

OVE'S PHILOSOPHY

In the Exhibition

Explore the **doodles and ephemera** at the beginning of the exhibition to uncover Ove's ideas around what a modern engineer should be.

How does the **Penguin Pool** at London Zoo demonstrate Ove's philosophy and playful approach to engineering?

At the Museum

Go through the Grand Entrance of the Museum into the main foyer. Use large paper and graphite to make some doodles inspired by the shapes and patterns you can see in the space. Now use your doodles to solve the following challenges:

- A way for visitors to go from the middle of the Grand Entrance all the way up to Level 6 without stopping at any other floor. Describe to a friend how your design would work.
- A solution for the Museum's John Madejski Garden (straight ahead of you through the shop) which will allow visitors to cross the garden in a straight line without walking around the perimeter.

Go One Step Further

Develop one of your drawings into a 3D model. Think about what problems you might need to solve to realise this design, what materials would you use and what testing you might need to carry out for this to work. Who would you need to work with to help expand this design into a reality?

CIVIC RESPONSIBILITY

In the Exhibition

Investigate the **wartime shelter designs** created by Ove Arup to find out more about how he championed and designed safer shelters for the public.

Do you think designers, architects and engineers have a responsibility to society? Why?

At the Museum

Visit the 20th Century gallery (Level 3). Walk through to Room 76 and look for the **Civilian Receiver 'Utility' Radio**. This radio is a good example of civic responsibility. Its production involved lots of British manufacturers overcoming their competitiveness and working together to design a readily available and cheap radio for the general public. This was essential for communicating important national messages during the Second World War.

Explore rooms 74 to 76, and document as many radios as you can find, using the key words below to help describe each of them:

Integrated, Portable, Simplistic, Colourful, High-performing, Automated, Retro, Durable, Precise, Mass-produced, Compact, User-friendly, Elegant, Robust, Elaborate

Designers and manufacturers are often driven by the changing needs of society, such as war or economic crisis. Looking back at your descriptions, identify those radios which exhibit more than one social design element. What do you think designers and manufacturers were responding to? Which do you think was the best designed? Why?

Go One Step Further

Nowadays radios are mostly integrated into other devices such as mobile phones, tablets and computers. Choose one of these everyday objects, and look back at earlier models. Can you identify any social design aspects throughout their development? How have our modes of communication changed? Discuss with a partner.

INNOVATION

In the Exhibition

Explore the models and drawings of the **Sydney Opera House** to discover how Arup used spherical geometry and new technology to solve this engineering quandary.

Find two examples in the exhibition of how the Arup firm has continued to innovate today through the use of new materials, technologies or processes.

At the Museum

Use the '**Six Degrees of Separation**' activity sheet to explore objects in the V&A's collection that demonstrate innovation, either because of their material or the way they have been made.

What links can you make between them, and in what way has the designer or maker used innovation to create them?

Go One Step Further

Choose an everyday item at home that you use on a regular basis, like a toothbrush or a mobile phone. Spend some time investigating the object carefully. What materials or techniques have been used to construct it?

Can you think of other, more innovative materials or techniques that could be used instead? What is your reasoning? Is it lighter, cheaper, more environmentally friendly?

For example, a toothbrush handle is plastic, which is not environmentally friendly; however, it is extremely cheap. An alternative could be made from wood, which, although better for the environment, is useless without lacquers or varnishes as it is not waterproof or durable, and could cause nasty splinters.

COLLABORATION

In the Exhibition

Take a closer look at the concept drawing for the Pompidou Centre. Think about the range of skills and knowledge required to develop such a complex project.

At the Museum

Visit the Architecture gallery on Level 4 (Room 128). Find the model of the **'Biome of the Eden Project'** which shows a section of the interlocking hexagons that form its exterior. This innovative structure is a great example of collaboration between the architect Nicholas Grimshaw and engineering and material specialists, including the Arup firm, who were responsible for ensuring the interior of the structure was suitable for plants to thrive.

Working in a small team, imagine you have been tasked to design a visually stunning greenhouse which can house tropical plant life. Your structure should reflect its contents through its external design and also be suitable for plant life to bloom within. Using the surrounding galleries for inspiration, consider the structure itself, the materials it might be made from and ways to ensure that light, heat and air flow are controlled within.

Go One Step Further

The Shard in London is the tallest building in the UK. Find out the different backgrounds of the experts that had to work together to achieve this feat.

Work in pairs, assigning one person as the engineer and one as the architect, to design and construct a tower. The engineer must ensure that the structure of the tower is sound, while the architect must consider the tower's form and overall aesthetic.

How successful was your collaboration? What challenges did you face? Did you have to reach any compromises?

INVISIBLE ENGINEERING

In the Exhibition

Watch the Mass Motion case studies and visit the Arup Soundlab® towards the end of the exhibition.

What are the benefits of these tools for designing new public spaces?

At the Museum

Visit the Architecture gallery on Level 4 (Rooms 127–8). In pairs, choose a model on display and imagine how people would use this building.

Consider how buildings are engineered for their different purposes – how is this reflected in their structure and design? Discuss possible factors that the builders, engineers and architects had to consider when they were working on the project. Are all of these obvious from the model, or are there some you can't necessarily see?

From the Architecture gallery, head down the stairs to the mezzanine balcony on Level 3. Using this unique perspective, make quick overlapping drawings of the visitors below moving around the Grand Entrance. Do you notice any patterns in the way people are moving? Use this information to think about how you might redesign this space to enhance it for our visitors.

Go One Step Further

Imagine you are not constrained by the laws of physics here on Earth. What would you design for the future to solve a particular problem (social, environmental, financial) or improve the quality of human life? Consider what human advances would be necessary to make your idea a reality.