Monthly Maths

Not a first for the Stones at Glastonbury?

A 'rock star' of a very different type, Adrian Gray, demonstrated stone balancing in the Avalon area as part of the Glastonbury 2007 Festival.

You can view this **YouTube clip -** not the best quality but it gives you the flavour of the event.

"It's all to do with physics. It's nature's glue as I say, so it's gravity and friction, but mainly it's just finding that centre of balance and positioning the stones in such a way that when you look at [them], it looks like magic." Gray explains in a **BBC interview**.

Read about how he got started in **this Bridport News article.**

Stone Balancing

Adrian Gray has been developing his art of stone balancing for many years. His ability to create almost impossible to believe compositions has created wonder and left witnesses in awe and mesmerized.

All the stones in these pictures are balanced, strictly without any aids or computer trickery. They remain in place through the natural force of gravity and friction.

"The trick is putting together stones which look like they couldn't possibly sit on top of one another. Only then can you make something extraordinary", Gray explains.

He explains more about his motivation and his methodology on this **YouTube SWNS TV clip**.

Stone age man - Adrian Gray balancing stones on Lyme Regis beach

In another **YouTube clip**, this time from the BBC Country Tracks programme, Jodie Kidd interviews Adrian Gray on the beach at Lyme Regis about how he balances the stones. This is a favourite location for Gray, where he has become something of a balancing busker, as you can see in this **video clip**.

Incredible Stone Balancing Sculptures - Country Tracks - BBC One

Gray talks about his work on his **stonebalancing website**: "I envisage how certain rocks will work together when balanced, whether they will complement each other or be an imperfect match. The hardness of the rock is important. If the rock is too soft, because of the intense pressure at the point of contact, it can crumble and all purchase is lost."

In a **2012 interview on Geoscientist Online**, Gray explains:
"There are some things you have to weigh up – and weigh up is a very appropriate word. I'm using friction to balance them so they look as though they might fall. If you have a stone that's too heavy, you can't get that bond of friction that you're looking for, or you can't get an acute one, so I do have to think about that."

Click here for the MEI Maths Item of the Month

A new MEI maths quiz is at the end of this bulletin. **Click here to download it from our website.**

Classroom activities

Try stone balancing yourself!

Robert Krampf, The Happy Scientist, explains **how to go about rock stacking** (or stone balancing).

'appy balancing

If you don't have many rocks near you, then why not download this **Stone Balancing app**?

"Stack stones in a tower of a maximum height. After you will be able to measure a height of your composition, take a photo of the tower, load it into the communicator Photo album in order to share it later with your friends."

What makes the stones stay balanced like that?

The place where each stone rests on the stone below is called a contact. The stone balancer chooses each contact, looking for a small depression, bubble, or chip in one of the rocks. The curve of the other stone nestles into this depression.

There must be three points around the edge of this depression at which the rocks are actually touching, forming a small triangle. The combined centre of gravity of the stone or stones above must be directly above the tiny triangle that forms each contact. There must also be enough friction at the contacts to prevent the stones from sliding off one another. The smaller and further from horizontal the contacts, the better the sculpture.

Static Friction Coefficient

Static friction is the opposing or resisting force between two solid surfaces, that prevents any relative motion between them. The normal forces and the frictional forces are exactly balanced to stall motion between the two surfaces. For example, a stone or rock may be stationed on a slope, due to the static friction between the slope surface and the rock surface.

Static friction coefficient can be defined as "The ratio between the maximum force of friction felt by two solid surfaces in contact and the normal force exerted between two surfaces" The direction of frictional force is opposite to the potential movement direction between these static surfaces.

Read more on Buzzle.

Friction Teaching Resources

The **Starter ideas and activities in mechanics** resource by David Holland and Emily Rae's session at the 2012 MEI Conference may also be useful in teaching about stone balancing and static friction. Likewise Ted Graham's 2010 presentation: **Simple Practical Activities in Mechanics**.

The Science Learning Centre provides **Friction Teachers' Notes**, as part of The National Kit Club, coordinated by the Teacher Scientist Network, Norwich, funded by the DfE.

A similar friction experiment to Ted's Calculator on a Slope is described and illustrated in **Ron Kurtus' School for Champions.**

Further reading

If you'd like to read about the art of stone balancing, you might like: **Axial Stones: An Art of Precarious Balance, by George Quasha**.
"37 axial stones are displayed in dazzling full-page color photos. The accompanying text explains not only how the stones were found and eventually came together, but explores the aesthetic, philosophical, spiritual, and practical implications of an art of danger and impermanence."

Wikipedia also has a useful page of links and information about **rock balancing**.

MEI On the following pages you will find a quiz by Carol Knights for you or your students to enjoy over the summer break - **download the files from the MEI website**.