# NOT ONLY LETTERS TELL TALES:
## FROM HIEROGLYPHS TO OCEAN MAPS


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NOT ONLY LETTERS TELL TALES

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# A TRIP AROUND THE WORLD

Close your eyes and put your finger down anywhere on a map. India, Vietnam, France, California, the Pacific Ocean... Maps show not only countries, but also deserts, forests, underwater mountain ranges. They can show the noise level at city intersections, the temperature under trees, routes taken by birds or wolves. You can explore the world by train, on foot and by boat. You can also do it with a map, as a well-travelled reader.

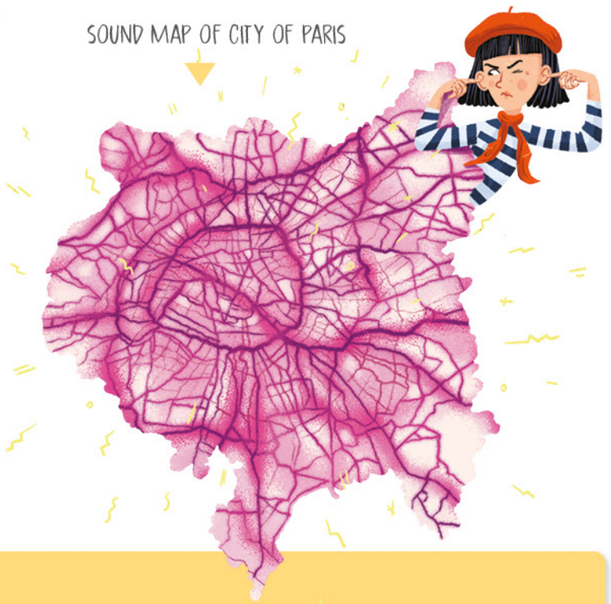

## Magic hat

People have been marking rivers, mountains and roads on rock faces since prehistoric times. Islamic scientists and **cartographers** made detailed maps of the known world in the 12th century. As tools of navigation improved, maps became more accurate. Thanks to satellites and computers, we can watch even the most remote parts of the world. And we carry maps in our pocket – in our phone!

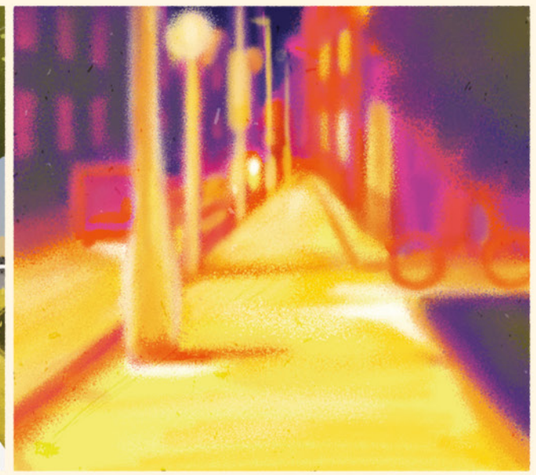



## 100 ways of mapping

Cities can roar loud enough to make our ears ring. Planes come in to land, ambulances and cars squeal, trains rumble. Noise comes from factories, motorbikes... All this can be captured by special noise measurement sensors. The data they gather is transferred to a map by computer. The more vivid the colour on the map, the noisier that part of the city. **Sound maps** help people plan quiet zones and protect residents from noise that can be harmful to health.




## Heat map



In summer, the city can get so hot, it's almost like being in a desert. Satellites and thermal cameras reveal so-called heat islands, which a castaway may find on a **heat map**. The hottest spots are marked in white and yellow, while cooler areas – parks, trees and rivers, for example – are marked in blue or purple. The latter help cool the city, which is important for its human and animal populations. These maps advise the city council on where best to plant trees.

# A BRIDGE BETWEEN HISTORY AND TODAY'S WORLD

When travelling in India and Nepal, we come across **Devanagari**. It is used to write Hindi, Marathi and Sanskrit. Knowledge of this script allows us to read the menu in an Indian restaurant, as well as wonderful stories about gods and heroes, sacred texts and modern fairy tales.


## Sharing stories

The **Arabic script** connects Arabs to their cultural heritage, allowing them to share stories and teachings. Some characters in Arabic have up to four different forms, depending on where they are in the word. Text is read from right to left. Calligraphic inscriptions in Arabic decorate mosques.

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## Spreading the word

The **Cyrillic** alphabet is a unique script found in books, on websites and in newspapers in eastern Europe and Asia. It was introduced by the Christian missionaries Cyril and Methodius in the 9th century. Slavs used it for the writing of religious texts, laws and other important documents in their native languages, helping preserve their culture and history.

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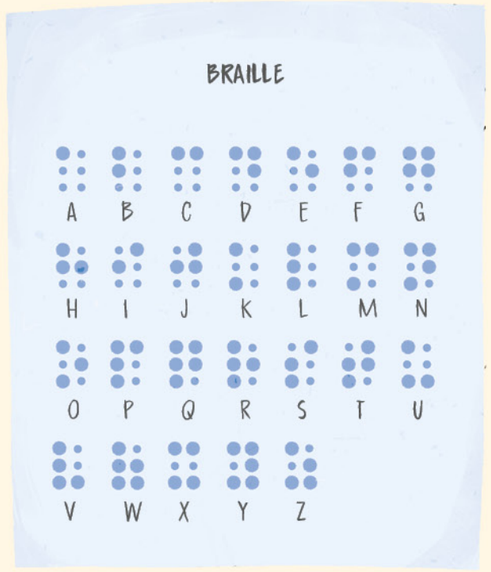
## Reading by touch

The loss of his sight aged three dealt **Louis Braille** a heavy blow. How would he read books and explore the world? Yet he refused to be despondent. At fifteen, he invented a system of writing that could be read by blind and partially sighted people. He did it by adapting the obsolete night writing by which soldiers used twelve raised dots on paper in various combinations to communicate messages in the dark. Braille settled on six dots. He would later improve the system to include musical notation. You, too, can read **Braille** – with your fingers! Look around for sets of dots at entrances to buildings, in lifts, etc.

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Imagine being able to send messages by dots and dashes! **Morse code**, invented in 1836 by **Samuel Morse**, uses these to signify letters and numbers. Sailors, radio enthusiasts, scouts and others use this code to send secret messages over long distances by means of lights and sounds. A famous story tells of the rescue of crew from the sinking ship Titanic. These crew had called for help by sending out the distress signal "SOS" in Morse code.

***SOS (= Save Our Souls)**

# READING UNDER THE SKIN

Why does the human brain shine like a city at night? When are doctors like detectives on a secret mission? How can a slight ripple result in a storm? The human body tells extraordinary stories. An ability to read its language often means saving a life.

## TO THE BONE

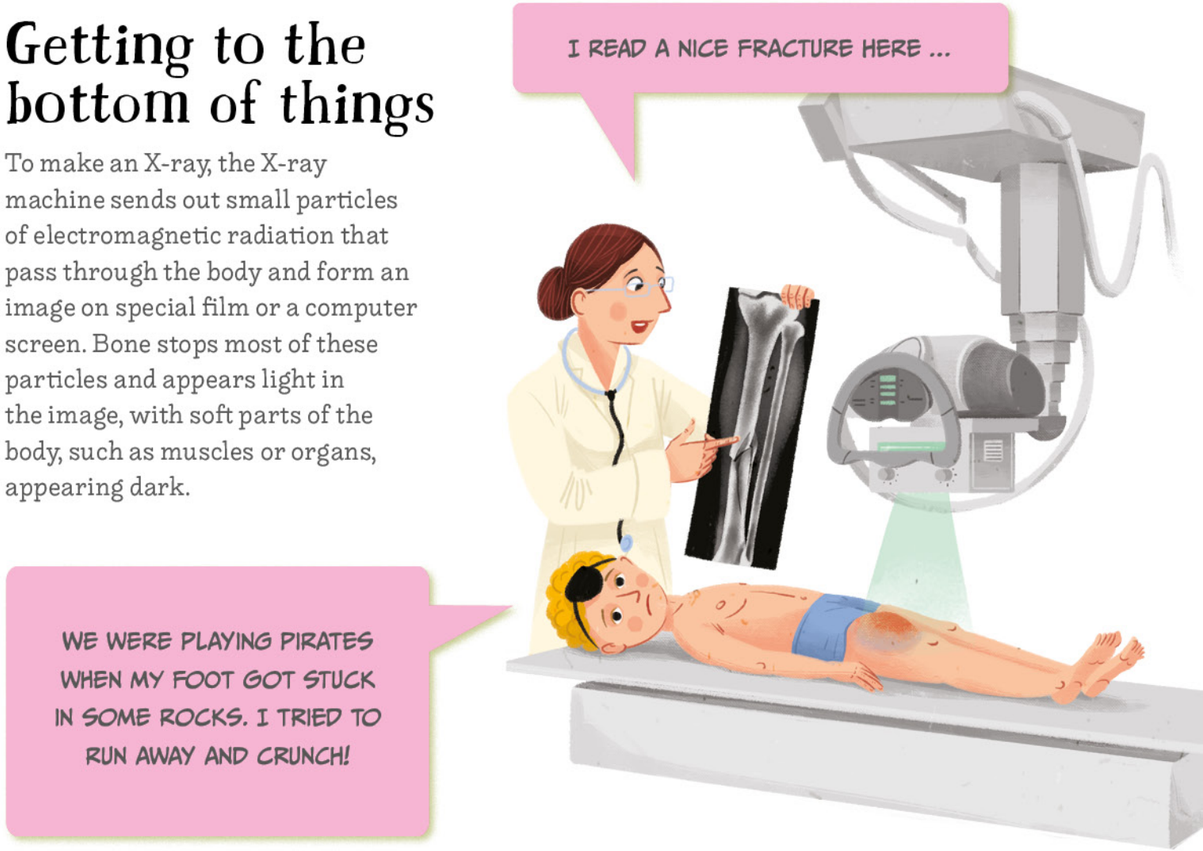
Doctors have an instrument that allows them to see bones inside the body. If you're thinking of superhero goggles, you're almost right: we mean the **X-ray** machine. To tell from an X-ray whether your bones are as they should be, the doctor needs a trained eye.


## World-changing discovery

X-rays were discovered by **Wilhelm Röntgen**, a German physicist. To help as many people as possible, he generously offered his discovery to doctors all over the world. In 1901, he received the prestigious Nobel Prize for his work to the benefit of humankind. Known for his dedication to science, he may have taken the first holiday of his life to mark the occasion!

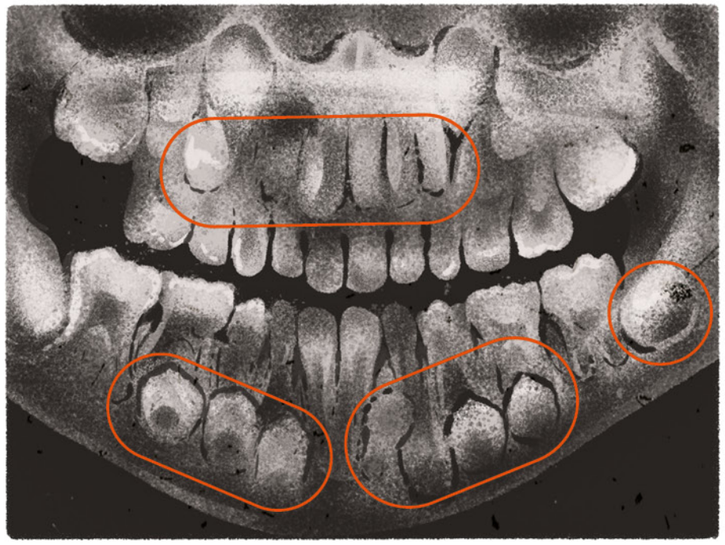
## Getting to the bottom of things

To make an X-ray, the X-ray machine sends out small particles of electromagnetic radiation that pass through the body and form an image on special film or a computer screen. Bone stops most of these particles and appears light in the image, with soft parts of the body, such as muscles or organs, appearing dark.




## Mouth full of roots

X-rays let us see the roots of teeth. If you still have your milk teeth, you should know that there are **second teeth** underneath that will grow in later! A new-born baby's teeth are hidden in its gums. A dentist can read from an image if your teeth have cavities. She can also tell if you don't brush your teeth often enough.



THERE IS A SECOND SET OF TEETH HIDING UNDER THE FIRST.

## Ancient notes

A message can be written in a **special ink** that is invisible until you heat it, use a special chemical on it, or shine a special light on it. It hides your writing like magic! All you need is a lemon. You write the message in the lemon's juice. Your message will appear when you heat the paper it is written on.


VERY IMPORTANT MESSAGE

## Invisible ink

A message can be written in a **special ink** that is invisible until you heat it, use a special chemical on it, or shine a special light on it. It hides your writing like magic! All you need is a lemon. You write the message in the lemon's juice. Your message will appear when you heat the paper it is written on.

## Modern codes

Much has changed since Caesar's day, including encryption. The reading of coded messages on the internet requires a special computer program. We now have digital signatures, and emails and text messages can be encrypted. People are keen to protect important information, such as their personal data and passwords.



## A genius announces himself

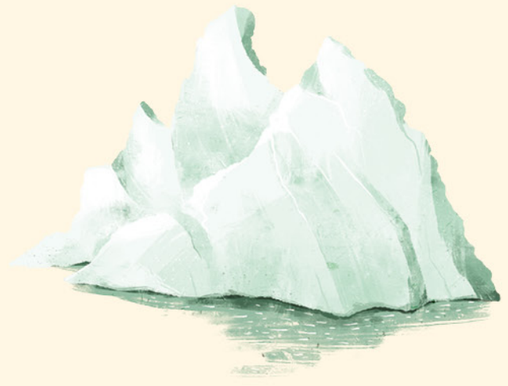
Boom! A bomb has landed on a factory near London. Thankfully, there was no one inside. For Britain and many other countries, the Second World War is raging. The enemy is unpredictable, and people are starting to despair. At this point, **Alan Turing**, a shy but persistent mathematician, enters the scene. He and his team break extremely complex codes encrypted by the **Enigma** machine, revealing secret Nazi plans. Not only does Turing's ingenuity help win the war, but it will also have a great influence on the computer as we know it today.

## Natural archives

Like annual growth rings, **dripstones** in caves, **corals** in the ocean and **glaciers** tell us about the past. Every year, they create new layers from which scientists can read what the weather was like, how long it rained, or how warm the sea was.

**Dripstones** are time capsules telling of our climate. Like trees, they form a layer every year. As they grow, they gather traces of minerals and chemicals that tell scientists what the climate was like or how long and how hard it rained at given times in the past.

**Corals** in the ocean are like colourful diaries of ocean life. Each added layer carries information about water temperature, salinity, even the chemical composition of the sea at the time it was formed. By studying these layers, scientists unravel the story of ocean currents and their influence on the global climate.



The icy embrace of **glaciers** preserves bubbles of ancient air, dust from ancient volcanoes, even pollen grains. Scientists analyse these long-icebound samples to reconstruct temperatures, atmosphere composition, even volcanic activity.

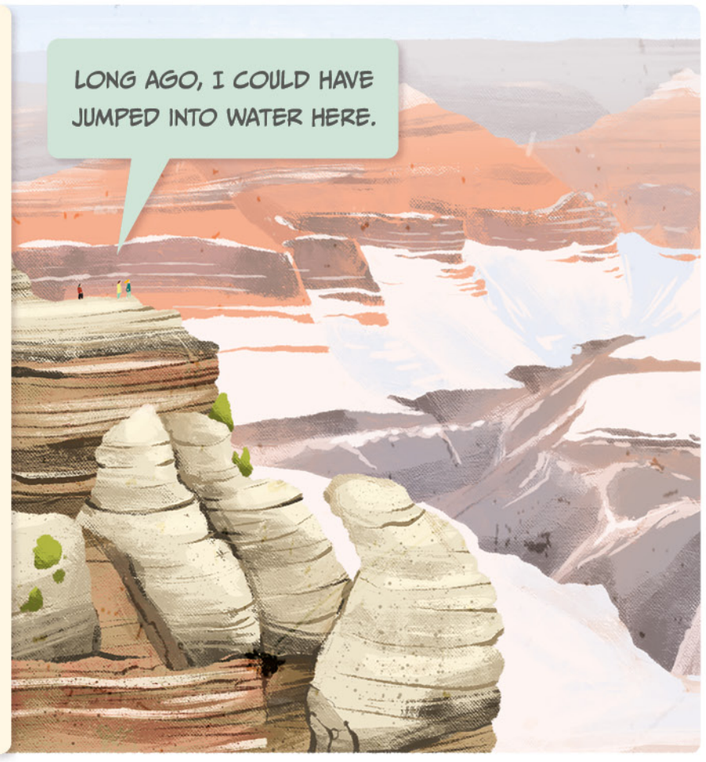


# LAYERED TIME

Every year, rivers, winds and ocean currents deposit a little sand, mud and other particles at the bottom of seas, lakes and rivers. Geologists read individual **geological strata** as if they were pages of a chronicle showing what the world was like millions of years ago, e.g. what was sea and what was land, or how long dinosaurs lived in a given place.

## Greatest groove in history

The coloured walls of the USA's **Grand Canyon** reveal layers up to two billion years old! In the lower layers lie fossils of sea creatures, such as shells and corals, telling of a time when the whole area was covered by sea. An ability to read the layers shows that some were formed by major earthquakes or volcanic eruptions. Such dramatic events have shaped the landscape we know today.




## Overview of strata (simplified)

**A** – FOSSILS RESEMBLING BIVALVES (270 MILLION YEARS AGO),

**B** – TRACES OF TERRESTRIAL ANIMALS (275 MILLION YEARS AGO),

**C** – WING OF THE *TYPUS WHITEI* DRAGONFLY (280 MILLION YEARS AGO),

**D** – *RAYONNOCERAS*, A CEPHALOPOD FROM THE PALEOZOIC ERA (350 MILLION YEARS AGO),

**E** – TRILOBITE, ONE OF THE OLDEST KNOWN CREATURES (505 MILLION YEARS AGO),

**F** – FOSSILIZED COATING FORMED BY BACTERIA – ONE OF THE OLDEST TRACES OF LIFE (MORE THAN 1 BILLION YEARS AGO)

## Space mail

In 1977, humans sent a message into space for extraterrestrial readers. The astrophysicist Carl Sagan and his team wrote it on a **gold-plated record** and put it on the side of the Voyager 1 probe, which was bound to explore the universe beyond our solar system. Could extraterrestrials make sense of it? It tells of Earth, nature and humanity in the universal language of sounds and images. Look!

**Voyager's gold-plated record.** The package includes instructions on how to play the record, plus a sample of radioactive uranium by which extra-terrestrials can determine the age of the disc. They can view 115 images and play an audio recording of 55 greetings in various languages of the world, a concert of 27 excerpts from important musical compositions, including songs of indigenous peoples, and 35 natural and artificial sounds, including elephant trumpeting, dolphin calls, rumbling thunder, and the sound of a moving tractor.



# THE LANGUAGE OF ART

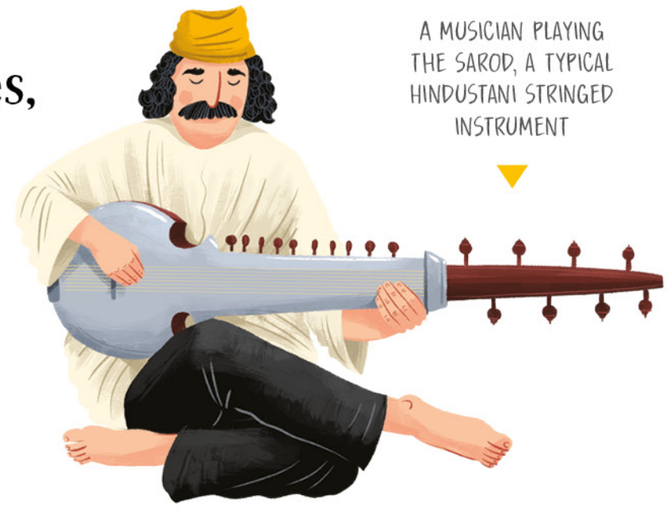
Every brushstroke, musical note and building plan tells the story of different countries, times and cultures in a way that we can learn to read. Let's learn together about the bountiful human imagination!


## READING MUSIC

Musicians use **musical notation**, a unique system of writing. As soon as they come up with a new song, they write it down so that others can hear it by reading the notation. The best of it is, if you know the piano or guitar, you can play songs from all over the world from sheet music. This is as true of music written today as of music written hundreds of years ago!

## Different countries, different customs

We can approach music in different ways. In India, music is written in **Hindustani** notation. It doesn't tell musicians which notes to play. Instead, it suggests paths to take so that they can play the music in their own way.



# Having it figured out

They say that numbers don't lie. If so, the same goes for other signs and symbols through which maths, physics and chemistry speak to us. These may confuse us at first, but step by step they teach us how fire is made and why it needs oxygen, the speed of Earth's rotation, or the brightness a glowworm's bottom.

## Language of the universe

Mathematics shows us how stars, planets, nature and video games work. Although mathematical equations may look like a collection of mysterious symbols, each has an important meaning. Once you understand them, the world is never the same again.

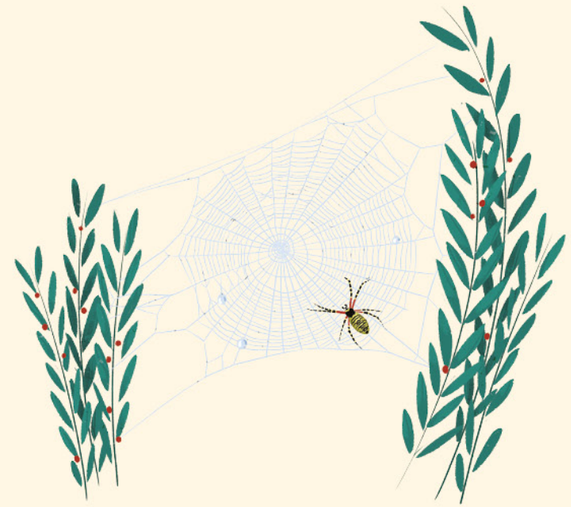


## First steps

At first, everything was simple: people counted – sheep to get to sleep, apples at the market. Then they looked at the stars and wondered how far away they were. Then they tried to build straight, solid walls. They found that they needed more than their fingers to count on. Over 5,000 years ago, the Egyptians used mathematics to build the pyramids; the Babylonians began to use clocks to count time; the Greeks laid the foundations of geometry. This was just the beginning...

## Geometry in nature

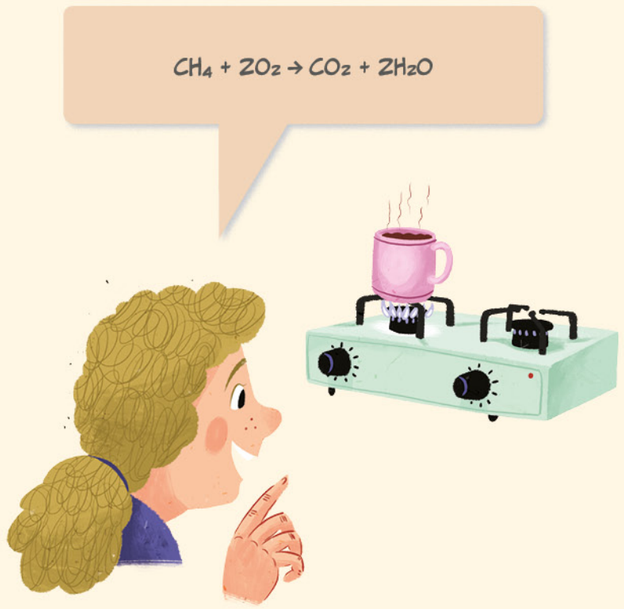
Animals, too, make great mathematicians. A **spider's web**, for instance, is a masterpiece of geometry! Spiders are very economical. They use as little material as possible, even when weaving a web over an entire lamp. They also take care so that the web doesn't get damaged. The spider's web inspires human architects and builders in their search for more durable structures that save materials and energy.



A perfect **hexagon** allows bees to leave as much space as possible for honey while using a minimum of materials when building their honeycombs. The same principle is found in modern architecture.

A snail's shell makes a beautiful **spiral**. The same design is used by artists and architects – in spiral staircases, for instance.

# Chemistry in the kitchen




When you heat cocoa on a gas stove, the methane from the natural gas reacts with oxygen in the air. This **reaction** creates fire, which is like a magic trick that turns gas and air into heat and light!


## $HCl + NaOH \rightarrow NaCl + H_2O$

When a pungent **acid** meets a hot **base**, something forms that you will find in every kitchen – salt. Drinking water is created as a byproduct.

# For love of science

Meet **Marie Curie**, who discovered two elements, radium and polonium. This courageous Polish scientist spent countless hours in the laboratory, where she and her husband Pierre immersed themselves in the study of atoms and the mysterious phenomenon of **radioactivity**. Not only did Marie's pioneering research open the door to new treatments, such as radiotherapy, but it also made her the first woman to win Nobel Prizes in two fields, physics and chemistry. A mother as well as a scientist, she passed on her love of science to her children. Her daughter, too, won a Nobel Prize.

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## FROM HIEROGLYPHS TO OCEAN MAPS

Books are far from being the only things we read. Heartbeats, cloud shapes, musical notes, animal droppings, secret codes – all these can be read! Join us to explore unusual stories about people deciphering messages all around us. For inquisitive readers aged 9 and up who wish to see the world through different eyes.

ISBN + EAN

b4u publishing
www.albatrosmedia.eu
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Illustrations © Jakub Cenkl