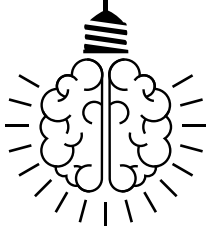
# Teacher's notes

## - bringing Catalyst to life in the classroom



Discover ideas and resources to build on the issues covered in edition 30 of Catalyst.

### Contents

# Brilliant boron

1

By Mark Langley, Professional Development Lead, STEM Learning

Matching article:
**From flatscreen TVs to your smartphone: the element boron deserves more attention**

Useful resources:
**www.stem.org.uk/lxeam**

Boron chemistry is fascinating - but often overlooked. Boron is generally considered as a non-metal, whereas aluminium, just below it on the periodic table, is a metal. In its simplest decryption, the addition of one more shell of electrons leads to very different behavior. Students might be confused when discussing gradual trends in groups when confronted by differences such as those between boron and aluminium.

Trends in groups of elements are fairly well understood when students look at Groups 1, 2 and 7. However, Group 3 is often overlooked, other than when students are encouraged to divide the periodic table into 'metals and non-metals'. The classic 'staircase line' acts as the divide between boron and aluminium, non-metal and metal.

Exploring the different bonding exhibited by boron (especially metal-boron bonds, where boron has a negative oxidation number, such as -1 in $Mg_2B$) gives students opportunities to demonstrate their understanding of bonding and oxidation states. Boron actually shows more similarity to silicon than to aluminium. Boron, in its elemental form, creates multi-boron atom structures with no delocalised electrons - unlike the metallic bonding of aluminium (and the equivalent in graphite).

# Looking for evidence of aliens

2

By Karen Hornby, Subject Specialist, STEM Learning

Matching article:
**Bring wastelands to life**

Useful resources:
**www.stem.org.uk/cx5ww**
**www.stem.org.uk/lxqco**

Ask your students to investigate three mystery sand samples, from an 'alien planet'. They should hydrate the samples and subject them to biochemical analysis to look for signs of protein, fat, sugars and other signatures of life. Ensure that one sand sample is inert, another contains Alka-Seltzer (producing a rapid chemical reaction) and the third should contain dried yeast granules and sources of organic molecules.

The activity is a great way of promoting teamwork and scientific inquiry. A full and comprehensive analysis of the sand samples can run over several lessons and cover aspects of: cell biology; microscopy; visual observation; biochemistry; constructing a theory; and working scientifically.

You can link the results of the practical investigation to the results of the Viking lander missions to Mars in the 1970s. A great deal of excitement was generated from the 'labelled release' experiment, where a large amount of gas was released from a sand sample. However, subsequent investigation showed that this was most likely the result of a chemical reaction, rather than a biological one.

# Shake, rattle and roll

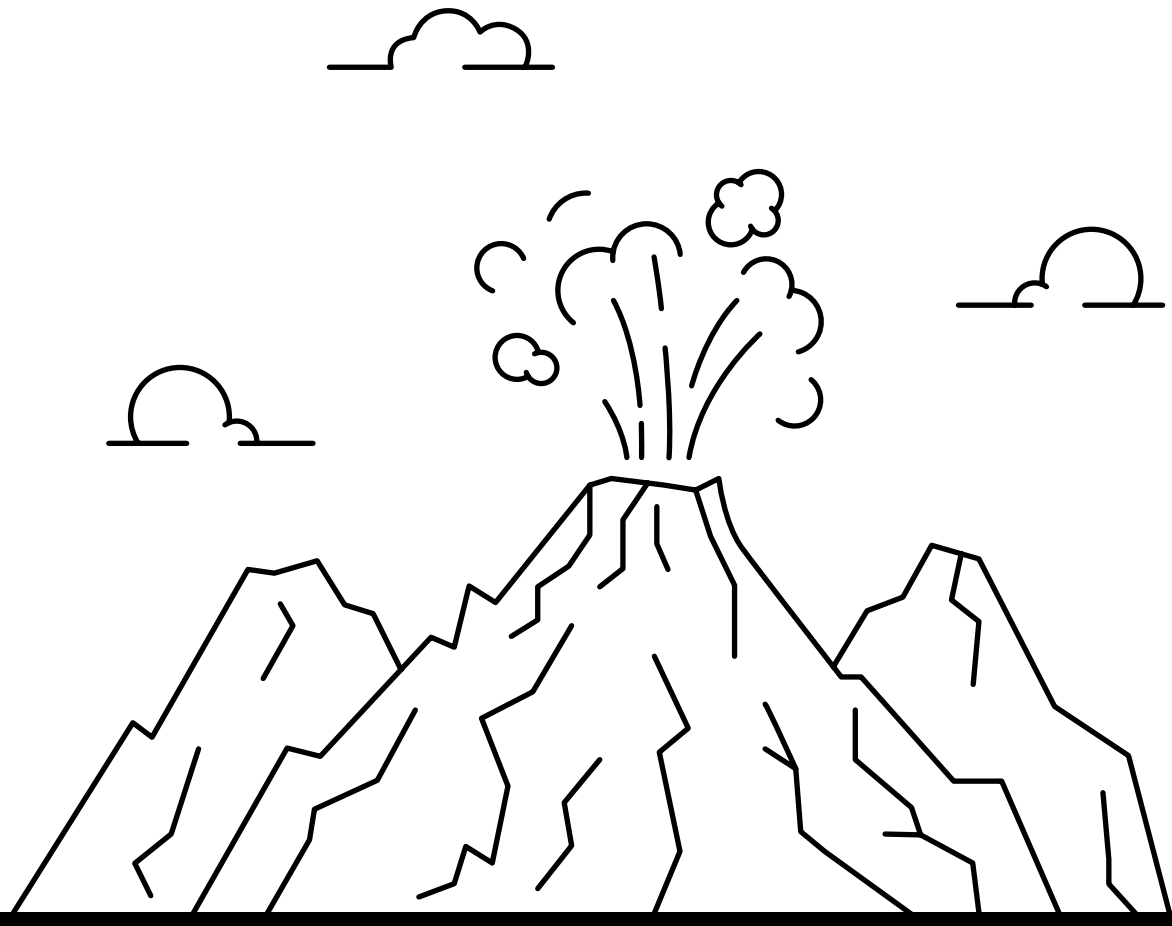
By Adam Little, Professional Development Lead, STEM Learning

Matching article:
**Monitoring our dynamic planet from space**

Useful resources:
**www.stem.org.uk/lxet43**

Earthquakes and volcanoes are a popular topic - what student doesn't find lava, and natural disaster fascinating? It's also a great context for teaching students about waves. Once you have shared the article with your students, to show how GPS and satellite imagery is being used to detect future disasters, use our suggested resources to develop their ideas about the 'big picture' across science.

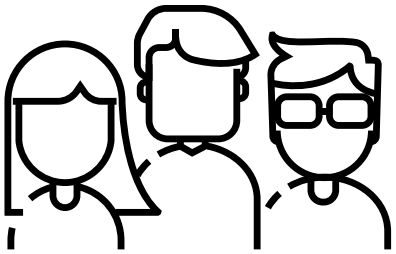
The first is a quick guide to GPS, which will help them gain a better understanding of how GPS satellites work, and their uses (other than earthquake detection). There is also a great activity called 'Fire and Ice' that you can undertake with students. Students use real seismic data to detect the location of a volcanic eruption. This will help develop their graph skills, as well as providing the real-world context of an eruption that they may have heard about in the news. You can also use this activity to introduce your students to the wave equation, and create links to the electromagnetic spectrum.

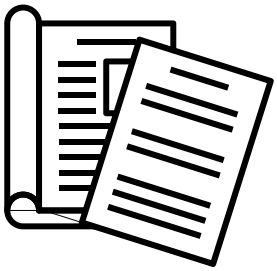


## Do you run a STEM Club?

Or perhaps you are thinking of starting one? STEM Learning have just relaunched the STEM Clubs programme, providing you with valuable tools, free resources and information to enable effective learning for the students in your club.

**www.stem.org.uk/ca/stem-clubs**





## Thank you

We hope you enjoyed this issue of Catalyst, and matching teacher's notes. If you have any feedback, or ideas for topics you'd like to see covered in future editions please email:

**catalyst@stem.org.uk**

Catalyst is produced thanks to the generous support of the Gatsby Charitable Foundation.

STEM Learning's work is made possible by the generous support of the Wellcome Trust, Gatsby Charitable Foundation, the Government, our partners in Project ENTHUSE and other funders of related STEM projects.

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