

Images of Light

SciArt Activity - Teacher Information Sheet

This science-art activity makes use of the refractive and reflective properties of materials to create unique and interesting photographs of light. This activity ties in to the Australian high school syllabus, by targeting the following dot points (or similar)

- Light from a source can be absorbed, reflected, and refracted,
- Energy appears in different forms, including movement (kinetic energy),
- Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures,
- A ray model of light may be used to describe reflection, refraction and image formation from lenses, mirrors, glasses, and other materials.

This activity can bring an experimental and creative aspect to science learning in the classroom, by allowing students to observe and use the refractive and reflective nature of light to create colourful and visually interesting photographs of the light structures, that can then be used by the students to decorate their spaces.

Education Links:

Year 5: ACSSU080

Year 8: ACSSU155

Years 7-10: ACSHE223

Year 9: ACSSU182

Physics: ACSPH071, ACSPH075

Year 7-8: VCSSU105

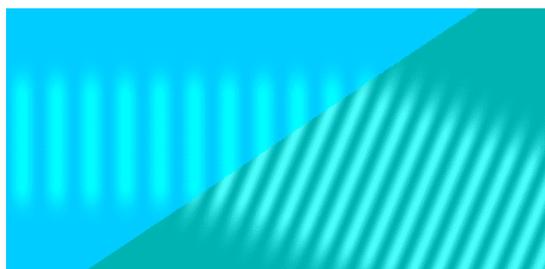
Images of Light

SciArt Activity Sheet

In this science-art activity, we make use of the **refraction** and **reflection** of light to create, observe, and photograph the images that this light produces when it interacts with materials with different properties. In this How-To guide, we use a simple drinking glass as an example of a good Refractive/Reflective Object (RO) for this activity, to create artistic images!

What are refraction and reflection?

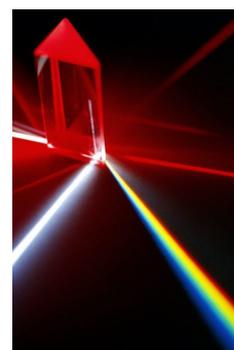
Refraction refers to the change of the direction of a wave, as it passes from one medium into another- or put more simply, it refers to the bending of waves.



Animation obtained from Wikipedia.

An **example** of this that you may have seen in your everyday life is the bending of light waves as they travel from air to glass, and vice versa.

The nature of the refraction depends on the material you're using and its shape, as well as the light source.



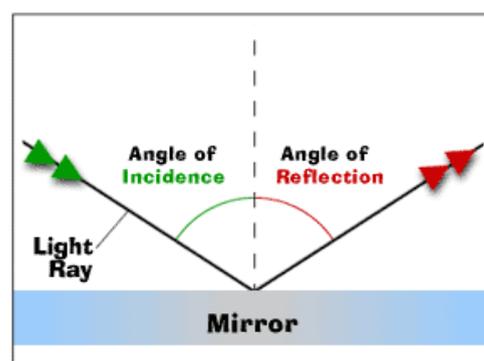
Credit: <https://www.sciencelearn.org.nz/resources/49-refraction-of-light>

Reflection refers to the change of direction of a wave at the boundary between two different media, where the wavefront remains in the same medium it began in.

We can use these interactions of light with objects and materials to create images that can then be photographed.

Credit:

<https://www.avnesh.com/2014/02/laws-of-reflection-of-light.html>



Materials

This activity, and the final images, can be extended on and diversified by playing around with all kinds of materials and objects. In the first part of this sheet, we showcase **how** to produce the images using the most basic and minimal number of objects, and in the second part we provide some possible ways to **enhance** the photographs.

The materials needed for each part are

Part 1

- A glass, preferably one with indentations or patterns
- A light source (e.g. flashlight)
- A box (optional)
- Cardboard paper or normal paper
- Scissors or cutters
- Sticky tape
- A pencil
- A table
- A photography device (e.g smartphone)

Part 2

- Additional glasses, lenses, mirrors or objects of various kinds
- Additional light sources of varying intensities
- Cellophane sheets of various colours (choose your favourites!)
- A laser pointer
- A photography device with additional settings, such as long-exposure, video, night-time photography, etc., as well as a tripod for stability
- Additional materials of your choosing, which you think will interact well with the light set up

Safety Note: you may need help from a trusted adult to support you with using some of the above materials, as they can be tricky to use!

Below are the steps for setting up the activity and creating the images of light.

Procedure

Part 1

Choose your RO (Refractive/Reflective Object):

Once you've collected the above materials, you can set up your space by placing one of the table edges against a wall, with your RO on it. When choosing a suitable RO, we recommend an **object with indentations or an interesting shape** to create more interesting light reflections or refractions. For this guide, we use this glass cup



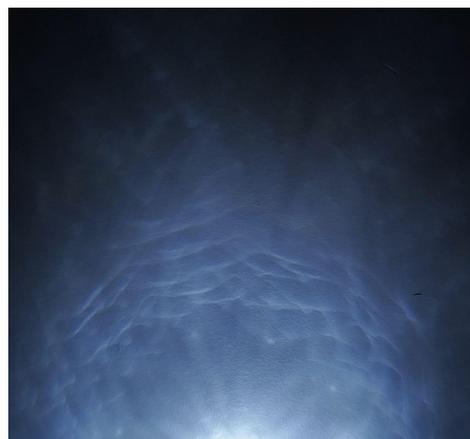
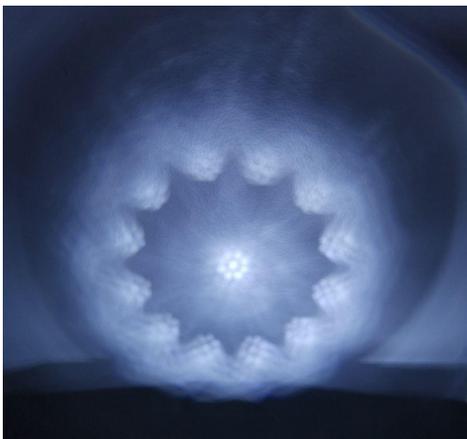
Plan Ahead! Have your materials close by - once the setup is ready, you will have to turn off other lights in the room to make the images clearer. **Safety Note:** Have a small source of light in the room, so that it's not completely dark and you don't fall and injure yourself. You might need to get help from a trusted adult to make sure that the room is dark enough for the images to be clear, without it being a safety hazard.

Shine Your Light! Start by shining your light source (here, a light torch) on your RO, and observe the patterns projected onto the wall. Play around with the RO configuration and the angle of your light source until you obtain an interesting light image - you can begin taking photos of the light structures you like.



We used the cup in the following configuration, and obtained the following light images

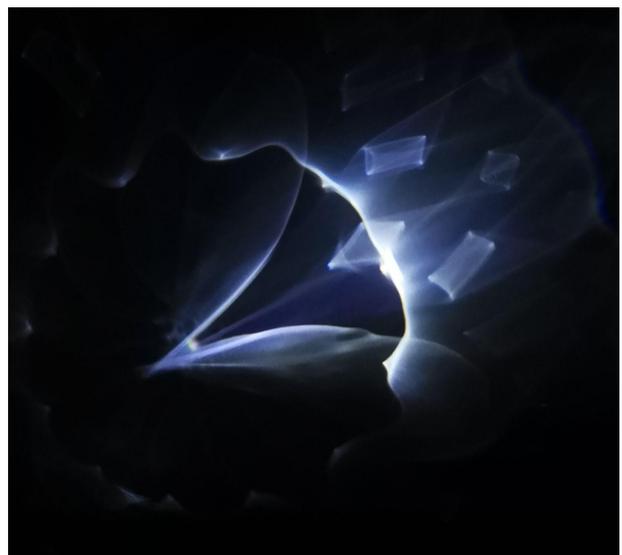
Hint: stabilize your photography device by placing it on a steady object (such as a table) to minimise blur in your photographs. Using a tripod (if available) can also help!

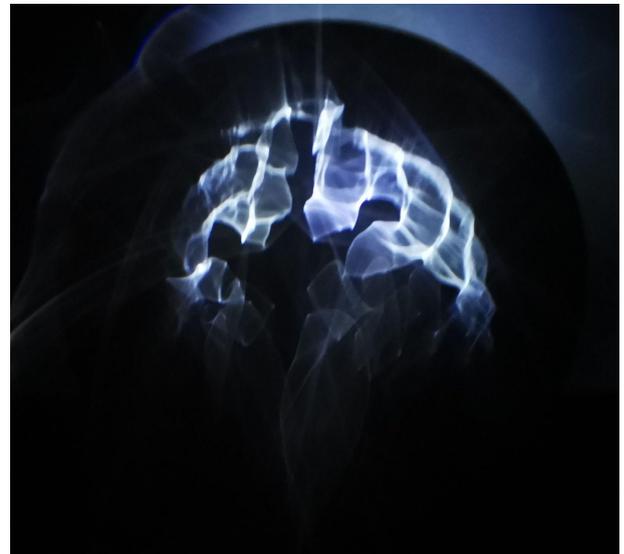




Clarify Your Image! We can control the clarity and detail in our light image by controlling the amount of light we let through, using cardboard or normal paper.

- Trace out a shape that is slightly larger than your light source onto the cardboard paper.
- Cut it out with some scissors or cutters, poking a small hole in the middle.
- Use sticky tape to attach this to your light source, like this.
- Observe the variations in the light images due to this change - we obtain the following images





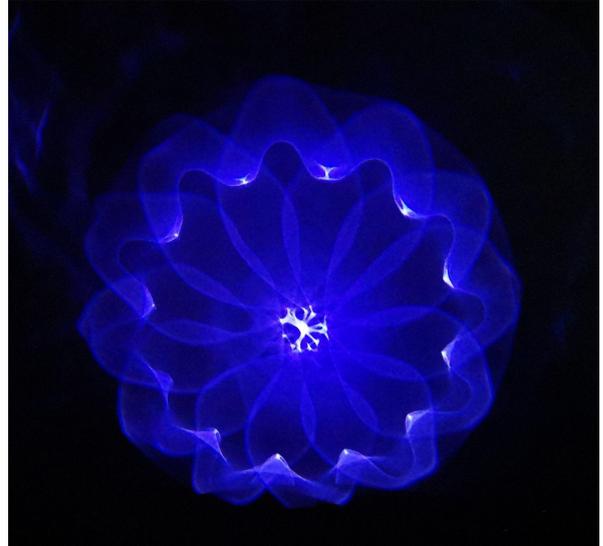
*** The basic setup above will allow you to create some interesting images, however you can extend on this using some of the techniques in part 2 below.***

Part 2

Below are some additional things you can experiment with to diversify your final images!

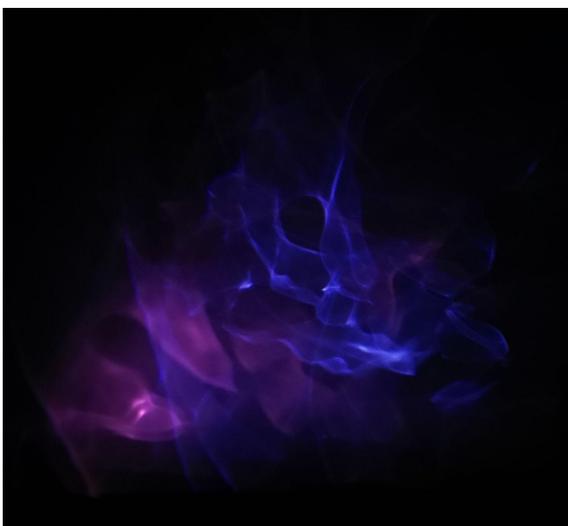
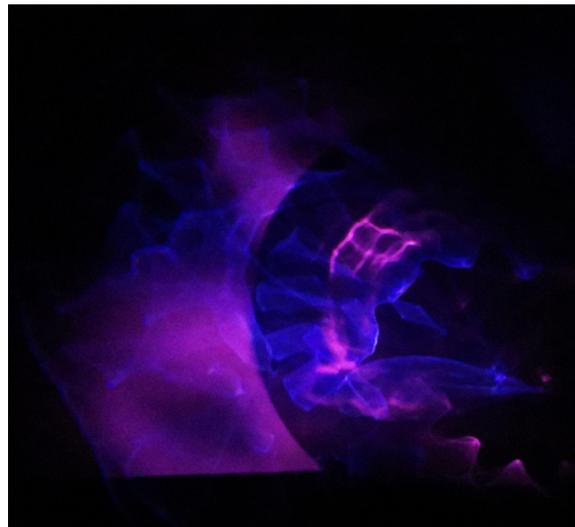
Colour

Colour can be added to your final images by using a **coloured RO**, or by adding coloured transparent sheets to your light source set up. An example is to use a few layers of a **cellophane sheet** to cover your light source, which gives us the following light images.



Light structures

You can experiment with adding more ROs (whether of the same kind or not), and/or using **more light sources** (e.g. torches) with or without cardboard paper covers and coloured sheets. Using some of these, we obtain the following images.



You can play around with your photography **device settings**, such as with video or long exposure settings. For example, we use our device's 'Light Painting' settings alongside this setup with a **laser pointer** to capture the motion of the light in an image.



A Final Note

You are encouraged to be **resourceful and curious** - walk around your home and think about how any objects found can be used to add to your images - anything can be potentially useful, regardless of how big or small, if it has the right qualities to interact with the light and RO in an interesting way.

Happy experimenting!