

Mountain Science



your
life

an opportunity to engage students with science and exploration.

WHAT'S THE IDEA?

An **expedition to Putha Hiunchuli (7246m)** in western Nepal in October 2014 undertaken by Dr Melanie Windridge. This will be preparation for Melanie's attempt to climb Everest in 2016 – in conjunction with a planned book on science and exploration – and **a chance to explore the science considerations in the mountains – physics as well as physiology!**

In association with Anturus and the Institute of Physics we will help bring the science of the outdoors into the classroom by producing videos and experiment resources on five problems that effect mountain climbers - sunburn, hypothermia, dehydration, lack of oxygen and associated mental and physical impairment.

WHO SHOULD BE INTERESTED?

Anyone with an interest in adventure, education and inspiring the next generation. This is an opportunity for STEM education organisations, STEM supporters and mountain equipment manufacturers to be involved in an exciting initiative to show students the connection between science and exploration and to engage them with science through the wonder of the outside world and inspiring personal challenge.

WHAT DO WE NEED?

We are seeking £5,000 in sponsorship and equipment to cover the provision of video and written resources.

Benefits to sponsors include:

Exposure online and in the classroom to students, teachers and parents alike.

Equipment sponsors have their kit featured in videos and experiments.

Opportunity for involvement with Melanie's future, larger activities.

WHO ARE WE?

Dr Melanie Windridge is a plasma physicist and science communicator. She has a PhD in Plasma Physics (Fusion Energy) from Imperial College London and is Business Development Manager of Tokamak Energy – a fusion start-up. She is an Educational Consultant for the Ogden Trust and a founder advocate and advisory board member of the government Your Life campaign.

Melanie is an experienced public speaker who regularly lectures on nuclear fusion or the northern lights. She has written a general introductory book on fusion energy and developed online training resources in STEM.

Melanie's media work has included radio and television (BBC, National Geographic) as well as a number of blogs and podcasts. She is now writing a book on the northern lights and is represented by Diane Banks Associates.

Melanie is also a keen alpine climber and skier who believes that science and exploration go hand in hand.



Anturus has a mission to bring science from the outdoors in to the learning space. They stage adventures throughout the year and collaborate with innovative adventurers to connect with schools and homes around the world. The expeditions can be followed live or on catch-up through video diaries and activities to do in your living room or classroom - they even give live lessons through Skype in the Classroom.

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TOPICS

The topics for investigation are five problems that affect mountain climbers. In each of these categories we look briefly at the science, suggest an experiment or demonstration that can be done in the classroom, and make a short video “on location” on Putha Hiunchuli.

Topics	Science	Experiment	Video
Sunburn	Less atmosphere to block UV rays	Use UV colour-changing beads to investigate intensity of UV and test how materials, e.g. sunglasses, block it. Use supplied colour chart to compare with result from Putha Hiunchuli.	Use UV colour-changing beads to investigate intensity of UV and test how materials, e.g. sunglasses, block it.
Lack of oxygen	Atmospheric pressure decreases with altitude, lungs don't take in as much oxygen	Show how marshmallows grow in size when they are placed in a sealed bottle that is then evacuated. As the pressure drops the marshmallows swell. Imagine the marshmallow is a fixed amount of oxygen and its original size is our lung volume. As the pressure drops the same amount of marshmallow (oxygen) takes up more space, so less fits into our lungs.	Show how the boiling point of water changes with altitude because of the reduction in pressure. Measure boiling temperature at different altitude camps. Plastic bottle changing shape with altitude - swells on ascent. A bottle is sealed at altitude and is crushed when descending.
Mental/physical impairment	At altitude the body doesn't get enough oxygen and symptoms of altitude sickness are headache and nausea. Normal tasks become more difficult.	Students time themselves doing set puzzles in the classroom and compare with result from Putha Hiunchuli.	Do time test with puzzles at various altitudes to show how performance slows down. Also talk about dangers of altitude sickness.
Hypothermia	Temperature decreases with altitude. Human core temperatures must stay above 35C or the person can die. Clothing insulates us and different materials have different insulation properties.	Wrap beakers of boiling water in different materials (e.g. paper, cotton wool, aluminium foil, fabrics) leave for 15 minutes and measure change in temperature for each. Which is most insulating? Why?	With support of clothing manufacturer, make small bags of different technical materials to each hold a small thermometer. Take measurements on Putha Hiunchuli. Explain why X is better than Y.
Dehydration	The dry mountain air and higher respiratory rate of climbers at altitude leads to greater loss of moisture from the lungs than normal. This can increase dehydration problems.	TBC	TBC

Extra video: Water boils at lower temperature and time taken to .e.g boil an egg increases.

On the trip, measurements could also be taken of various parameters at different altitudes for use in the classroom (depending on weight of equipment). Parameters include: temperature; air pressure; relative

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CONTACTS

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FURTHER INFO

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Twitter: @m_windridge

YouTube: <https://www.youtube.com/mw8295>

Anturus

Web: www.anturus.org

Twitter: @anturus

Facebook: www.facebook.com/anturus

YouTube: <https://www.youtube.com/anturuseducation>

Flickr: www.flickr.com/photos/anturus/

SUPPORTED BY:



The Ogden Trust - supporting the teaching and learning of physics.



The Your Life Campaign - promoting science and maths as the pathway to a successful future.



Raspberry Pi - making programmable, credit-card sized computers for use in electronics projects, teaching kids to program and manipulate the electronic world.



Vernier Software & Technology - pioneering interfaces, sensors, software, and curriculum to transform how educators teach science and how students collect, analyse and interpret data.

Instruments Direct (Services) Ltd - distributor of educational and industrial instruments.