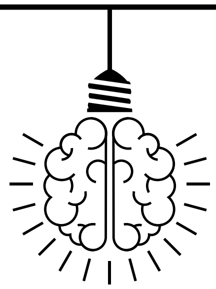
# Teachers’ notes

## - bringing Catalyst to life in the classroom



Discover ideas and resources to build on the issues covered in edition 31 of Catalyst.

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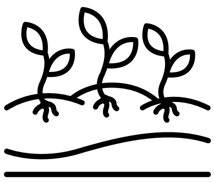
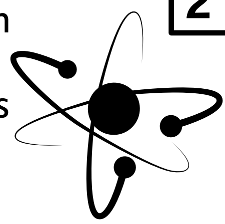
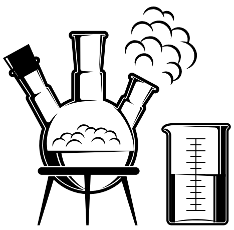






# Bog core analysis and climate change

1

By Karen Hornby, Science Specialist, STEM Learning

Matching article:
**Climate change vs our wildlife**

Useful resource:
**www.stem.org.uk/rx33jo**

When plants die, they normally decay. However, in anaerobic conditions, decay is greatly delayed and a peat bog may be formed. Within the bog, we can derive a considerable amount of information about previous climates by taking a core sample and analysing pollen trapped in the different layers to identify which plants were present at certain times in the past.

A simulation of a bog core can be achieved by putting different mixes of peat, soil, sand, gravel and powdered chalk in a series of layers in a transparent plastic tube. By adding 'pollen samples' (represented by coloured paper shapes for example), students can carry out a simulated bog core analysis. The data on plant species over time can then be used as an unusual way of looking at either succession or climate change. Students can then consider the relative population of different tree species in the woodland community at different points in the past, and relate this to changes in climate over that time.

# Engage with particle accelerators

2

By Adam Little, Professional Development Lead, STEM Learning

Matching article:
**Why antimatter matters**

Useful resources:
**www.stem.org.uk/rxekzt**
**www.stem.org.uk/nv200**

Particle physics intrigues students of all ages, and discussing quantum physics at A level really engages and inspires. In the 'good old days' we could say everyone had a particle accelerator in their living room, with the old cathode ray tube televisions, but with the introduction of flat screen TVs this is dying out.

Students rarely get the chance to engage with particle accelerators, but a visit to CERN isn't the only option. There are also Daresbury Laboratories in Cheshire or the Rutherford Appleton Laboratory near Didcot.

It could be looking at testing train wheels using high energy particles, or how cosmic rays can affect voting systems or air travel. When particles like neutrons, muons and pions hit semi-conductors in computer systems they can cause a single bit of information to 'flip' with potentially devastating consequences. For example, in 2003 in Schaerbeek, Belgium one of these events led to a candidate gaining an extra 4,096 votes. This was only realised when someone noticed the candidate affected had received more votes than it was possible to get.

STEM Learning has some excellent cutting edge science resources based on the work going on at CERN. In this resource students will learn about the tracks left by elementary particles when they are created in the high energy collisions in the Large Hadron Collider at CERN. They will learn about how the properties of each particle affect the path of the particle in a detector, as well as how we can use this to 'Hunt for the Higgs Boson'.

# Applying green chemistry principles to practical work

By Mark Langley, Science CPD Lead, STEM Learning

Matching article:
**Green chemistry is key to reducing waste and improving sustainability**

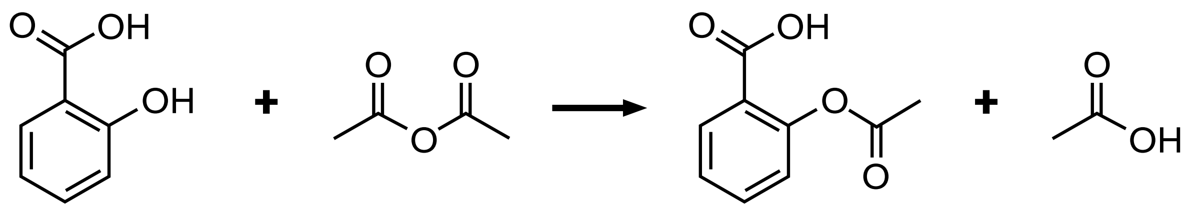
Useful resource:
**www.stem.org.uk/rxwzc**

Students can be encouraged to apply green chemistry principles to practical work they do. Using student safety sheets (from CLEAPSS) can allow students to understand the environmental hazards associated with the reagents they use - and they can suggest ways to minimise release outside the lab (such as neutralisation, collection or alternative chemicals).

At 14 to 16, students could turn a waste product (such as cooking oil) into a useful product (such as biodiesel). They could analyse this using paper chromatography and viscosity measurements, to compare to their original materials. This also allows the introduction of techniques such as chromatography in an unfamiliar context - they will not see coloured spots moving up the sheet, but will need to use a disclosing reagent, such as iodine, to be able to identify the spot and calculate Rf values.

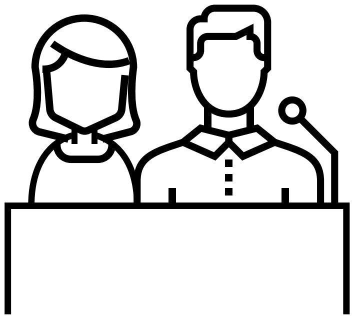
Post-16 students could look in more detail at the "atom economy" for their reactants as well as calculating yields. For this they could look at the production of aspirin and look to how much of the reagents are wasted. A large proportion of the chemicals used in the reaction do not make it into the final desired molecule - they could work out the efficiency and possibly investigate a better route. This approach could be taken to look at classic industrial processes, such as the Haber and Contact, with discussions as to how yield and rate are balanced to minimise energy use, while the importance of efficient catalysts can be discussed.

Students could also explore how the starting reagents in this classic school lab experiment are produced in the first place.



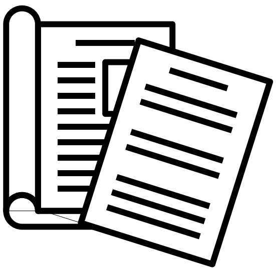

2-Hydroxybenzoic acid | Acetic anhydride | 2-Acetoxybenzoic acid (aspirin) | Ethanoic acid

## Bring a STEM Ambassador into your classroom



We have a network of over 30,000 inspiring STEM Ambassadors who volunteer their time to inspire the next generation in STEM.

Find out more about how you could bring a STEM Ambassador into your school or college: **www.stem.org.uk/stem-ambassadors**



## Thank you

We hope you enjoyed the 'new look' Catalyst, and matching teachers' 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**

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