

→ Activity 2: Building your exoplanet in a box

The students will create their own physical model of a transiting exoplanet to understand how variations in observed light of the host star can be used to detect exoplanets (the transit method). During this activity the students will learn how to use data logging applications and interpret graphs of observed light as a function of time.

Equipment

- Student worksheet printed for each group
- Annex 1 printed for each group (optional)
- Cardboard shoebox, or similar with lid
- Torch
- Light meter (e.g. smartphone with app or datalogger)
- Craft knife / scissors
- Semi-circular protractor
- Clothes peg
- Cocktail sticks or wooden BBQ skewer
- White paper
- Sticky tape
- Modelling clay or similar

Health and safety

The construction of the box involves the use of sharp tools

Exercise 1

Explain to the students that they will design and plan the construction of a physical model to study an analogue to an exoplanet photometric transit: an exoplanet in a box. A video demonstration of the activity is available here: <https://youtu.be/gddL-mrHB2o>). Use the image provided on the student worksheet or complement this information by showing an animation (for example https://www.esa.int/ESA_Multimedia/Videos/2019/12/Detecting_exoplanets_with_the_transit_method). This could also be demonstrated by moving a ball in front of a light source.

Students should work in groups of 3 to 4 students. In their groups, the students should discuss which variable(s) need to be measured, what will change, what will be kept constant, what their set up will be, what equipment they need to take their readings, and how they will present the data.

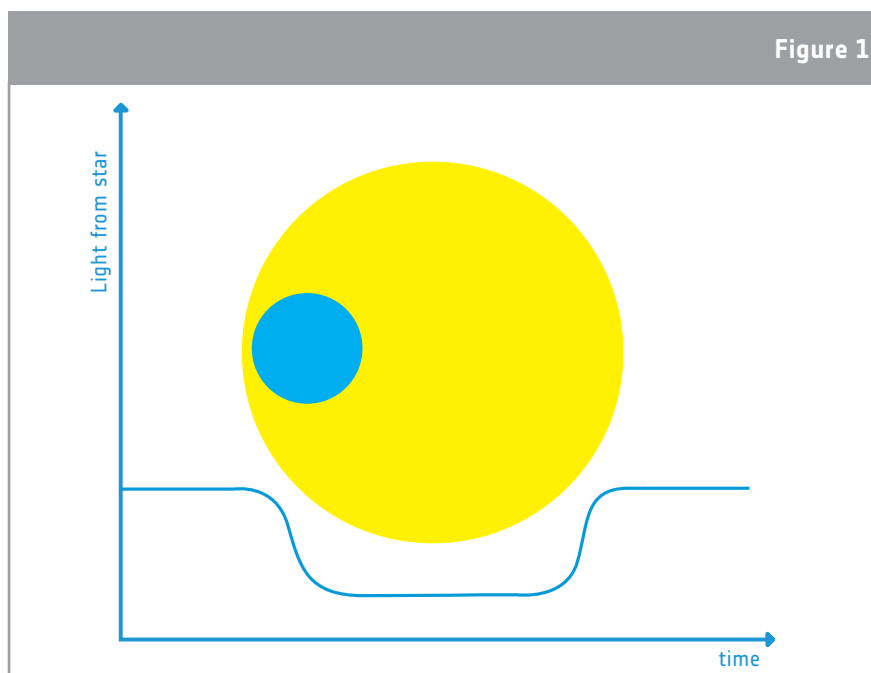
Exercise 2

After each group has prepared their plan and debated the best way to build their exoplanet in a box model distribute the materials for the groups to create their own designs. Alternatively, the students can follow the construction guide in Annex 1.

To record the data in this activity students can use a light meter. If this tool is not available to you, then there are also many apps available that enable a smartphone to be used as a substitute.

→ Activity 2: Exoplanet in a box

With your group, you will have to plan and construct a physical model to reproduce an exoplanet transit inside a paper box, like the one you see on Figure 1.



↑ Representation of an exoplanet transit. When the planet passes in front of the star the telescope receives less light and there is a dip in the measurement of the light from the star.

Exercise 1

In your group, plan how you would build a model to characterise and reproduce a light curve of an “exoplanet” transit inside a box. Take into consideration the questions below and try to answer them.

- Which variable(s) need(s) to be measured?
- Which variable(s) do you expect will change?
- Which variable(s) should be kept constant?
- What will be your set up?
- What equipment do you need to take readings?
- How will you present the data?

Exercise 2

After presenting your plan to your teacher build your exoplanet in a box and test it.