

## TRAPPED IN TAR PITS

Thousands of years ago some animals walked around what is now Los Angeles and got stuck! Tar is an example of thick liquids that we can study!

### KEYWORDS:

#### Solid

Substances that do not change shape or flow

#### Liquid

Substances that change shape and flow

#### Viscosity

How fast a liquid flows

### K-3RD NGS STANDARDS COVERED:

- 2-PS1-4:** Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
- 2-PS1-1:** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- 2-ESS1-1:** Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

### ASK YOUR CLASS:

**Q:** Ice warms to become liquid water. Can you cool it to make it solid again? Can you think of a way to heat something that changes it permanently? **A:** Liquid water can be refrozen into ice, which can then be melted again. It is a reversible process. If you heat cake batter it bakes into a cake. Cakes cannot be cooled back into batter so this is an irreversible process. Start a discussion about other examples of heating processes that are reversible or irreversible. (2-PS1-4)

**Q:** What is viscosity? What are some examples of liquids with high viscosity? What about low viscosity? **A:** Viscosity is how quickly or slowly a liquid flows. Examples with high viscosity: molasses, mud, maple syrup. Examples with low viscosity: soda, vinegar, juice.

**Q:** Using what you know about viscosity, compare the following pairs of liquids. Which one in each pair is more viscous? **A:** (**Bolded** option is more viscous) Water or **Soap** | **Honey** or Milk | Juice or **Smoothie** | Oil or **Ketchup** (2-PS1-1)

**Q:** Think about the liquids in our viscosity race experiment and the pitch drop experiment and compare them to solids like a table. How quickly do these things change? **A:** Low viscosity liquids flow and change shape quickly compared to high viscosity liquids. Solids don't flow, so they never change unless something else, like heat, is introduced. (2-ESS1-1)

**Q:** What is your hypothesis about why Oobleck can act like a solid and liquid? Take ideas from the students as a discussion. **A:** The cornstarch is suspended in water - it does dissolve or react. Poking at Oobleck quickly compresses the cornstarch and pushes the water out of the way making it solid. As the force applied remains unchanged, the water flows back between the cornstarch making the Oobleck liquid again.