

The Great *Exhibition* AT HOME

Week 1

Welcome to the Great Exhibition at Home Challenge. Inspired by the Great Exhibition of 1851, we are exploring how engineers can help protect the planet.

This is the start of a 7 week STEM adventure. You can keep all the exhibits that you create in the first 6 weeks to display in your Great Exhibition at Home in week 7 – they may even feature in your challenge video!

Use the worksheets provided to learn about this week's 1851der, the Yacht Piano and inspiring engineer, Laurence Kemball-Cook. Then take part in this week's engineering challenges and bring the wonder of the Great Exhibition into your own home!

Top Tip: You can find an 'Introduction to engineering' on page 10 of your digital Great Exhibition at Home pack!



1851*der* Worksheet 1:

The Yacht Piano

There were all manner of inventions, exhibits and curiosities shown inside the Crystal Palace at the original Great Exhibition - in fact there were more than 100,000 exhibits!

These inventions were cutting edge for their time and sought to revolutionize Victorian living.

Whatever the size of your yacht, it is not complete without a piano, or so William Jenkins, a British inventor and manufacturer, thought. His answer was to produce a folding piano complete with collapsible keyboard to squeeze into tight spaces such as a yacht, saloon or 'ladies' parlour'.

The clever design was exhibited at The Great Exhibition and inspired the manufacture of other Yacht Pianos to be stocked in London department stores. The first record player wasn't invented until 1877 so in 1851 musical instruments were an important source of entertainment – even at sea.



Take up the challenge!

Yacht pianos kept wealthy Victorians entertained. Today yachts are being used by climate campaigners, including Greta Thunberg, as way to travel between continents. But what about places that aren't near the sea?

Can you think of new and exciting ways to travel on land which don't harm the environment? Try drawing or writing about your ideas, you may even want to test them yourself – can you travel from one side of the room to the other in an innovative way?

On the next page, meet an engineer who is finding ways to harness human travel to help combat climate change...

Laurence Kembball-Cook

Laurence founded Pavegen after graduating from Loughborough University. Since then his invention, which converts people's footsteps into energy, has captured over 1/2 billion footsteps.

What is Pavegen?

Pavegen is a smart flooring system which harnesses the kinetic power of people's footsteps and converts it into off grid energy and personalised data.

How does it work?

As people step on the top surface, their weight causes generators underneath the tiles to rotate, creating off-grid power via electromagnetic induction. Electromagnetic induction involves magnets moving around a coil of wire to create an electrical current. All magnets have a south pole on one end and a north pole on the other end. Poles which are the same repel and push away from one another whereas opposite poles attract, pulling towards each other. By alternating push and pull at timed intervals the magnets will rotate around the coil of wire producing an electrical current. It is this energy that can be harvested to power things such as lights!

Pavegen walkways also have integrated Bluetooth sensors built into their tiles that capture and analyse data such as the number of steps and energy harvested.

How can Pavegen be used?

Pavegen has been installed over 200 times around the world, helping big and small communities with LED lighting, environmental sensors, and charitable donations from footsteps.

In 2019, Pavegen built an energy-generating running track in a Hong Kong office building. This meant that workers exercising during the day could help to power lights inside the office from their steps.

How can Pavegen help the environment?

Not only are we running out of non-renewable energy sources such as fossil fuels, but changing our everyday behaviours to combat global warming with renewable energy is harder than ever. Consequently finding alternative ways to generate energy and change our habits takes a long time. Pavegen offers a smart energy that puts people at the heart of its technology, empowering citizens to make their city greener.

NOW IT'S YOUR TURN
Can you think of a new way to generate renewable energy?
Would it utilise weather, humans or machines?

Get ready for week 2, where you can discover another inspiring engineer, intriguing inventions and extra challenges!

