



EXOPLANETS: A NEW EARTH?

In order to obtain a Bronze CREST Award students should spend approximately 10 hours researching exoplanets and choose one that they think may be suitable for humans to live on.

About CREST Awards

CREST is an easy-to-run STEM enrichment scheme in the UK, endorsed by UCAS for use in personal statements. It allows 11-19 year olds to build skills and demonstrate personal achievement in creative STEM (science, technology, engineering and maths) project work supporting their curriculum-based learning. CREST is run by the British Science Association, accredits over 35 other national schemes and offers tangible benefits to both students and teachers. CREST Awards can now also be used toward a 'skill' section in the Duke of Edinburgh's Award scheme at the corresponding level. Find out more at: www.britishsociety.org/crest

Prompts

The student brief (page 24) gives some triggers to start students thinking. They should realise that each trigger implies several items to compare. Encourage students to identify possibilities themselves and refer them to the relevant activities (see activity links below). However, if still necessary additional prompts such as the below might be given to point students in suitable directions.

Prompt on student brief	
How do astronomers investigate planets outside our solar system?	
How was your exoplanet discovered?	
Additional prompts	Activity Links
What methods are there for detecting exoplanets?	<i>Activity 1: The transit method</i>
What does the light from the star/planet tell us about an exoplanets size, orbit and atmosphere?	<i>Activity 3: Exoplanet atmospheres</i>

Prompt on student brief	
What different types of stars are there?	
How is your exoplanet's star different from the Sun?	
Additional prompts	Activity Links
The Sun is called a yellow dwarf; what are other star called and why?	<i>Activity 2: The habitable zone</i>
For your exoplanet system, is the habitable zone closer or further away from the star than that of the Solar system? Why?	<i>Activity 3: Exoplanet atmospheres</i>

Prompt on student brief	
What are conditions like on different planets?	
Could the exoplanet sustain life - how could humans survive there?	
Additional prompts	Activity Links
Does it have an atmosphere? Is it breathable?	<i>Activity 3: Exoplanet atmospheres</i>
How hot or cold is the planet?	<i>Activity 4: Planet density</i>
What is the planet made of? Would you be able to stand on it?	<i>Activity 5: Day and night, seasons</i>
Is the gravity stronger or weaker than on Earth?	
How long is a day on the planet, what sort of seasons does it experience?	
What conditions are needed to make a planet habitable for humans?	
What type of equipment might humans need to live on the exoplanet?	

Suggestions for supporting students

Students must research and select information for themselves. However, they may need some direction from you to identify suitable sources of relevant information at an appropriate level. Though primarily based on secondary sources, the research project is likely to be more meaningful if the students if the student includes some practical work. This could build on some of the Exoplanet Physics activities. One possibility is for two students to undertake their projects – one research, the other practical – working independently, but coming together, to share mutually useful information and activities.

Although Bronze Award students are not expected to have an official Mentor for their project, access to expert advice makes students feel their work is important. Also, if the topic is not in your area of expertise, you may find a Mentor valuable. Your CREST Local Coordinator may be able to suggest suitable contacts. Alternatively you can use the Institute’s web-site to source a physicist:
www.iop.org/engaging_physicists.

Someone with knowledge and/or experience of astronomy and/or exoplanets would be ideal.

Discuss with students how they will manage their time (after school clubs, working during lunch hours, homework). Agree a completion date with them.

Students should decide their focus, although this may alter in the light of experience as the project progresses.

Internet Search

Useful search terms: exoplanet – habitable planet – main sequence star

Or try:

planetquest.jpl.nasa.gov

kepler.nasa.gov

exoplanets.org or exoplanet.eu

phl.upr.edu

Alternative CREST projects

For other Bronze, and also Silver and Gold CREST Award project ideas visit www.iop.org/exoplanets



EXOPLANETS: A NEW EARTH?

The search for a new Earth

Astronomers have discovered thousands of exoplanets in our galaxy. Some of them orbit stars much hotter than our Sun; others planets go around stars that are cooler. Astronomers think there may be billions of exoplanets in our galaxy. Do any of them have life? Could we live on them one day?

Have you ever wondered?

Are there other Earth-like planets in our galaxy?

You might like to imagine yourself in a situation such as...

You are part of a team of astronomers that is planning a mission to send a probe to an exoplanet. You want to find out what conditions are like on the surface to see if humans may be able to live there one day. But with so many exoplanets to choose from which one would you select for the mission?

Your task is to research exoplanets and choose one to send a probe to. You decide to:

- Research conditions needed to make a planet habitable
- Compare data available on different exoplanets
- Recommend one exoplanet

Health and Safety

Should you decide to carry out an experiment or practical activity:

- (a) find out if any of the substances, equipment or procedures are hazardous
- (b) assess the risks (think about what could go wrong and how serious it might be)
- (c) decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on)
- (d) make sure your teacher agrees with your plan and risk assessment
- (e) If special tools or machines are needed, arrange to use them in a properly supervised D&T workshop.

Note: Your teacher will check your risk assessment against that of your school. If no risk assessment exists for that activity, your teacher may need to obtain special advice. This may take some time.

Some things to think about:

- How do astronomers investigate planets outside our solar system?
- How was your exoplanet discovered?
- What different types of stars are there?
- How is your exoplanet's star different from the sun?
- What are conditions like on different planets?
- Could your exoplanet sustain life – how could humans survive there?