



# Ignite

**CERC Newsletter**

**MARCH 2021**

**Shrobona**

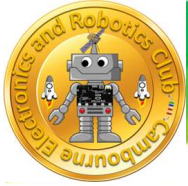
Founder

**Sujit Bhattacharya**

Mentor

**Maya & Sreenidhi**

Editors



## Message from the Founder of CERC

### Dr. Shrobona Bhattacharya



Maasai parents in Kenya are so eager to have their children mentored, inspired, and trained by Cambourne Electronics and Robotics Club – CERC.

Young Maasai Man who invented a solar light system to scare away lions who preyed on Maasai cattle at the age of 11. His innovation brought a big change in his community, CERC is happy to support him with life changing engineering skills and making more scientists and engineers among the Maasai community in Kenya. CamCare UK and CERC jointly aim “making innovators at home” in Cambourne, Cambridgeshire and rest of the globe.

<https://www.bbc.co.uk/news/business-44398952>





## Message from the Mentor Dr. Sujit Bhattacharya



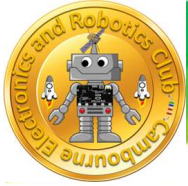
The safe landing of NASA's Perseverance rover along with the helicopter has indeed created lots of enthusiasm amongst the students. Did you know that the rover has two "computer brains," one of which is normally asleep? In case of problems the other computer brain can be awakened to take over control and continue the mission. It has 10 years old processor, and the helicopter runs Python.

Back here in our academy, we are working on various sensors with our own CERA rover with Block coding and Micro:Python and trying to mimic such planetary rovers in terms of autonomy and auto-navigation.

I am also excited by the launch of new Raspberry Pi Pico, a low cost (less than £4) microcontroller which has great potential to create many interesting low-cost hands-on projects.

We are constantly innovating STEM education solutions that build confidence and the skills that will help students succeed in school and beyond, including collaboration, problem-solving and computational thinking. By allowing a child the opportunity to explore and discover through such meaningful hands-on experience not only teaches that one thing, but also teaches them how to learn. Please joins us in this mission of creating Innovators at home by empowering the youth with new skills.

I am sure that the articles in all the issues of Ignite will help fire up the students' imagination and create their lifelong interest in STEM.



## Message from Editorial board by Venkat Kommi



Hope everyone is safe and healthy, schools are open and kids back to normal routine hope you will find some free time to read this month magazine.

Please find answers puzzles from last month magazine on page 19.

It is nice to see different topics for this edition of Ignite. We are looking forward to seeing more response from the readers.

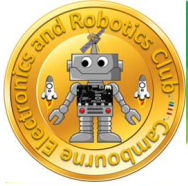
Readers please feel free to comment on their articles. This will boost their confidence levels.

The Ignite magazine is a community based volunteered magazine, where a group of professionals, academics and young children are working together.

These articles are written by the children and are edited by a team.

The editorial team is in charge of the publication of the magazine.

*If you have any questions, suggestions, or concerns, please address them to [ignite.camcare@gmail.com](mailto:ignite.camcare@gmail.com)*



## Lego Innovation Project Presentation by Team CERC

*(Vivek Kommi, Srinidhi, Maya Acharya, Avni Balan, Aaron Balan, Ted Heys, Thehan Desilva, Pranav Shukla, 12 to 14 years old Cambridge, UK)*



### Get your Back Back

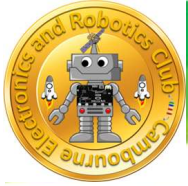
#### Before this Idea

Team CERC were researching project ideas on how to motivate inactive people with all abilities. The team have come up with 4 projects below.

1) Using heart rate monitors to measure activity and encourage them with a voucher scheme

You can view this project (80% done) with the link below:

[https://docs.google.com/presentation/d/1nn2BVca1-gAggM9Ch54jMn\\_vJPWWkZ37gZAKYitFHCM/edit?usp=sharing](https://docs.google.com/presentation/d/1nn2BVca1-gAggM9Ch54jMn_vJPWWkZ37gZAKYitFHCM/edit?usp=sharing)



# Ignite

Tasks	Completed	People	
Coupons	5/10	Lara	😊
Cycle desk	0/10	anar, shah, saamir	😊
Posture check	0.5/10	vik, anar, shah	😊
Mini mu	5/10	anar, saamir Maya, rohit, shah, saamir	😊

2) Using the Mini Mu Electronics Kit to help/encourage people in care homes to do activities

3) By Using Roblox we could show the difference between a Healthy village compared to an Industrial Village and display them with a 3D Google Lens

4) A Desk cycle to help people who are working in offices

The Team wanted to do an innovative project which can be used remotely using the latest technology right from the beginning.

## Research behind this Project

Our team created a Google survey and collected the data from it.

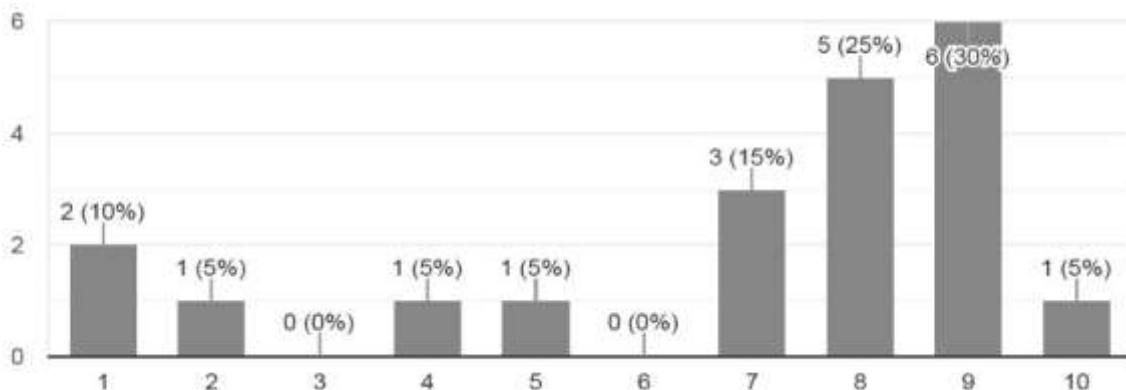
You can view the full Questionnaire with the responses as below

<https://drive.google.com/file/d/1w0a4hEzSSCUDvch97VuOgWmKLszoUoOh/view?usp=sharing>

Below there are two questions to address the main cause of the problem

If there was a financial benefit or coupons for amount of time you spent for exercise, would you like to do more exercise?

20 responses

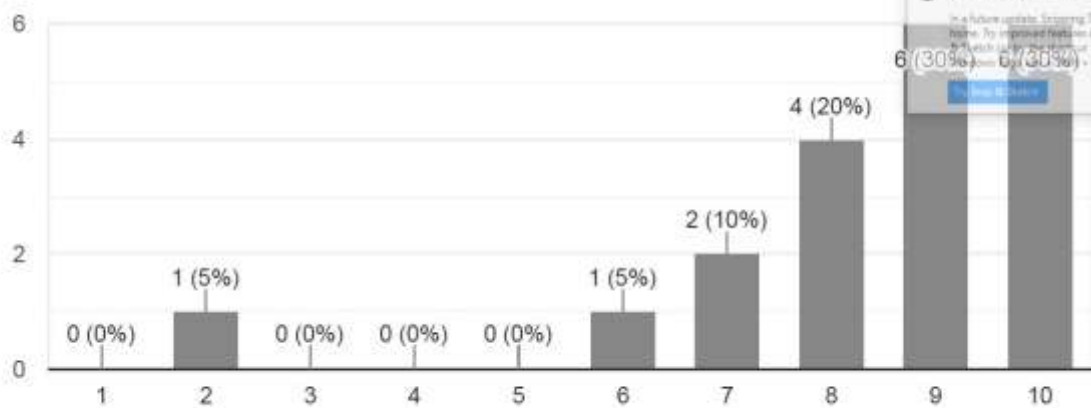






Provided if you have time for exercise, Would you do more exercise?

20 responses



The team researched the topic and they could not find any AI computer solutions that addressed the problem of sitting too long in front of a computer. There is total screen time and internet time on some operating systems like windows and Mac but that is the total time the computer is turned on.

The team wanted to explore and help by reducing actual continuous sitting time in front of computer after finding the advantages of HIIT exercises at regular intervals.

## Overview

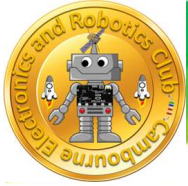
While researching about solutions we realized that time is the main constraint, we also came across Virtual Personal Trainers using AI Technologies like [Kentai](#) and [YogAI: TensorFlow powered yoga instructor](#) –

We thought this technology is useful under lockdown when all gyms are closed, all fitness videos are helpful if you can go with the pace of video whereas this AI personal trainer will help to achieve your goals at your own pace.

With limited knowledge of AI Team tried to learn different AI platforms available we came across Google AI platform [Teachable Machine](#) which is easy to train AI models and use it with your application.

The team thought having a good posture and taking breaks to move from sitting the whole day is fundamental or easier to achieve for most of office workers than motivate them to do exercises.

<https://drive.google.com/file/d/1WxiKEAgV4R15IH0yqt6xwXByySsTKn9s/view?usp=sharing>



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(Click above to see video)

### How do I use it?

**Class 1** [Icons of people]

**Class 2** [Icons of people]

**1 Gather**  
Gather and group your examples into classes, or categories, that you want the computer to learn.  
[Video: Gather samples](#)

**2 Train**  
Train your model, then instantly test it out to see whether it can correctly classify new examples.  
[Video: Train your model](#)

**3 Export**  
Export your model for your projects, sites, apps, and more. You can download your model or host it online for free.  
[Video: Export your model](#)

**TRAIN MODEL**

MYPROJECT [Icons of people]

Teachable Machine is a web-based tool that makes creating machine learning models fast, easy, and accessible to everyone.

The team trained the model with each kid and parent taking poses at each Lego session. Then we used the model to detect if the person is sitting straight in front of computer or not.

Preview [Export Model](#)

Input  ON Webcam

Switch Webcam

Output

Good

Bad  100%

Preview [Export Model](#)

Input  ON Webcam

Output

Good

Bad  100%

Preview [Export Model](#)

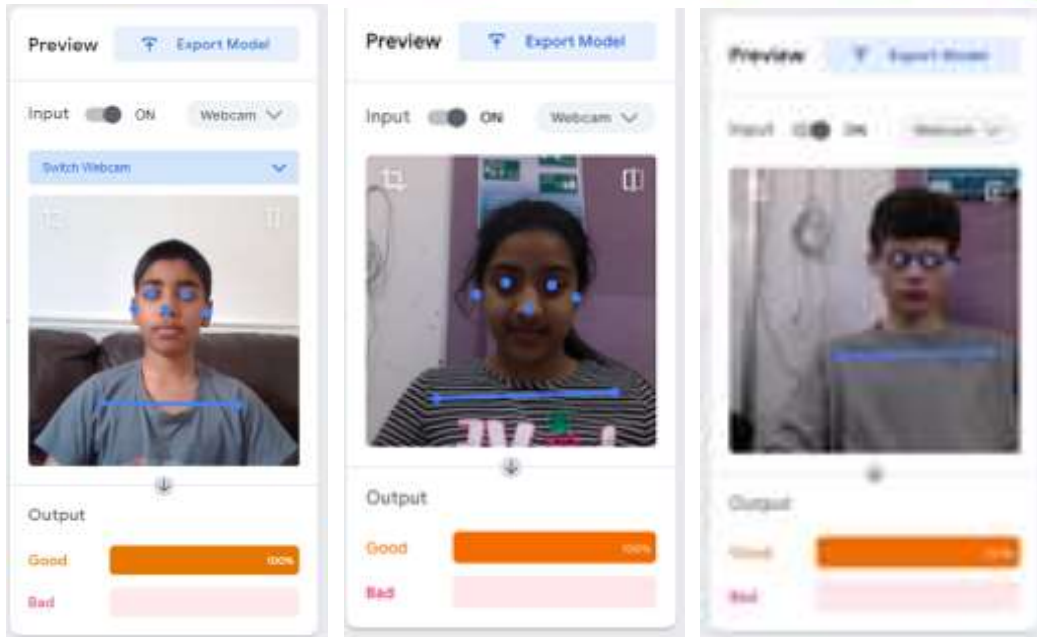
Input  ON Webcam

Output

Good

Bad  100%





We are planning to implement this app as a background windows service like an Antivirus so it is always checking the **Persons sitting pose** and **how long they are sitting, how long they are watching** the computer.

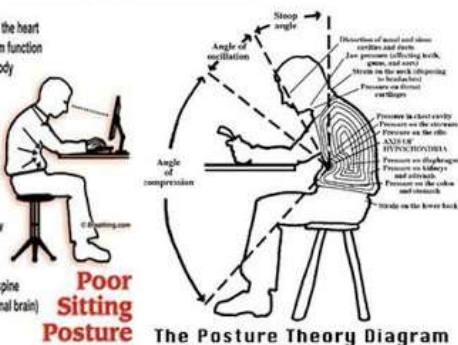
Then give a Green, Orange, Red notification warning to take a break to get active.

## Benefits of having a good posture

Firstly, having a good posture can help our muscles and joints by keeping them in the correct alignment so that our muscles are used correctly. A good posture will allow all muscles to work more efficiently, this will allow the body to use less energy, therefore, preventing muscle fatigue. It also helps prevent muscle strain, overuse disorders and even back pain and muscular pain.

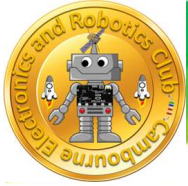
### EFFECTS OF POOR SITTING POSTURE

- Inhibits blood flow to and from the heart
- Stifles breathing and diaphragm function
- Shortens muscles in front of body
- Stresses the lower back
- Hyperextends back muscles
- Closes off throat and windpipe
- Constricts the voice
- Habituates bending forward
- Adds pressure to kidneys, adrenals, colon and stomach
- Inhibits cerebrospinal fluid flow
- Inhibits learning
- Invites osteoporosis
- Impedes nerve force from the spine
- Restricts solar plexus (abdominal brain)
- May negatively impact sleep



Get [posture and activity sensor](#) and improve your posture compatible with Apple iPhone 5S, 5C, 5, 4S, iPad (3rd and 4th gen), iPad Mini, iPod touch and [Lift Clasp](#) for affordable price by using [LUMOback Coupons](#)



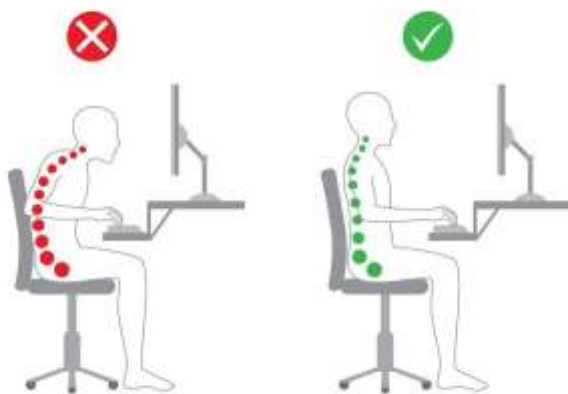


Secondly, having a better posture benefits you because breathing becomes easier and deeper. When we slouch, our ribcage can sink down towards our abdomen which can cause a restriction to deep breathing. This can assist with improved relaxation and concentration as we move through the day. Good posture allows our ribs to expand more easily.



As a result of good posture, it improves circulation, heart rate control and digestion. Good, upright posture allows the organs to assume their natural position and function, whereas poor posture can cause undue compression of the internal organs in the abdomen.

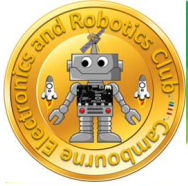
Additionally, good posture promotes a healthy neck and spine. Having a correct posture is a simple but very important way to keep the intricate structures in the neck and spine healthy. This is especially important for people who spend many hours sitting in an office chair or standing throughout the day. Poor posture and inadequate back support can add stress and strain to the muscles and joints of the spine. Over time, there can be shortening of the ligaments and muscles of the spine with the possibility of ongoing pain, stiffness, and discomfort.



Lastly, proper posture gives us a positive mind-set. Posture affects our frame of mind, and our frame of mind can affect our posture. So, when we are well and happy, our posture tends to be upright and open. In contrast, when we feel down or in pain, we often sit or stand slouched.

## What do experts think about this project and what is their input

The team has presented our idea to Apurva who is a senior Physiotherapist at Progress. She has been working at Spire Cambridge Lea Hospital since 2005. Apurva's special interests include shoulders, necks, workstation assessment, ergonomics and posture re-education. She has also completed Pilates training.



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Apurva also offers treatment with Acupuncture, taping and strapping. Apurva is a very keen badminton player which gives her a good know how on racket related sporting injuries to help tailor rehabilitation goals.



*(Click above picture to see Apurva's feedback)*

Team also presented same concept to Scientists from IMS-MRL Cambridge



*(Click above picture to see feedback from Scientists IMS-MRL Cambridge)*



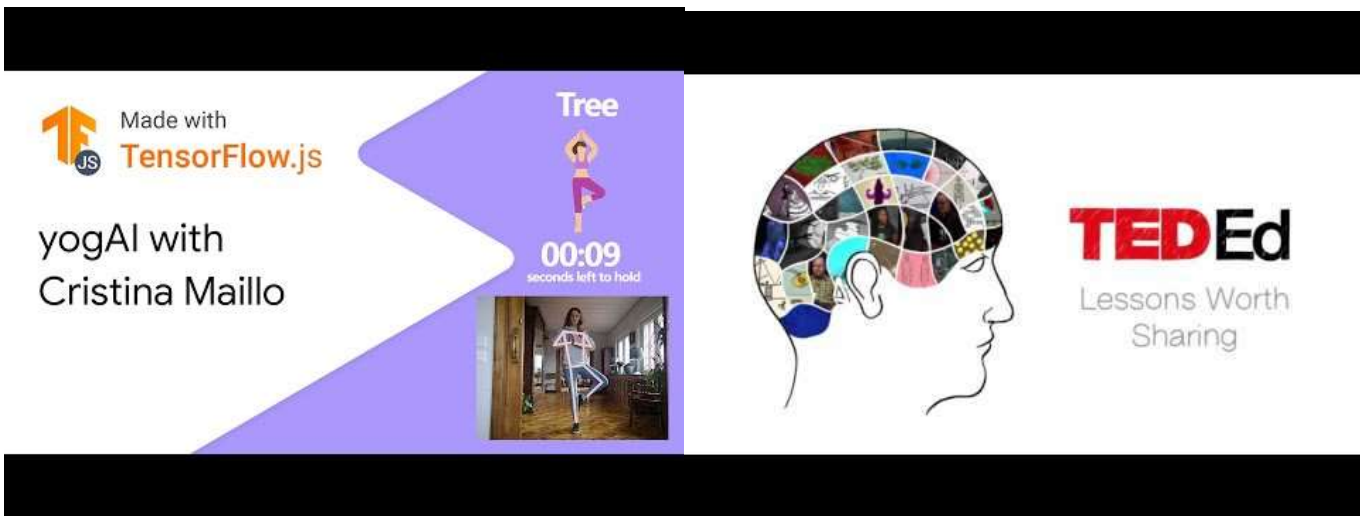
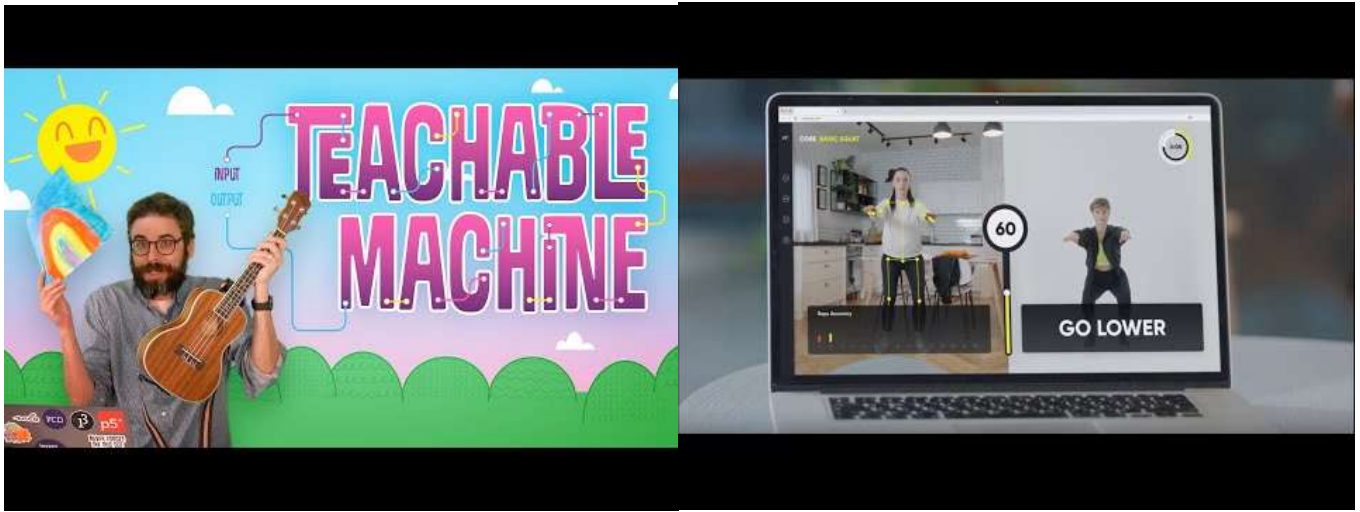


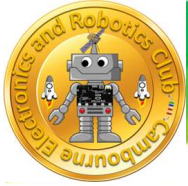
# Ignite

## References

<https://app.kemtai.com/welcome>

<https://teachablemachine.withgoogle.com/>





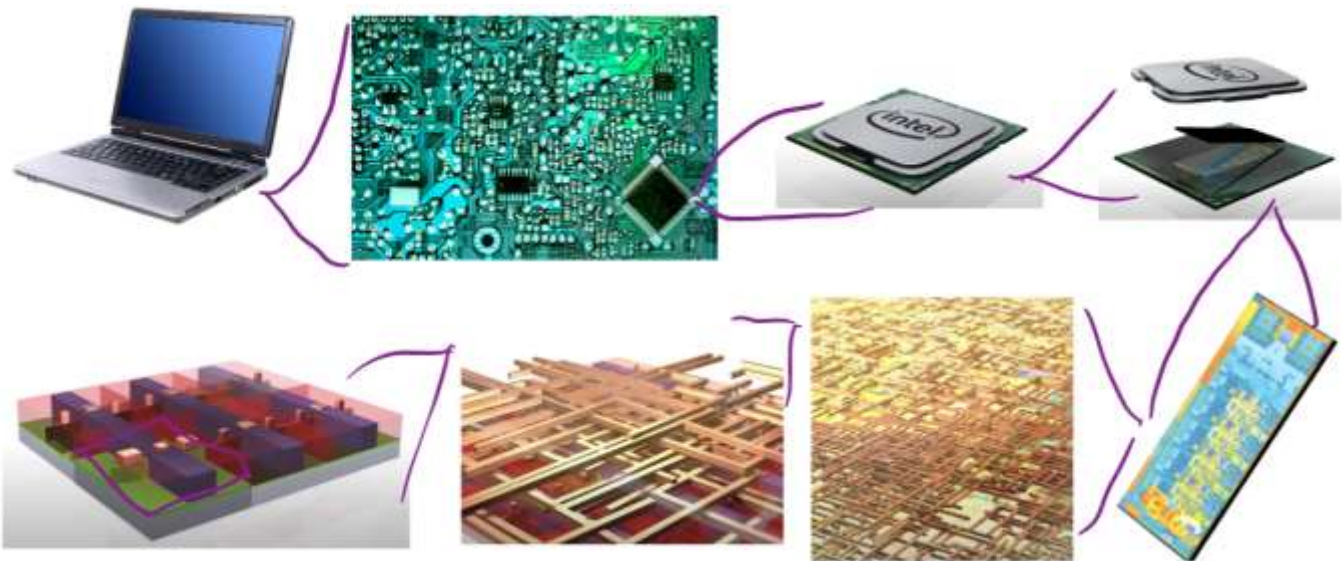
## Transistors - The invention that changed everything

*(by Vivek Kommi 12 years, Cambridge, UK)*



If I asked you, what was the most successful invention that revolutionized the world, what would you say? The printing press, the telephone, the airplane. Transistors are the building blocks of all of the electronics you have at home. Your phone and computer have billions and billions of transistors. Here is a step by step diagram to show you the transistors in your computer.

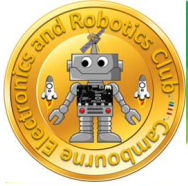
WOW isn't that insane!!! Transistors are everywhere. Therefore I think transistors are the most



successful invention in the history of the world.

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. Transistors are one of the basic building blocks of modern electronics. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. Think of it as a switch with two states: on and off. In computing we call "on", the 1 state and "off", the 0 state.



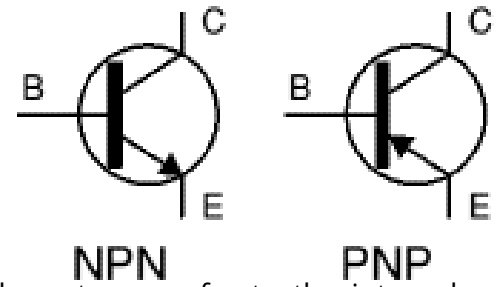


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N = Negative

P = Positive

There are two types of transistors, NPN and PNP, with different circuit symbols as shown. The letters refer to the layers of semiconductor material used to make the transistor. Most transistors used today are NPN because this is the easiest type to make from silicon. If you are new to electronics it is best to start by learning how to use NPN transistors.



The leads are labelled base (B), collector (C) and emitter (E). These terms refer to the internal operation of a transistor but they are not much help in understanding how a transistor is used, so just treat them as labels.

A [Darlington pair](#) is two transistors connected together to give a very high current gain.

## Atomic view of a Transistor:

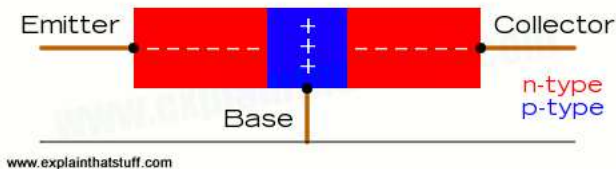
Now suppose we use three layers of silicon in our sandwich instead of two. We can either make a positive - negative - positive sandwich (with a slice of n-type silicon as the filling between two slices of p-type) or an n-p-n sandwich (with the p-type in between the two slabs of n-type). If we join electrical contacts to all three layers of the sandwich, we can make a component that will either amplify a current or switch it on or off—in other words, a transistor. Let's see how it works in the case of an n-p-n transistor.

### FUN FACT:

Scientists have developed a single-atom transistor. A single-atom transistor is a device that can open and close an electrical circuit by the controlled and reversible repositioning of one single atom.

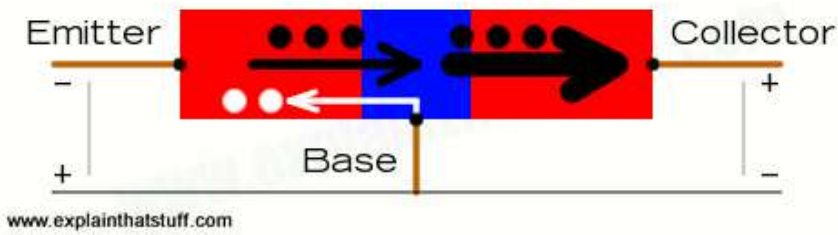
So we know what we're talking about, let's give names to the three electrical contacts. We'll call the two contacts joined to the two pieces of n-type silicon the emitter and the collector, and the contact joined to the p-type silicon we'll call the base. When no current is flowing in the transistor, we know the p-type silicon is short of electrons (shown here by the little plus signs, representing positive charges) and the two pieces of n-type silicon have extra electrons (shown by the little minus signs, representing negative charges).

Another way of looking at this is to say that while the n-type has a surplus of electrons, the p-type has holes where electrons should be. Normally, the holes in the base act like a barrier, preventing any significant current flow from the emitter to the collector while the transistor is in its "off" state.



A transistor works when the electrons and the holes start moving across the two junctions between the n-type and p-type silicon.



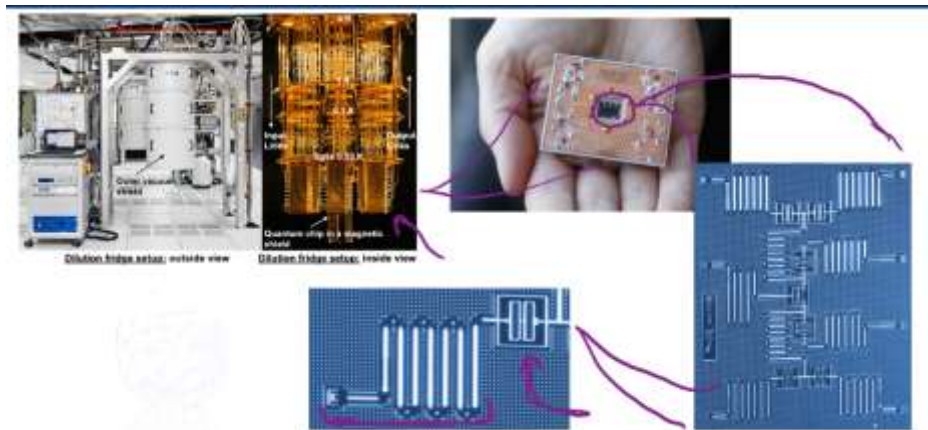


Let's connect the transistor up to some power. Suppose we attach a small positive voltage to the base, make the emitter negatively charged, and make the collector positively charged. Electrons are pulled from the emitter into the base—and then

from the base into the collector. And the transistor switches to its "on" state:

But there is one problem with this. Industries all want to make the thinnest, more compact laptops and phones. But to do that we need smaller transistors as there are billions of them. But as the transistor grows smaller, so does the barrier. This is when Quantum Tunneling comes in and electrons are allowed to move between p and n layers. This can change everything.

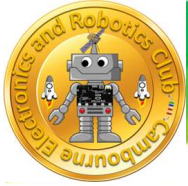
Let's look at Quantum computer chips. Instead of transistors, Quantum computing has Qubits where it is the opposite of a switch. Qubits have a phenomenon called "spin" where they have a superposition of 1 and 0. Albert Einstein was not a fan of this type of physics and he called it "Spooky action at a distance."



*Click below image to see video that I made:*



In Conclusion, transistors are the basic building blocks for all electronics in your house. They have a very simple atomic structure and they are made out of semiconductors. We also learnt that Quantum tunneling can happen if the transistors are too small. We also saw what Quantum computers use instead of transistors



## Engineering in Everyday Life – Making a Netball/Basketball Pump *by Maya Acharya 14 years old*



### Background

It was the last day of half term. School was starting on Monday and I suddenly remembered that I needed to inflate my Netball for PE.

### Problem

The Netball hadn't been used for a while and was in a bad state. The biggest problem was that I didn't have a Netball pump. I could have just ordered it from Amazon, but the pump would not have arrived on time. I tried inflating it with a cycle pump, but it wouldn't work with the air escaping from the end.

### Solution

I had to get the Netball inflated as soon as I could, or I would be in trouble on Monday for leaving things so late. So, I decided to convert a bicycle pump into one that I could use to inflate a Netball.

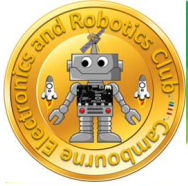
Parts you will need:

- ✚ Sellotape
- ✚ An ink cartridge from a ballpoint pen (preferably empty)
- ✚ A bicycle pump
- ✚ Scissors

### Method:

- 1) Cut the ink cartridge into thirds.
- 2) Cut a strip of sellotape depending on the size of the hole in the bicycle pump nozzle.
- 3) Wrap the sellotape around the end of the cartridge that should fit into the pump.
- 4) If the cartridge is too big for the ball, file it down to size.
- 5) Fit the ink cartridge into the nozzle of the pump securely or it will just pop off or the air will leak.
- 6) Fit the other end of the cartridge into the ball so it is tightly secured.
- 7) Gently, inflate the ball using the bicycle pump. If it pops off just reconnect it.

Now the Netball or Basketball is ready to use!



## Chase for the Red Planet *by Aoife Datta, 10 years, UK*

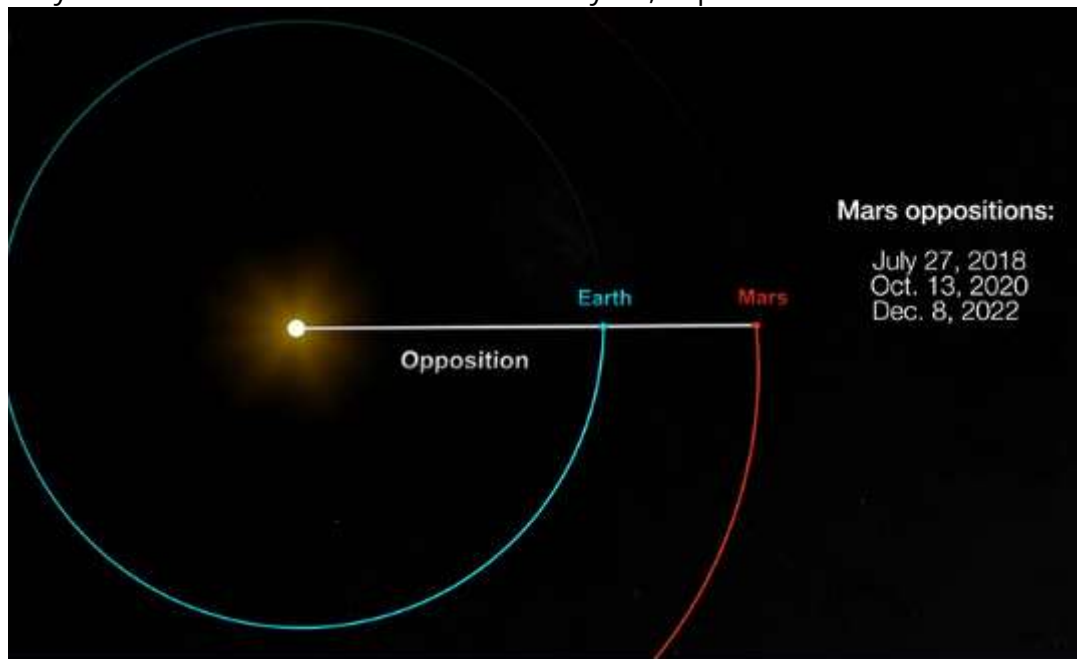


May 30th 1971, Mariner 9 was launched as an orbiting satellite around Mars. Just 4 years later NASA launched a second rover, Viking. The third mission to Mars was launched less than a year later on September 9th 1975 with Viking 2. Fast forward to 2020, on 30th of July NASA launched its newest rover which landed on Mars' Jezero crater on the 18th of February 2021. This new rover named Perseverance will examine this red curiosity for past or present life.

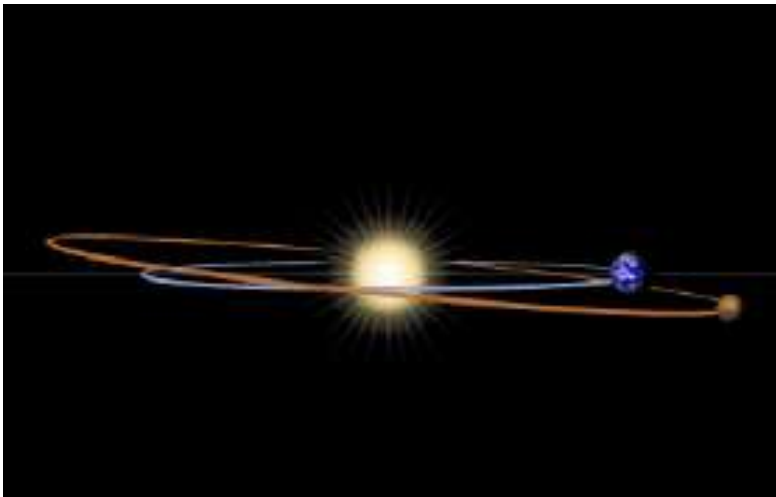
But the questions that many of us are asking about Mars aren't about the past, they're about the present and our future:

Why are so many nations sending probes, rovers, satellites or planning to send people within the next 10 years?

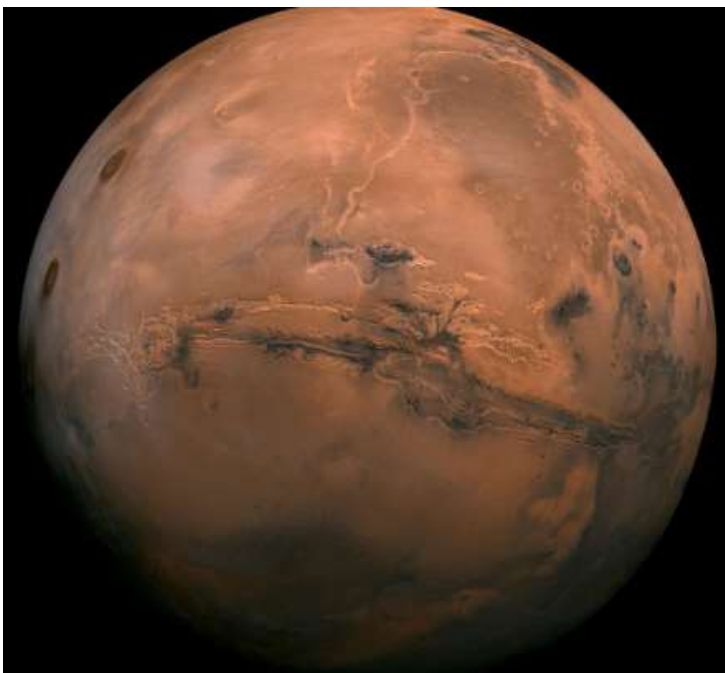
Why is there so much talk about Mars this year, in particular?







In fact this last question has something to do with the current international race to Mars. The diagram shows the position of Mars in relation to Earth as they both orbit the Sun.



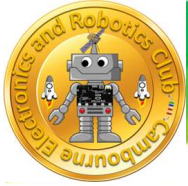
Mars takes 2 years to orbit the sun while Earth takes just 1 year for a complete orbit. Due to their orbits not being perfectly circular there are times when Mars is much closer than others. This autumn was one of those times. NASA chose to launch their newest rover on the 30th of July 2020. At the same time both China and the United Arab Emirates launched their own craft to explore the red planet. Mars' closest approach to Earth was in October 2020, when all of the international space craft were on their journey to the red planet.

NASA, plan to bring samples of rock and soil back to Earth at some point between 2022 (when the planets will be closely aligned again) and 2031 when they will have launched a sampler return craft to collect the samples and bring them back. The company 'SpaceX', intend to have humans on Mars by 2026 but even they say this is an aspirational target. Nowadays it's taken for granted that humans have travelled to the moon, maybe in our lifetime it will be normal to travel to Mars!

#### Sources

<https://mars.nasa.gov>

<https://www.npr.org/2020/07/16/890368269/its-a-good-time-to-head-to-mars>



## **Gardening for the Environment** *by Hamza A, 17 years, UK*



During my current time at sixth form, I am choosing to get involved in Gold DofE which has 4 sections and one of them are skills that I plan to do for six months weekly at Morden after the pandemic stops.

### Subject

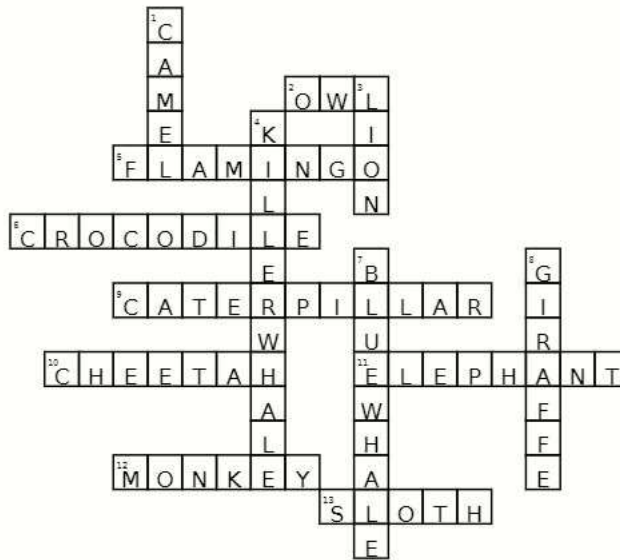
Gardening is extremely useful for the environment because it impacts global warming significantly and preserves wildlife. So many communitive gardens equal a quarter of trees in non-forest environments. In addition, is underrated and very rarely looked at for people to enjoy.

### Conclusion

Overall, it is a very effective way to learn something for your brain and strengthen your experience well.

## Answers to last month puzzles

### Animals



Down:

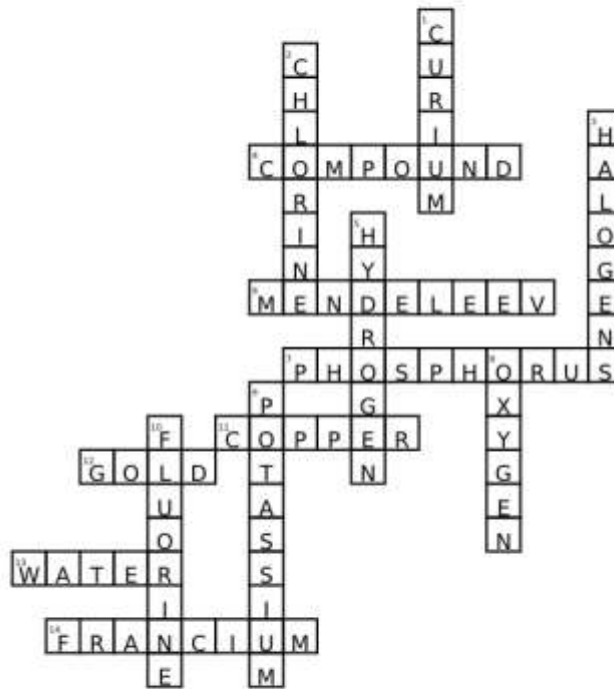
1. Lives in deserts and has humps
3. King of the jungle
4. Largest dolphin
7. Largest animal
8. Very long neck

Across:

2. Can move its head 360 degrees
5. Stands on one leg
6. Biggest reptile
9. A baby butterfly
10. Fastest land animal
11. Largest land animal
12. Swings on trees
13. Slowest land animal



## The periodic table

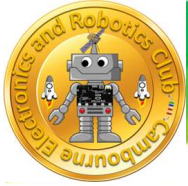


### Down:

1. Named after Marie Curie
2. Commonly to keep swimming pools clean
3. The name of group 7
5. The first element in the periodic table
8. What we breathe in
9. Found in bananas
10. Used in toothpaste

### Across:

4. Where two or more elements are chemically bonded together
6. The creator of the periodic table
7. The oldest element in the world
11. The material coins are made out of
12. The symbol of this element is Au
13. The substance called H<sub>2</sub>O
14. The rarest element on earth



## Article from the Young Scientists for the Next Issue:

*Ignite Team is looking for young scientists to write an article for the next issue of the magazine. Please submit the article by **Sunday, 28<sup>st</sup> March 2021** by emailing the article at [ignite.camcare@gmail.com](mailto:ignite.camcare@gmail.com) and with a subject "Article for Ignite".*

*Please use the following template for writing the article:*

<https://bit.ly/3nF820h>

## Volunteers Needed:

*Ignite Team is looking young volunteers with knowledge of Editing/Presentation Skills, HTML, Web Authoring tools.*

*Volunteering certification can also be provided for the Duke of Edinburgh Skill enhancement.*