IS THAT ROBOT REAL?

How Small Can Robots Be?

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What is A ROBOT?

What is a robot?

Robots are machines **designed** to perform a **function**. They often do jobs that are repetitive or difficult for people to do. Robots are built to suit their task, so sometimes they look like mechanical humans and sometimes they don't.

Robots need a source of **power** and **control** to do their job. Once they receive commands, robots can work on their own. Often, they can sense and respond to their surroundings.

Are there robots the size of a child?

Yes, there are robots as tall as a child!

Mars rovers are remote controlled robots.

Function: The Mars rovers carry equipment that helps scientists investigate the planet Mars.

Design: The rovers navigate the rocky Martian landscape using six wheels and a special suspension.

Control: The rovers are controlled by scientists on Earth, who send commands to computers inside the rovers.

Power: The rovers use solar panels and rechargeable batteries for power. It's so cold on Mars that the batteries need a heater to work!

Are there robots the size of a hand?

Yes, there are robots as tall as a hand!

Robot appliances can work in your home.

Function: Roomba® Vacuuming Robots clean the floors in millions of homes.

Design: The Roomba scoots around on wheels and has special sensors to keep it from hitting things or falling down stairs.

Control: The robot's internal computer sends it around a room in spiral and criss-cross patterns, until the entire area has been covered.

Power: The Roomba is powered by a rechargeable battery. When the battery gets low, it finds its charger and plugs itself in.

Are there robots the size of a finger?

Yes, there are robots as wide as a finger!

Mini robots exist, but they can't do much yet.

Function: Researchers are trying to make very small robots that could do jobs that are difficult for people or bigger robots.

Design: These mini robots use legs, wheels, or treads (like a bulldozer) to move around. Some are so small that the fibers of a carpet are big obstacles for them!

Control: Mini robots are often controlled by a wireless connection to a computer. They carry a computer chip that can process commands.

Power: Power is a big problem for mini robots. Some of them lug around huge batteries that don't last long.

Are there robots the size of a freckle?

Yes, there are freckle-sized robots!

This tiny robot can play soccer!

Function: This robot is so small it can sit on a grain of salt. It plays soccer on a field the size of a grain of rice!

Design: The robot is made of magnetic materials, so that it can be controlled by external magnetic fields.

Control and Power: The scientists who made the robot have to use a microscope to see the soccer game! They create magnetic fields to move the robot, and make it push a tiny soccer ball into the goal.

Are there robots the size of a hair?

Yes, there are robots as wide as a hair!

This robot is so small that 100 could line up on a penny!

Function: Scientists invented a mini robot that is as wide as a strand of hair. Its inventors are still figuring out what it could be used for.

Design: The robot uses tiny silicon feet to crawl around like an inchworm on a special grid. To turn, it rotates around its steering arm.

Control and Power: The special grid gives the robot power and commands. This design keeps the robot from having to carry a heavy battery—but it means the robot can't leave its special floor.

Are there robots the size of blood cells?

No, cell-sized robots don't exist.

Only nature makes "machines" this small!

Function: People imagine that some day we might have robots as small as red blood cells. Maybe these robots could help fight the things that make us sick—or maybe they would be dangerous themselves.

Design: Water feels as thick as honey when you're as small as a cell, so it would be hard for a robot this size to move around! Scientists are studying how germs move in order to figure out how to make robots this small.

Control and Power: We don't know how to build, control, or power robots this small. The computer chips and batteries that we can make today are too big!

Are there robots the size of bacteria?

No, bacteria-sized robots don't exist.

This "robot" is imaginary.

Function: This futuristic "swim bot" is as small as a bacteria cell. It's not real, but the artist that created it imagines that it could help repair cells and do other things to keep people healthy.

Design: In order for a tiny robot to live inside humans, it would have to be made of materials compatible with our bodies.

Control and Power: How would a tiny robot like this get power and commands? The technology for bacteria-sized robots hasn't been invented yet.

Are there robots the size of molecules?

No, molecule-sized robots don't exist.

Nanobots are imaginary!

Function: Researchers are working to create robots as small as molecules that could perform many functions. They haven't done it yet.

Design: Nanobots would face a tough environment. When things are as small as a molecule, they shake a lot, they move all around, and they stick to other things. If scientists managed to make a nanobot, it might jiggle itself apart or it might bump into other molecules and stick to them!

Control and Power: We don't know how to build, control, or power nanobots. Scientists actually built the"nanocar" in this picture from individual molecules. It looks like a car, and its wheels turn, but it has no control or power.

Will there be NANOBOTS IN OUR FUTURE?

Will there be nanobots in our future?

Some people think that in the future we will be able to make tiny robots called nanobots to do jobs we can't do with normal-sized tools.

But right now nanobots are imaginary—none of them are real.

If you could build a really tiny robot, what would you make?

How small can a robot be?

Macrosize

REAL

These robots do exist

Are there robots the size of a child?
Yes, there are robots as tall as a person!
The Mars rovers are about 1 meter tall.

Are there robots the size of a hand?
Yes, there are robots as tall as a hand!
The Roomba® Vacuum Robot is 1 decimeter thick.

Are there robots the size of a finger?
Yes, there are robots as wide as a finger!
This mini robot is about 1 centimeter wide.

Are there robots the size of a freckle?
Yes, there are robots as small as a freckle!
This mini robot is less than 1 millimeter wide.

Are there robots the size of a hair?
Yes, there are robots as wide as a hair!
This mini robot is about one tenth of a millimeter wide.

Microsize

NOT REAL

Micro-sized robots don't exist

Are there robots the size of blood cells?
No, cell-sized robots don't exist.
This tiny robot was created by an artist and is just imaginary.

Are there robots the size of bacteria?
No, bacteria-sized robots don't exist.
This "swim bot" was created by an artist and is just imaginary.

Nanosize

NOT REAL

Nanobots don't exist

Are there robots the size of molecules?
No, molecule-sized robots don't exist.
This experimental nanocar is built from atoms, but is not a robot.

Image Sources:

Mars Rover
Courtesy of NASA
www.nasa.gov

Roomba® by iRobot
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Finger-sized Mini Robot
Courtesy of Sandia National Laboratories
www.sandia.gov

Freckle-sized robot
Courtesy of the Multi-Scale Robotics Lab,
Institute of Robotics and Intelligent Systems
www.iris.ethz.ch/msrl/research

Girl, Red Blood Cells, Freckle, Penny, Bacteria
www.istockphoto.com

Hand, Fingers
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Hair Strands
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Glucose Molecule
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Hair-sized Robot
Courtesy of Dartmouth Institute
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Cell Injector
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Swim Bot
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Nanocar
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Second Edition, August 2008

Sciencenter
Ithaca, New York

www.sciencenter.org

Emily Maletz
graphic design

www.emilymaletz.com

With support from:

NISE network
NANOSCALE INFORMAL SCIENCE EDUCATION

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This material is based upon work supported by the National Science Foundation under Agreement No. ESI-0532536.
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Are there robots the size of a hand? How about the size of a strand of hair? Can a robot be as tiny as a single molecule? Learn what makes a robot a robot, then step down in size and find out which robots are real and which are science fiction.

Book created by Sciencenter, Ithaca, NY, with support from the NISE Network and The National Science Foundation.
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