



YOUNG EINSTEIN

Ages
7+

ELECTRICITY

Discovery Book

Create Electricity • Build a Battery • Detect Static Electricity
Three experiments. A world of discovery.



Create Electricity with Faraday

Learn how moving magnets can generate electricity.



Build a Battery with Volta

Combine metal, water and salt to generate enough electricity to light an LED.



Detect Static Electricity with Bennet

Use a balloon to create an electric charge and watch its effect on a metal leaf detector.



Science becomes unforgettable when you can
see it, touch it, make it happen yourself.



Welcome!

Are you ready to become a scientist?

Have you ever wondered where electricity comes from?
How a battery makes a light shine? Or why a balloon can
make your hair stand on end?

You're about to find out!

Welcome to the wonderful world of electricity, where you'll discover
some amazing scientific secrets by carrying out three exciting experiments.
And the best part? You'll be doing the experimenting yourself!



Science becomes
unforgettable when you can
**see it, touch it,
make it happen
yourself.**

Meet three amazing scientists



**Michael
Faraday**

Create Electricity

Discover how moving magnets
can generate electricity. Watch
a galvanometer needle move
as you turn movement into
electrical energy!



**Alessandro
Volta**

Build a Battery

Make your own battery using
two different metals and saltwater.
Can you generate enough
electricity to light an LED?



**Abraham
Bennet**

Detect Static Electricity

Explore an invisible electric force
using a balloon and a special detector.
Watch what happens when electric
charges push against each other!



Think like a scientist!

As you work through this book, you'll learn to:



Predict

What do you think
will happen?



Experiment

Try it for
yourself!



Observe

Watch carefully
and notice
what changes.



Record

Write or draw
what you discover.



Explain

Work out why
it happened.



Science isn't about
getting everything
right the first time.
It's about asking
questions, trying
new ideas and
discovering how
the world works.



Your journey starts here!

Get your equipment ready, find a safe place to experiment
and ask an adult to help you when needed.
There are amazing discoveries waiting to be made.

Let's get experimenting!

Your Discovery Journey

Three amazing experiments. Three famous scientists. Let's explore!

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Create Electricity with Faraday

Can moving a magnet make electricity?

In 1831, scientist Michael Faraday discovered that changing a magnetic field near a coil of wire can produce an electric current. You can investigate this remarkable idea using the equipment in your kit.

YOUR MISSION

Move magnets through a copper coil. Watch a galvanometer needle respond. Find out what happens when you change the speed and direction of movement.

Before you begin

Name: _____ Date: _____

My prediction: What do you think the needle will do when a magnet moves through the coil?

You will learn to...

- Explore attraction and repulsion between magnets.
- Observe electricity produced by a changing magnetic field.
- Record results and explain what you discover.

Meet Michael Faraday

Faraday was a scientist who explored the connection between magnetism and electricity. His work in 1831 helped explain the principle behind electric generators.

A discovery that changed the world

Electricity can be generated when the magnetic field through a coil changes. The effect is called electromagnetic induction.

THINK ABOUT IT

Where do we use electricity every day? Write or draw three examples.

Electricity all around us

Wind turbines, power stations and bicycle dynamos all use electromagnetic induction to generate electricity.

Challenge: What makes the magnets or coils move in a wind turbine?

How does it work?

The three important parts

MAGNET	COPPER COIL	GALVANOMETER
Produces a magnetic field.	A loop of conducting wire.	A sensitive meter that shows current direction and relative size.

What happens?

Try this	What to expect
Move magnet into coil	The needle briefly deflects.
Hold magnet still	The needle returns towards zero.
Pull magnet out	The needle deflects in the opposite direction.

THE BIG IDEA

A changing magnetic field through the coil induces a voltage. When the circuit is closed, a current flows and the galvanometer needle moves.

Energy changes form

Your movement supplies mechanical energy. Some of that energy is transferred into electrical energy in the circuit. Energy is transferred, not created from nothing.

Science words

Magnetic field • Coil • Current • Induction • Galvanometer

Get ready to investigate

Equipment checklist

- ☐ Copper coil ☐ Ring magnets ☐ Galvanometer
☐ Connecting wires ☐ Levitation pole

Safety first

- Ask an adult to supervise. Keep small magnets away from young children.
- Keep magnets away from implanted medical devices and sensitive electronics.
- Move magnets carefully; do not pinch fingers.
- Do not connect this kit to mains electricity or high-voltage sources.

Warm-up: magnetic forces

1. Use the levitation pole to explore how two ring magnets interact.
2. Turn one magnet around. What changes?

When like poles face each other, I observed:

When opposite poles face each other, I observed:

Make your prediction

Will a faster-moving magnet cause a larger or smaller needle movement? Why?

Make electricity move!

Set up

1. Connect the two ends of the copper coil to the galvanometer using the wires.
2. Place the coil securely on a table. Check that the meter reads near zero when nothing moves.
3. Hold the magnet assembly in line with the centre of the coil.

Test A — Slow movement

Gently move the magnet through the coil. Watch the needle. Repeat to check your result.

Test B — Fast movement

Move the magnet through the coil faster, but still carefully. Compare the largest needle movement with Test A.

Test C — Change direction

Move the magnet into the coil, then pull it out. Watch which way the needle deflects.

Test D — Hold still

Hold the magnet still inside or near the coil. What happens to the needle?

FAIR TEST TIP

When comparing speed, use the same magnet, coil and direction. Change only how quickly the magnet moves.

Record your discoveries

Use words, arrows or simple drawings to describe the galvanometer needle.

Test	What I changed	What I observed
A	Slow movement	
B	Fast movement	
C	Into / out of coil	
D	Magnet held still	

Draw your experiment

Sketch the coil, magnet and galvanometer. Add arrows to show movement.

Spot a pattern

When did the needle move the most?

Think like a scientist

1. Why does the needle move when the magnet moves?

2. What happened when you moved the magnet faster?

3. Why did the needle change direction when you pulled the magnet out?

4. What happened when you held the magnet still?

Try the challenge

How is this experiment similar to how a wind turbine generates electricity?

You made a discovery!

Three things to remember

1. A changing magnetic field through a coil can induce a voltage.
2. In a closed circuit, that voltage can make current flow.
3. Faster changes can produce a larger needle deflection; reversing movement can reverse the deflection.

Finish the sentence

I discovered that electricity can be generated when...

My science check

Circle one answer for each statement.

I can...	My answer
Describe what happened to the needle	Yes / Almost / Not yet
Explain why movement matters	Yes / Almost / Not yet
Use the words coil, magnet and current	Yes / Almost / Not yet

Keep exploring

Try different numbers of magnets or a different coil orientation, if your equipment allows. Change one thing at a time and compare your observations.

NEXT DISCOVERY → VOLTA: BUILD A BATTERY

Build a Battery with Volta

Can two metals and salty water make electricity?

In 1800, scientist Alessandro Volta showed that two different metals and a salty liquid can produce electricity. You can build a simple battery using the equipment in your kit.

YOUR MISSION

Place copper and zinc in saltwater. Connect the cells together, measure their voltage and find out whether you can light a red LED.

Before you begin

Name: _____ Date: _____

My prediction: What do you think will happen when copper and zinc are placed in saltwater?

You will learn to...

- Build a simple battery using copper, zinc and saltwater.
- Observe how adding cells changes the voltage.
- Record results and explain what you discover.

Meet Alessandro Volta

Volta was an Italian scientist who investigated how electricity could be produced by different metals. In 1800 he invented the voltaic pile, an early battery.

A discovery that changed the world

A battery uses chemical reactions to transfer energy into electrical energy. A single cell makes a small voltage; several cells connected in series can make a larger voltage.

THINK ABOUT IT

Where do we use batteries every day? Write or draw three examples.

Batteries all around us

Torches, remote controls, mobile phones and electric cars all use batteries. They store energy chemically and supply electrical energy when connected to a circuit.

Challenge: Why might a torch need more than one battery cell?

How does it work?

The three important parts

COPPER	ZINC	SALTWATER
One metal electrode.	A different metal electrode.	Electrolyte: lets ions move.

What happens?

Try this	What to expect
Connect one cell	A small voltage reading.
Connect two cells	The voltages add together.
Connect four cells	A larger voltage; LED may light.

THE BIG IDEA

Zinc reacts and releases electrons. When a circuit is connected, electrons can travel through the wires. Saltwater allows charged particles called ions to move inside each cell.

Energy changes form

Chemical energy stored in the materials is transferred into electrical energy. Connecting cells in series adds their voltages together; it does not create energy from nothing.

Science words

Electrode • Electrolyte • Voltage • Current • Series circuit

Get ready to investigate

Equipment checklist

- ☐ Copper plates (4) ☐ Zinc plates (4) ☐ Test tubes (4)
- ☐ Saltwater ☐ Connecting wires ☐ LED ☐ Voltmeter

Safety first

- Ask an adult to supervise and help prepare saltwater.
- Handle metal plates carefully; edges may be sharp.
- Do not drink the liquid or put parts in your mouth; wash hands afterwards.
- Keep liquid away from mains electricity and other electronics.

Warm-up: explore the metals

1. Look closely at a copper plate and a zinc plate.
2. Compare their colours, surfaces and appearance.

The two metals are similar because:

The two metals are different because:

Make your prediction

Will two cells connected in series produce more or less voltage than one cell? Why?

Make a battery!

Set up

1. With adult help, prepare the saltwater and fill the test tubes as directed for your kit.
2. Put one copper plate and one zinc plate in each tube. Keep the metals apart.
3. Connect the first cell to the voltmeter and check the reading.

Test A — One cell

Measure and record the voltage of one copper–zinc cell.

Test B — Two cells

Connect two cells in series (zinc of one to copper of the next). Measure the total voltage.

Test C — Four cells

Connect four cells in series. Measure the voltage and try the red LED with the correct polarity.

Test D — Check the circuit

If the LED does not light, check the connections and LED direction with an adult. What changed?

FAIR TEST TIP

Use the same metals and saltwater for each test. Change only the number of cells and compare the readings.

Record your discoveries

Write the voltage shown by your voltmeter. Record whether the LED lights.

Test	What I changed	What I observed
A	One cell	
B	Two cells in series	
C	Four cells in series	
D	Check LED and wires	

Draw your battery

Sketch two test tubes, the copper and zinc plates, and the wires linking them in series.

Spot a pattern

What happened to the voltage when you added more cells?

Think like a scientist

1. Why are two different metals needed in a battery cell?

2. What happened to the voltage when you connected more cells in series?

3. Why is saltwater important inside the battery?

4. Why might the LED not light with only one cell?

Try the challenge

How is your homemade battery similar to the batteries used in a torch or phone?

You built a battery!

Three things to remember

1. A battery cell uses chemical reactions to produce a voltage.
2. Saltwater lets ions move, while electrons travel through the external wires.
3. Connecting cells in series increases the total voltage.

Finish the sentence

I discovered that a battery can produce electricity when...

My science check

Circle one answer for each statement.

I can...	My answer
Describe how the battery worked	Yes / Almost / Not yet
Explain why adding cells matters	Yes / Almost / Not yet
Use electrode, electrolyte and voltage	Yes / Almost / Not yet

Keep exploring

With adult help, compare different saltwater strengths or investigate another safe electrolyte. Change one thing at a time and record the voltage.

NEXT DISCOVERY → BENNET: DETECT STATIC ELECTRICITY

Detect Static Electricity with Bennet

Can a balloon move a metal leaf without touching it?

Abraham Bennet developed an early instrument for detecting electric charge. In this experiment, you will make invisible static electricity easier to see using a balloon and a sensitive metal-leaf detector.

YOUR MISSION

Rub a balloon to give it static charge. Bring it close to the detector and watch the thin metal leaf move. Discover how electric forces can act without touching.

Before you begin

Name: _____ Date: _____

My prediction: What do you think the metal leaf will do when a rubbed balloon comes close?

You will learn to...

- Make static charge by rubbing a balloon.
- Observe how a metal-leaf detector responds without contact.
- Record results and explain what you discover.

Meet Abraham Bennet

Abraham Bennet was an English scientist who investigated electricity. His sensitive gold-leaf electroscope, described in 1787, helped people detect very small amounts of electric charge.

A discovery that changed the world

Static electricity is a build-up of electric charge. A charged object can make charges inside a nearby conductor rearrange, even when the objects do not touch.

THINK ABOUT IT

When have you noticed static electricity? Write or draw three examples.

Static electricity all around us

You may have seen hair stand up near a balloon or felt a tiny spark after walking on carpet. Static electricity is also useful in paint spraying and some air-cleaning devices.

Challenge: Why might a balloon stick to a wall after being rubbed?

How does it work?

The three important parts

BALLOON	METAL PLATE	METAL LEAF
Gains charge when rubbed.	Conducts and redistributes charge.	Moves when like charges repel.

What happens?

Try this	What to expect
Bring balloon close	The metal leaf moves outward.
Move balloon away	The leaf may return towards rest.
Bring balloon closer again	The leaf may move further.

THE BIG IDEA

Rubbing can transfer electrons onto a balloon. When the charged balloon comes near the metal plate, charges inside the detector rearrange. Parts of the detector gain like charges and repel, so the thin leaf moves.

Energy changes form

The balloon and fabric exchange electrons when rubbed. The detector reveals the electric force produced by separated charges; the balloon does not need to touch the metal.

Science words

Static charge • Electron • Repel • Attract • Induction

Get ready to investigate

Equipment checklist

- ☐ Balloon ☐ Bennet-style static detector ☐ Wool or dry fabric
- ☐ Dry, clear work surface ☐ Pencil for recording results

Safety first

- Ask an adult to supervise the activity.
- Keep balloons and broken balloon pieces away from young children.
- Check for latex allergies before using a latex balloon.
- Do not use the detector near mains electricity or electrical sockets.

Warm-up: make a charged balloon

1. Inflate and tie the balloon with adult help.
2. Rub it against dry hair or wool for several seconds.

When I rubbed the balloon, I noticed:

When I brought it near my hair or small pieces of paper, I noticed:

Make your prediction

Will the leaf move more when the charged balloon is closer to the metal plate? Why?

Make invisible charge visible!

Set up

1. Place the static detector upright on a dry, steady surface.
2. Make sure the thin metal leaf can move freely inside its case.
3. Rub the balloon on dry hair or wool to charge it.

Test A — Bring it close

Bring the charged balloon towards the metal plate without touching it. Watch the leaf.

Test B — Move it away

Move the balloon away slowly. Does the leaf return towards its starting position?

Test C — Change distance

Recharge the balloon and compare the leaf movement at different distances.

Test D — Try another fabric

Rub the balloon with a different dry fabric. Repeat the test and compare the leaf.

FAIR TEST TIP

Use the same balloon, detector and rubbing time when testing distance. Change only how close the balloon comes to the metal plate.

Record your discoveries

Use words, arrows or simple drawings to describe how far the metal leaf moves.

Test	What I changed	What I observed
A	Balloon brought close	
B	Balloon moved away	
C	Distance from plate	
D	Different rubbing fabric	

Draw your experiment

Sketch the balloon near the detector. Label the metal plate and leaf, and show the distance between them.

Spot a pattern

Which test made the metal leaf move the most?

Think like a scientist

1. How did rubbing the balloon give it static charge?

2. What happened to the leaf when you brought the balloon closer?

3. Why could the leaf move even when the balloon did not touch the plate?

4. What happened when you moved the balloon away?

Try the challenge

Why might your hair stand up after rubbing it with a balloon?

You detected static electricity!

Three things to remember

1. Rubbing certain materials can transfer electrons and create static charge.
2. A charged balloon can rearrange charges in a nearby metal detector without touching it.
3. Like charges repel, causing the thin metal leaf to move.

Finish the sentence

I discovered that static electricity can be detected when...

My science check

Circle one answer for each statement.

I can...	My answer
Describe how the metal leaf moved	Yes / Almost / Not yet
Explain why touching is not needed	Yes / Almost / Not yet
Use charge, electrons and repel	Yes / Almost / Not yet

Keep exploring

With adult help, compare different dry fabrics or try the experiment on a more humid day. Change one thing at a time and record what happens.

YOU DID IT! → THREE ELECTRICITY DISCOVERIES COMPLETE

Congratulations, Young Einstein!

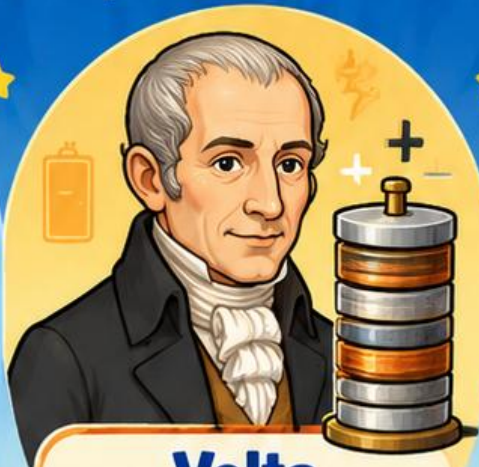
You've completed your
Electricity Discovery Journey!

You've explored three amazing discoveries
that helped change the world.



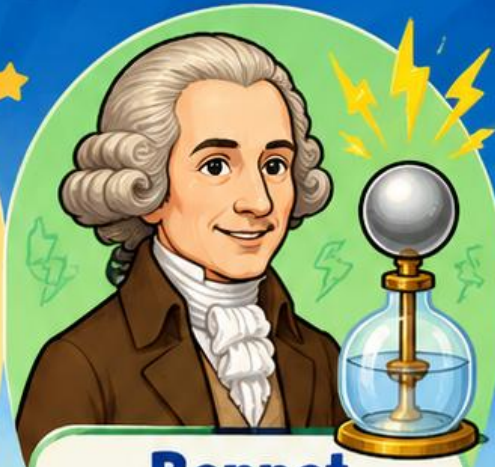
Faraday

Created electricity
using magnets



Volta

Built a battery



Bennet

Detected static
electricity

This book belongs to:

I completed my Electricity Discovery Journey on:

**Your next discovery
starts with a question!**

Keep asking questions. Keep experimenting.
Keep discovering.




YOUNG EINSTEIN

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