SOFT MATTER PHYSICS WITH DR AKHSHAY BHADWAL AND DR JOSEPH COUSINS

TALKING POINTS

KNOWLEDGE

1. What does LCD stand for?
2. When and how were liquid crystals first discovered?
3. Where can nematics be found in nature?

COMPREHENSION

4. What two properties of nematics make them useful for making computer screens?
5. How would you describe a free surface?
6. What happens to a nematic when a voltage is applied?

APPLICATION

7. How is it possible to fill a glass of water to slightly above the edge of the glass? (You can try this yourself!)
8. What shape would a water droplet have if it was in space? Why?

ANALYSIS

9. In what ways is a nematic like a solid crystal? In what ways is it like a liquid?
10. As an experimental physicist and an applied mathematician, why is it important that Akhshay and Joseph are collaborating on this project? Why could neither of them fully understand nematics if they worked alone?

SYNTHESIS

11. Paint, blood and ice cream are all examples of soft matter. How and why might a mathematician, physicist, chemist, biologist, engineer and social scientist each study these substances?

ACTIVITIES

MAKE YOUR OWN RIVULETS

Investigate the physics of rivulets while creating some colourful artwork.

1. A CREATIVE EXPERIMENT

You will need: paints, water, thick paper, a pipette (you can improvise if you don't have a pipette).

- Mix up a palette of four or five colours of paint of varying degrees of wateriness.
- Use the pipette to drop a small amount of paint onto your paper, then hold the paper at an angle to let the drop run down the page.
- Continue doing this, experimenting with different paint viscosities, starting locations, drop sizes and paper angles.
- Watch how the rivulets run and interact with each other. What patterns can you make? What happens when rivulets cross paths?

2. A QUANTITATIVE EXPERIMENT

You will need: tray, spoon, stopwatch, ruler, a variety of liquids (e.g. water, honey, ketchup, dish soap).

- Holding the tray at an angle, pour a spoonful of liquid at the top of the tray and time how long it takes for the rivulet to reach the bottom.
- While the liquid is flowing, use the ruler to measure the height of the rivulet.
- Repeat for all your different liquids and compare the results. How does the viscosity of the liquid influence the flow speed and height of the rivulet?

MORE RESOURCES

The University of Strathclyde runs Strath Science Scouts, in which Strathclyde science students visit local schools to run science activities: **www.strath.ac.uk/science/strathsciencescouts**

Follow University of Strathclyde graduate Chris Smith on Twitter (**@aap03012**) for his **#MathsNewsletter**

The Universities of Strathclyde and Glasgow are involved in Maths Week Scotland, which organises outreach events throughout the year: **www.mathsweek.scot**

The University of Glasgow STEMM public engagement group works on a variety of public outreach events, including the Glasgow Science Festival: **www.gla.ac.uk/myglasgow/publicengagementgroupinstemm/#glasgowsciencefestivalprojects**

The Physics Department at Nottingham Trent University (**www.ntu.ac.uk/course/physics**) provides a wide variety of opportunities for school students who are interested in physics, including open dome events at their astronomical observatory (**www.ntu.ac.uk/sat/facilities/trent_astronomical_observatory/outreach/index.html**) and research placements with the Nuffield Foundation (**www.nuffieldfoundation.org/students-teachers/nuffield-research-placements**)

This video highlights an example of Nottingham Trent University's outreach: **www.youtube.com/watch?v=Gx9aDLfbdUg**

This video (From carrot juice to TVs) explains the story of liquid crystals: **www.youtube.com/watch?v=sAr5MHk-EPA&ab_channel=NigelMottram**