

# High speed camera

## Location

Ground floor, All About Us exhibition

## In a nutshell

How high can you jump? Our bodies can absorb great stress. The brain, muscles and skeleton all help to reduce the forces in the body. Our camera shows these forces in action during a vertical jump.



## What to do

Students scan their barcodes and then jump vertically with a force plate below them. They can then view a slow motion replay of their jump and force diagram of pressure applied to the plate during the jump

## Time Required

KS3 & KS4 3-4 minutes per student.

## What's happening?

While jumping on the spot may seem easy to most of us, researchers in biomechanics can show that there are many things happening together, all coordinated by our brain.

Firstly we need to generate the power to leave the ground, this will allow us to create a force to temporarily overcome gravity. Crouching puts tension into your tendons and muscles, this tension is the potential energy that can be converted into the jump. Remember that tendons attach muscles to the bone, while ligaments hold bones to other bones. We also tend to use our arms which do make us jump higher by changing the amount of work carried out by the lower joints.

Upon landing the body must then cushion itself against the forces. Gravity will have accelerated the body towards the ground so there is work to bring it to a halt. The springy arch of the foot will absorb some of the force and the hips and knees will bend.

### Curriculum links

Curriculum links	
<b>KS3</b>	<p><b>Science -The skeletal and muscular systems</b></p> <ul style="list-style-type: none"> <li>- the structure and functions of the human skeleton, to include support, protection, movement and making blood cells</li> <li>- biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles</li> </ul> <p><b>Science - Changes in systems</b></p> <ul style="list-style-type: none"> <li>- using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes</li> </ul> <p><b>Science - Forces</b></p> <ul style="list-style-type: none"> <li>- forces as pushes or pulls, arising from the interaction between two objects</li> </ul> <p><b>Science - Forces and motion</b></p> <ul style="list-style-type: none"> <li>- forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)</li> </ul> <p><b>Mathematics - Number</b></p> <ul style="list-style-type: none"> <li>- use standard units of mass, length, time, money and other measures, including with decimal quantities</li> </ul> <p><b>Mathematics - Statistics</b></p> <ul style="list-style-type: none"> <li>- construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data</li> </ul>
<b>KS4</b>	<p><b>Science – Energy</b></p> <ul style="list-style-type: none"> <li>- describe all the changes involved in the way energy is stored when a system changes</li> </ul> <p><b>Science - Forces and their interactions</b></p> <ul style="list-style-type: none"> <li>- recall examples of ways in which objects interact</li> </ul> <p><b>Design and technology</b></p> <ul style="list-style-type: none"> <li>- how electronic systems provide functionality to products and processes, including sensors and control devices to respond to a variety of inputs, and devices to produce a range of outputs</li> </ul>

## Relates to:

Workshops & Theme Days	Shows	Trails	Other exhibits
<ul style="list-style-type: none"> <li>• Choose Health (KS3 lower)</li> </ul>	<ul style="list-style-type: none"> <li>• Boggling Brains (KS3 &amp; KS4)</li> <li>• How my body works (KS3)</li> </ul>		<ul style="list-style-type: none"> <li>• Motion disabled</li> <li>• Body mirror</li> <li>• Food energy</li> </ul>

