

# Engineer Inside

## Expert Creation

### Make a Rainbow Challenge

**Dr Phil Jemmett**

Hi everyone, my name is Phil. I work for WMG in the outreach team which means I make education resources for STEM, engineering, science. Today I'll show you how I might make a rainbow. Think where you've seen a rainbow before...

You'll need some of this stuff – bright, lovely sunshine. Rainbows don't just form when it's sunny though – we need some rain too. Rainbows form in the sky when there has been rain and now the sun is coming through. They are caused by light bouncing around inside raindrops in the air.

The sun gives us loads of white light all the colours of light are all mixed together. When the light bounces around in the raindrops the different colours bounce at different angles. That is what gives us our rainbow. To recreate this, I'm going to need a droplet of water, or at least something the same shape as a droplet of water. And I'm going to need a lot of sunlight.

You can see that light gets bent by water when we put an image behind a glass of water the image gets flipped because the water is the light from the image. So here's my hypothesis: raindrops split white light from the sun into rainbows so a glass of water should split the sunlight too.

I'm going to test this by placing a glass of water near a window with bright sunlight. A rainbow pattern should appear in front of the glass.

I'm sat next to a window. But if I pitch this camera down I've got a wine glass here. It's difficult to see this - it's too bright. That might be the same for you if you try this. I'm going to put something down that's black because black doesn't reflect the light so much and I'll bring something in to give us a little shade. If I do that, hopefully you can see this light coming through. It looks a little bit more like a rainbow. If I move this around ever so slightly, hopefully we will start to get something that actually looks like a rainbow.

While the light is being bent not all the colours are bent the same. The purples get bent a little more, the reds get bent a little less. And by the time it hits the paper on the other side the colours have all spread out.

So here's another set up and again I've tried to make some shade and what you can see is there are loads of overlapping reflections and bright bits and bright spots. So what we need to do is build up shade so the rainbow is visible.

So what's happening is that we've got sunlight coming through the window hitting the water in this glass the light gets bent slightly as it enters the water all the colours get bent a little differently to each other. Some get bent more, some get bent less.

As the light comes through and spread out to land here the blue light has been spread a bit more than the red light. So they all spread out and we end up with our rainbow.

Things for you to try at home:

- try different shaped glasses,
- see if you can get a rainbow in a reflection,
- and see how putting something black down makes it more visible.