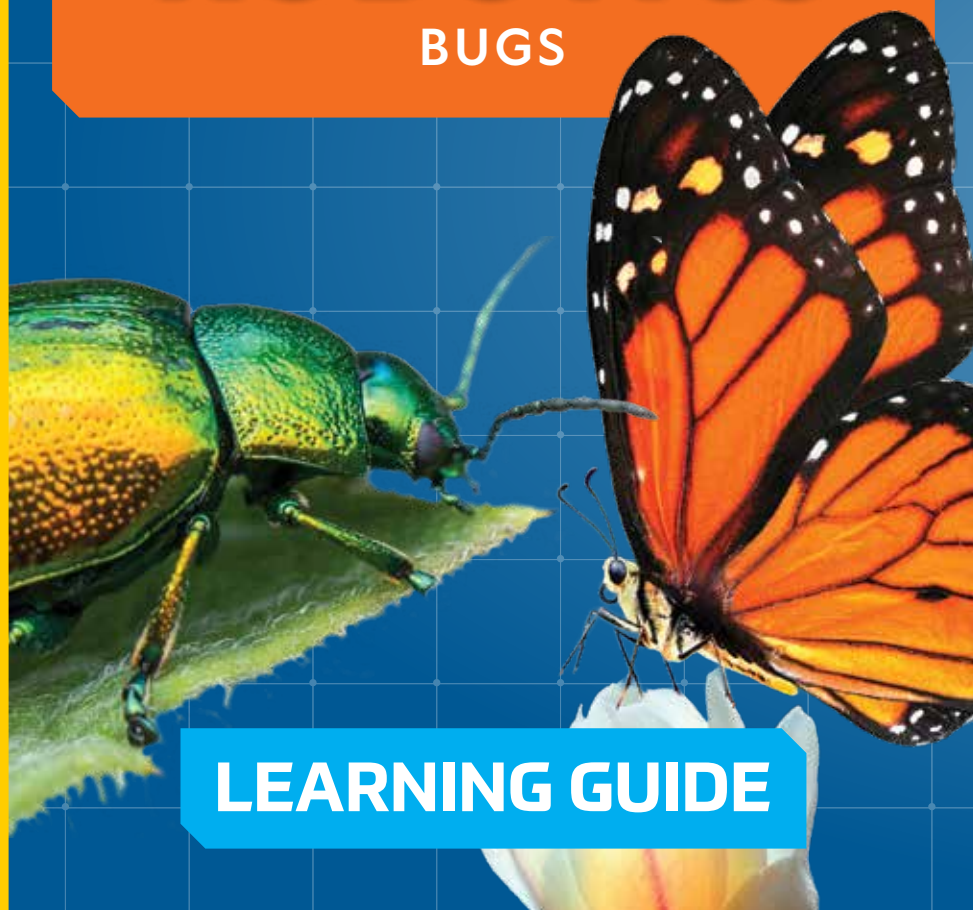




NATIONAL
GEOGRAPHIC

JUNIOR ROBOTICS

BUGS



LEARNING GUIDE

ROBOTICS

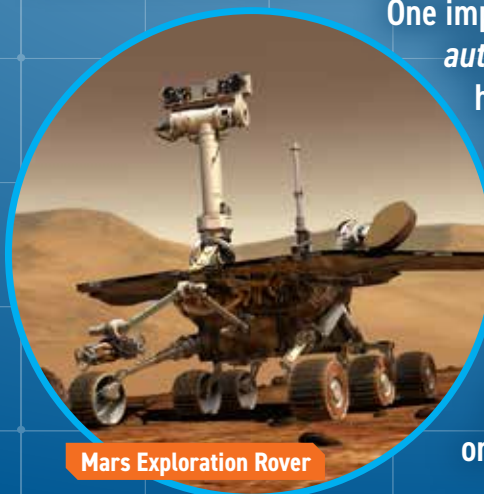
THE INCREDIBLE WORLD OF ROBOTICS

Robotics is an interdisciplinary field that combines mechanical engineering, computer science, and electrical engineering to create machines that replicate human actions.

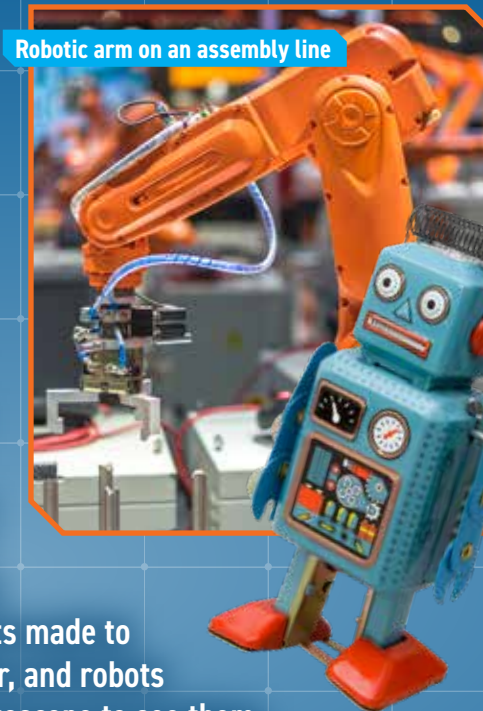
The design and function of these machines vary widely, with some robots made to assist in the repetitive tasks of manufacturing, or planting and harvesting. Some robots are even used in healthcare to aid in surgeries. There are robots made to resemble human form and behavior, and robots that are so small you'd need a microscope to see them.

One important characteristic of robots is their *autonomy*, or their ability to act without human intervention or supervision.

This autonomy can be extremely complex, such as when robots use real-time information from cameras, radar, and other input sensors to analyze dangerous areas humans can't safely reach, like the deepest regions of the ocean floor or the surfaces of other planets.



Mars Exploration Rover



Robotic arm on an assembly line

ROBOT HISTORY

The word "robot" was first popularized by a playwright named Karl Capek in 1921 to describe mechanical men that worked on a factory line. However, the idea of creating autonomous devices to assist humans in their daily tasks stretches back thousands of years.

Egyptian water clock



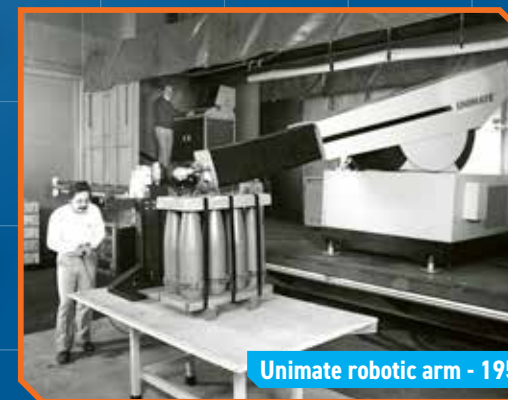
For instance, ancient Egyptians used human-shaped figures to strike the hour bell on water clocks. In the 1560s, an engineer and inventor named Giovanni Torriani created numerous autonomous devices, including a figure that could play the lute. Subsequent centuries saw countless examples of autonomous machines, but it is not until the middle of the 20th century that robots, as we now know them, got their start.

The dawn of modern industrial robotics starts with George Devol, who filed a patent in 1954 for a machine that would later become the Unimate robotic arm. In 1956, Devol met Joseph Engelberger and together they formed Unimation Inc., which is regarded as the first-ever robotics company. By 1961, Unimation had supplied GM with a Unimation robot that moved and stacked hot die-cast metal pieces on an assembly line.

Over the following decades, robots have expanded into many industries and now play a vital role in manufacturing, trade, and the global economy.



Eric the Robot - 1928



Unimate robotic arm - 1954

BEETLES

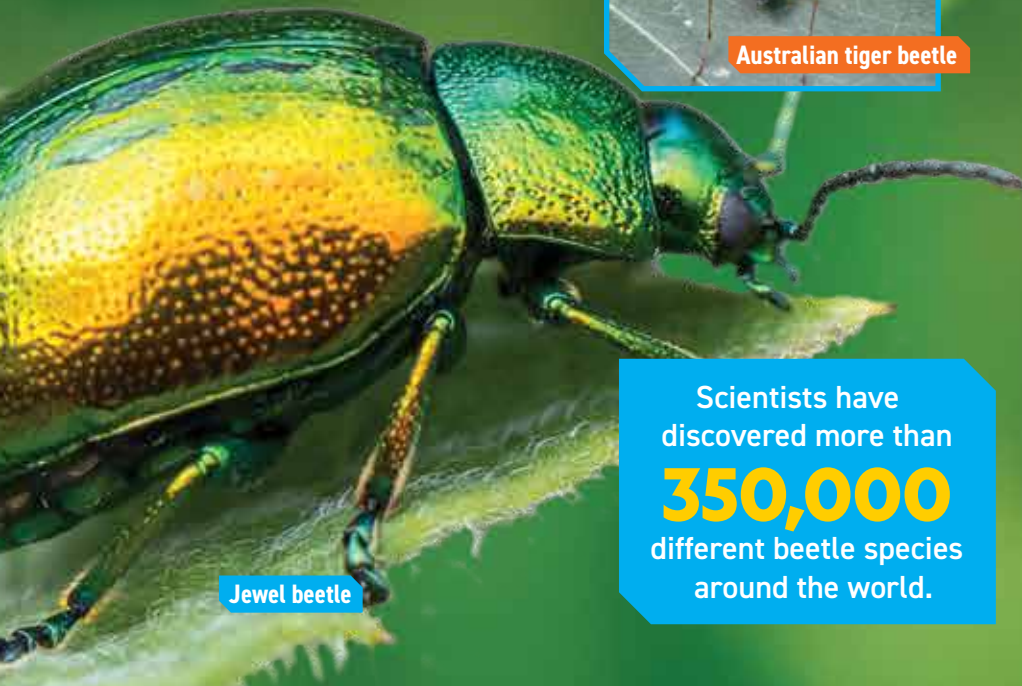
Beetles are insects with hardened, protective protective fore wings that are used to cover a second pair of wings called hind wings, which they use to fly. Some beetles can be very, very small or up to 7 inches (18 cm) long, and some have very interesting features. The stag beetle, for instance, has pincers that are nearly as long as its body. Jewel beetles are brightly colored and often look as if they have a metallic sheen. The Australian tiger beetle has long, spindly legs that it uses to run.



Stag beetle



Australian tiger beetle



Jewel beetle

Scientists have discovered more than **350,000** different beetle species around the world.

The amazing patterns on butterfly wings can provide camouflage from predators and help to attract mates.

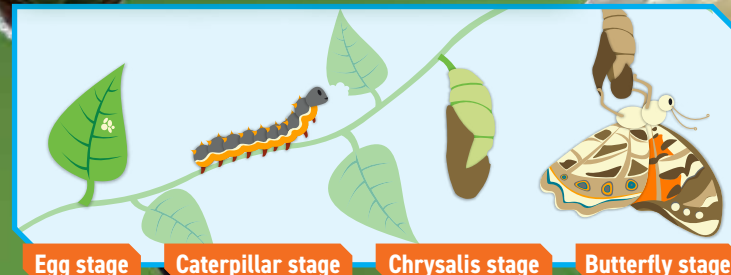
BUTTERFLIES



Monarch butterfly

Butterflies are amazing insects that undergo one of the most incredible transformations in all of nature. This transformation is called *metamorphosis*, and it occurs in four stages. The first is the egg stage, followed by the caterpillar stage. Caterpillars grow at a rapid pace, and they love to eat, becoming 100 times bigger than they were when they first emerged from the egg. The third stage is the chrysalis stage, where the caterpillar develops a hardened, protective shell to grow the wings, limbs, organs, and tissue that will eventually make it a butterfly. The final stage occurs when the butterfly breaks out of its chrysalis and lets its soft wings open to dry and become strong enough to fly.

THE 4 STAGES OF METAMORPHOSIS



Egg stage

Caterpillar stage

Chrysalis stage

Butterfly stage

LADYBUGS

Ladybugs are a type of beetle and are sometimes even called ladybird beetles. You can find ladybugs all over the world, but one of the most visually recognizable is the seven-spotted ladybug, which is bright red or orange with black spots. The seven-spotted ladybug is native to Europe, but in the middle of the 20th century, the species was imported into North America to help control aphid populations. A single ladybug can eat up to 5000 insects in its lifetime, making them very helpful to farmers who need to protect their crops from pests.

There are around **5,000** different ladybug species around the world.



Seven-spotted ladybug

DIFFERENT LADYBUG SPECIES



Eyed ladybird



Orange ladybird



Spotted lady beetle



Fourteen-spotted ladybug