

Build-an-Ant



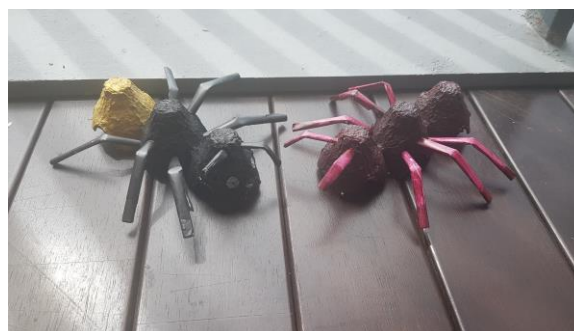
Overall Details

Objective	To get to know ant species native to Singapore, namely: <ul style="list-style-type: none">• Golden Ants (<i>Polyrhachis beccarii</i>)• Giant Forest Ants (<i>Dinomyrmex gigas</i>)• Green Weaver Ants (<i>Oecophylla smaragdina</i>)• Carpenter Ants (<i>Camponotus auriventris</i>) and how they contribute to natural and urban spaces.
Summary	A hands-on craft to make an ant out of a row of egg carton and a worksheet on ants' nests.
Duration	Approximately 20 minutes.
What you will need:	<ul style="list-style-type: none">• 1 egg carton• Colouring materials (e.g. non-toxic acrylic paint (recommended), markers, colour pencils etc.)• Paper• Tape• A pair of scissors
Remarks	Background Information can be found on page 8. Reference sheet can be found in Annex A. Printable worksheets can be found in Annex B.

Activity Description


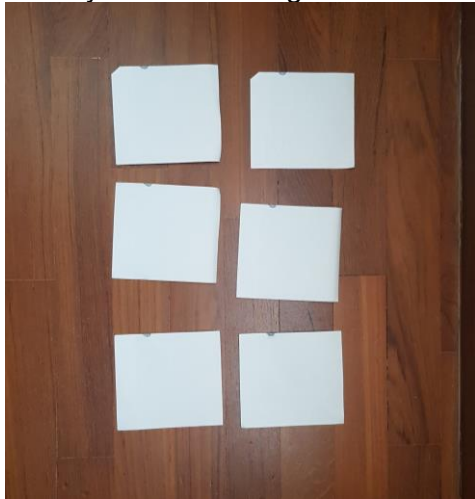
Participants will make and paint an ant out of a row of egg carton and paper, getting to know native ant species in the process and their ecological impact.

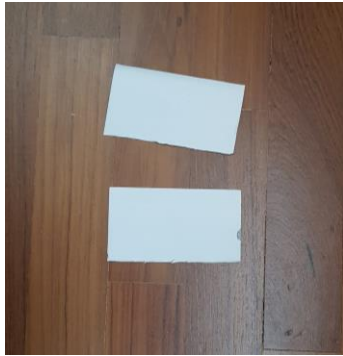
Depending on the ant species, they can then do the worksheet activity based on the ants' nesting behaviours (see Annex B).




Pre-workshop Preparation


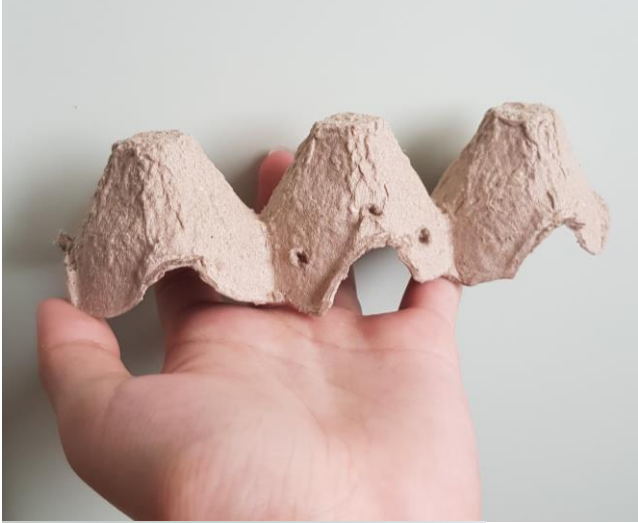


No	Suggested Flow	Facilitators' Notes
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1	Read the Background Information (see page 8).	
2	<p>Cut out a row of 3 dimples from an egg carton.</p> 	
3	Print out the reference sheet (see Annex A).	<i>Optional, but recommended for participants to be able to visualise what the ants look like in real life.</i>
4	Prepare a surface for painting.	<i>Optional if acrylic paint is not used as the colouring medium.</i>
5	<p>Cut out 6 rectangular pieces of paper of approximately 9cm by 8cm for the legs of the ant.</p> 	<i>Alternatively, post-it notes or memo pads can be used for this step.</i>
6	<p>Cut out 2 rectangular pieces of paper of approximately 4.5cm by 8cm for the antenna of the ant.</p>	<i>Alternatively, post-it notes or memo pads can be used</i>

		<i>and cut in half for this step.</i>
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How to Conduct the Workshop

No	Suggested Flow	Facilitators' Notes
1	Introduce the 4 ant species to the participants using the reference sheet and let them choose which species of ant they would like to make.	<i>Explain briefly about where they can be found and provide some background information (see page 15) on the ants.</i>
2	<p>Tightly roll up the 6 larger pieces of paper to form cylinders. Use tape to hold the cylinder together. Gently fold them in half. These will form the segmented legs of the ant.</p> 	
3	<p>Tightly roll up the 2 smaller pieces of paper to form cylinders. Use tape to hold the cylinder together. Gently fold them so one segment is shorter than the other. These will form the segmented antenna of the ant.</p>	.

		
4	<p>Using the blade of a pair of scissors, poke 3 holes along each side of the 2nd dimple near the bottom of the ant, forming 6 holes in total for the legs.</p>  	<p> <i>Please supervise the participant when they are using scissors. If the participant is young, please do this step for them.</i></p> <p><i>It is best to make these holes relatively small so the paper legs and antenna will fit in the hole securely.</i></p>

5


Poke 2 holes near the top of the 1st dimple for the antenna.



6

Attach the legs and antenna by slotting them through the holes.



7	<p>Paint the ant using the colours the participant has chosen. The eyes of the ant can also be painted on.</p> 	
8	<p>While the ant is drying, give the “An Ant’s Home” worksheet (see Annex B) to the participant to complete. Depending on the species of the ant chosen, give the appropriate worksheet depicting the type of nest the chosen species make.</p> <ul style="list-style-type: none"> • Golden Ants (<i>Polyrhachis beccarii</i>) - Soil nests • Giant Forest Ants (<i>Dinomyrmex gigas</i>) - Soil nests • Green Weaver Ants (<i>Oecophylla smaragdina</i>) - Leaf nests • Carpenter Ants (<i>Camponotus auriventris</i>) - Wood nests 	

Background Information

The following pages are supplementary information on the topics covered in this workshop. Facilitators may read them to get a better idea of the information that this workshop wishes to teach.

Overview of Ants

Ants are eusocial insects, meaning that they live in groups and take care of the colony's young together. A colony is usually one big family, where all workers have a single mother, the queen ant. Ants are closely related to bees and wasps, but not termites. Termites are actually closely related to cockroaches!

Ants form colonies that can reach millions of individuals and span large land areas. Colonies have been described as “superorganisms” as the ants appear to work like a single entity, much like cells comprising a body. The ants work together to fulfill the needs of the entire colony.

Ants can be found in all continents except Antarctica. Their prevalence is attributed to their cooperative operations and their ability to alter their habitats, make use of resources and defend themselves. They are also adaptive and have evolved alongside many other species to form intricate and sophisticated relationships. For example, there are spiders (genus *Amyciaea*) that have evolved to mimic the behavior and appearance of ants so as to avoid detection of the colony and hunt individual ants.



Above: Ant-mimicking Crab Spider (*Amyciaea lineatipes*)
Photo credit: CharlesLam under CC BY-SA 2.0 license

Ant Anatomy

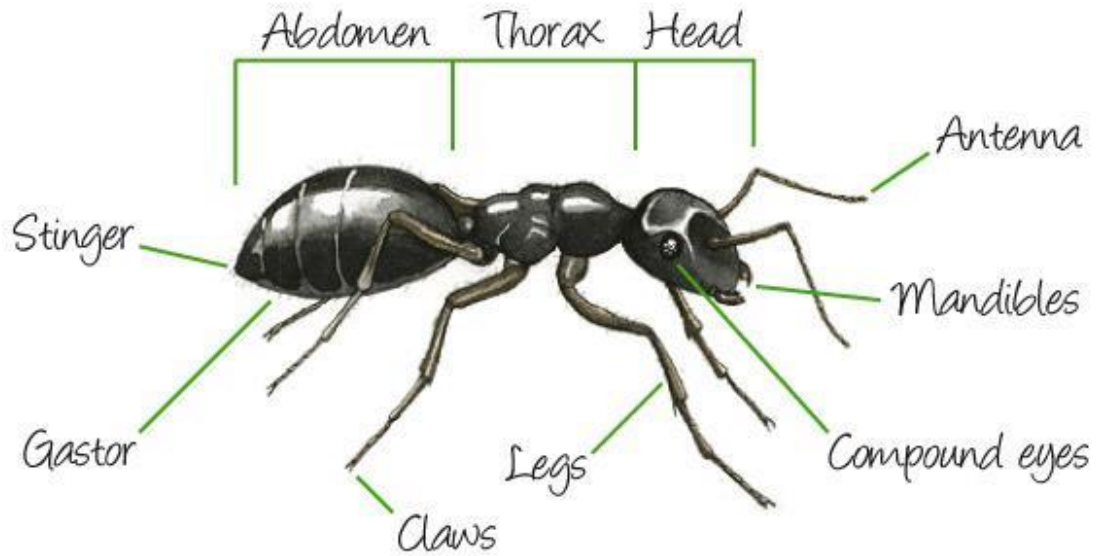


Photo credit: <https://antark.net/>

Castes (or Types of Ants) in the Colony

1. Queen Ant



Green Weaver Ant Queen (*Oecophylla smaragdina*)

Photo credit: budak under CC BY-NC-ND 2.0 license

This ant is the mother of all the ants in the colony. She lives for much longer than her daughters, usually for decades (25-30 years)! She is the largest caste of ants. Her role in the colony is to lay eggs to expand the size of the colony. When she first starts her colony, however, she is also responsible for raising and protecting her young.

Queen ants start off as female alates. When a colony becomes mature (i.e. gets big enough and has enough resources), they produce reproductive alates. These are winged male and female ants that will go on to form the next generation of ants. Usually after rain, these ants participate in a nuptial flight, where the ants fly into the air and mate with ants from other colonies. You may see these flying ants as they often come into our homes, attracted by light. These wings are also why queen ants have relatively large thoraxes - they contain wing muscles to power her flight.

After the nuptial flight, the female alates land to start her colony. For most ant species, this involves digging a chamber in the ground and enclosing herself completely. She sheds off her wings and converts the wing muscles in her thorax into a nutritious food that she feeds to her young. Once her first workers reach maturity, they take on the task of foraging for food and taking care of the young.

2. Drone Ant



Male Drone Ant (unknown species)

Photo credit: budak under CC BY-NC-ND 2.0 license

These ants are the only male ants in a colony. They have a very short lifespan as they die after nuptial flight. Though larger than worker ants, they are smaller than the queens and female alates. They also have smaller abdomens, making them look very similar to wasps. These male alates are produced when the colony reaches maturity and resources are abundant.

3. Worker Ants



Marauder Ant Workers (*Carebara diversa*). The minors are hitching a ride on the much larger major.

Photo credit: budak under CC BY-NC-ND 2.0 license

These ants form the bulk of the colony and so are most commonly seen. They are all female and born from the queen ant. Depending on the species, they live for around a few weeks to many months. They perform all other tasks in the colony like building nests, foraging for food, looking after the young and defending the nest.

Some species of ants are polymorphic, which means that the workers range in size. The workers can then be further split into subcastes:

A. Majors

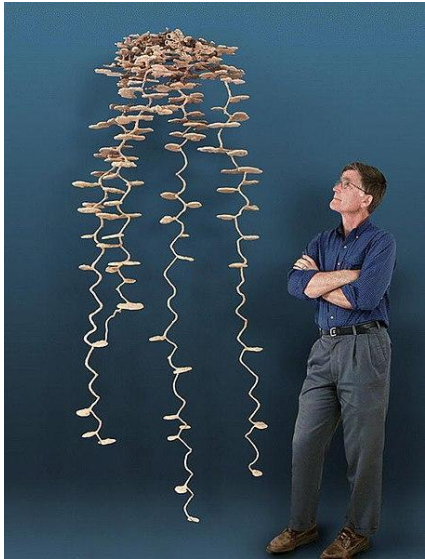
These ants are larger than the minors. In some species, the majors are specialised and have large heads and mandibles for cutting food or defence.

B. Minors

These ants are smaller and typically are involved more in taking care of the young, foraging and transporting food.

Types of Ant Nests

1. Soil Nests



Metal cast of underground ant nest

Photo credit: shaners becker under CC BY-SA 2.0 license

Most species of ants dig extensive tunnels underground. Each chamber they create is used for a singular purpose such as housing the young based on developmental stage or for use as the communal bathroom. The ants constantly change and remodel the chambers of their nest to keep the internal environment of the nest at a constant to best suit the colony's needs, such as maintaining a certain humidity for the eggs and the larva. They will even destroy chambers by refilling them with soil when necessary, such as when the chamber delegated for waste becomes too unhygienic.

As a result of this behaviour, the ants aerate the soil which benefits the plants that live around their nest. The plants also profit from the nitrogen in the ants' waste.

2. Leaf Nests



Weaver Ant Nests (*Oecophylla smaragdina*)

Photo credit: Raghu Mohan under CC BY 2.0 license

Some species of ants are arboreal, which means they nest exclusively in trees. They do so by using the silk spun from their larva to stick leaves together and form a nest. These ants can create multiple leaf nests on the same tree. The nests are kept moist by transpiration from the leaves. The ants seem to know when the leaves will wither as they move out of the nest and construct new ones before it dries out!

While one might think this nesting harms the plant, the ants are actually furiously protective of their host plant. They even defend prey on harmful insects, thereby forming a mutualistic relationship with their host plant.

3. Wood Nests



Carpenter Ants (*Camponotus* sp.) nest in some structural board

Photo credit: Nwbeeson under CC BY-SA 4.0 license

Some species of ants nest in wood. They chew through the fibers to create neat tunnels. However, unlike termites, they do not consume the wood as they lack the necessary microflora in their gut to digest the wood. Instead, they simply chew through the wood and transport the wood particles to outside of the nest.

Such ants nest in deadwood like fallen trees, branches and decaying roots. Very rarely, the ants burrow into living wood. Due to their ability to excavate wood, these ants play an important role in decomposition in the forest.

Ants and Humans

1. As ecological helpers

Ants, such as weaver ants (*Oecophylla smaragdina*), have been used as biological control by farmers as they prey on plant pests in Thailand and China.

The seeds of rooibos (*Aspalathus linearis*), a plant used for making herbal tea, are harvested in South Africa by gathering them from ant nests. As the plant disperses its seeds widely, it is difficult to harvest them efficiently. Some species of ants however, collect the seeds and store them for consumption. Hence, farmers gather their rooibos seeds in larger quantities from ant nests at one time rather than finding the seeds individually.

2. As food

Ants and their brood have been eaten for decades in countries such as Mexico, Thailand, India and Myanmar. Native Americans have also been recorded to consume ants.

3. In an urban environment

Since ants are so adaptive and opportunistic, they have easily assimilated to life in an urban landscape. They are common sights in our homes as they will nest anywhere suitable. They can nest in potted plants, in cracks in the walls and wherever they can find humidity and darkness. Common behaviour in the species of ants that are prevalent in urban areas include:

A. Polygyny

Polygyny refers to a colony having multiple queens. Some species of ants are tolerant of other genetically unrelated colonies and may even assimilate to form one larger colony. As a result, the whole colony can have upwards of 10 queens. Having so many egg-producers benefits the colony as the size of the colony can increase quickly to gather more resources. Hence, even if a large portion of the colony were to be exterminated by humans, the presence of queens means that the colony can and will continue to survive and thrive.

B. Satellite nests/Budding

When a colony gets very large, the ants may start nesting in a separate place from the main nest. A portion of the colony, including queens, workers and brood, will move to another nesting site. As a result, it is difficult to eradicate the whole colony as they are spread out.

Hence, a single colony may have territory over an entire multi-storey building!

While ants in our homes may be an annoyance to some, they play important roles in urban landscapes as well, such as in our parks:

A. Decomposers/Nutrient Cycling

Many species of ants are opportunistic hunters or scavengers. They are important organisms in the decomposition process as they eat a wide range of food, from rotting fruit to dead animals thereby speeding up the return of nutrients to the soil.

When ants find a piece of food much larger than themselves, they often bury it to hide it from other animals while they process and eat it. This behaviour exposes more surface area of the food to other soil creatures and fungi that aid in decomposition as well.



B. Soil Aeration

Mentioned above, soil-dwelling ants loosen the soil when they dig their nests, thereby avoiding soil compaction. The roots of the plants can hence grow deeply and allows for a more robust plant.

C. Food for Other Animals

Ants are preyed upon by many animals like the Sunda Pangolin (*Manis javanica*), pitcher plants (*Nepenthes rafflesiana*), and birds. Notably, in Singapore, the Oriental Magpie Robin, which preys on ants, (*Copsychus saularis*) is rebounding back in population since the days when the species was poached.

Species of Ants Featured

Species	Fun Facts
<p>Golden Ants (<i>Polyrhachis beccarii</i>)</p>  <p>Photo credit: www.NatureLoveYou.sg</p>	<ul style="list-style-type: none"> - Workers are about 7mm long. - They appear gold as at certain angles, the short dense hair on their bodies reflect light, giving them a metallic sheen. - <i>Polyrhachis</i> ants have distinct spines along their bodies. - These ants have no stinger, and attack by spraying formic acid into bites inflicted by their mandibles.
<p>Giant Forest Ant (<i>Dinomyrmex gigas</i>)</p>  <p>Photo credit: Soh Kam Yung under CC BY-NC license</p>	<ul style="list-style-type: none"> - These ants are one of the largest in the world: minors measure around 20.9 mm and majors measure around 28.1 mm. - These ants primarily feed on the “<u>honeydew</u>”, sweet secretions of insects like Rose Coreids (<i>Mictis longicornis</i>) that consume plant sap. They protect these insects from predators and herd them into one area. - The ants usually nest in the soil under buttress tree roots, and can also nest in rotten wood. - These ants are nocturnal, and send out an <u>exodus</u>, a large group of workers at once to forage every night. - Majors have been observed to engage in one-on-one <u>ritualistic fights</u> with other majors from unrelated colonies. They open their mandibles and box with their front legs. These battles rarely result in the death of either party but can last for up to 30 days, during which the majors take breaks, return to the nest to clean their legs and antenna, before returning to the battlefield again.

Green Weaver Ants	- Workers are around 8mm long.
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(*Oecophylla smaragdina*)



Photo credit: Soh Kam Yung under CC BY-NC license

- Despite its name, the workers of this species are reddish in colour locally. The same species in Australia have bright green gasters.
- The queens of this species, however, are green.
- These ants make leaf nests by sticking leaves together using silk produced from their larva.
- These ants use their own bodies to form chains to reach leaves that may be out of reach to join to the nest.

Carpenter Ants

(*Camponotus auriventris*)



Photo credit: www.NatureLoveYou.sg

- These ants exhibit polymorphism. Minors are around 6-8mm and majors are 8-10mm long.
- These ants can nest in wood and also dig subterranean tunnels.
- The *Camponotus* genus is extremely large and diverse. More than 1000 species and 500 subspecies are categorised as *Camponotus* ants.
- These ants forage in the day unlike many species who are crepuscular or nocturnal in nature.

Annex A: Reference Sheet



Golden Ants (*Polyrhachis beccarii*)
Photo credit: www.NatureLoveYou.sg



Giant Forest Ants (*Dinomyrmex gigas*)
Photo credit: budak under CC BY-NC license



Green Weaver Ants (*Oecophylla smaragdina*)
Photo credit: Soh Kam Yung under CC BY-NC license



Carpenter Ants (*Camponotus auriventris*)
Photo credit: www.NatureLoveYou.sg

Annex B: Printable “An Ant’s Home” Worksheets

Name: _____

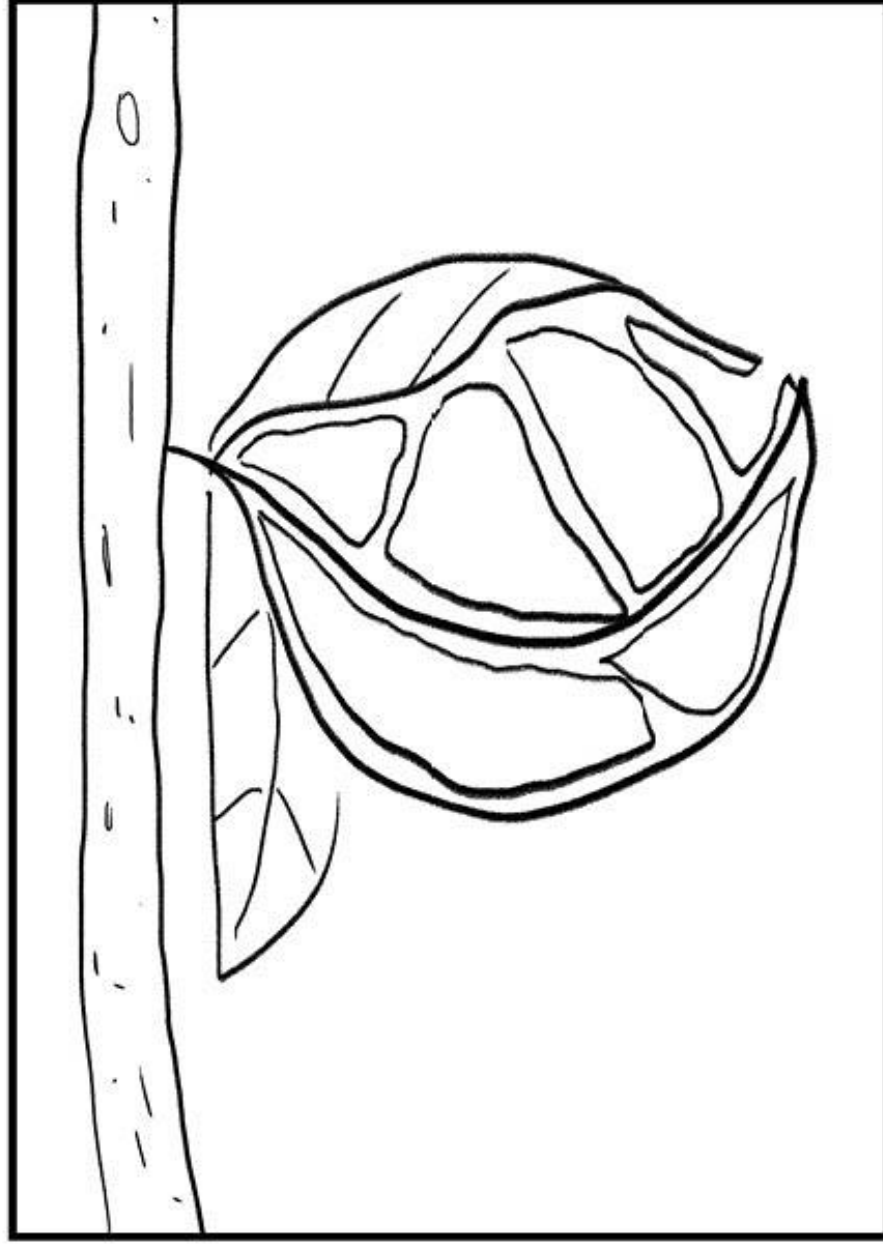
An Ant's Home: Leaf Nests

Can you draw
some ants in their
home? Colour in
their nest!

Some ants, like
weaver ants
(*Oecophylla*
smaragdina),
make nests in
the trees by
using silk to
stick leaves
together!



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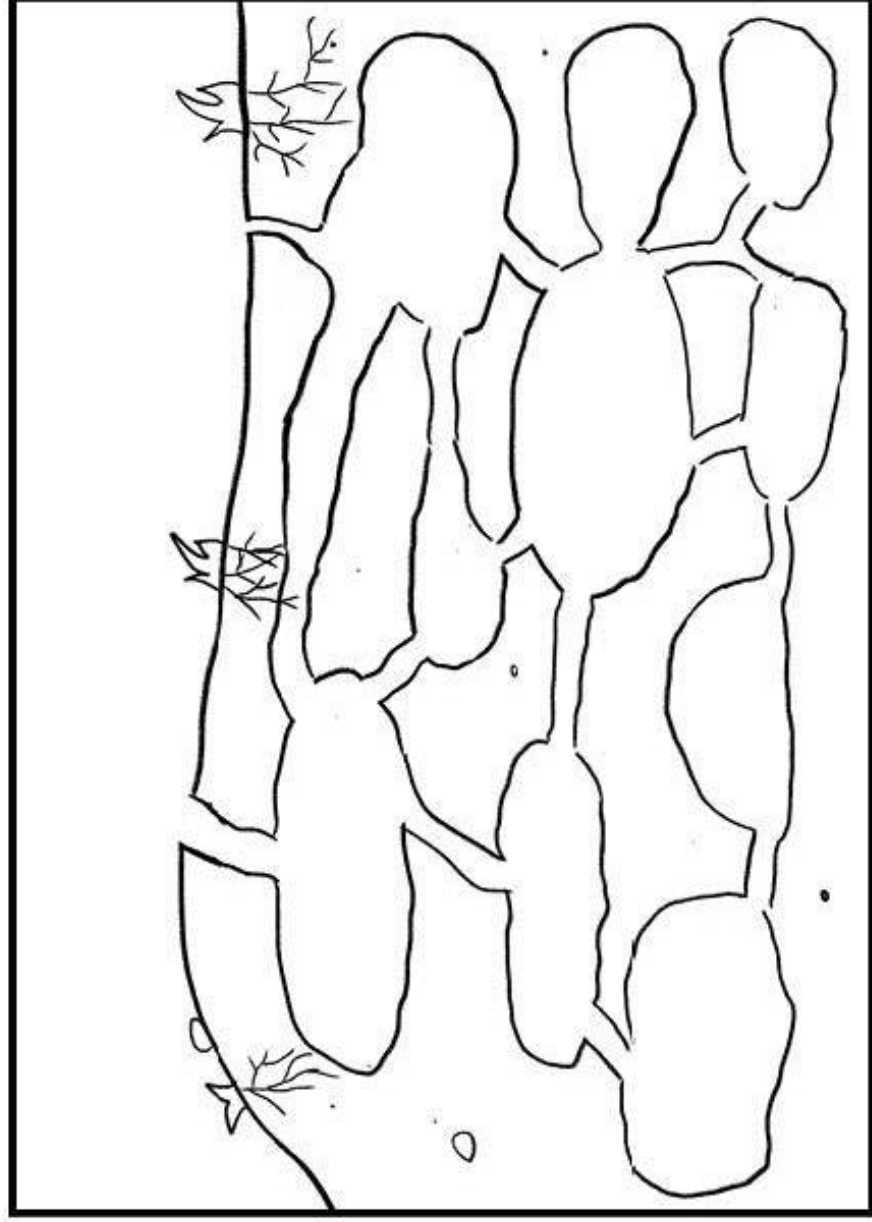


Name: _____

An Ant's Home: Soil Nests

Can you draw
some ants in their
home? Colour in
their nest!

Most ants, like
giant forest ants
(*Dinomyrmex*
gigas) and
trapjaw ants
(*Odontomachus*
rixosus), build nests
by digging under-
ground tunnels
and rooms!



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Name: _____

An Ant's Home: Wood Nests

*Can you draw
some ants in their
home? Colour in
their nest!*

Some ants, like
carpenter ants
(*Camponotus
auriventris*)
build nests
by chewing
through dead-
wood to form
neat tunnels!



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