



Royal Academy
of Engineering

THIS IS
ENGINEERING

ENGINEERING IN THE MOVIES SMARTPHONE PROJECTOR

STEM

Science, Technology, Engineering and Maths Focus

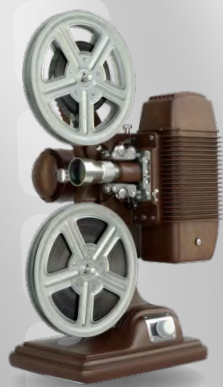
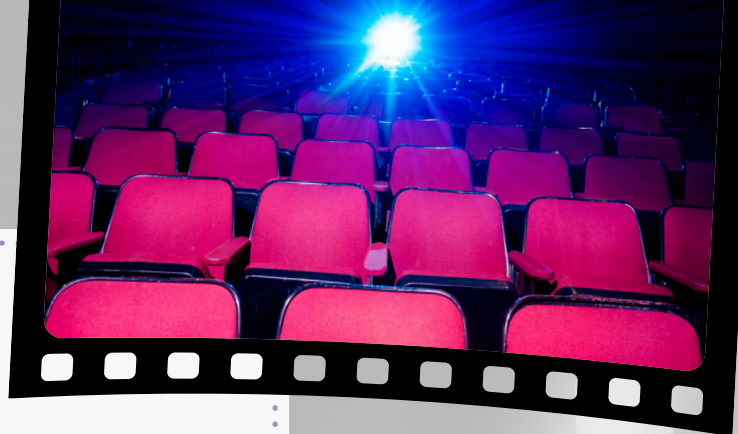


INTRODUCTION

You have made a movie, but how does it get projected onto a large cinema screen? A movie projector is an opto-mech device (short for optical and mechanical) designed to display motion picture film by projecting it onto a screen.

The Lumière brothers invented the first successful movie projector in 1894. In 1999, digital cinema projectors were being tried out in movie theatres.

The operation of a projector is actually very straightforward – film passes through the projector and light projects the moving image through a lens. Is it really that simple? What about focus and the size of the screen? These and other questions will be answers in this practical projector building challenge.



OVERVIEW

Understand how movies are projected and enjoy your own theatre by building a smartphone projector.

THE CHALLENGE

Did you know you can turn an old shoebox and some materials into a smartphone projector?

It is a fun, simple and easy STEM experiment that you can do in class. See and learn how light projects moving images.

WHAT YOU WILL NEED



CHALLENGE

-  Teams of three or four
-  240 minutes
-  KS3
-  Expert

MATERIALS

- Magnifying glass
- Foam board
- Masking tape
- Smartphone
- Glue sticks
- PVA glue
- Shoebox
- Detachable phone case

TOOLS

- Hobby knife (XACTO)
- Hot glue gun
- Cutting knife
- Hacksaw
- Ruler

THE PROCEDURE



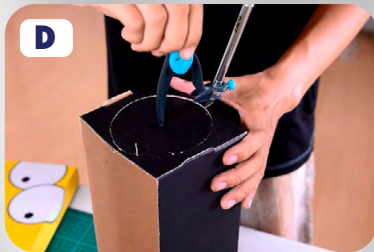
Stick the mirrored piece to the centre of the balloon drum



Reinforce the box by gluing the flaps and corners of the box



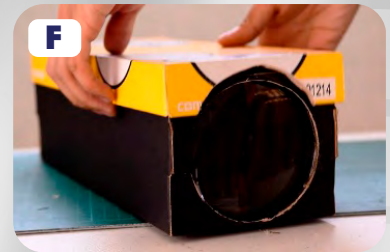
Place your magnifying lens on top then centre it. Use a pencil to trace the cut line



Use the glue gun to build the phone stand from foam board



Use double sided tape to mount your phone case to the stand



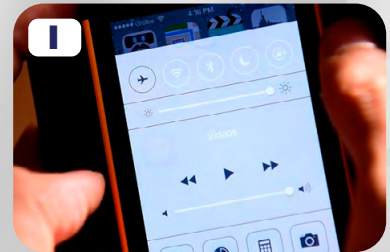
Set your phone to the highest brightness. More light results in a brighter projection



Use the glue gun to build the phone stand from foam board



Use double sided tape to mount your phone case to the stand



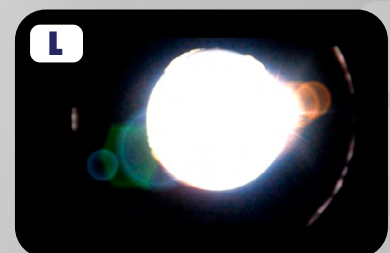
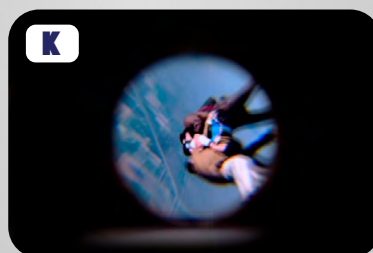
Set your phone to the highest brightness. More light results in a brighter projection

DON'T FORGET TO LOCK THE SCREEN:

The lens inverts the light source (your phone's LCD) to the projected image. This means you'll have to position your phone's screen in an upside-down position to prevent it from auto rotating. Go to the lock-screen setting on your phone and disable the auto rotate.



Position your phone at the very end of the box then slowly move it closer to the lens. You will notice that the image will turn sharper/ softer. Move it back and forth until you get the sharpest projection.



Put the lid on and enjoy the movie!

SUPPORTING LINK

www.youtube.com/watch?v=Tx4vPeL9y2g



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Together we're working to tackle the greatest challenges of our age.

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We're developing skills for the future by identifying the challenges of an ever-changing world and developing the skills and approaches we need to build a resilient and diverse engineering profession.

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