

Environmental detectives: Water, soil and air pollution

Zoë Fleming, 10th November 2017

How do humans pollute water, land and the atmosphere? And what role does chemistry play? We will demonstrate ocean acidification, detect local air pollution and bring the issue of pollution to life in this interactive display, where hands-on soil, air and water testing and filtration let you play the role of environmental consultants in highlighting the consequences of pollution. We will also show how small sensors and citizen science can help the public to take their own measurements.

Website: <http://unearthed.nerc.ac.uk/> 17-20 November 2017

Location: Earth, 112-118 Holyrood Road, Edinburgh, Lothian, EH8 8AS

Social media: Twitter #UnEarthed2017 @NERCscience and @NERCPlanetEarth

How will your activity contribute to the overall aim of the showcase?

We will cover a range of science areas but show that one area of science (chemistry) is a tool to carry this out. It may help children to realise that chemistry is a useful subject to study. It may help to raise the profile of chemistry for adults as many see it as an industrial subject, not an environmental one. It will also show the modern aspect of the science, as we demonstrate how technology and small sensors and even the internet of things can be used to integrate the science and provide a local, national or global picture of the impact of pollution.

Ocean acidification exhibit:

Large cylinder or round-bottomed flask filled with water and NaCl solution (probably dilute this with water by 5) and put in universal indicator or litmus solution or pH litmus paper. Sea water is alkaline and when you add dry ice (frozen CO₂) it creates an acidic solution, the indicator changes colour and there is an overflowing of CO₂ gas (we can measure that with our CO₂ monitor).

Information: Ocean acidification: <http://www.nature.com/scitable/knowledge/library/ocean-acidification-25822734>



Ocean acidification experiment in small flask or large round-bottomed flask

Soil chemistry



Rowena on the zeolite (left) and pastics in soil (right) experiments last year

Using Zeolites to extract Chromium from contaminated soils and water:

Zeolites will be added to aqueous solutions and extracted with filtration to test how much of the contaminant is extracted. Use poster and explanations to explain about contaminated land and clean up techniques

General soil testing:

pH, Phosphate and nitrate test strips and solutions

Soil testing: <http://www.chemistryland.com/CHM107Lab/Lab5/Soil/Lab5Exp3Soil.html>

Soil: <https://www.rain.org/global-garden/soil-types-and-testing.htm>

Microplastics in soil: Pulling out plastic from the soil and investigating under a microscope

Water quality testing

Water testing kits (<http://sensingcity.org/when/>) and for example SO₂, ammonium, phosphate testing kits: <https://www.apifishcare.com/product.php?id=594#.WszOl02ovpw> and pH papers: Tap water and stream water samples for local water quality tests with some water test strips

Air quality monitors

Two of these on the stall: <https://airvisual.com/node> showing CO₂ and Particulate Matter (PM) levels. A mock AQMESH instrument will be there: <http://www.aqmesh.com/product/>.

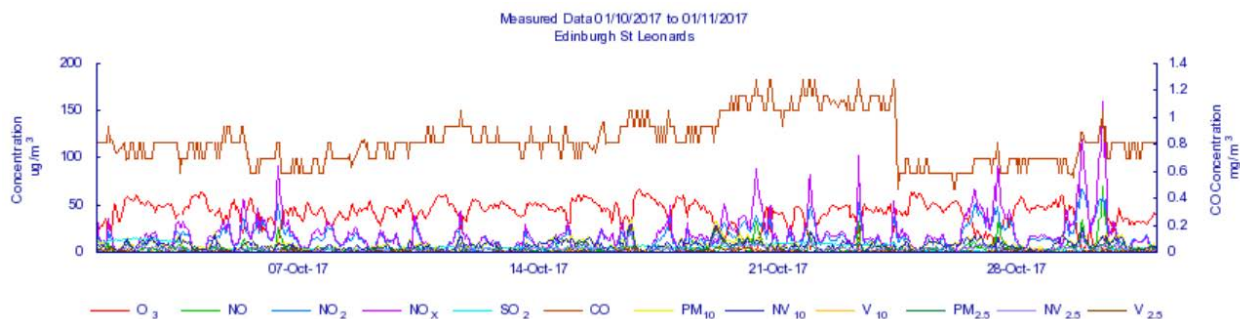


Airvisual



and AQMesh

Some examples from data from Leicester and Edinburgh St Leonard's air quality monitoring station (https://uk-air.defra.gov.uk/data/data_selector?q=870002#mid). Download and plot data from the week before the exhibit so you can show that.



Information **PM:** <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>,
<http://www.emirates247.com/news/over-90-of-world-breathing-bad-air-who-2016-09-27-1.641073>

CO2: <http://www.esrl.noaa.gov/gmd/ccgg/trends/weekly.html>, <https://www.co2.earth/>