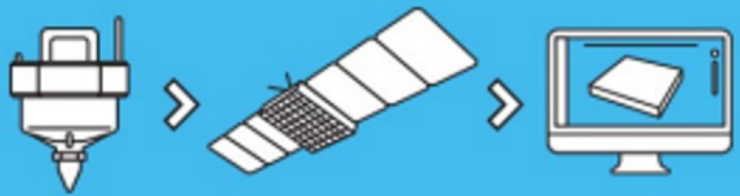


EXOSPHERE CHALLENGE

BY FLEET



Get your students ready for the Science Alive! STEM Day Out Exosphere Challenge. This is an opportunity for your students to understand the connection between space and mineral exploration, beamforming technology on satellites, the Geodes, and how these together have built Exosphere. Our tasks on wave interferences at school and the Geode sandpit at Science Alive! will be a fun and exciting way for the students to learn about Exosphere and its satellite technology.

Design and create your best Scanimation and bring it to the event to take part in the Exosphere Challenge. Place your Geode in the sand, connect to the satellite, analyse the data, and beat everyone to the punch identifying the minerals hidden in the sandpit!

What is Exosphere?

ExoSphere is a tool that uses the Geode, a satellite-enabled seismometer, to search for important minerals (such as gold and copper) in remote locations. Specially processed information recorded by these Geodes is transmitted to a constellation of satellites in space and is then relayed to computers (back on Earth) that use intelligent data processing to generate colorful 3-D maps of the subsurface. The combination of Geodes and satellite connectivity allows small teams to map vast amounts of land accurately and with little to no environmental disturbance. In addition, unlike traditional methods which can take months to years to complete, data collection and processing can be completed in a matter of days.

Let's have a look at these videos to understand Exosphere's operating principle:

1. [ExoSphere by Fleet](#)
2. [Fleet Space Technologies ExoSphere Interface](#)

Satellite communication is used to rapidly collect data from Geodes in the field to the cloud network. Fleet's satellites use beamforming technology, a concept similar to constructive wave interface, to transmit and receive data from Geode to the cloud in a secure and fast manner. Data signals are steered by controlling where constructive interference occurs.

Let's investigate waves interference through a simple activity.

At school activity

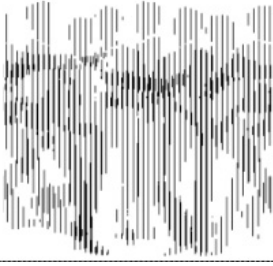
When you look through one chain-link fence at another, you sometimes see a pattern of light and dark lines that shifts as you move. That is called the Moiré pattern, an "interference pattern" created by overlapping grids, lines, etc as shown in [this animation](#).

Moire patterns are created whenever one semitransparent object with a repetitive pattern is placed over another. A slight motion of one of the objects creates large-scale changes in the Moiré pattern. These patterns can be used to demonstrate wave interference.

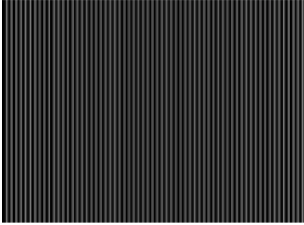
The purpose of this activity is to give students the opportunity to improve their knowledge about waves and how they constructively interfere, playing with a Moire pattern animation illusion: the scanimation process.

How does it work?

Barrier-grid animation, also called Scanimation, is an animation effect created by moving a striped transparent overlay across an interlaced image. The process is made up of two parts.



1. Choose a printed drawing, composed of a random set of vertical lines which seem illegible. In fact, these lines contain many images, different phases of a movement (in the example, dancing men).



2. Next, print a transparent plastic sleeve with a fine pattern of black lines printed on it. Between the black lines, the plastic is transparent. By posing this plastic sheet on the printed drawing, we see only certain lines: one of the different key moments of animation is revealed through the transparent lines!



Now, if you slip this transparent sheet laterally, you see one after the other the different phases of animation and your brain transforms these drawings into a fluid animation (in the example, a dancing man), according to the well-known process of retinal persistence!

Objectives:

- Utilize design and physical processes
- Encourage creativity, critical thinking and problem solving
- Learn about wave interference and how it can be utilized to display information such as images
- Provide a practical hands-on learning experience

What you will need:

- Paper
- Printer
- Laptop
- Transparent plastic sheet
- Scanimation template

Teacher Materials:

You may want to get the students to watch these videos for preparation:

<https://www.youtube.com/watch?v=1e0J4TrubKw>

<https://www.youtube.com/watch?v=Audku2Nyngng>

These online tutorials give you the opportunity to download and unpack a sample animation with the animation images and the grid you need to try the scanimation effect yourself. You can simply use that, you can use the other animation images provided below, or you can challenge yourself and create your own unique scanimation (watch this video to understand how: https://www.youtube.com/watch?v=7T1F_od-BgE)

Useful Links:

[Fleetspace Mineral Exploration](#)

[Infinity Mining Limited](#)

[Fleet Space Technologies](#)

[Moire Patterns](#)

[Moire Pattern Effect](#)

[Youtube - Incredible Moire Patterns](#)

[Youtube - Scanimation](#)

[Homemade Scanimation](#)

Curriculum Links:

Science

[Science Understanding - Year 9 Physical sciences](#)

Energy transfer through different mediums can be explained using wave and particle models (ACSSU182)

[Science Understanding- Year 8 Earth and Space Sciences](#)

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

[Science as a Human Endeavour – Years 8 – Nature and Development of Science](#)

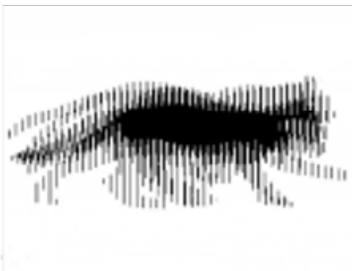
Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures (ACSHE226)

[Senior Secondary Curriculum – Earth and Environmental Science](#)

Mineral and energy resources are discovered using a variety of remote sensing techniques (for example, satellite images, aerial photographs and geophysical datasets) and direct sampling techniques (for example, drilling, core sampling, soil and rock sampling) to identify the spatial extent of the deposit and quality of the resource (ACSES073)

Animation Images:

Cat



Bee



Box



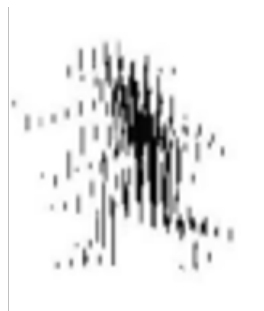
Dancing Man



Birds



Man Walking



Dinosaur

