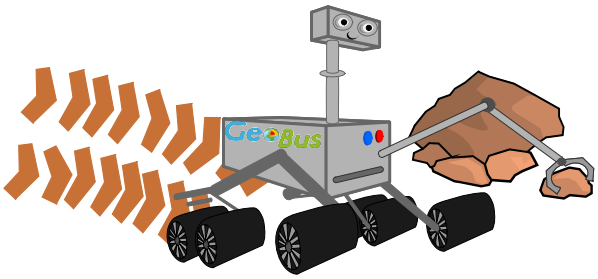
Plate Tectonics On Mars
Teacher Notes



Activity title:	Is Earth the only planet to experience plate tectonics?
Target Age Group:	Scottish S1-S4 (approximately 12-16)
Preparation:	Collect materials, download associated PowerPoint & 'Plate Tectonics on Mars' Geology In A Minute video, print student worksheet (if using)
Activity Description:	After an introduction to the different plate boundaries and geological features observed, students compare Plate Tectonics on Earth and Mars using a simple model - with crackers representing the plates and yogurt/bread representing the planetary interior.
Time:	5-10mins introduction/preparation, 20mins activity, 5-10mins reflection **Total: 30-40mins**
Learning Outcomes:	Understand the mechanisms of Plate Tectonics on Earth Understand the geological features formed by Plate Tectonics Investigate the differences between the interiors of Earth and Mars Observe the evidence for Plate Tectonics on Mars
Materials:	- 3 crackers per group (Jacob' cream crackers work well) - 2 plates per group - 1 slice of bread per group - 1 cup of water per group - Yoghurt
Student Organisation:	This activity may be done individually or in small groups, depending on class size – groups of around 4 usually work best

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Instructions:

The 'Tectonics on Mars' PowerPoint gives an introduction to the mechanisms that drive Plate Tectonics on Earth, the different types of plate boundary, and the geological features that can be observed.

The GeoBus Geology In A Minute videos on Plate Tectonics can also be used to highlight/expand these points.

Having introduced (or recapped) Plate Tectonics on Earth, carry out the first part of the activity demonstrating the different boundaries;

1. On one plate, spread a layer of yoghurt 2-4cm thick
2. Place two crackers side by side on the plate, edges just touching
3. To represent a transform boundary, slide the two crackers past each other (see images)

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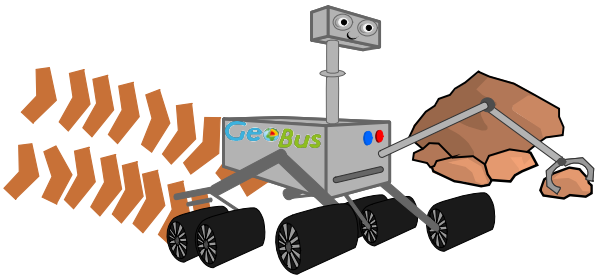


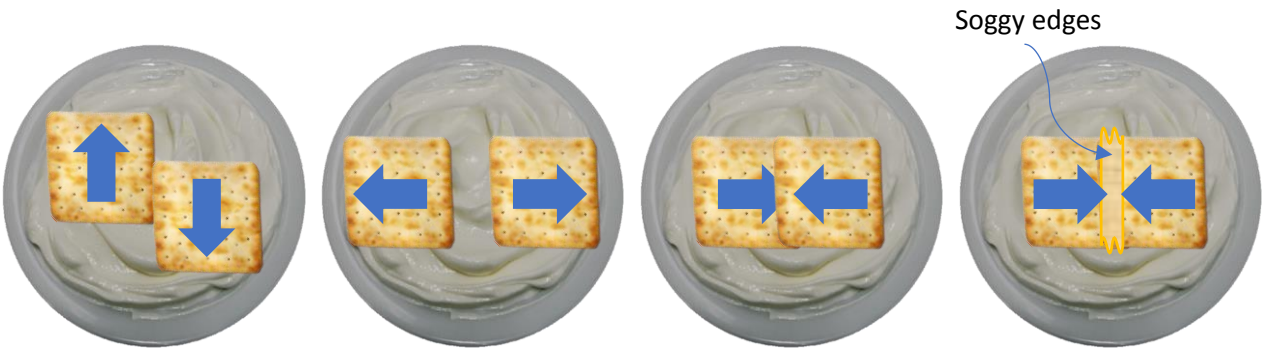
4. To represent a divergent boundary, push the two crackers in opposite directions away from each other
5. To represent a convergent boundary (subduction zone), push the two crackers towards each other, allowing one to slide underneath
6. Remove the crackers from the yoghurt and dunk the bottom half of each into the cup of water
7. Place the slightly soggy crackers back on the yoghurt, wet edges together
8. To represent a convergent boundary (mountain building), push the two crackers towards each other, allowing the soggy portions to wrinkle up

Now discuss the evidence for geological features on Mars that could have been formed by Plate Tectonics – particularly the Valles Marineris trench. Introduce the concept that Mars has cooled more quickly than Earth and, from what we know, its interior is therefore unable to flow in the same way. Without movement (convection of heat from the core) in the mantle, there is no strong driving force for Plate Tectonics.

Repeat the activity using the second plate with a slice of bread instead of yoghurt, and only one cracker to represent the single piece of crust on Mars. It should be difficult to reproduce the plate movements and interactions.

Talking Points: It is likely that Mars had active Plate Tectonics in the past, but because the interior behaves differently to the interior of Earth (less heat, therefore no mantle convection) there is not currently active Plate Tectonics in the same way as on Earth.

Extension: Use the GeoBus 'What Happened to Mars' Magnetic Field?' Geology In A Minute video to discover more about the interior of Mars and the implications of the core cooling.



Transform Boundary | Divergent Boundary | Convergent Boundary (subduction zone) | Convergent Boundary (mountain building)

Name: …… Date ……

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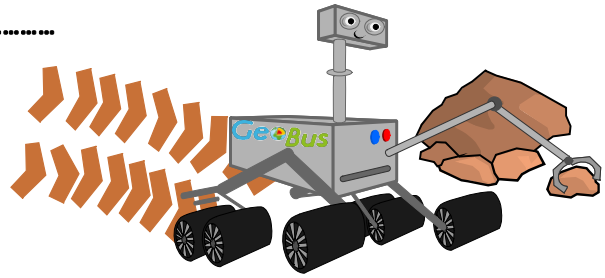
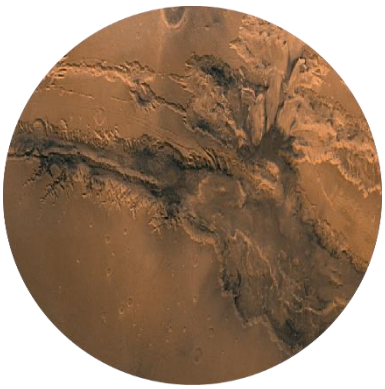


Consider the images below showing two of the main geological features on the surface of Mars. By comparing each to similar features found on Earth, explain how it is thought to have formed and therefore what evidence it might contain about Plate Tectonics on Mars.

Olympus Mons:

Valles Marineris:



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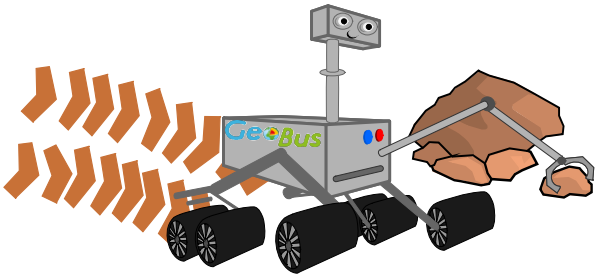

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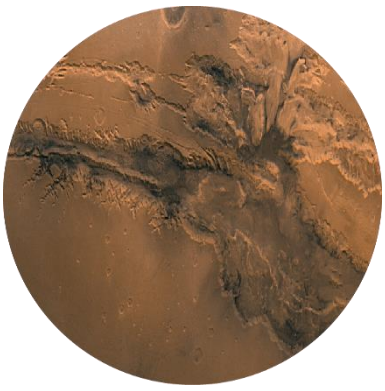
Olympus Mons:

Feature - large shield volcano

Evidence of magma rising to surface and erupting, possibly as a result of plate movements, but large size suggests any mantle upwelling constrained to one place (i.e. crust is not moving above hotspot like on Earth - Hawaii chain of volcanic islands) therefore Plate Tectonics less active than on Earth and no longer occurring?

Valles Marineris:



Feature - potential rift valley?

Evidence of crust being torn apart, large rift system thought to be 150km across. Evidence of active Plate Tectonics (in the past) but indicating a crust split in to only two large plates, rather than multiple smaller plates found on Earth.

Also evidence within rift of very steep sided canyon walls, typically found on Earth where faults have occurred. Faults = crust movement.