# Wood badge Report

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North St Ives Group NSW 2024

## *Science into Joey Scouts*

Science impacts us all every day. It is also an underlying aspect of the scouting method including observation, evidence gathering and care for country. Children are natural scientists and love learning about their world. They ask questions and what to know “why?”.

The Joey Scout program includes science in many aspects of the method: Learning by doing, Nature and the Outdoors and personal progression. Core outdoor skills include compass work and campfires and special interest areas – STEM and Innovation, the environment and creating a better world. The SPICES intellectual development includes science as well.

Science is not a belief.

Science results from an evidence base. In our world, the evidence exists, does not exist or it is contested therefore needing more research to figure it all out.

Evidence is obtained from observation, experiments and developing models to understand how our world works. The evidence is then used to solve a problem, create a new way of doing things or inventing a new technology.

This report provides different activities and programs that Joey leaders can do with their mob. All the activities use easy to obtain materials. The report also provides references, suggested places to obtain the materials and simple scientific explanations in some cases.

Many of these activities are based on the North St Ives Group and Scout Hall being near the Ku-Ring-Gai National Park. But they can be modified for the animals in our local area, even if it is built up.

Table 1 shows how these activities match the to scout model components.

| | | Environment | | | Kitchen Chemistry | | | | | | | Physics | | | | | | Astronomy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.1 Observing the environment by counting animals living arou | 1.2 Learning to create a collection. | 1.3 Citizen scientist | 2.1 Chromatography using water towels and felt tipped pens or food colouring. | 2.2 How many drops of water can you place on a $1 coin? | 2.3 Perserving food | 2.4 Acids and bases | 2.5 Gummy bear osmosis | 2.6 Mentos and cola rocket demonstration | 2.7 Growing sprouts | 3.1 Hot air ballon | 3.2 Magnets and compasses | 3.3 Motors | 3.4 Pressure | 3.5 Robotics | 3.6 Simple Light Refraction Experiment | 4.1 A simple method is to make a Southern Cross Finder. | 4.2 Night Sky |
| Core | Bushcraft | ■ | ■ | ■ | | | | | | | | | ■ | | | | | ■ | ■ |
| | Bushwalking | | | | | | | | | | | | ■ | | | | | ■ | ■ |
| | Camping | | | | ■ | | ■ | ■ | ■ | | ■ | | ■ | | | | | ■ | ■ |
| Specialist Adventure Skills | Alpine | | | | | | | | | | | | | | | | | ■ | ■ |
| | Aquatics | | | | | | | ■ | | | | | | | | | | | |
| | Boating | | | | | | | | | | | | | | | | ■ | ■ | ■ |
| | Cycling | | | | | | | | | | | | | | ■ | | | | |
| | Paddling | | | | | | | | | | | | | | | | | | |
| | Vertical | | | | | | | | | | | | | | | | | | |
| Special Interest Areas | Adventure and sport | | | | | | | | | ■ | | ■ | ■ | ■ | ■ | ■ | | | |
| | Art and Literature | | | | | | | | | | | | | ■ | | ■ | | | |
| | Creating a better world | | | ■ | | | | ■ | | | ■ | | | ■ | | ■ | | | |
| | Growth and development | | | ■ | | | | | | | | | | | | ■ | | | |
| | Environment | ■ | ■ | ■ | | | | | | | | | | | | | | ■ | ■ |
| | STEM and Innovation | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SPICES | Social | | | | | | | | | | | | | | | | | | |
| | Physical | | | | | ■ | | | | | | | | | | | | | |
| | Intellectual | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Character | | | | | ■ | | | | | | | | | | | | | |
| | Emotional | | | | | | | | | | | | | | | | | | |
| | Spiritual | | | | | | | | | | | | | | | | | | |

*Table 1: How these activities link to the Joey Scouting Model*

# 1. Environment

### 1.1 Observing the environment by counting animals living around me

a. Encouraging Joeys to look at their world and observe the different animals can be undertaken during a bush walk or a walk around your local area. Each time a Joey sees one of the animals on the list they can add a tick to their record. It is also possible for the Joey to do this with their family and bring back the sheet and compare who sees what animals depending on where they live.

Two work sheets are prepared on the next pages one for animals and one exclusively for birds. See pages 5 and 6-7

b. Playing a game: Whose poo is that? The collection of poo pictures and related animals can be done as a power point slide or on pieces of paper as a guessing game. The aim is to enable Joeys to see that we can learn about what animals are about by what they leave behind even if they can't see them. This is also useful for bush walks. See pages 8-21 for the pack.

It is interesting to ask why their poos all look different. Wombats have cubic poo for example. Why is that?

Answer: It is the result of the drying of the faeces in their colon and muscular contraction which form the uniform size and corners of the poo.

### 1.2 Learning to create a collection.

Using an egg carton, Joeys go about a scavenger style hunt and stat their own collections. Note that they can't do this in a national park as it is illegal to take items from the park. But they can gather things from around the hall. They can also collect rocks, seeds, leaves and other things. There is a generic template available here: https://cdn.shopify.com/s/files/1/1333/7751/files/Egg-Carton.pdf?257 and see https://wonderfilleddays.com/printable-egg-carton-nature-scavenger-hunt/

### 1.3 Citizen scientist

Joeys may wish to consider becoming a citizen scientist. https://citizenscience.org.au/ They also provide seed grants to help you.

Joey Scouts **Name: _____**

## Observing the environment by counting animals living around me

Place a tick in the box next to the bird or animal you see each day for the next week. Bring this sheet back

| ANIMAL | PLACE A TICK EACH TIME YOU SEE ONE | TOTAL |
|---|---|---|
| **DOG** | | |
| **CAT** | | |
| **WALLABY** | | |
| **BANDICOOT** | | |
| **POSSUM** | | |
| **FRUIT BAT** | | |
| **KOOKABURRA** | | |
| **MAGPIE** | | |
| **RAINBOW LORIKEET** | | |
| **BUTCHER BIRD** | | |
| **KING PARROT** | | |
| **RABBIT** | | |
| **SULPHUR CRESTED COCKATOO** | | |
| **PLOVER** | | |
| **LIZARD** | | |
| **GOANNA** | | |
| **SNAKE** | | |

Joey Scouts **Name: _____**

**Counting birds you see in the area** Place a tick in the box next to the bird or animal you see each day for the next week. Bring this sheet back

| Bird | Number of sights | Total |
|---|---|---|
| | Kookaburra | |
| | Sulpha crested Cockatoo | |
| | Masked Lap Wing (Plover) | |
| | Magpie | |
| | Lorikeet | |

Galah

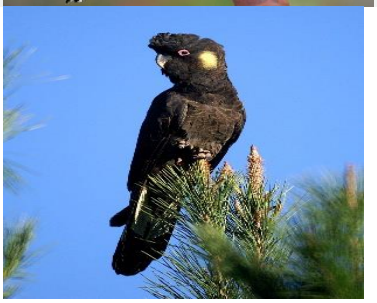
King Parrot

Noise Miner

Mowpok Owl

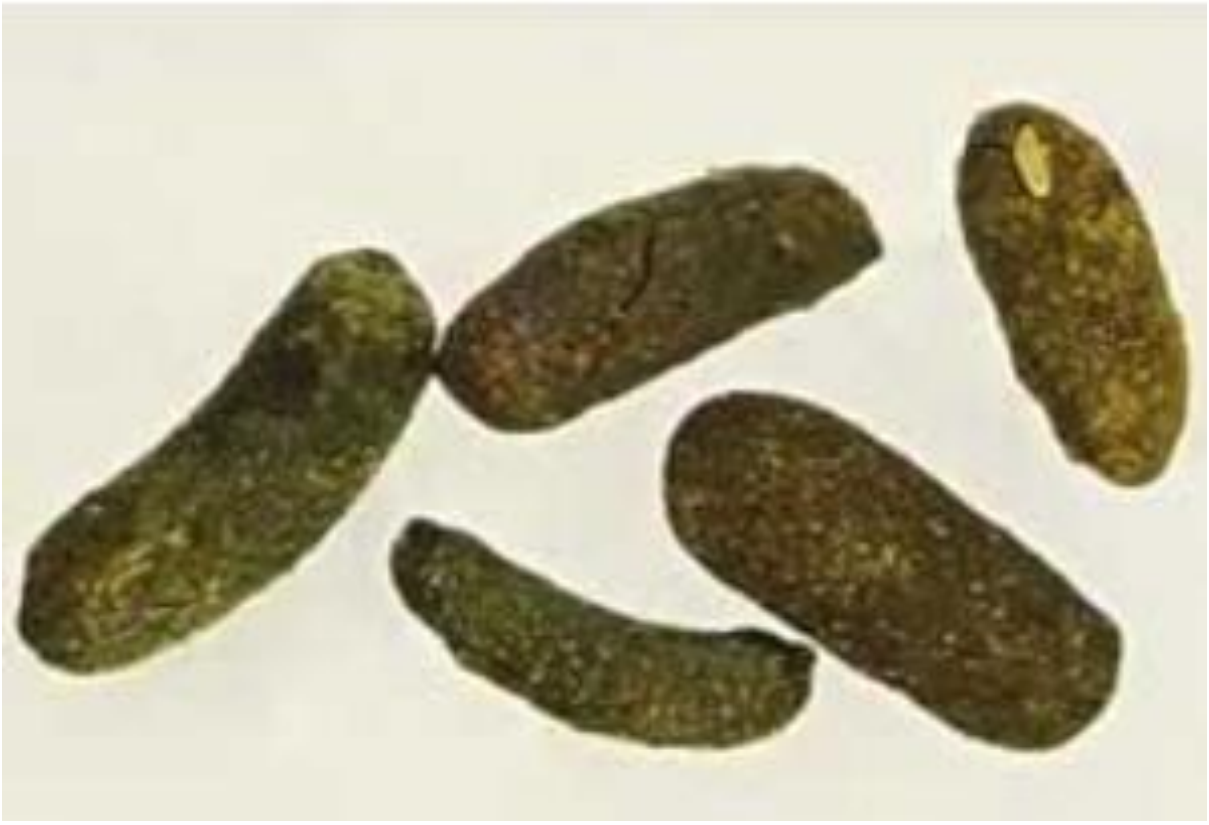
Whip Bird

Butcher bird



Black Cockatoo

# Whose poo is that?



# A possum!

# Whose poo is that?

# A wombat!

# Whose poo is that?

# A koala

# Whose poo is that?

# Swamp wallabies

# Whose poo is that?

# Foxes

# Whose poo is that?

# A rabbit

# Whose poo is that?

# An Owl!

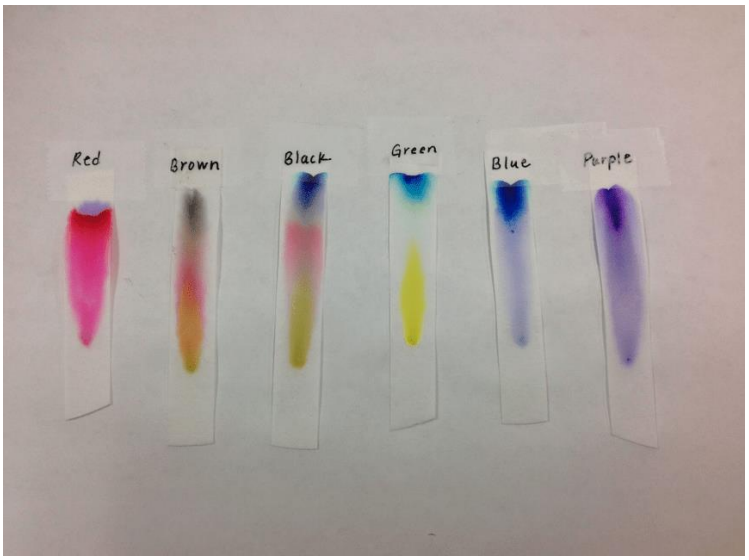
# 2. Kitchen Chemistry

There are very many great experiments that can be done easily using things from the kitchen! Cooking is just a big chemistry experiment after all.

### 2.1 Chromatography using water towels and felt tipped pens or food colouring.

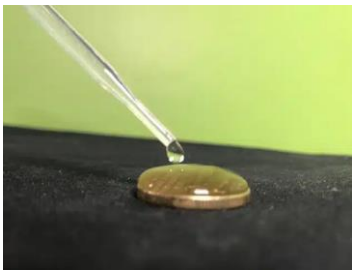
Chromatography is a technique used to separate soluble substances that have been mixed. We know that we can make colours by mixing different colours together such as yellow and blue makes green. Chromatography is the way to reverse this.

Method: Cut a thin strip of paper towel. Either place some drops of food colouring or draw a line across the bottom with felt tipped pen. Place the paper strip into a glass of water so that only the edge of paper touches the surface of the water. The water will rise through the paper towel due to capillary action. When the water reaches the ink, the colours start to separate. Try different coloured pens or food colours and see what happens.




### 2.2 How many drops of water can you place on a $1 coin?

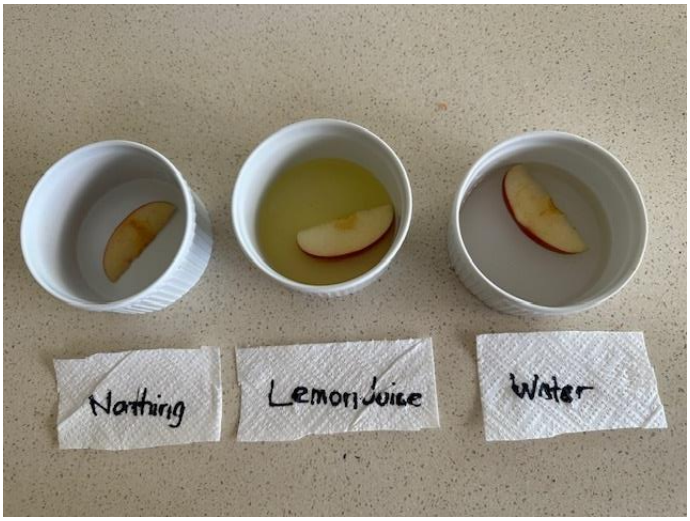
Use a dropper (can use a recycled one from baby Panadol for example) or use a straw which you dip into water then place your fingertip over the end. Remove the straw from the water noting the water keeps inside the straw. With a drop at a time, see how many droplets of water you can place on the $1 coin surface. You will see the water start to form like a dome on the coin until it bulges and break. Compare the skills of the Joeys!



### 2.3 Preserving food

Use a knife to cut an apple into thin slices. Each Joey has three slices. Place each one in a separate bowl. Leave one apple piece as is. Pour water on the second bowl to cover the apple and similarly pour lemon juice on the third. Leave for 30 minutes and see what happens. Get the Joeys to record their findings on a table like the one below.

| Preservation method | Nothing | Water | Lemon Juice |
|---|---|---|---|
| **Draw a picture of what you see** | | | |
| **Write a description of what you see** | | | |




### 2.4 Acids and bases

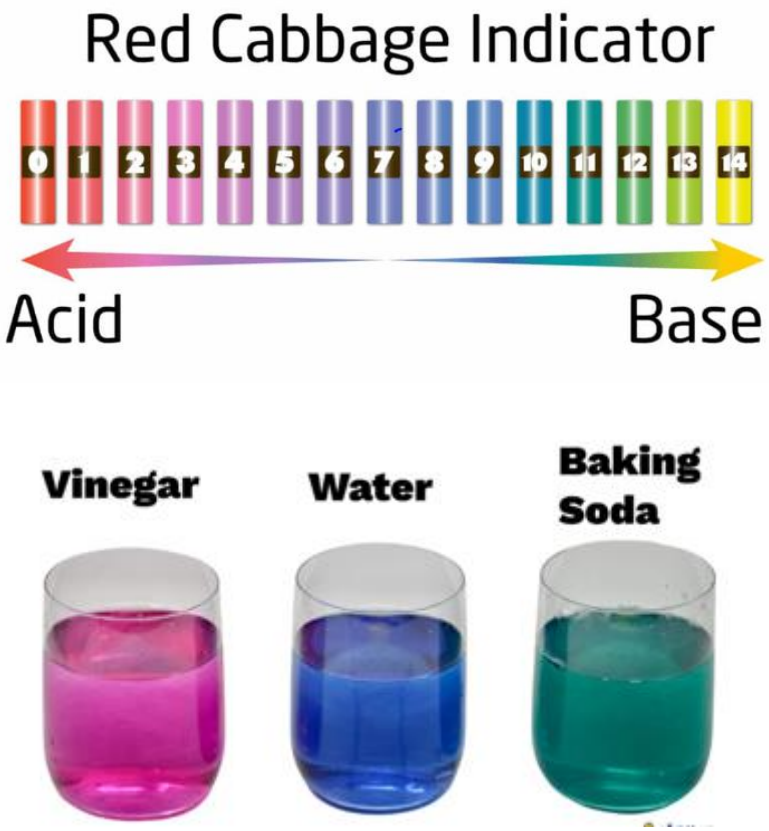
We use acids and bases all the time. They are a basic consideration for food preservation, making soap, stopping bugs growing in our water and making sure our soil is healthy for growing things. It is also possible to add acids and bases to change the state of water or soil for example. This is a terrific experiment that is easy to set up.

Step 1: Make the red cabbage indicator. Chop up 2 cups of red cabbage. Place the chopped cabbage into a pot and cover with water. Boil until it is a deep purple. Strain the leaves out and either eat them for dinner or discard in the composite. The remaining liquid is your cabbage indicator. This could be placed into a bottle best with a dropper.

Step 2: Gather a collection of household solutions- weak bleach, bi-carbonate or baking soda (dissolved in water), hand sanitiser, pH balanced shampoo, tap water, pool water, white vinegar, lemon juice and lemonade.

Step 3: in a series of clear drinking glasses, place about 50 ml of each liquid. And use drops of the indicator and see what colour it turns? Play around and add white vinegar to the baking soda. Or add baking soda to the acidic liquids. Can you just add enough to make it go neutral (blue)?

RED CABBAGE INDICATOR PH COLOURS




### 2.5 Gummy bear osmosis

Using soft gummy bears (not the Hambrol brand but brands that have a matt finish and are soft).

From the web site: https://www.howtohomeschool.com/free-homeschooling/gummy-bear-osmosis

Most sugary candy dissolves in water. Gummy bears are an exception – they don't dissolve in water. This is because they're made with gelatine**.** When gummy bears are made, gelatine and water are heated and mixed (like when you make gelatine/jelly at home). As the mixture cools, *water leaves the gummy bear* and the gummy bear hardens and becomes gummy/chewy. When you put a gummy bear in water, it is a solute, and the water molecules are a solvent. Since the gummy bear does not contain water (remember, the water was removed when the gummy bear was made), water now moves into the bear by the process of osmosis.

Osmosis is the process where water moves from a greater concentration of water to a lower concentration of water (from a container of water to the gummy bear). Also, gummy bears have a semi-permeable membrane – their surface has holes in it and these holes allow small, non-charged particles like water in, but don't let larger particles (like sugar) out.

At the beginning of the experiment, there is less water and more gelatine inside each gummy bear. As time passes, this changes, as the gelatine makes the gummy bear act like a sponge, absorbing water rather than being dissolved in it (like other candies).

Using 4 glasses, label them: water, salt water, sugar water and baking soda water. Fill each glass with half a cup of water. Add a teaspoon of salt one, 1 tablespoon of sugar to another, 1 tablespoon of baking soda to the other. Make sure the salt, sugar and baking soda are dissolved into the water. You can also use tap water, distilled water and milk.

Take your gummy bear and measure its size or outline its shape on a piece of paper. Or just compare it to a gummy bear that has not been treated.

Add one gummy bear to each glass. Wait 12 hours. And take them out a measure it. Put it back in and then wait another 12 hours and then wait for another 24 hours.

This is a good experiment for a camp! Also note that they should not eat the soaked gummy bears!

### 2.6 Mentos and cola rocket demonstration

Do this outside. Buy some cheap diet or regular cola and Mentos. Note it works best with diet cola. When Mentos and cola come into contact, lots of carbon dioxide (CO2) bubbles form very quickly and cause a geyser-like eruption.

You need at least 5 Mentos that are added simultaneously to 2 litres of cola.

There a great how to video on the web site:
https://www.acs.org/education/whatischemistry/adventures-in-chemistry/experiments/mentos-diet-coke.html

### 2.7 Growing sprouts

Collect some glass jars. The jars from Morello cherries are good size.

Add a teaspoon of sprouts seeds to the jar. Cover with about 3 cm of cool water and soak for 8 hours. Cover with a layer of loosely woven material held in place by a rubber band. Cut up old tea towels work well. Drain the seeds and rinse and drain again. Leave them in a cool dark place. Continue to rinse and drain the seeds twice a day until they start to sprout (305 days). When little yellow leaves appear, move the jar to a well-lit area. When they turn green, they are ready to eat! Refrigerate until you use them. Make sure you wash them before you eat them. They are great on sandwiches!

See a work sheets on the next two pages.

# Science Night

# Kitchen Chemistry

Name:_____

**Experiment station 1: Sprouts**

Grow them from seed – take home and bring back to show us next week!

**Experiment station 2: Gummy bear osmosis**

What did you see? How long did it take?

Sugar _____

Salt_____

Water_____

Vinegar_____

**Experiment station 3: Pen Chromatography**

What did you see?

Staple a paper towel experiment here:

# X

**Experiment station 4: How many drops of water can you put on a coin?**

Write the number of drops here:_____

**Experiment station 5: Preserving fruit**

Do the following substances stop apples going brown?

Lemon_____

Water_____

Air_____

Salt_____

**Experimental station 6: Acids and bases**

Use the red cabbage indictor to see if the following solutions are acid and base

Vinegar_____

Water_____

Baking power_____

Lemonade_____

## Demonstrations

Cola and mentos

How many mentos lollies are needed?

# 3. Physics

## 3.1 Hot air ballon

Using a light garbage bag or a sealed up drycleaning plastic cover and a toaster or blower heater.

Use some poster size cardboard to make a ring around the toaster using 2 pieces of cardboard sticky tapes together.

Place the dry-cleaning bag over the cardboard and hold it up so the hot air heated by toaster can fill it. Keep holding until the balloon is filled with hot air. Then release it and see how long it is airborne. Our group leader and his Joey used a black garbage bag and a blower heater and got the same result!

## 3.2 Magnets and compasses

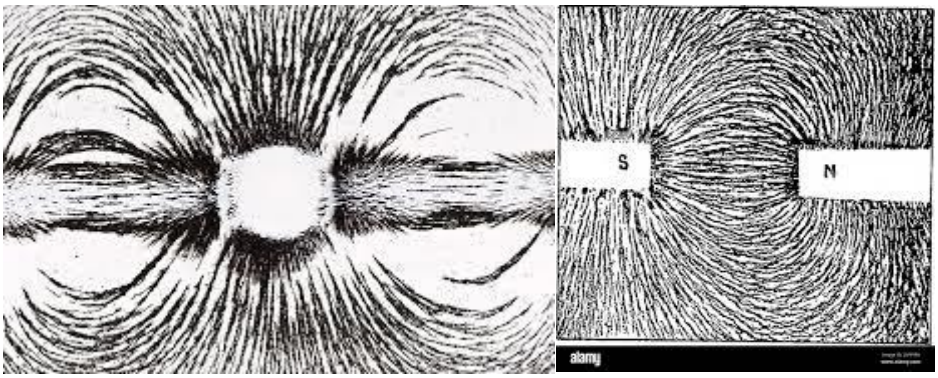
Compasses work because the Earth is a big bar magnet. Magnetism is one of the most fascinating forces and critical for scouts as a compass is an important tool for navigation.

Magnetism is also a lot of fun.

It is possible to buy different magnets from hardware stores such a Bunnings. For joeys, it is fun to play with alnico or ferrite magnets. I suggest buying about 20 small bar magnets that have north and south marked on them. They are medium in magnetic strength and good for experiencing attraction between north and south poles and repulsion between like poles. It is also worth purchasing some simple compasses also available cheaply from hardware store or dollar shops.

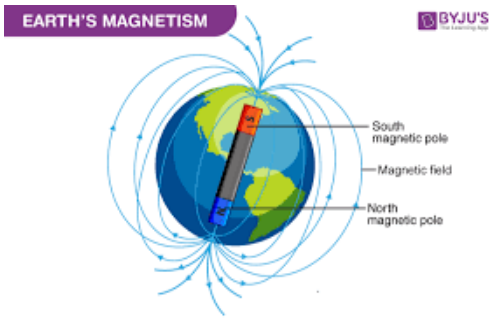
a. Magnetic field lines.

Using two bar magnets, place them apart in different configurations. Place a piece of paper of the top. Sprinkle a few iron filings (available from many stores) and see how the limes of force form. Be careful to not let the filings get onto the magnets if possible.




b. Compasses are just a magnet.

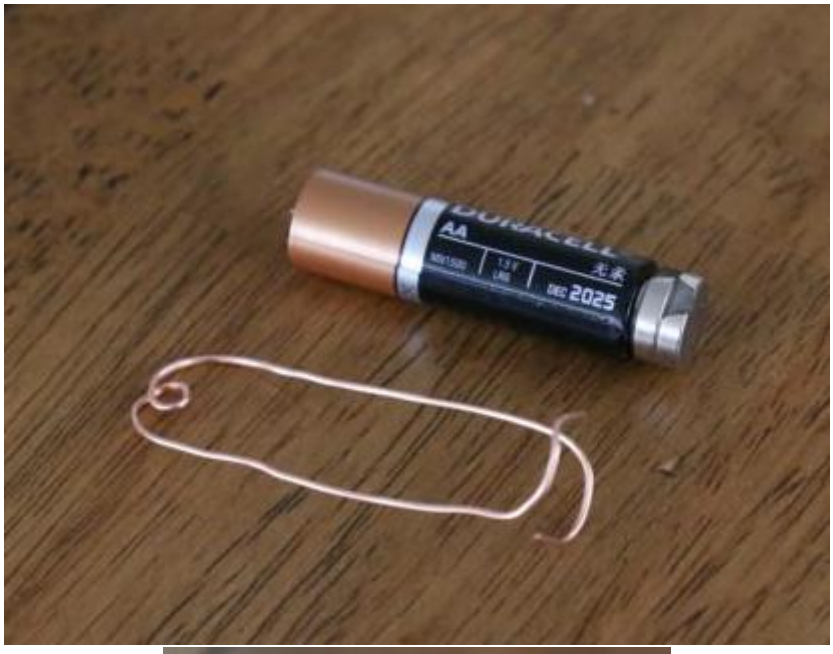
Use a magnet and a compass to see how the magnet makes the compass move. Talk with the Joeys about how magnets line up long the field lines they saw in the experiment above. We use the as the Earth is a big bar magnet, so we know where north is. Talk about the north and south pole of the Earth is just like the north and south pole of a magnet.




### 3.3 Motors

It is possible to make a simple motor with a battery, some copper wire and a rare earth or super magnet. These can be purchased from hardware stores. See the web site: https://www.youtube.com/watch?v=L-2Bmqlp7PQ

AA Battery with 18 gauge copy wire, 1-2 rare earth magnets. Place the magnets on the -ve end of the battery. Using a pair of pliers, bend the copper wire into the shape shown below. And place on the battery. Watch is turn!



### 3.4 Pressure

a. Plastic bag and pencils!

Take a sandwich sized plastic Ziplock bag and fill with water. Using lots of sharpened pencils, stable the bag with the pencils through both sides.

b. Bursting balloons – not!

Blow up some balloons. Place some stick tape on the surface using two pieces to make a cross. Use A PIN to pierce the balloon where the sticky tape is located. The balloon does not burst. This is because balloons pop due to catastrophic crack propagation. This means that the hole in the balloon widens quickly and causes the pop. The tape slows this down.

### 3.5 Robotics

We can make a hand robot using cardboard, straws, cotton thread of fine ribbon and sticky tape.

Draw your hand onto some thin cardboard and cut it out. Bend the fingers in the places where your fingers bend. Cut some straws into 12 x1 cm and 2x 0.5 cm lengths.

Sticky tape the cut straws onto the fingers as shown in the figure below. Thread some cotton or ribbon through the straws, secure them with sticky tape at the tip of each finger. Gather and place the thread or ribbon through a wider straw cut about 3 com long. Attach this to the palm of the cardboard hand and sticky tape into place. See https://cubscoutideas.com/7825/how-to-make-an-easy-cub-scout-robot-hand/

### 3.6 Simple Light Refraction Experiment

Watching the original light refraction experiment on YouTube will give you a great look at what's involved in this activity. See https://www.youtube.com/watch?v=RNjlLtFMc6U

But you only need four things:

- A sticky note (such as a Post-It)
- A marker
- An empty transparent bottle/glass
- Water

The arrows appear to change direction! The top arrow, which points to the left, appears to point to the right. And the bottom arrow, which points to the right, appears to point to the left! As the light travels through a substance, it becomes concentrated into a focal point, usually near the centre. After light passes through the focal point, the rays cross over each other and cause images to appear reversed.

A Work sheet is a on the next two pages.

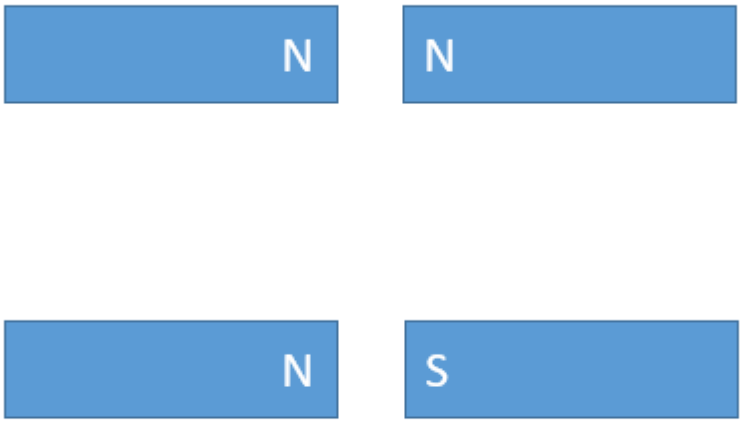
# Joey Scout Science Night

# Experiment Record Book

**Name** _____

## Station 1: Magnets and magnetic fields

1. **Draw the pattern of the iron filings**




2. **What happens when you move a magnet over a compass**?

## Station 2: Poke the sharp pencils through [make sure the pencils are sharp]

## Station 3: Make a simple motor

What happens?

# Station 4: Simple Light Refraction Experiment

Look at the arrows through the bottle of water. What do you see?

# 4. Astronomy

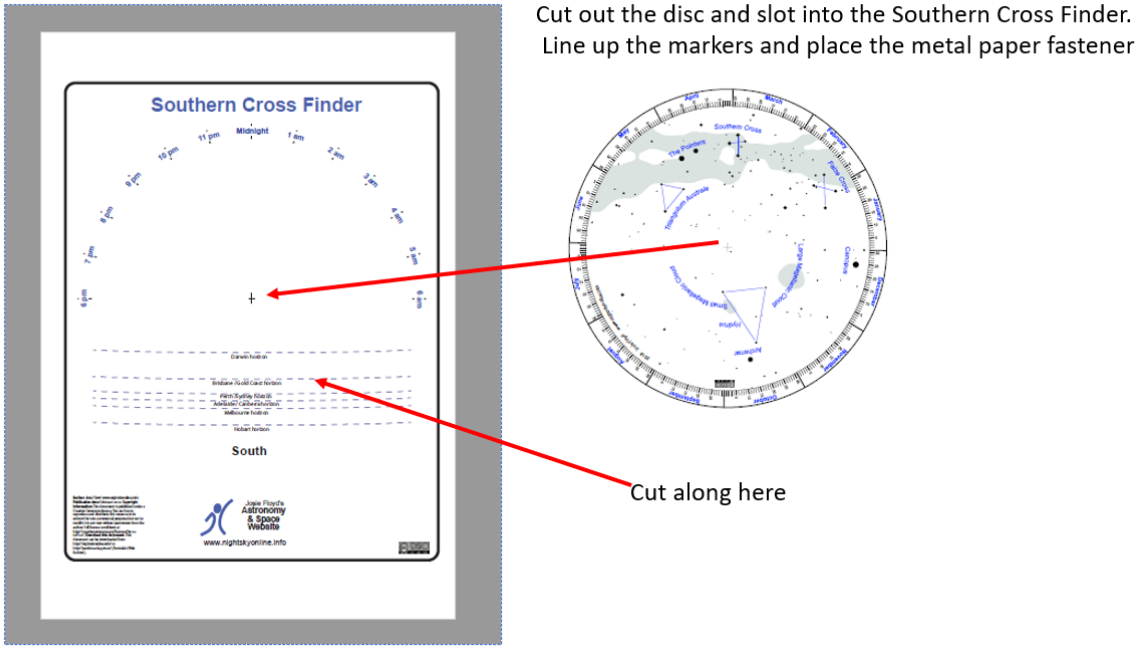
In Australia we have a wonderful night sky as we can see the Southern Cross and the Milky Way as well as many other stars and planets. As the Southern Cross is on our Australian Flag, it is important for Joeys to learn about the connection to it.

### 4.1 A simple method is to make a Southern Cross Finder.

Two printed sheets

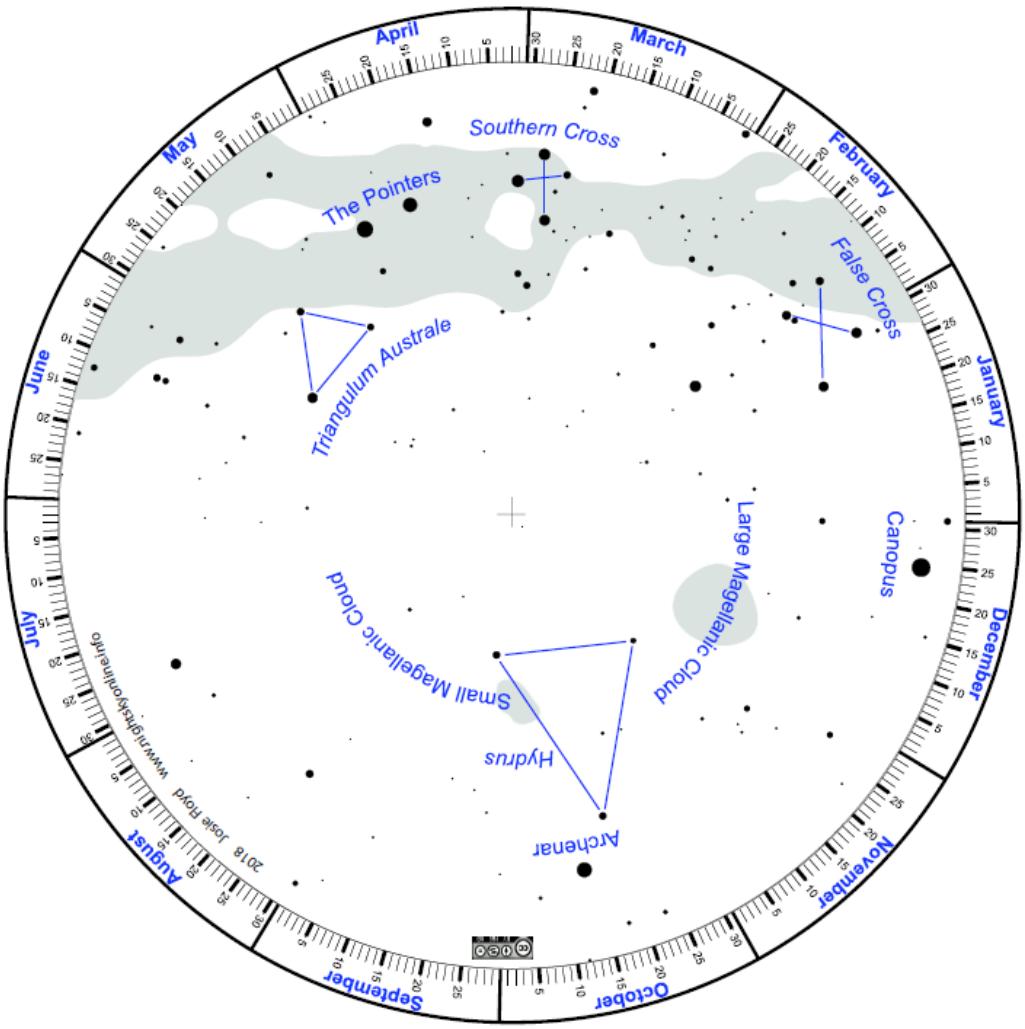
Paper Fastener

Scissors




http://nightskyonline.info/wp-content/uploads/2011/08/Southern_Cross_finder_base_2018_Josie_Floyd.pdf

http://nightskyonline.info/wp-content/uploads/2011/08/Southern_Cross_finder_star_disc_February_2018_Josie_Floyd.pdf


April
March
February
January
December
November
October
September
August
July
June
May
Southern Cross
The Pointers
False Cross
Triangulum Australe
Small Magellanic Cloud
Large Magellanic Cloud
Canopus
Hydrus
Achenar
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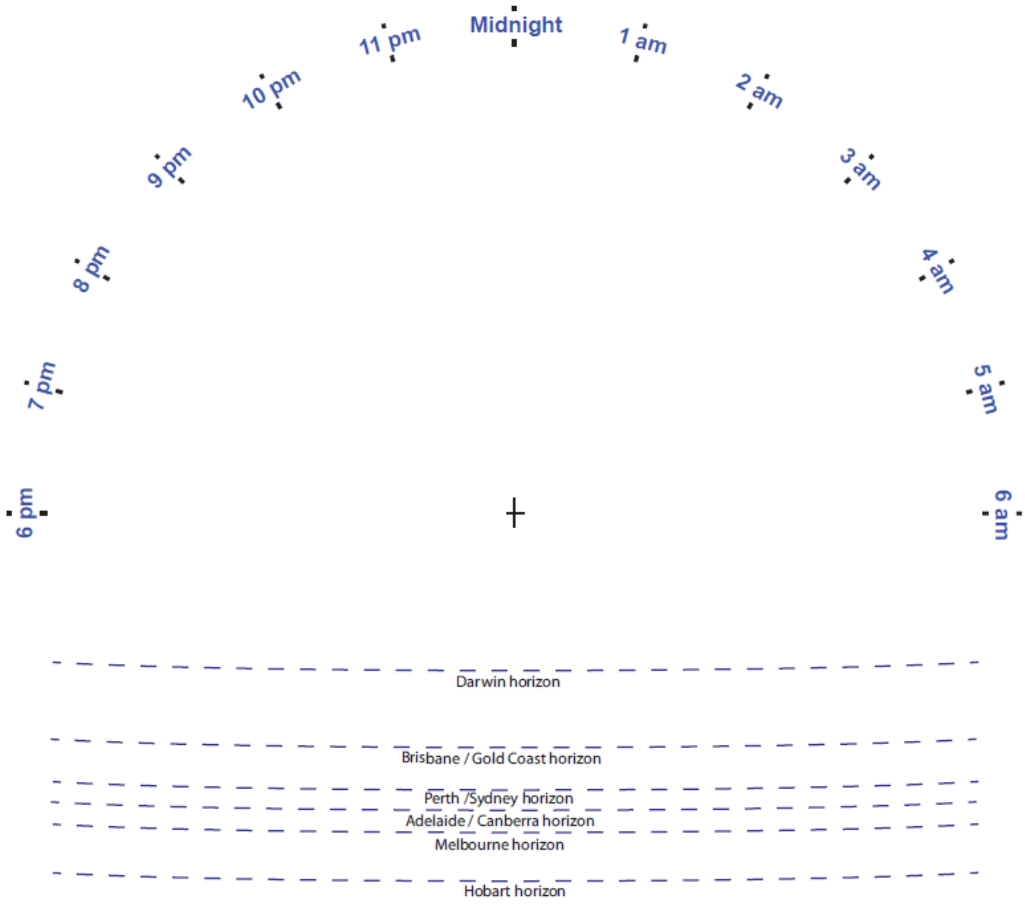
# Southern Cross Finder




**Author:** Josie Floyd www.nightskyonline.info
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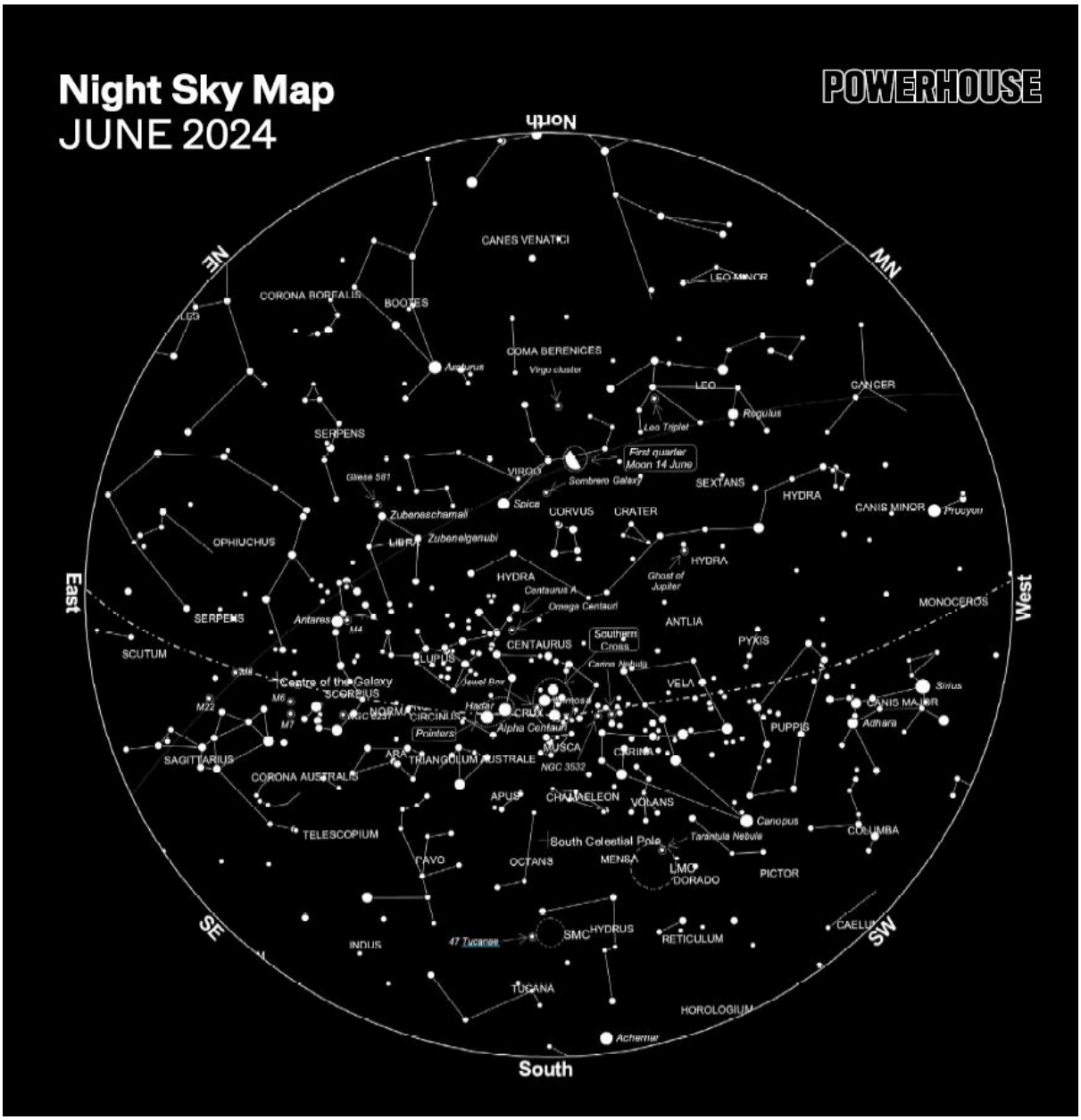
Josie Floyd's Astronomy

### 4.2 Night Sky

Night start map can be obtained for the specific night from the Sydney Observatory and Power House Museum web site this is updated each month see for example : https://powerhouse.com.au/stories/sky-guide-september-2024



Suggested References:

Lisa Harvey-Smith, Universal Guide to the Night Sky, 2023 Thames and Hudson, London.

Chris Maynard, Kitchen Science, 2001 D&K London

Correy Tutt, The First Scientists, 2021 Hardy Grant Publishing, Sydney