Suitable for 3-7 years

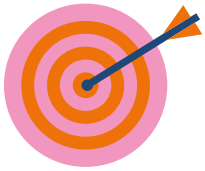
- [x] Solo
- [x] Pairs
- [ ] Groups

Christiaan's activity

Stencilling 'microchips'

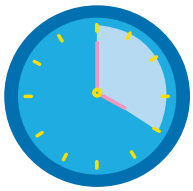
How to guide

Christiaan's activity
Stencilling 'microchips'



Aim

The aim of this activity is to find out more about microchips and how they are made using the same manufacturing method at a large scale, i.e. stencilling together 'microchip' components.



Timings

~20:00 minutes

Story to guide activity

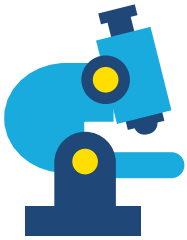
What's Smaller Than a Pygmy Shrew Robert E. Wells

Materials and equipment

- Photos of real microchips
- Printable base sheet
- Stencil outlines (components and connectors)
- Different coloured paint
- Paint brushes or sponges to apply the paint to the stencil

Instructions

1. Read What's Smaller Than a Pygmy Shrew.
2. Electrons are really tiny and they carry electricity which makes so many things work. Watch Messy Goes to Okido here.
3. Within all the devices shown in the Okido song, microchips are used to direct the electricity in the ways that we want and engineers have to make connections for the electrons to travel along at really small scales. Today we're going to use the same process in connecting some microchip designs.
4. Give the children access to their base sheets with the parts to be connected along with the stencils and paints.



Background information

Many of us have never seen a microchip yet it is hard to imagine life without them – they are crucial components of multiple modern technologies like computers, smartphones, cars, hospital equipment (e.g. MRI scanners), robots and even some toys, like those which light up or speak or move about.

There are memory chips which store information, like the photos that you take, and logic chips, which process information, e.g. sending signals to get the computer to complete a task like sending a message to a friend.

A microchip might be the size of your fingernail but it will contain billions of connections and switches (transistors). The more connectors that engineers can fit onto one microchip the more the chip can do. Therefore, engineers try to make the pattern of connectors and switches as tiny as possible.

The way that engineers make these tiny devices is using a technique called lithography which is basically a miniaturised version of using stencils to create a pattern. Materials are added and removed to create a multi-layered network of interconnected shapes, which on the microchip means that different components can be turned on and communicate with each other to send messages or store information.

Engineers making microchips for modern technologies need to design complicated patterns to connect

many different devices together, with sizes too small to see individually. The overlap (alignment) between different layers of patterns is crucial, as a mistake of only a hair's width is enough to not only completely miss the device we want to connect, but even to connect to the wrong component! Luckily, we have some really powerful and precise machines these days to help in our work, and make it easy to make very sophisticated patterns and structures.

To find out more about the history of microchips: read 25 microchips that shook the world and for lots of photos visit the smithsonian's website.

Prompt questions

- What are you connecting? What does that button do?
- Are the parts overlapping or have you got any gaps which would stop the electrons from flowing?

Extension Ideas

Challenge the children to design and connect their own microchip designs, and maybe even to make their own stencils out of cardboard for different shaped components and connectors. Older children could even try cutting out several of the connector pieces at once from one piece of cardboard – the shapes don't have to be the same, but can't overlap and should connect as many components as possible. In practice, engineers don't make the connections one at a time, but try to make their devices in as few steps as possible.

Try an alternative printing method – you could use what we call imprint lithography. To do this you will need a potato cut in half and with a shape cut out on the flat surface. Dip this part in the paint and use to print connectors.

Why not try some basic electricity activities like easy PlayDough circuits: or squishy circuits science experiment.

Or why not have a go at making a potato or lemon clock.

Microchips are used in robots and computers – why not find out more about robots with Emilyann or computers with Paul?