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Contents

Ministry of Education

THE INVISIBLE FORCE

by Johanna Knox

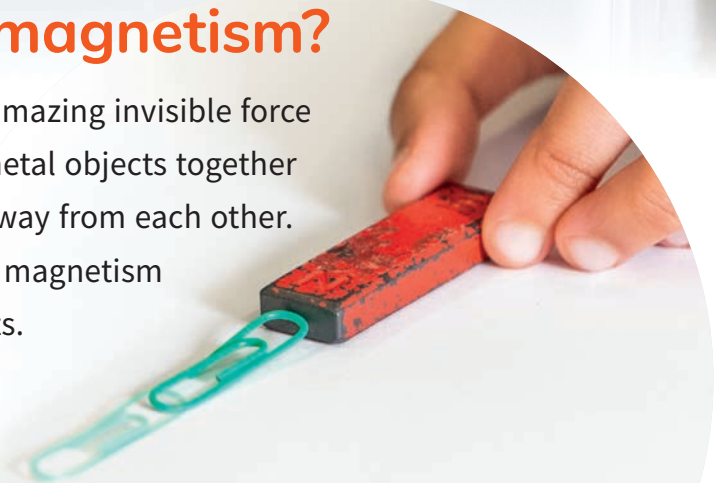
Why do these letters stick to the fridge?

What keeps the fridge door closed?

The answer to these questions is **"magnetism"**.

What is magnetism?

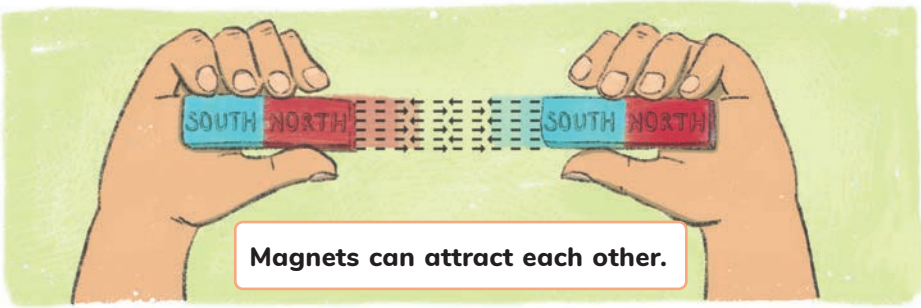
Magnetism is an amazing invisible force that pulls some metal objects together or pushes them away from each other. Objects that have magnetism are called magnets.



If you hold two magnets close to each other, you can feel this invisible force at work. Sometimes the magnets will "attract" (pull towards) each other. If you turn one of the magnets around, they will "repel" (push away) each other.

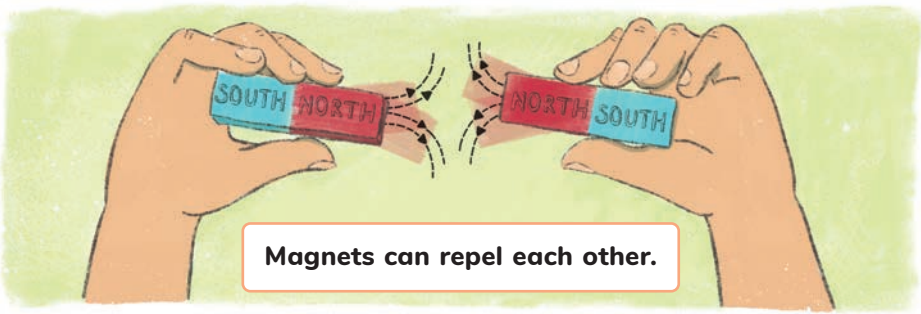
They do this because each end of a magnet is different. The ends of the magnets are called "poles". One end is called the north pole, and the other end is called the south pole.

If you hold one magnet so that its north pole is facing another magnet's south pole – bam! They try to join together. Have you ever heard the saying "opposites attract"? It comes from magnets!



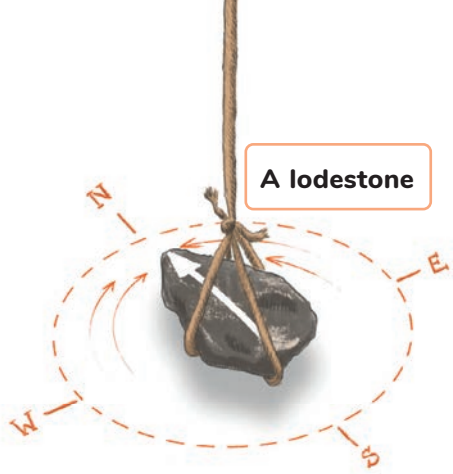
Magnets can attract each other.

But poles that are the same – two north poles or two south poles – repel each other.



Magnets can repel each other.

The first magnets



A lodestone

Thousands of years ago, people in Greece and China discovered that a special kind of stone could attract some metals. This special stone is called a lodestone.

People also found that if they held up a lodestone and let it swing round, the lodestone would always turn to face north. They discovered that they could use lodestones to help them find their way on long journeys. When travellers knew which way was north, they could check where they were and work out which way they needed to go.

Later, people used this idea to make compasses. A compass has a magnetic needle that always points north.

A compass

Magnets today

In 1820, a scientist called William Sturgeon discovered that he could make magnets by sending electricity through some metals. These days, magnets are made this way in factories.

Some magnets can be as big as a room. Others are so small you can only see them with a microscope. Wherever they are and whatever they look like, they all have an invisible force.

A large magnet being used to pick up metal in a factory

AMAZING MAGNETS

by Johanna Knox

Magnets are used in many different places for many different reasons. Magnets can do some amazing things!

Magnets at home and school

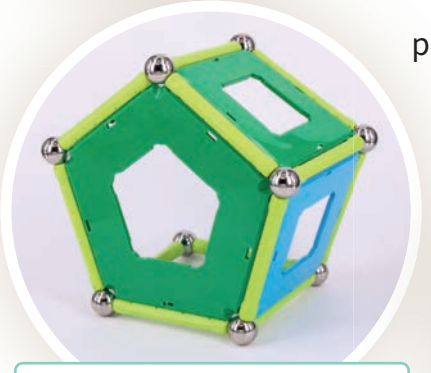
At home, you might use a magnet to pick up pins or paper clips or to stick pictures and shopping lists on the fridge.

Fridges and freezers have magnetic strips in their doors to keep them closed so their cold air stays inside.

These metal knives are held in place by a magnetic strip.

At school, you might use magnetic letters to make words on a whiteboard. Some whiteboard dusters have a magnet inside so that the duster will stick to the board.

Some games use magnets to join pieces together or keep pieces in place.



A magnetic construction set

A magnetic chess set

Magnets at work

Many factories and businesses use magnets.

Factories that make food use powerful magnets to keep the food safe. They place magnets close to the food. If any metal gets into the food accidentally, it will be attracted to the magnet. Then it can be removed.

Magnets are used at recycling centres to separate metal from other rubbish.

A magnetic strip attracts metal objects at a recycling centre.

Scrap-metal yards use giant magnets to lift large pieces of metal. Sometimes they lift whole cars!

A giant magnet at work in a scrap-metal yard

Magnets on the move

Magnets are often used to attract objects, but they can also be used to repel objects. A really interesting example of this is a maglev train.

A maglev train has magnets underneath the carriages, and it travels on a magnetic track. But the magnets on the train and the track have the same poles. This means they repel each other. The train is pushed up off the track so that it floats in the air. How amazing!

MAGLEV

Maglev is short for **mag**netic **lev**itation. Levitation is when something lifts up and floats in the air.

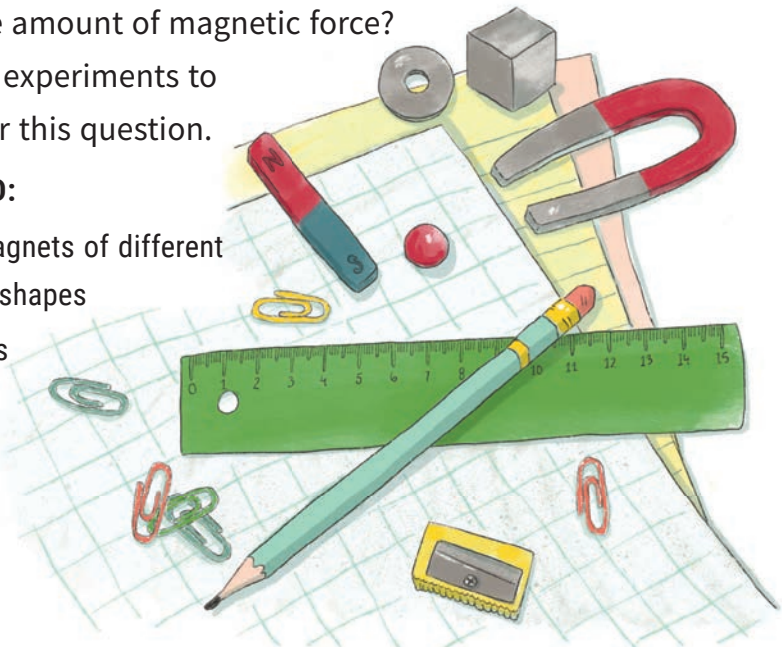
INVESTIGATING MAGNETS

by Dr Sarah Kenworthy

We know that magnets can attract other magnets and metal objects. This is magnetic force in action. But do all magnets have the same amount of magnetic force? Let's try some experiments to help us answer this question.

YOU WILL NEED:

- several magnets of different sizes and shapes
- paper clips
- paper
- a pencil
- a ruler.



Do all magnets have the same amount of magnetic force?

EXPERIMENT ONE

1. Choose one magnet and touch it to a pile of paper clips.

2. Lift the magnet up and count how many paper clips the magnet has lifted.

3. On your paper, draw a table with the headings Magnet, Prediction, and Result and write the result for your first magnet.

4. Make a prediction about how many paper clips each of the other magnets will lift.

5. Test each magnet and write down your results.

Magnet	Prediction	Result
	—	2
	2	3
	6	6
	3	4

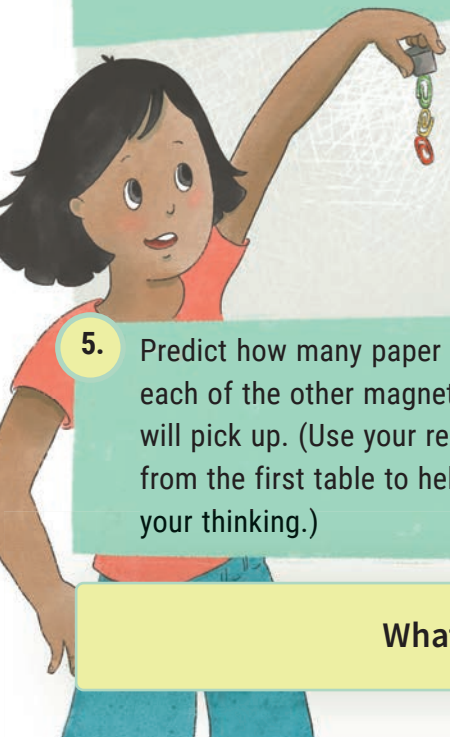
Were the results the same for each magnet?

EXPERIMENT TWO

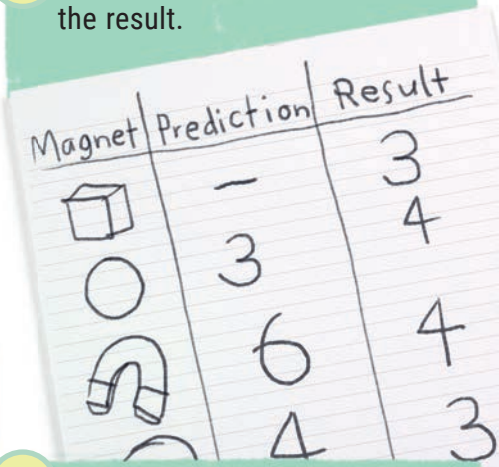
1. Use a magnet to pick up a paper clip.

2. Hold the magnet and paper clip over a second paper clip. The first paper clip should pick up the second one.

3. See how many paper clips you can add to the chain.



4. Draw another table and write the result.



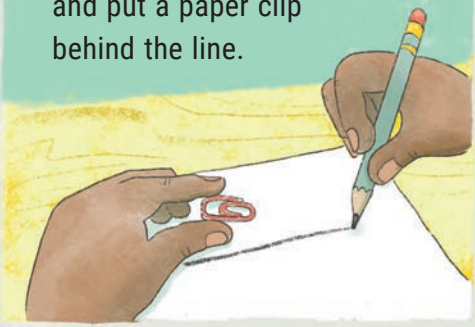
5. Predict how many paper clips each of the other magnets will pick up. (Use your results from the first table to help your thinking.)

6. Test each magnet and write down the results.

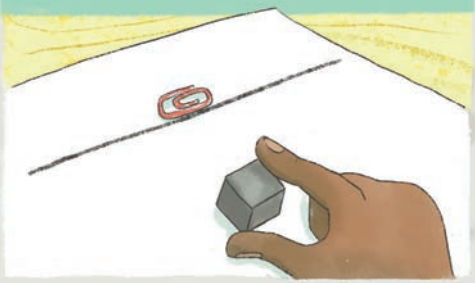
What are you noticing?

EXPERIMENT THREE

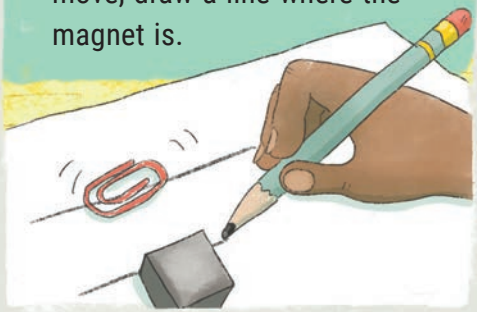
1. Draw a line on a piece of paper and put a paper clip behind the line.



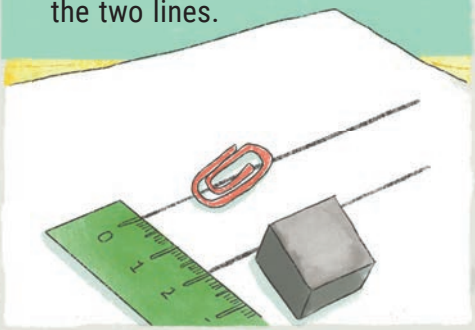
2. Choose one magnet and move it towards the paper clip.



3. When the paper clip starts to move, draw a line where the magnet is.



4. Measure the distance between the two lines.



5. Draw another table. Add in your result and predict how close the other magnets will need to be.

Magnet	Prediction	Result
	—	2cm
	1·5cm	

6. Test each magnet and write down your results.

Is it the same distance for all the magnets?

How have these experiments helped your thinking?
Do all magnets have the same amount of magnetic force?

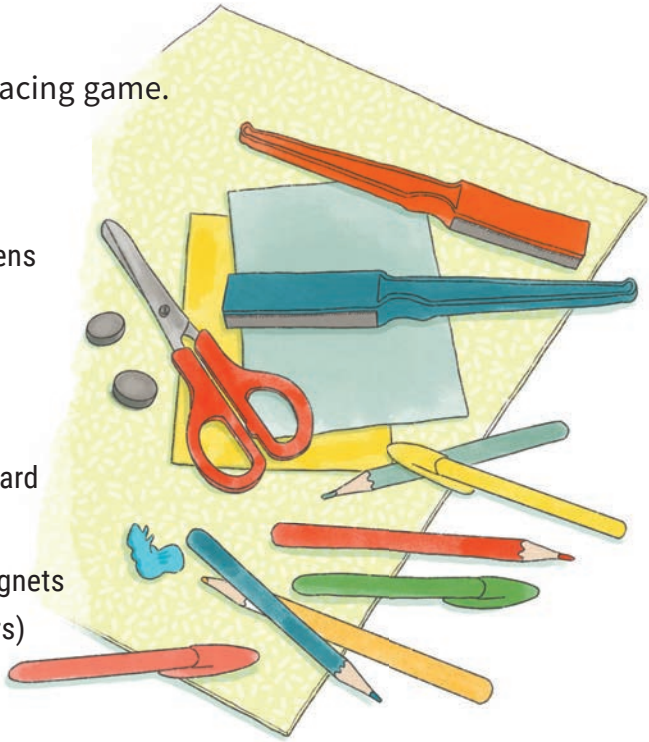
LET'S RACE

by Dr Sarah Kenworthy

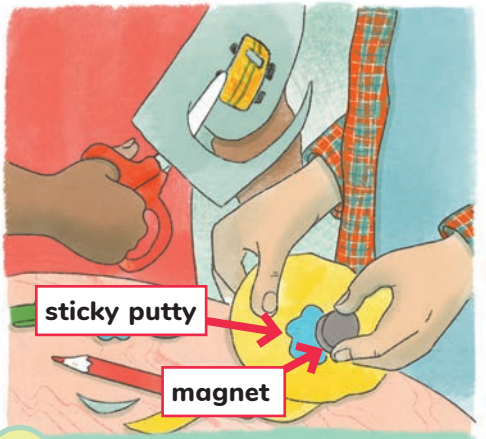
Use magnets to make a racing game.

YOU WILL NEED:

- small pieces of card
- colouring pencils or pens
- scissors
- two small magnets
- sticky putty or tape
- a large piece of stiff card
- two magnetic wands (or you can attach magnets to the end of two rulers)



WHAT TO DO:



1. Draw two racing cars on the small pieces of card. Cut them out and attach them to the small magnets with the sticky putty or tape.

2. Draw a race track on the large piece of card. (Don't forget a start and finish line.)

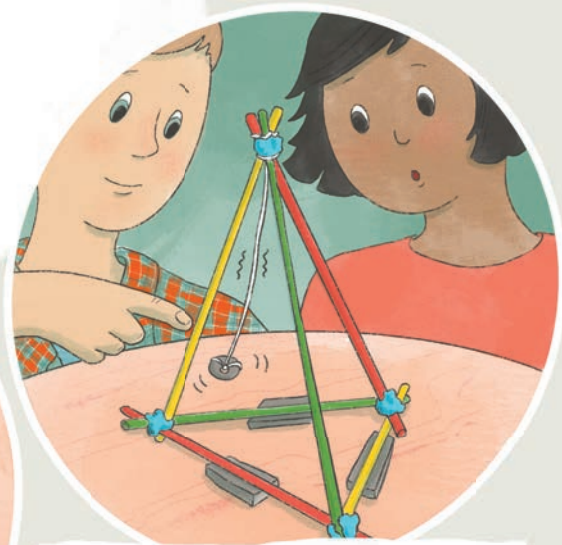
3. Place the track on a table or on top of some books to lift it up so that you can slide the wands underneath.

4. Start racing – on your marks, get set, GO!

More ideas

Here are some more ideas for things you can do with magnets.

Make a fishing game using paper clips, cut-out fish, and a magnet on a string.

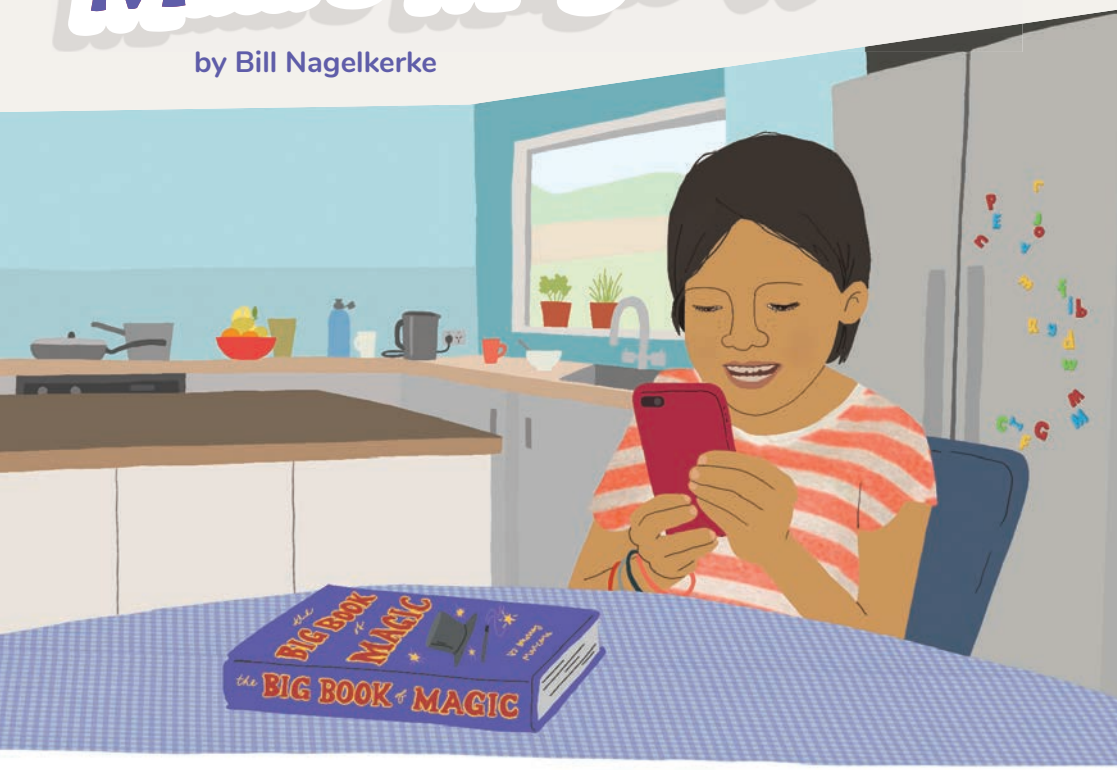


Make a tripod with sticks and modelling clay. Hang a magnet from the centre. Put three other magnets under the tripod. See what happens to the hanging magnet.

Put on a show! Attach magnets to toys and use another magnet to move them around on a cardboard box. (Keep the other magnet out of sight under the box.)

Maia's Magic Wand

by Bill Nagelkerke



Aunty Anna phoned to ask Maia what she wanted for her birthday. Aunty Anna was a scientist. She was always busy, so sometimes she didn't listen very carefully.

"I'd love a magic wand," Maia said. She had just finished reading a book about how to do magic tricks and couldn't wait to try out some of the tricks on her family. A magic wand was just what she needed.

"What a great idea! That's easy," her aunty said. "I'll get one and post it to you."

On Maia's birthday, a package arrived.

"Yay, this will be my magic wand!" cried Maia, tearing off the paper.

Maia's brother, Tai, looked at the present. "That's a funny sort of wand," he said, and he carried on playing with his cars.

Tai was right. The wand didn't *look* magical. It wasn't made of wood, and it wasn't round like a magic wand should be. It was flat, and one end was wider than the other. The wide end felt heavy.

"Aunty put a birthday card with it," said Mum. She handed it over.

Maia read the card.

"But I asked for a *magic* wand, not a magnetic wand!" said Maia.

"It's almost the same thing," said Dad cheerfully. He walked over to the fridge. "Look at this."

Dad made the word MAGNETIC with the letters on the fridge. "Now, this is the clever part," he said. "If you take out these letters, you're left with MAGIC! How about that!"

"That's not magic," said Maia, disappointed. She put the wand on a chair.

Amber the dog looked up from her basket, then she came over and sniffed the wand. Suddenly, the wand jumped up and stuck to Amber's name tag. Amber shook her head from side to side, trying to get rid of the wand. She spun around, her paws sliding all over the floor and sending Tai's toy cars flying off in all directions.

"Hey, stop that!" said Tai.

Dad grabbed hold of Amber and gently removed the wand. "Her tag is made of metal," he explained. "That's why the wand stuck to it. Magnets are attracted to metal."

"That actually *did* look a bit like magic!" Maia said.

Mum laughed and gave Amber a pat. "That looked really funny, Amber," she said.

"*Not* funny," said Tai, "Two of my cars are gone." He looked as though he was about to cry.

"Amber must have kicked them somewhere when she was running around," said Maia.

"They might have gone under the fridge," said Dad. "Have a look."

Tai lay down and peered under the fridge. "It's too dark to see," he said.

Dad got a torch.

"Yes, now I can see something shiny," said Tai. "*Two* shiny things."

Mum reached under the fridge. "They're too far away," she said. "I can't reach them."

“I know what we can do,” said Maia, grabbing her wand. “My wand stuck to Amber’s tag, so it will stick to Tai’s cars too.”

“That’s right!” said Dad. “Tai’s cars are made of metal. Good thinking!”

Maia poked the magnetic wand under the fridge. She felt it tug at something. She pulled the wand back out – with one of Tai’s cars attached to it.

“I’ll get the other one now,” said Maia.

“No, I want to do it,” said Tai, so Maia gave him the wand.

“It’s just like fishing,” said Tai as the second car appeared.

“I guess my magnetic wand *is* a magic wand after all,” said Maia, with a smile.

illustrations by Ali Teo

RUA AND TE MANU

A traditional story of Ngāti Porou

Retold and illustrated by Isobel Te Aho-White

This story tells how whakairo, the art of carving, came to the world.

Long ago, Rua (Rua-te-pupuke) and his son, Te Manu (Te Manu-hau-turuki), lived in a village by the sea.


But one day, Te Manu paddled too far.
Auē! The current is too strong!
Underneath the waves, the sea god, Tangaroa, was watching and waiting ...
Later, back on shore ...
Te Manu's waka! Auē! Tangaroa has taken my son!
I must find Te Manu and bring him back home.
Far out at sea, something caught Rua's eye.
What's that? A whare under the sea?
He dived into the water.
These carvings are tino pai!

But then Rua saw the tekoteko fixed to the top of the whare.

That is my son!

Suddenly Rua heard a voice.

Tēnā koe.

This is the whare of Tangaroa. You will have to defeat him if you want to get your son back. I will help you.

Tēnā koe, e kuia. I am listening.

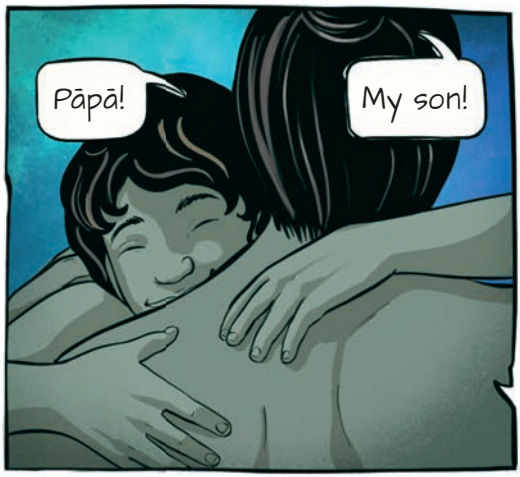
Tangaroa and his sea whānau are out catching food, but they will return at sunset. While they sleep, you must fill up all the holes in the whare so that they cannot tell if it is day or night. Then set the whare on fire!

So Rua hid and waited. At last, Tangaroa and his whānau returned.

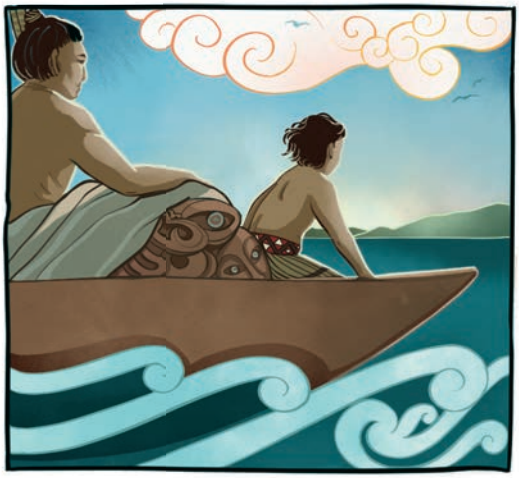
When Tangaroa was sleeping, Rua did as the kuia had told him and filled the holes in the whare with mud.


Then, he set fire to the whare.
AUĒ!
Tangaroa burst out of the whare ...
... followed by his sea whānau. Rua killed many of the fish, but some escaped.

Rua took Te Manu down from the roof. At last, his son could move and talk again.



They gazed at the burning whare and the carvings lying on the ground.



And that is the story of how whakairo, the art of carving, came to the world.

Kākahu Pekepeke

by Keri Welham

Many people have taonga – treasures that have an important link to the past. An iwi might have a waiata that has been sung by their whānau for many years. A family might have a photo of their grandmother that they look at every day. These treasures are loved and respected, and people take great care to keep them safe.

At Ōtūmoetai Primary School in Tauranga, one of their taonga is a whakairo (carving) called Kākahu Pekepeke. The whakairo was presented to the school by Kerry Wilson in 1992 for the school's new library.

Telling a story

The carving tells the story of three local springs that were very important to the iwi living around them. Long ago, the people of Ngāi Tamarāwaho drank from the first spring, bathed in the second spring, and washed their clothes in the third spring.

Sometimes the third spring would have less water, so the clothes would have to be washed in one of the other springs. People said that the way the clothes were moved between the springs reminded them of the way cloaks are moved between Māori families when someone dies.

This idea gave the carving its name. A kākahu is a cloak, and pekepeke means to move from one person or place to another.

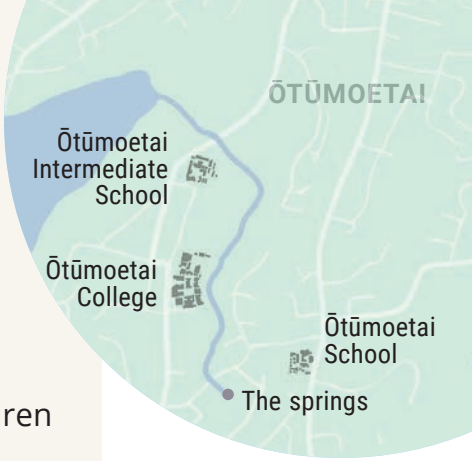
Des Tata, a kaumātua of Ngāi Tamarāwaho

Bringing comfort

Des Tata says that when somebody dies, people bring cloaks that have been passed between their families for many years. The cloaks bring comfort to the family that is grieving. If another person dies, the cloaks move again, bringing comfort to the new grieving family.

The springs today

The springs are at the bottom of a hill below the school. They flow into a creek that runs past Ōtūmoetai Intermediate and Ōtūmoetai College. As the children of Ōtūmoetai School get older and move to the intermediate and then the college, the creek will remind them of the story of the springs.



The blue line shows the creek

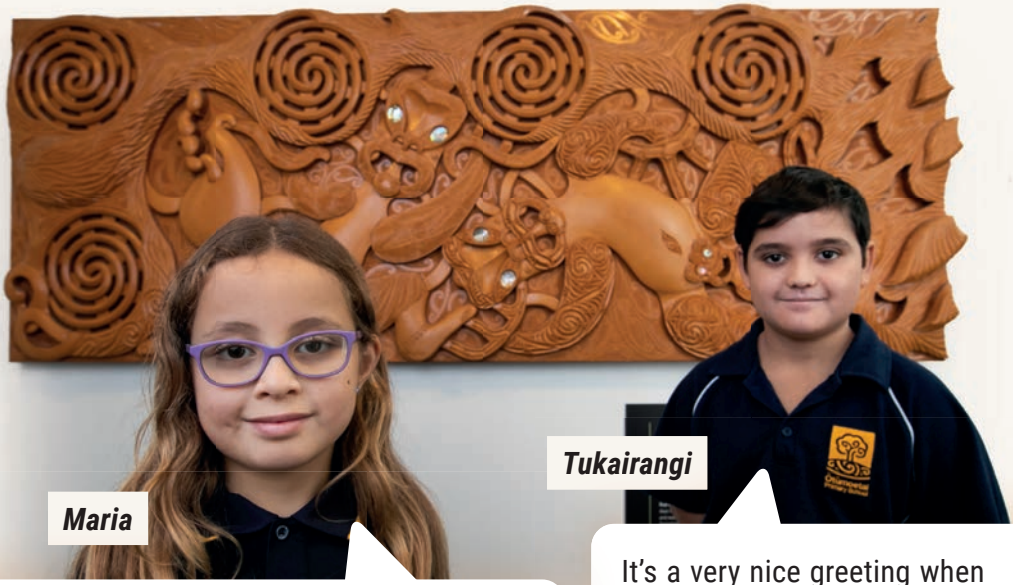
You can't see the spring water most of the time because it's underground, but you can see the creek that goes behind the intermediate and the college.

Waimarama

A new home for Kākahu Pekepeke

Zara McIndoe

Zara McIndoe is the principal of Ōtūmoetai School. When she came to the school, she noticed that the carving was high up on the library wall above the books, so it was hard to see. Ms McIndoe wanted to move the carving so everyone could see it easily. She asked Mr Tata and other kaumātua to help with a ceremony to move the carving to the office area. Now, students and visitors can see it and enjoy it as soon as they walk through the door.



Maria

On the carving, you can see a mother giving birth to a little baby, and there are springs around it. The eyes of all the family are made out of shells.

Tukairangi

It's a very nice greeting when you come through that door and see the carving.

Other taonga

Ōtūmoetai School has other taonga too. The school has carved panels telling the story of the Tākitimu waka that brought the ancestors of Ngāi Tamarāwaho to the area. They also have a carving of the prow (front) of the waka. Other school taonga are an oak tree planted by the original principal 125 years ago and murals showing the first small classrooms.

What are the taonga of your school?

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TITLE	GUIDED READING LEVEL
The Invisible Force	**Purple 2**
Amazing Magnets	**Purple 2**
Kākahu Pekepeke	**Gold 2**
Maia's Magic Wand	**Purple 2**
Rua and Te Manu	**Gold 1**

The New Zealand Curriculum
LEVEL 2

Junior Journal 61

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Kākahu Pekepeke	✓	✓
Rua and Te Manu	✓	✓

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TE TĀHUHU O TE MĀTAURANGA

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