with Australian spiders. The exhibition is divided into the following sections:

## **What are Spiders?**

All arachnids have 8 legs, but that doesn't make a spider. Discover what sets spiders apart from other arachnids.

## **Diversity and Distribution**

Spiders are found everywhere in far higher quantities than you might expect. Explore spider distribution in Australia and find out what's in your backyard.

## **Reproduction and Growth**

The reputation for eating mates is well-founded amongst spiders. Many males have developed highly complex mating behaviours to navigate the dangerous jaws of a hungry female. Others don't seem to find the prospect of being devoured that troubling.

## **Sensing the World**

As premier invertebrate hunters, spiders possess amazing senses. Find out how they see and feel the world around them, seeking their prey and mates in a massive world.

## **Diet, Jaws and Venom**

Synonymous with spiders is their venom, which they inject using their fangs. Used to incapacitate and digest their prey, venoms come in a bewildering array of types and effects.

## **Contemporary Science**

Come and see live specimens of some of Australia's most famous spiders. Each spider is housed in its own specialised habitat.

## **Webs and Silk**

Not only are spiders excellent hunters, many are also accomplished architects. The complex protein structure of their silk allows spiders to build webs of breathtaking size, shape and complexity. The strength of these webs ensures they can catch the prey they need—sometimes including small birds or lizards.

# Links to the NSW Syllabus for the Australian Curriculum

Stage 4 - NSW Syllabus for the Australian Curriculum				
		Outcomes	Content	Spiders Activity
Science	Values and Attitudes	SC4-1VA › appreciates the importance of science in their lives and the role of scientific inquiry in increasing understanding of the world around them	-	Throughout exhibition
	Skills	SC4-6WS › follows a sequence of instructions to safely undertake a range of investigation types, collaboratively and individually  SC4-7WS › processes and analyses data from a first-hand investigation and secondary sources to identify trends, patterns and relationships, and draw conclusions  SC4-9WS › presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations	WS6e WS6f WS7.1a WS7.1b WS7.1c WS7.1d WS9a WS9b	Option1+2 Option1+2 Option1+2 Post-visit activity Option1+2 Option1+2 Option 1 Post-visit activity
	Knowledge and Understanding	SC4-14LW › relates the structure and function of living things to their classification, survival and reproduction  SC4-15LW › explains how new biological evidence changes people's understanding of the world	LW1a LW1b  LW1c LW1e LW1f LW3a LW3b LW5b LW5d	B4 H1, H3, W1, W2, Pre-visit activity Pre-visit activity H1, H3, W1 B2, B3, H1, H3, W1, W3 B1, H4, W4 B1, H4 H2
English	Values and Attitudes	The power of effective communication using the language modes of speaking, listening, reading, writing, viewing and representing	-	Option1+2
	Skills	OUTCOME 5 › thinks imaginatively, creatively, interpretively and critically about information, ideas and arguments to respond to and compose text	See syllabus	Option1+2
	Knowledge and Understanding			

Stage 5 - NSW Syllabus for the Australian Curriculum				
		Outcomes	Content	Spiders Activity
Science	Values and Attitudes	SC5-1VA › appreciates the importance of science in their lives and the role of scientific inquiry in increasing understanding of the world around them	-	Throughout exhibition
	Skills	SC5-7WS › processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions  SC5-9WS › presents science ideas and evidence for a particular purpose and to a specific audience, using appropriate scientific language, conventions and representations	WS7.1b WS7.1c WS7.2g WS9a WS9d WS9e	Option1+2 Option1+2 Option1+2 Post-visit activity Option1+2 Option 1, Post-visit activity
	Knowledge and Understanding	SC5-14LW › analyses interactions between components and processes within biological systems  SC5-15LW › explains how biological understanding has advanced through scientific discoveries, technological developments and the needs of society	LW1b LW2a LW3e LW4a LW4b LW4d	1 3 Post-visit activity 3,5 2 4
English	Values and Attitudes	The power of effective communication using the language modes of speaking, listening, reading, writing, viewing and representing	-	Option1+2
	Skills Knowledge and Understanding	OUTCOME 5 › thinks imaginatively, creatively, interpretively and critically about information and increasingly complex ideas and arguments to respond to and compose texts in a range of contexts	See syllabus	Option1+2

# Teacher Notes

## 1. Student Activities for the *Spiders* Exhibition

There are two self-guided education programs on offer for the *Spiders* exhibition. Teachers are welcome to choose the option that they believe is suited to their students.

### **Option 1: digital (bring your own device)**

Option 1 is a student-centred activity. We suggest that students work in small groups. Students could make a 30 second video with five photos using Adobe Spark Video on their own device.

***We recommend that students and teachers familiarise themselves with Adobe Spark Video and practice making a video before coming to the museum (<https://spark.adobe.com/#>). It can be downloaded as a free app.***

### **Option 2: worksheets**

Worksheets for Stage 4 and Stage 5 have been designed so that students can complete activities as they explore the exhibition. They can be found on pages 17-31.

## 2. Background Information about Spiders

Spiders, along with scorpions, ticks, mites and harvestmen, belong to the group of invertebrates called arachnids (class Arachnida). The arachnids are arthropods, which means they have an exoskeleton (external skeleton), a segmented body and jointed legs. Other arthropods include the insects, crustaceans and myriapods (Figure 1).

Arachnids can be distinguished from other arthropods by the number of body parts, legs and antennae. Spiders have two main body parts called the cephalothorax (fused head and thorax) and abdomen, eight legs and no antennae (Figure 2). Insects and crustaceans have three body parts (a head, thorax and abdomen). Insects, however, have six legs and one pair of antennae, whilst crustaceans have ten legs and two pairs of antennae. Unlike insects, spiders never have wings (Figure 1).

Spiders have evolved other specialised appendages to help them survive and reproduce. Spider jaws are tipped with fangs and most species use venom to paralyse their prey. Pedipalps are located between the jaws and legs and are used to handle food, move objects and males use them to transfer sperm to females. The pincers of scorpions are modified pedipalps. Spiders are the only arachnids with abdominal spinnerets and they can produce silk throughout their lifetime (except as an egg).

Spiders form the order Araneae which is divided into the two suborders, Mesothelae and Opisthothelae (Figure 3). The Mesothelae are the most ancient group of spiders consisting of approximately 90 species. The abdomen of these nocturnal, burrowing spiders is divided into visible segments called tergites and the spinnerets are in the middle of the underside of the abdomen.

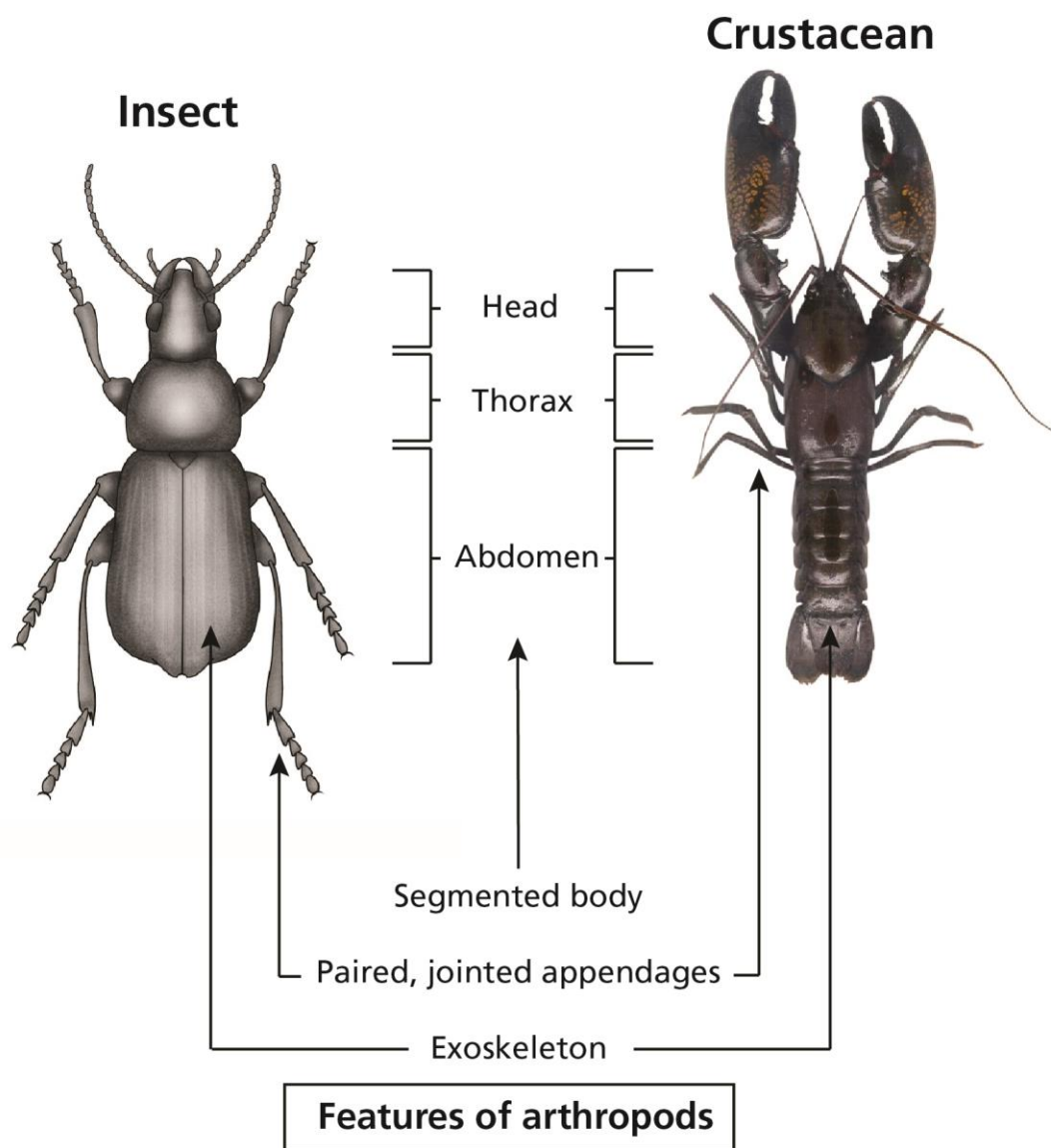
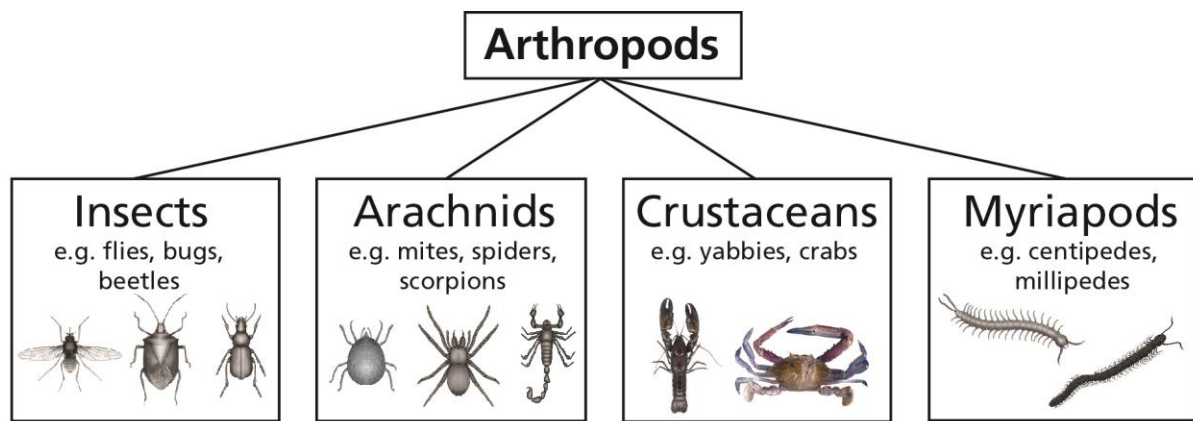
The Opisthothelae are the more recently evolved and diverse group of spiders. The name of this order means 'posterior teat' which refers to spinnerets on the tip of the abdomen. The Opisthothelae are further divided into two infraorders, the Mygalomorphae (Taranatulas, Funnelwebs etc.) and the Araneomorphae ("true spiders"). In the Spiders exhibition the Mesothelae and Mygalomorphs are referred to as **Burrowers** and the Araneomorphs as **Hunters** or **Weavers**. Illustrations of the three types of spider are shown throughout the exhibition to help students classify each species.

The Mygalomorphs generally have large and often dark coloured bodies. These species also have well developed mouthparts for digging burrows and their fangs move in a vertical direction which restricts them to catching prey on solid surfaces. An example of an Australian species is the Sydney Funnelweb Spider.

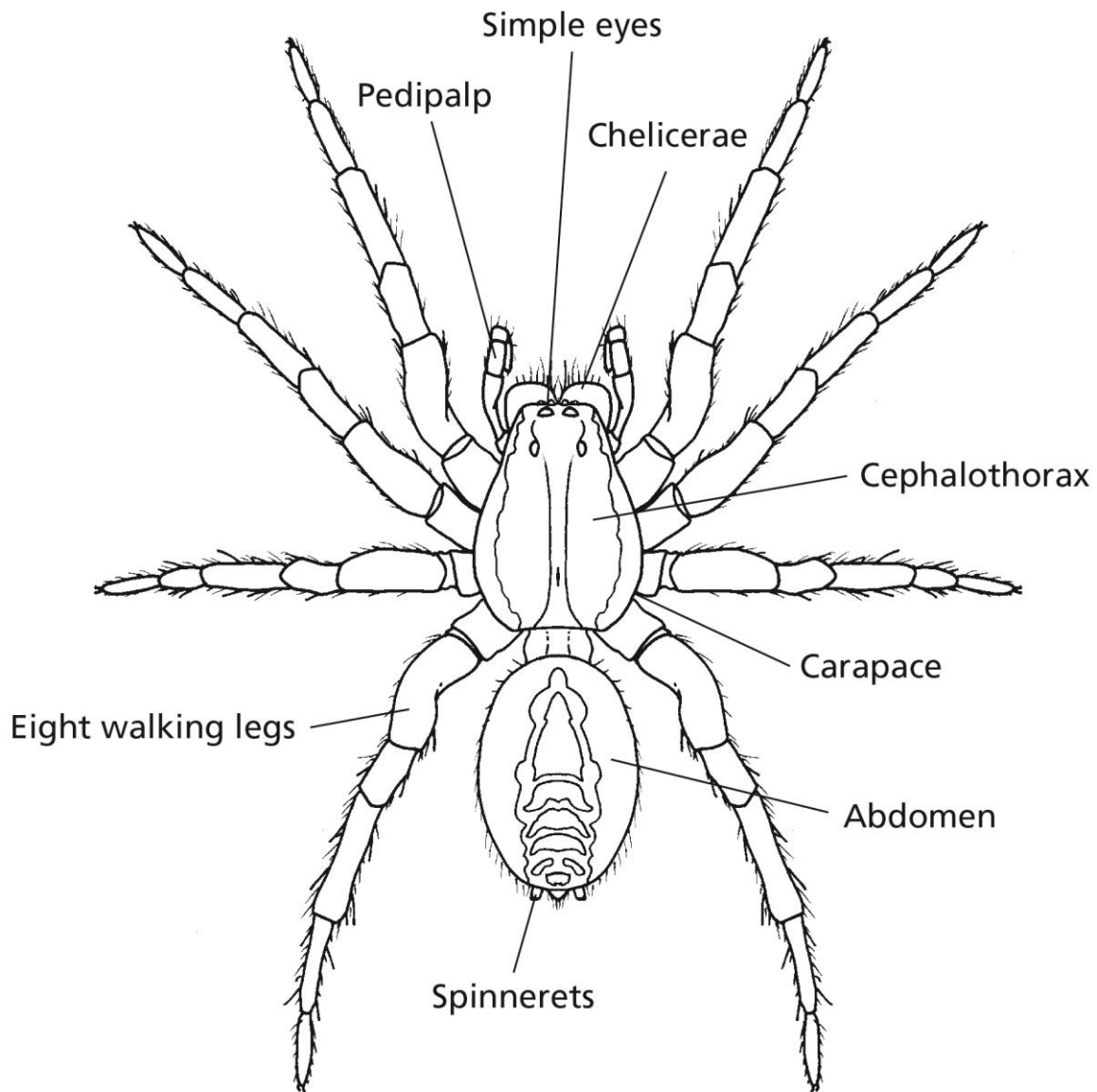
The Araneomorphs are the most recently evolved and species-rich (~40,000 species) group of spiders. Their webs and silk have fascinated humans for thousands of years, and within this group there is a remarkable diversity of physical and behavioural adaptations. The diversity of this group is attributed to the evolution of specialised silk glands that produce several types of silk. The fangs of these spiders close in a horizontal direction, hunters have better developed eyes to find prey, and the weavers often have long, thin legs well suited for life on a web. Some Australian species include the Orb-weavers, Redback (weavers), Huntsman, Wolf Spiders and Jumping Spiders (hunters).

In this exhibition students will be able to explore the habitats, adaptations, evolution, life cycles and food chains of Australian spiders and will appreciate the importance of these remarkable animals in our ecosystem.





**Figure 1. Arthropod Classification and Body Structure**



© Helen Smith, Australian Museum

**Cephalothorax**

A main body part consisting of the fused head and thorax.

**Abdomen**

A main body part at the posterior end of the body.

**Legs**

Spiders have four pairs of jointed legs.

**Pedipalps**

Appendages between the front legs and jaws. They are used to handle and crush prey, move objects and males use them to transfer sperm to females.

**Carapace**

A hard exoskeleton covering the surface of the cephalothorax. It provides support, protection and a site for muscle attachment.

**Chelicerae (Jaws) tipped with fangs**

Used to paralyse prey.

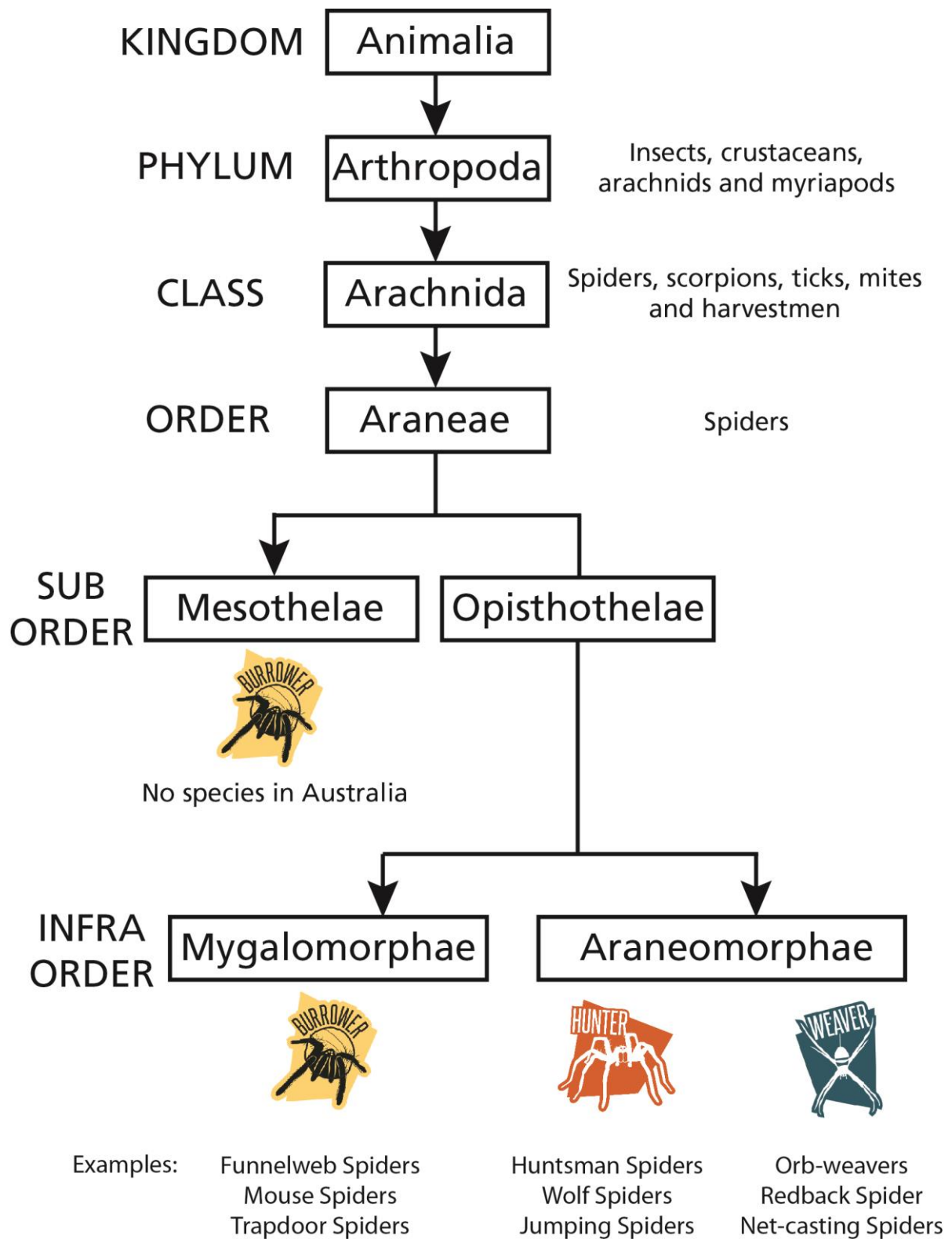
**Spinnerets**

Silk spinning organs.

**Simple eyes**

Spiders generally have eight eyes.

**Figure 2. Spider Anatomy**



**Figure 3. Spider Classification**

# Pre-visit Activities

## Stage 4 and 5

The following are some suggested activities for students to complete before visiting the *Spiders* exhibition.

1. Go to the ABC Splash website and watch the “Spectacular spiders and their stunning silks” video. The “Things to think about” tab provides some useful points for students to consider as they watch the video.



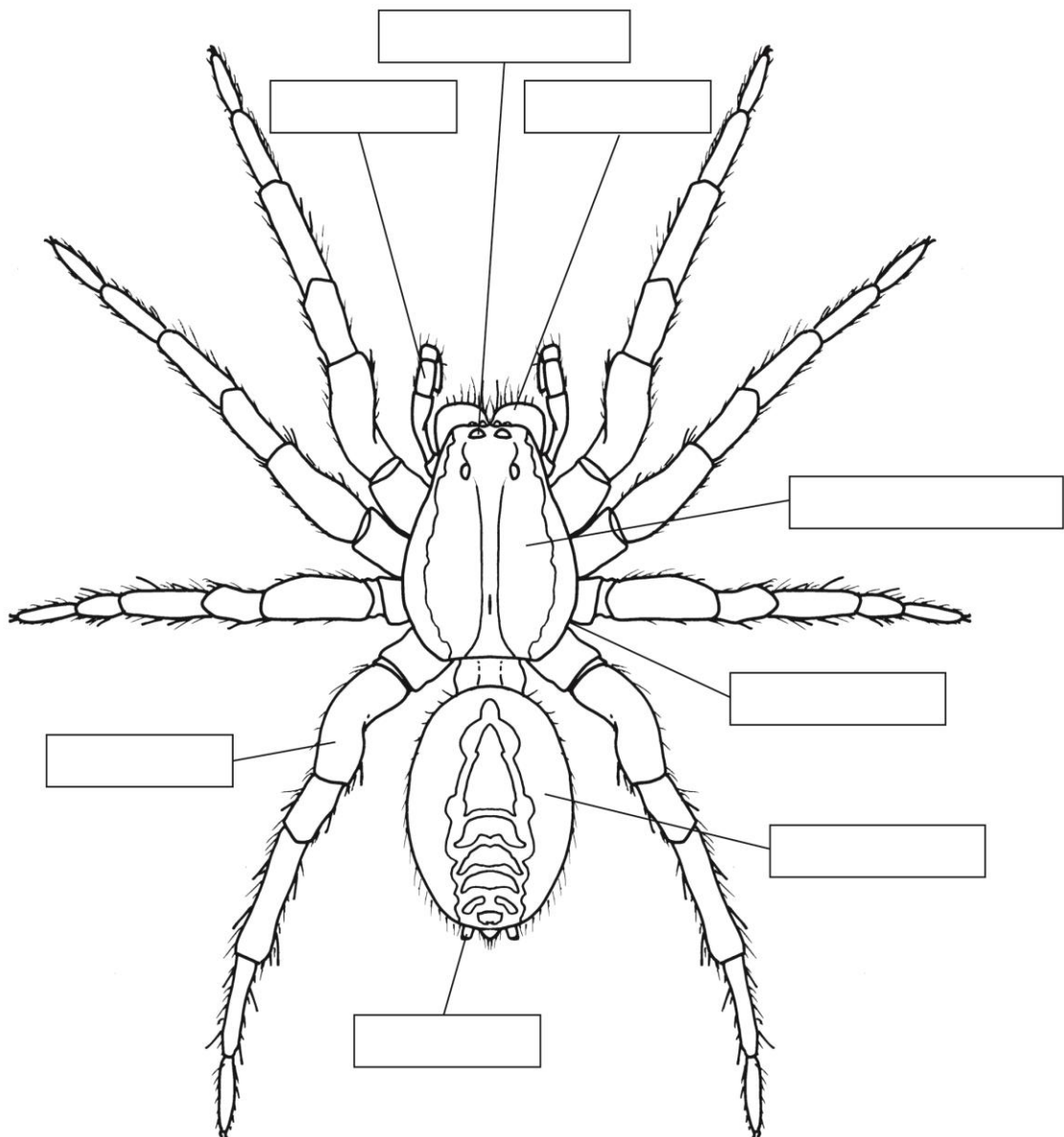
<http://splash.abc.net.au/home#!/media/1182898/spectacular-spiders-and-their-stunning-silks>

2. Students’ knowledge of spiders can be tested with the Australian Museum interactive spider quiz:

<http://australianmuseum.net.au/document/interactive-web2spider-quiz>

3. Label the spider body parts on page 11.

4. Use the dichotomous key on page 12 to identify leaf litter arthropods.



**Cephalothorax**

A main body part consisting of the fused head and thorax.

**Abdomen**

A main body part at the posterior end of the body.

**Legs**

Spiders have four pairs of jointed legs.

**Pedipalps**

Appendages between the front legs and jaws. They are used to handle and crush prey, move objects and males use them to transfer sperm to females.

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A hard exoskeleton covering the surface of the cephalothorax. It provides support, protection and a site for muscle attachment.

**Chelicerae (Jaws) tipped with fangs**

Used to paralyse prey.

**Spinnerets**

Silk spinning organs.

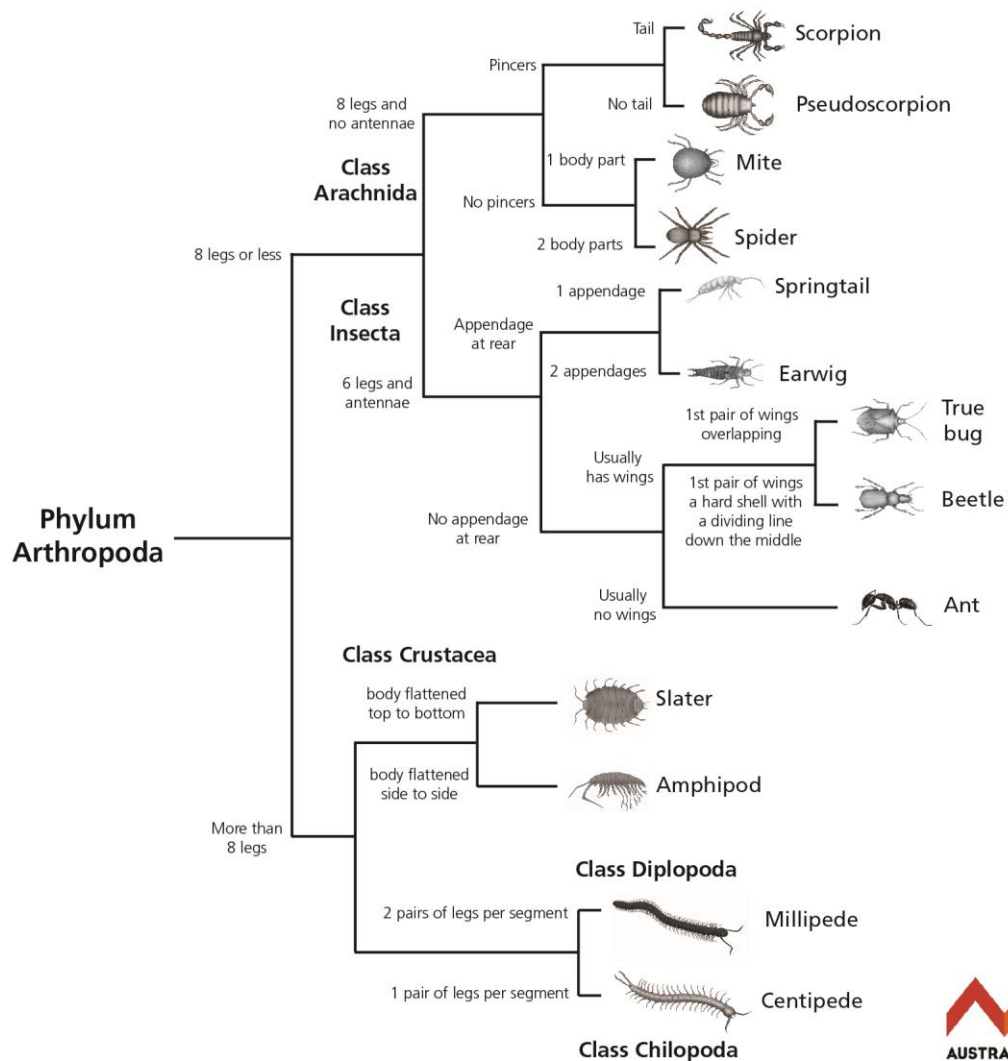
**Simple eyes**

Spiders generally have eight eyes.

(a) Use the dichotomous key to identify the following leaf litter arthropods:



## Leaf Litter Arthropods



(b) Use the dichotomous key to describe the features of a spider.

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# Post-visit Activities

## Stage 4 and 5

The following are some suggested activities for students to complete after visiting the *Spiders* exhibition.

### 1. Web2Spider Toolkit for Schools

Use the Australian Museum Web2Spider Toolkit for Schools to monitor spider diversity in the school playground or at home. **Caution! Students should not touch spiders.** <http://australianmuseum.net.au/web2spider-toolkit-for-schools>

### 2. Class presentation

Students could form groups and give a presentation about the adaptations of burrowers, hunters or weavers and how these adaptations help spiders survive and reproduce. This activity will provide the whole class with an overview of spiders and develop students' presentation skills.

### 3. Research your favourite spider

Each student could perform further research on their favourite species of Australian spider. They could gather information from secondary sources to:

- Provide the common and scientific name of the species
- Identify and describe physical and behavioural adaptations of the species
- Describe its habitat and distribution in Australia
- Describe how the spider uses silk
- Explain how the adaptations help the spider to survive and reproduce

### 4. Spider crossword puzzle on page 14.

### 5. The technology and ethics of antivenom

Antivenoms are used to treat bites from Australia's most venomous animals. Visit 'The Venome Centre' website at the Australian Reptile Park and watch the video link to learn more about antivenoms. Students could identify venomous Australian animals, explain how antivenoms are made and discuss the ethics of using rabbits or horses to produce them.

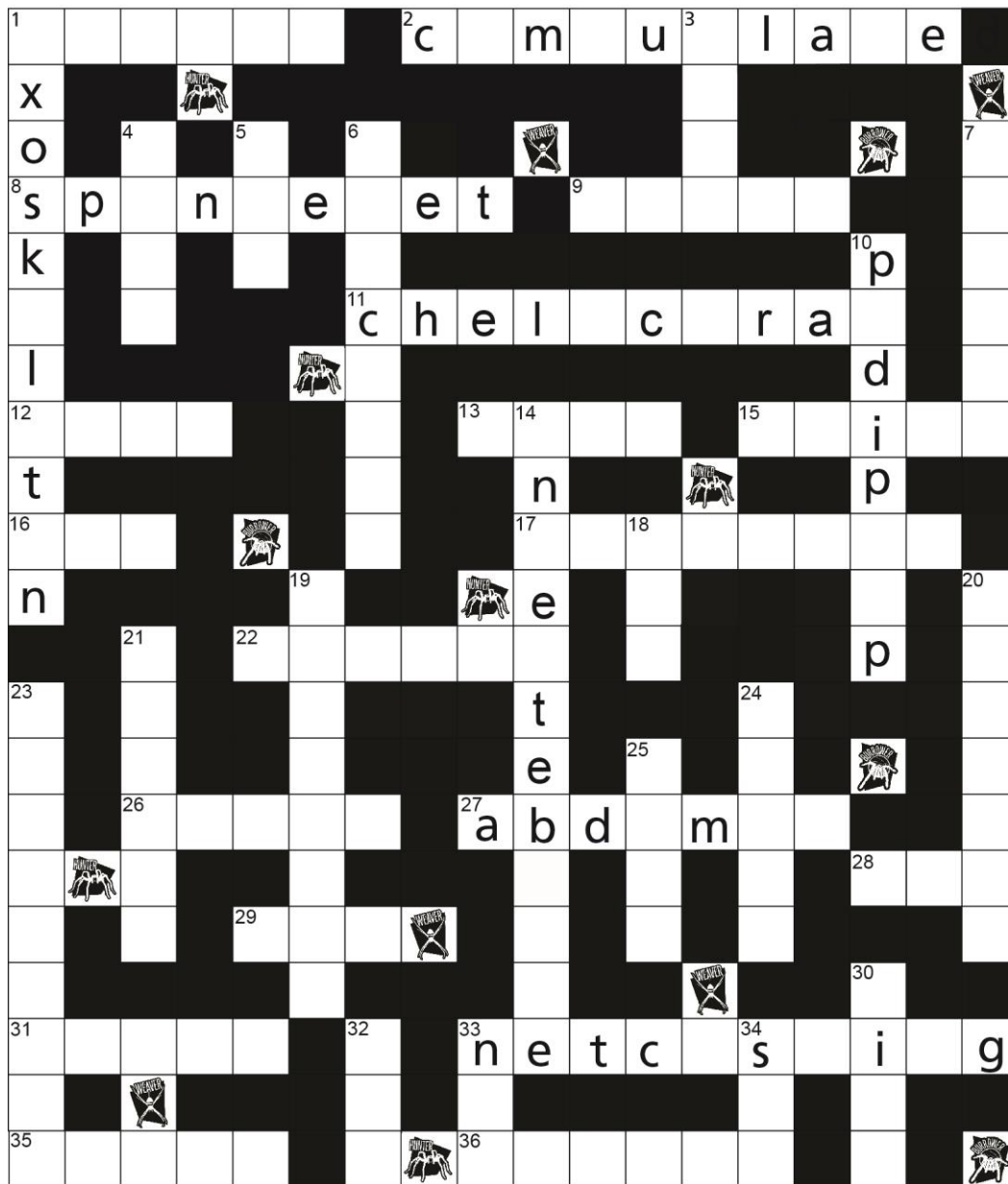


<http://reptilepark.com.au/venom-program/>

### 6. The phylogenetic tree of spiders

Students could reflect on their visit to the exhibition and then read 'Silk: the Spider's Success Story' (<http://australianmuseum.net.au/silk-the-spiders-success-story>) to help them to complete the phylogenetic tree of spiders on page 15.

# Spider Crossword Puzzle



## Across

1. A ball made of silk that protects spider eggs
2. Body colouring that makes me hard to see
8. The organ through which silk is produced
9. Most spiders have this number of eyes
11. The name for spider jaws
12. Hunters have large \_\_\_\_\_ to find prey
13. A type of microscopic arachnid
15. Found on the body and detect vibrations
16. A type of spider web often seen in the garden
17. Burrowers fangs close in this direction
22. The Huntsman is in this group of spiders
26. Injected by fangs to paralyse prey
27. A main body part of a spider
28. Spiders are \_\_\_ vertebrates
29. Spiders make this to catch prey
31. Spiders can't fly because they never have these
33. This spider throws it web over its prey
35. The \_olas spider spins a sticky blob on a silk thread
36. The central body part of an insect

## Down

1. A skeleton on the outside of a body
3. Found on the tip of spider jaws
4. Spiders can produce this material their whole life
5. Some arachnids have only \_\_\_\_\_ body part
6. Spiders belong to this class of animals
7. Silk is made in gla\_d\_ in the abdomen
10. An appendage located between the jaws and front legs
14. Animals without a backbone
18. The \_\_\_back is a venomous species of weaver
19. The Funnelweb belongs to this spider group
20. These invertebrates can have wings
21. The St. Andrew's Cross Spider is a burrower, weaver or hunter?
23. A bite from this spider can kill a human
24. Spider silk is stronger than this material
25. This spider is named after a dog that hunts in a pack
30. A blood-sucking arachnid
32. Crustaceans usually have this many legs
33. Insects are \_\_\_ arachnids
34. Insects have \_\_\_ legs



A phylogenetic tree shows the evolutionary relationship between species. Read the following paragraph and 'Silk: the Spider's Success Story' (<http://australianmuseum.net.au/silk-the-spiders-success-story>), and reflect on your visit to the Spiders exhibition, to help you complete the phylogenetic tree of spiders.

Spiders (Order Araneae) are divided into the two main groups called the Mesothelae and Opisthothelae. The Mesothelae are the most ancient spiders and are nocturnal burrowers. The abdomen of mesothelae have visible segments and the spinnerets are in the middle of the underside of the abdomen. The Opisthothelae are the more recently evolved spiders that have spinnerets on the tip of their abdomen. The Opisthothelae are further divided into two groups, the Mygalomorphae and the Araneomorphae. Mygalomorphs generally have large and dark coloured bodies, well developed mouthparts for digging burrows and their fangs move in a vertical direction which restricts them to catching prey on solid surfaces. Araneomorphs have physical and behavioural adaptations. The fangs of these spiders close in a horizontal direction; some have long, thin legs for life on a web, while others have large eyes to hunt their prey.

**Write each of the following words in the correct box**

Araneae, Araneomorphae, Mesothelae, Mygalomorphae, Opisthothelae

**Draw a line to connect each spider to the correct box**

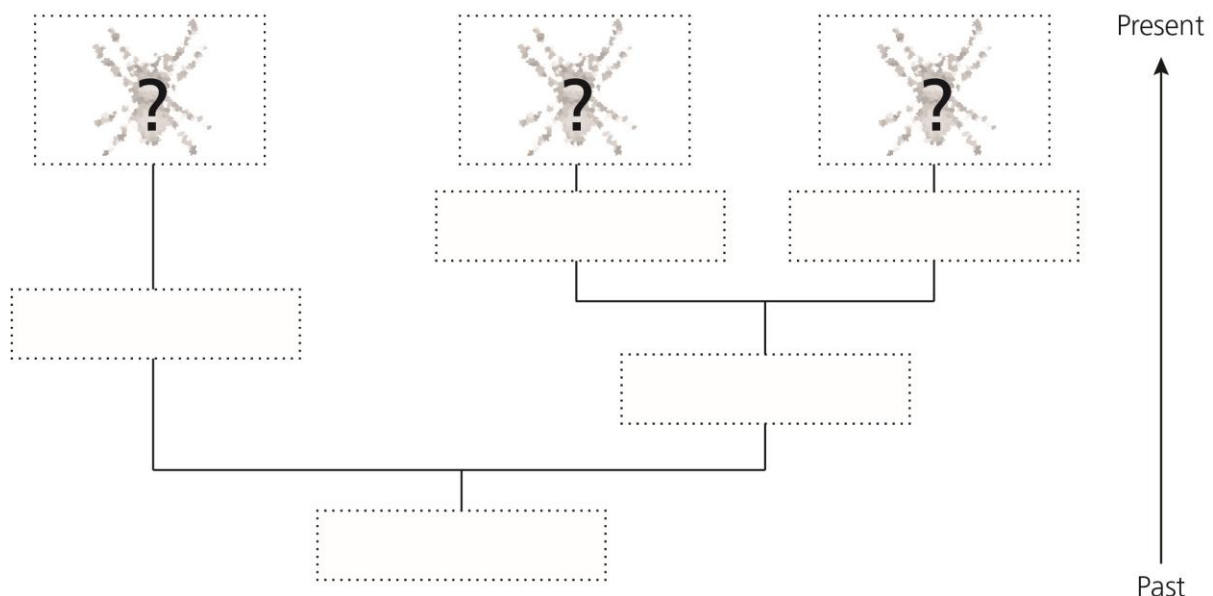
Blue Mountains Funnelweb



Golden Orb-weaver



A segmented spider



b. Name three pieces of evidence used to make the phylogenetic tree of spiders.

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_

# Self-guided Activities for Spiders

## OPTION 1: Stage 4 and 5 (Years 7-10)

### Instructions

**1)** Your mission is to form a team (five per group) and make a short video about spiders on a topic of your choice. Some example topics could be spider diversity, habitats, adaptations, life cycles or the importance of spiders in Australian ecosystems.

**2)**  Open Adobe Spark Video on your phone.

**3)** Take 5 photos during your exploration of the exhibition. Make them count! You can only use five photos in your video.



**4)**  Make a 30 second recording

**5)** Share your video via E-mail with your teacher before you return your phone.



## **OPTION 2: Stage 4 (Years 7-8)**

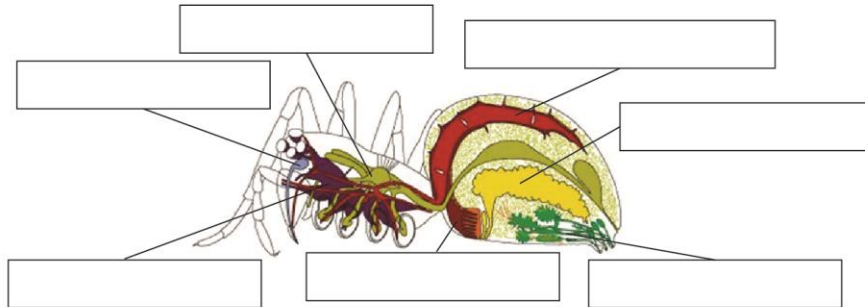
Students should form small groups (3-5 students per group) and work as a team to explore the exhibition. Each group should select one of the characters below and answer the accompanying questions about their fellow burrowers, hunters or weavers!





## Burrowers

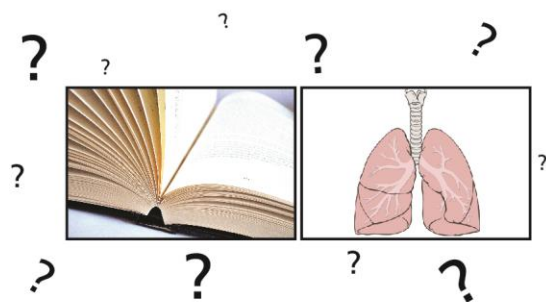
**B1. (a)** Spiders have organ systems that carry out specialised functions that enable them to survive and reproduce. Go to the **spider anatomy touch screen** in **WHAT ARE SPIDERS?** to help you label the organ systems on the diagram below.



**(b)** Help the spider to connect a piece of silk between each organ system on the left to the correct function on the right.

<b>Venom system</b>	Tranfers haemolymph around the body.
<b>Digestive system</b>	Produces venom to paralyse prey.
<b>Vascular system</b>	Produces silk for webs and egg sacs.
<b>Reproductive system</b>	Breaks down food and absorbs nutrients.
<b>Silk system</b>	Detects touch, olfactory and visual stimuli.
<b>Pulmonary system</b>	Produces sperm or eggs.
<b>Nervous system</b>	Exchanges oxygen with haemolymph.

**(c)** Cryptic question!






**Spiders use these to breathe**

\_\_\_\_\_

Circle me on the spider diagram above

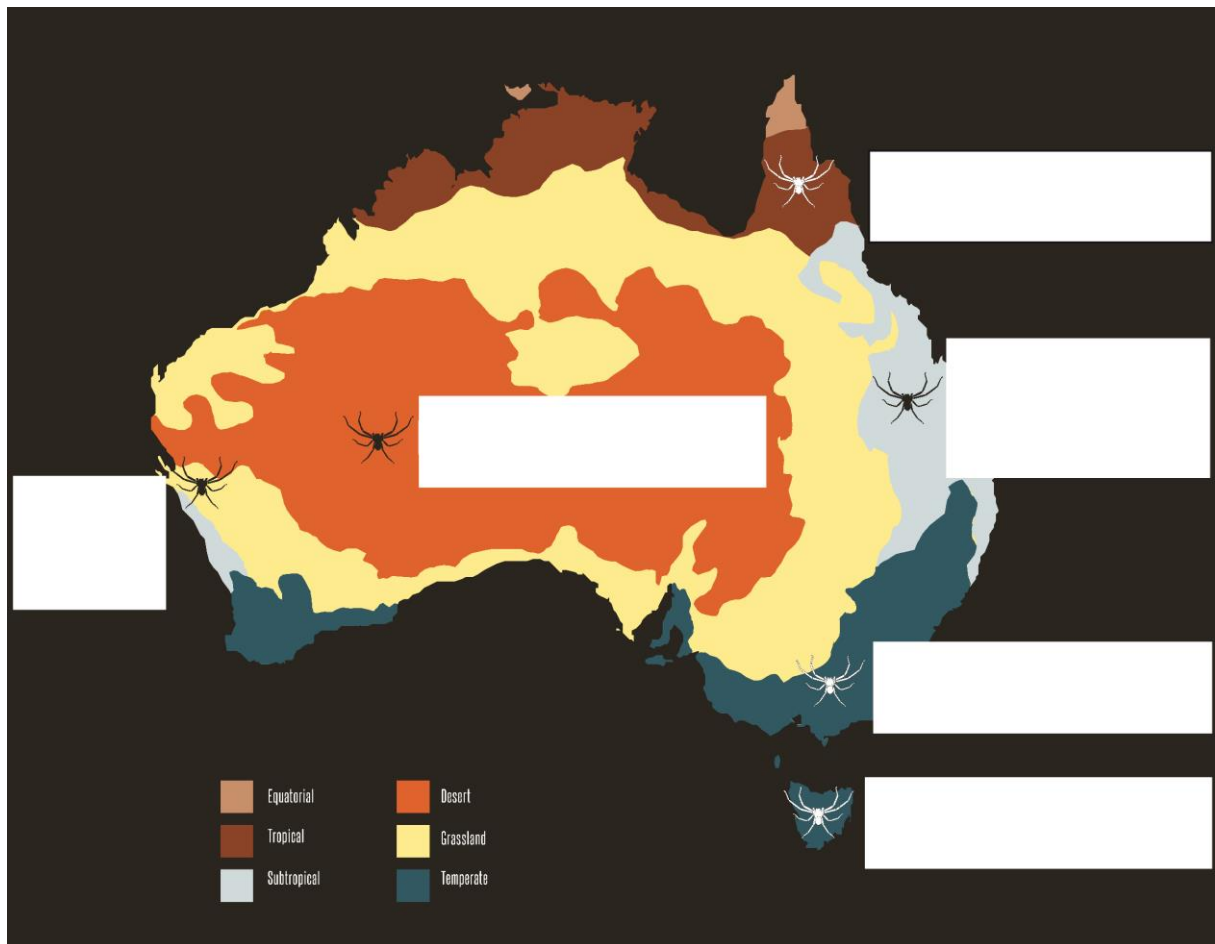
**B2.** Go to the **interactive backyard screen** in **WHERE ARE SPIDERS?** Find a burrower, hunter and weaver and complete the table.

Species	Draw and label your spider	Describe the spider's adaptations	Explain how the adaptations help the spider to survive and reproduce
 Common name: _____  Scientific name: _____ _____			
 Common name: _____  Scientific name: _____ _____			
 Common name: _____  Scientific name: _____ _____			

How are burrowers different to hunters and weavers?\_\_\_\_\_

\_\_\_\_\_

**B3. (a)** Go to the the **Australian Diversity display** in **WHERE ARE SPIDERS?** to help you name a spider species that lives in each climate zone of Australia.



Examine the three dioramas next to the map of Australia to help you answer the following questions:

**b)** In which climate zone would you find the Wolf Spider?

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**c)** Describe the features of this habitat.

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**d)** How is a burrowing lifestyle an adaptation for survival in this environment?

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**B4.** Explore **DIET, JAWS AND VENOMS** to answer the following questions.

**a)** Explain how an arachnologist could tell the difference between a burrower and weaver by looking at its fangs.

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**b)** Rank the following causes of death in Australia in 2013 by placing a number in each box (1 = most deaths, 10 = least deaths).

<input type="text"/>	Heart disease
<input type="text"/>	Homicide
<input type="text"/>	Bees and wasps
<input type="text"/>	Falls
<input type="text"/>	Spiders
<input type="text"/>	Car accidents
<input type="text"/>	Sharks
<input type="text"/>	HIV/AIDS
<input type="text"/>	Cancer
<input type="text"/>	Snakes

**c)** Would you classify spiders as a dangerous based on your answer above?

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**d)** Why is it important to identify a spider if you are bitten?

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# Hunters

**H1.** Go to the **Diversity display** with the sliding magnifying glass on rails in **WHAT ARE SPIDERS?** Use the text in the display and look closely at the spiders to identify this species:

Clue 1: I have large eyes compared to my ancestors.

Clue 2: I have hairy feet for a good grip.

Clue 3: I have spiny legs to hold on to prey.

Clue 4: I am camouflaged to help me catch prey.

Clue 5: I wait for prey on flowers.

Clue 6: I have a white body.

Who am I? \_\_\_\_\_

**H2.** Go to the **What's for Dinner?** display in **DIET, JAWS AND VENOM** to help you complete the following questions:

**a)** Are spiders producers, consumers or decomposers?

\_\_\_\_\_

**b)** Describe the similarities and differences in the prey caught by the Huntsman, compared to the Funnelweb and Golden Orb-weaving Spider.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**c)** What adaptations could account for the different prey caught by the three species?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**d)** Explain the importance of spiders in our ecosystem.




\_\_\_\_\_

\_\_\_\_\_

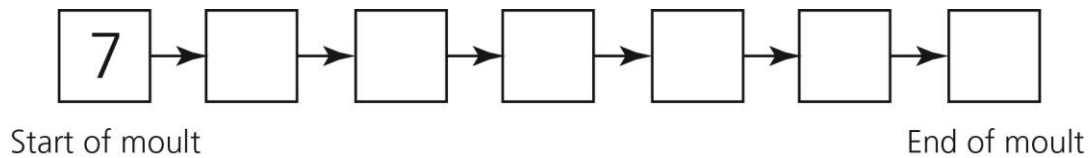
\_\_\_\_\_



**H3.** Spiders use camouflage to stalk their prey and also to escape being eaten themselves. Spiders can also be prey for many other animals such as birds, mammals and reptiles, and even other spiders! Explore the **Camouflage display** in **WHERE ARE SPIDERS?** to find two species of hunter and compare them to one species of weaver.

Species	Description of camouflage	How camouflage helps the spider to survive
 <p>Common name:</p> <p>_____</p> <p>Scientific name:</p> <p>_____</p>		
 <p>Common name:</p> <p>_____</p> <p>Scientific name:</p> <p>_____</p>		
 <p>Common name:</p> <p>_____</p> <p>Scientific name:</p> <p>_____</p>		

**H4. (a)** Spiders have an exoskeleton that provides structural support, protects them from predators and stops them from drying out. Spiders shed their exoskeleton in a process known as moulting. The moulting stages shown below are in the incorrect order. Gather information from the from the **REPRODUCTION AND GROWTH** section to place the stages in the correct order.



1. Cephalothorax swells and abdomen shrinks
2. Exoskeleton completely hardens
3. Body grows while exoskeleton slowly hardens
4. Increased heart rate pumps most body fluid into cephalothorax
5. Carapace tears open
6. Torso and legs are freed by muscle movement and jaw
7. Exoskeleton is softened on the inside

**(b)** How is a spider skeleton different to a vertebrate skeleton?

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**(c)** Why do spiders need to moul't?

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## Weavers

**W1.** Go to the **Diversity display** with the sliding magnifying glass on rails **WHERE ARE SPIDERS?** to help you answer the following questions.

**a)** Give the common and scientific name of a weaver species.

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**b)** Compare the species you selected in (a) to the Whistling Spider (a burrower). Identify three differences between the two species:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

**c)** How do the physical adaptations of your chosen weaver help it to survive and reproduce in its habitat?

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**W2.** Look closely at the spiders on display and read the text about burrowers, hunters and weavers to determine if the following statements about weavers are true or false.

Weavers have many different body shapes	T	F
Weavers sometimes have long, fine legs	T	F
Weavers have short, stocky legs to better reach across their web	T	F
Weavers have smooth feet to help them move across their web	T	F
Weavers sometimes have protective features such as hard, spiky coverings	T	F
Weavers have poor camouflage	T	F
The Sydney Funnelweb Spider is a weaver	T	F
The Golden Orb-weaving Spider is a burrower	T	F

**W3.** Watch the videos in the **Australian Diversity** display in **WHERE AND SPIDERS?** and find the **live** spiders to help you complete the table.

Species	Draw the spider showing how it uses silk to catch prey	Describe the behavioural adaptations of the spider
 <p>Common name:</p> <p>_____</p>		
 <p>Common name:</p> <p>_____</p>		
 <p>Common name:</p> <p>_____</p>		

**W4.** Go to the **Silk** display in **WEBS ARE SILK** to help you fill in the blanks.

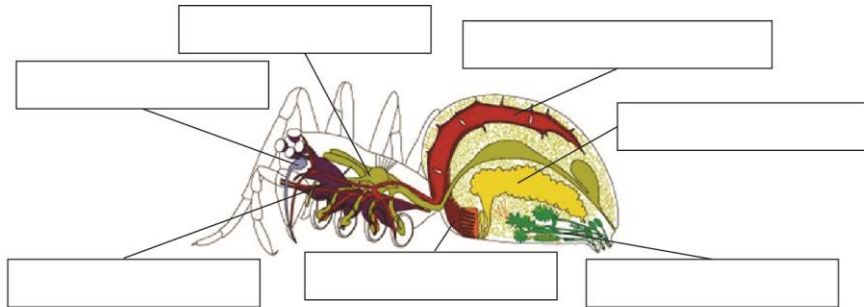
\_\_\_\_\_ are successful predators because they produce \_\_\_\_\_ throughout their lives. Unlike some species of \_\_\_\_\_ that produce one simple type of silk, spiders can make many types of silk proteins in specialised organs called \_\_\_\_\_ on their abdomen. Each spinneret consists of two or three spinneret pairs. Spinnerets consist of microscopic \_\_\_\_\_ that control the \_\_\_\_\_ of the silk filament. The spinnerets combine the silk strands to make a sturdy silk fibre.

Words:

thickness      silk      spiders      spinnerets      insect      spigots

## OPTION 2: Stage 5 (Years 9-10)

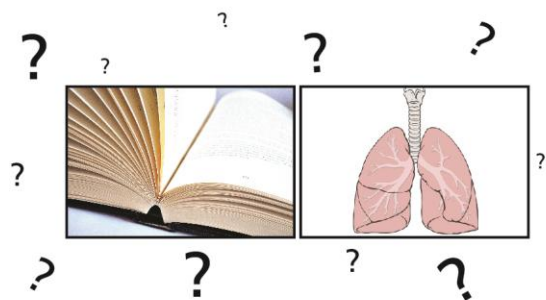
1. (a) Spiders have organ systems that carry out specialised functions that enable them to survive and reproduce. Go to the **spider anatomy touch screen** in **WHAT ARE SPIDERS?** to help you label the organ systems on the diagram below.



(b) Help the spider to connect a piece of silk between each organ system on the left to the correct function on the right.

<b>Venom system</b>		Transfers haemolymph around the body.
<b>Digestive system</b>		Produces venom to paralyse prey.
<b>Vascular system</b>		Produces silk for webs and egg sacs.
<b>Reproductive system</b>		Breaks down food and absorbs nutrients.
<b>Silk system</b>		Detects touch, olfactory and visual stimuli.
<b>Pulmonary system</b>		Produces sperm or eggs.
<b>Nervous system</b>		Exchanges oxygen with haemolymph.

(c) Cryptic question!



**Spiders use these to breathe**

\_\_\_\_\_

Circle me on the spider diagram above

2. Use the evolutionary timeline in **WHAT ARE SPIDERS?** to help you complete the following activity.

a) Draw an arrow from each box to the timeline to show when each group of living thing began evolving.

First  
arachnids

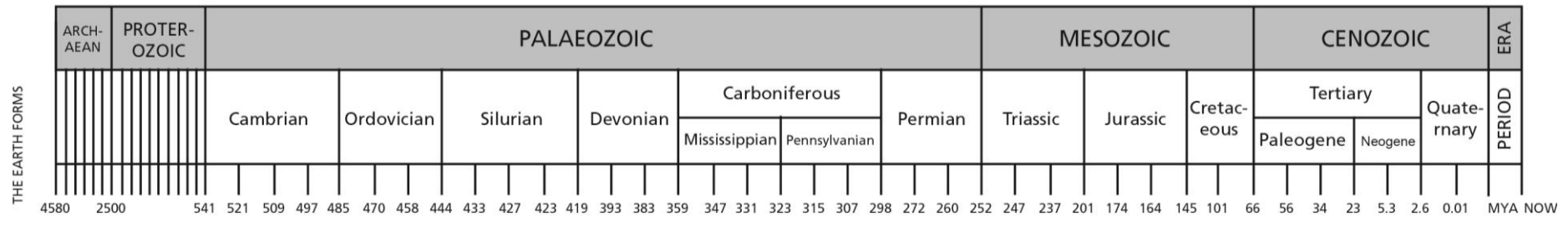
First  
life forms

First  
true spiders

First  
land plants

First  
modern humans

First  
dinosaurs






b) Find the fossil of *Talbragaraneus jurrasicus* and mark its location on the timeline. During which geological period did this spider live?

c) Why are spider rock fossils rare?

d) Describe another way that spiders can be preserved. \_\_\_\_\_

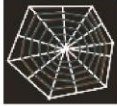





e) What is the name of the most ancient group of spiders? Explain how structural features of their abdomen is evidence of an evolutionary relationship with other arthropods.

3. Find your favourite species of burrower, hunter and weaver as you explore the exhibition and complete the following table. Hints: think about how they use silk, how they catch prey, and how they avoid predators

Species	Physical adaptations (Draw or describe)	Behavioural adaptations	Explain how the adaptations help the spider to survive and reproduce
 <p>Common name:</p> <p>_____</p> <p>Scientific name:</p> <p>_____</p>			
 <p>Common name:</p> <p>_____</p> <p>Scientific name:</p> <p>_____</p>			
 <p>Common name:</p> <p>_____</p> <p>Scientific name:</p> <p>_____</p>			



4. (a) Use the information in **WEBS AND SILK** to help the spider connect a silk thread to the correct function.

Type of silk	Diagram	Gland
Capture spiral silk		Aggregate
		Flagelliform
Attachment silk		Pyriform
Auxilliary spiral silk		Minor ampullate
Egg sac silk		Cylindrical
Prey wrapping silk		Aciniform
Structural silk		Major ampullate



Function of silk
Forms the soft inner lining of egg sacs and used to wrap prey
Cements joints and attachments
Gluey, highly adhesive droplets on the capture spiral
Forms the structural fibres of the capture spiral
Forms the dragline and structure of the web
Forms the auxillary spiral (guide for making capture spiral)
Tough, insulating cover around egg sacs

**(b) Extension.** DNA is the blueprint of life. It is organised into chromosomes in the cells of all living things. Genes are small pieces of DNA on chromosomes that contain codes to make proteins. Spider silk is made of protein that is encoded by genes in the DNA of spiders. Each type of silk is encoded by a unique gene. Ancient spiders such as Funnelwebs can make a few types of silk, while more recently evolved spider such as the Orb Weavers with their spectacular webs can make up to seven silk types. **Explain how new silk genes evolved and how this enabled spiders to diversify and occupy new niches.**

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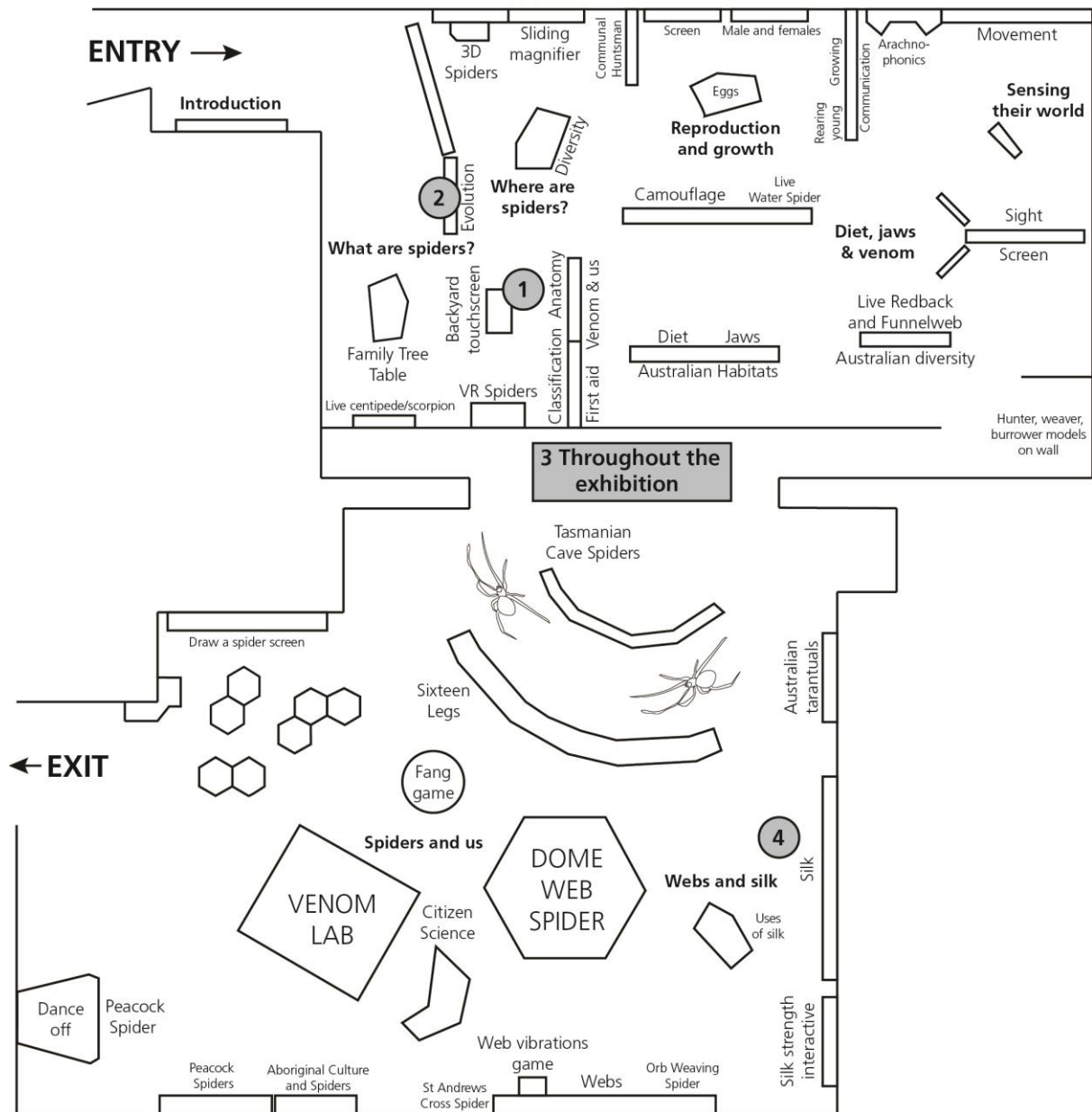


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# Spiders Map for Stage 4 Activities



## Spiders Map for Stage 5 Activities



# 4

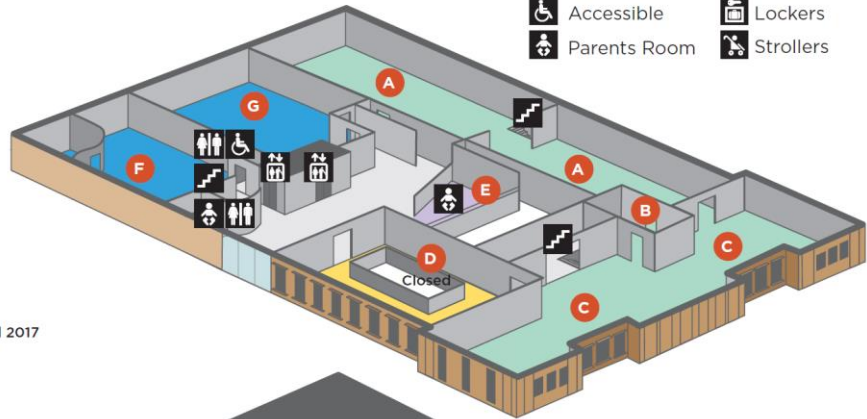
No. 1 William  
Enjoy food with a view.  
Take the lift or stairs to Level 4.

- |              |           |
|--------------|-----------|
| Admissions   | Theatre   |
| Information  | Stairs    |
| Toilets      | Lifts     |
| Accessible   | Lockers   |
| Parents Room | Strollers |

# 2



- A** Surviving Australia
- B** Pacific Spirit
- C** Dinosaurs
- D** Birds & Insects *Closed until mid 2017*
- E** Kidspace
- F** Search & Discover
- G** Education Rooms



# 1



Level 1 partially closed from mid October  
to mid November. Completely closed  
mid November until late December.

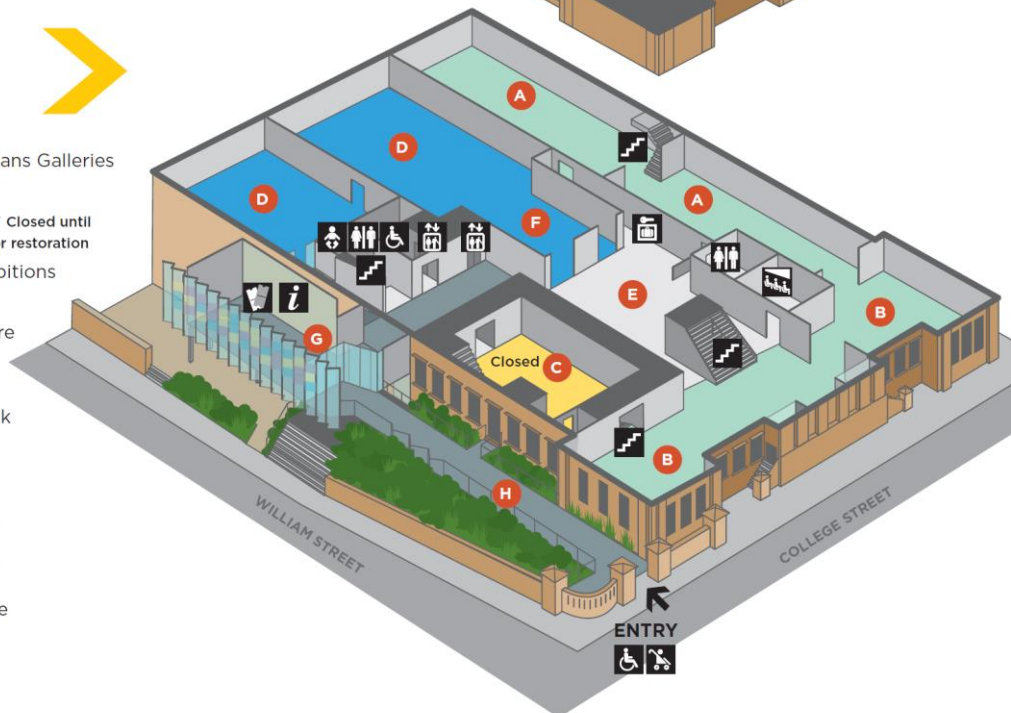
- A** Planet of Minerals *Closed for restoration*
- B** Minerals featuring  
the Albert Chapman Collection



# G



- A** First Australians Galleries
- B** Wild Planet
- C** Long Gallery *Closed until  
October 2017 for restoration*
- D** Special Exhibitions
- E** Atrium
- F** Museum Store
- G** Crystal Hall  
Entrance
- H** Museum Walk



# LG

Members Lounge