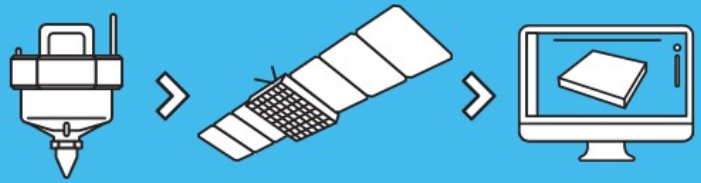


# EXOSPHERE CHALLENGE

BY FLEET



Get your students ready for the Science Alive! STEM Day Out Exosphere Challenge.

## Teacher Materials

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: <https://www.mathsisfun.com/definitions/moire-pattern.htm>

Moiré 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.

## What is Exosphere?

ExoSphere is a tool that uses 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.

You may want to get the students to watch this video for preparation:

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

<https://www.youtube.com/watch?v=Audku2Nygng>

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.

This online tutorial gives 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](https://www.youtube.com/watch?v=7T1F_od-BgE) )!

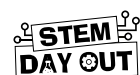
## Useful Links

- <https://fleetspace.com/mineral-exploration>
- [https://www.linkedin.com/posts/infinity-mining-limited\\_fleet-space-geode-relocation-at-infinity-activity-7049899072584908800-KiG5?utm\\_source=share&utm\\_medium=member\\_desktop](https://www.linkedin.com/posts/infinity-mining-limited_fleet-space-geode-relocation-at-infinity-activity-7049899072584908800-KiG5?utm_source=share&utm_medium=member_desktop)
- <https://www.linkedin.com/feed/update/urn:li:activity:7049554707568070656>
- <https://www.exploratorium.edu/snacks/moire-patterns>
- [https://www.youtube.com/watch?v=cvWF\\_Q5-Kt8](https://www.youtube.com/watch?v=cvWF_Q5-Kt8)
- <https://www.youtube.com/watch?v=4fhWJvG9dAs>
- <https://www.instructables.com/Homemade-Scanimation/>

FLEET

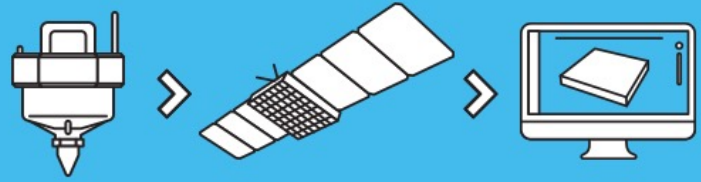


Government  
of South Australia



# EXOSPHERE CHALLENGE

BY FLEET



Get your students ready for Science Alive! **STEM Day Out Exosphere Challenge.**

This is an opportunity for your students to understand the connection between space and mineral exploration, beam-forming technology on satellites, the Geodes, and how these together have built Exosphere.

## At school activity

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!

## Creating your Scanimation:

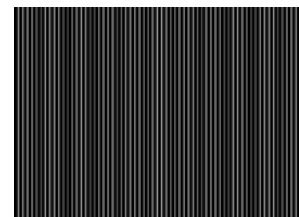
Barrier-grid animation, also called Scanimation, is an animation effect created by moving a striped transparent overlay across an interlaced image.

This is the process to follow to create your own scanimation:

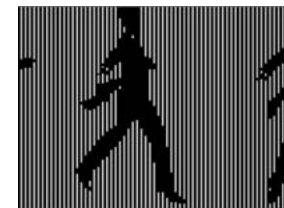
1. Choose a printed drawing, composed of a random set of vertical lines which seem illegible. In fact, these lines contain many images, different phases of a movement (in the example here, they are dancing men). You can choose from the templates attached or find your own.



2. Next print as transparent plastic sleeve with a fine pattern of black lines. Between the black lines, the plastic is transparent. By posing this plastic sheet on top of the printed drawing, we see only certain lines. (One of the different key moments of animation is revealed through the transparent lines)



3. Now, if you slip this transparent sheet slowly across the printed drawing, you will see one after the other the different phases of animation. Your brain transforms these drawings into a fluid animation (in the example, a dancing man) due to the process of retinal persistence.



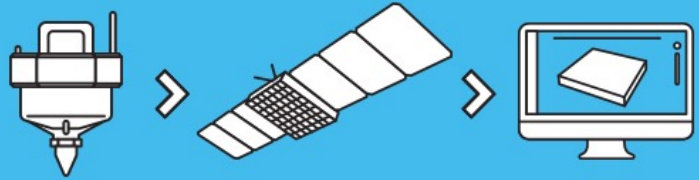
## Objectives:

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.

- 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

# EXOSPHERE CHALLENGE

BY FLEET



## What you will need:

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

## 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)

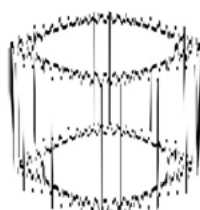
#### Senior Secondary Curriculum - Earth and Environmental Science

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:



A bee



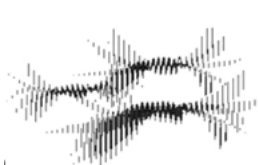
A box



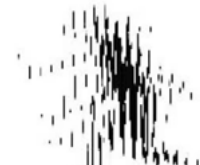
A Cat



Dancing Man



Birds



Man Walking



A Dinosaur