

## **A Level Physics – A journey through time and space - The Solar System and Beyond**

*Morning prospective physicists. Today we are going to be starting on our exciting research project on the Solar System. It will involve you investigating, watching and researching using a range of different resources to answer some key questions.*

*Each week will involve you researching a particular area and then completing a short task (details will be on each week's assignment). The aim is that we start to look at some A level content as well as some interesting stuff from the world of Astrophysics. You can turn in a task each week to demonstrate your progression. The project will culminate in an extended written piece that you will bring with you to induction in September. As you get your assignments you can either ask questions on here or you can email me on **slawrence@toothillschool.co.uk** if you need to. I hope that you find the tasks both engaging and enjoyable. There is a wealth of material available for our subject, please have some fun in finding out about the wider physics beyond our Earth.*

### **Week ONE: The Solar System : The current view**

- **The key structures in the Solar System**
- **Features of the planets**
- **Additional structures**

***Task :*** You need to research and detail the key structures found in the Solar System. This task builds upon the key discoveries discussed in week one. You will need to describe the key features of each object and its place in the Solar System. Current understanding of the object will be important. Historical context may be of interest here too.

***Key structures – Sun, Inner (Rocky) planets, Outer (Gas giants) planets.***

***Additional structures – Comets, Asteroids, Kuiper Belt, Oort Cloud, Heliopause.***

#### **Useful websites:**

<https://solarsystem.nasa.gov/planets/overview/>

<https://nineplanets.org/tour/>

***BBC iplayer – ‘The Planets’*** - <https://www.bbc.co.uk/iplayer/episode/p06qj2l5/the-planets-series-1-1-a-moment-in-the-sun-the-terrestrial-planets>

***Podcasts :*** You can use these podcasts to search for any particular planet – This first podcast discusses Mercury <http://www.astronomycast.com/2007/08/episode-49-mercury/>

Use the ***BBC Sounds app*** <https://www.bbc.co.uk/programmes/p004y25b>

<https://www.bbc.co.uk/programmes/p033k0td>

***Disney Plus*** - The National Geographical channel includes a range of informative programs– Search for ‘Cosmos’ by Neil deGrasse Tyson (Episode1), Mission to the Sun or Exploration Mars.

## **Week ONE Extension: The history of observation : Seeking truth in the heavens**

- What is the Solar System?
- Understand that the scientific model has changed over time
- Appreciate the key historical figures and the importance of their discoveries

**Task :** Science has always been fascinated with seeking the explanation for the Earth, Sun, Moon and planets. Many theories have been developed and discarded over the period of historical time. Disagreements have arisen and scientific observation has often been ignored as an inconvenient truth.

Your task is to investigate a few of the key players and their contribution to the current model of the Solar system. Each have made a significant contribution at different points in the process.

An appreciation of their key piece of scientific reasoning and how this changed the model is called for here. How they collected their evidence and then presented it to the wider scientific community should be shown.

Scientists to consider (chronological):

***Nicolaus Copernicus, Tycho Brahe, Johannes Kepler, Galileo Galilei, Isaac Newton, William and Caroline Herschel, John Adams (see example), Clyde Tombaugh***

### **Useful websites:**

Scientific Revolution : <https://www.youtube.com/watch?v=w70BkCqgyyI>

Renaissance Astronomy :

<https://www.atnf.csiro.au/outreach//education/senior/cosmicengine/renaissanceastro.html#renaissance>

Wikipedia – <https://en.wikipedia.org/wiki/Heliocentrism> This is often a very reliable source for Physics. Use carefully and not as a single source!

Podcast : History of observations: 500 years of looking skywards.

<http://www.astronomycast.com/2018/09/ep-500-live-celebration/>

Example :

**Name :** John Adams (1819-1892), England.

**Key Discovery :** Predicted the existence of a new planet. Observations correctly identified the planet now known as Neptune.

**Observational technique :** Studied the orbit of Uranus. Understood that this orbit appeared to 'wobble'. Used mathematical techniques to predict that another large object must be causing these irregularities. Used NEWTONS Law of Gravitation to predict the size and position of the unknown object.

**Overall contribution :** Adams did not publish his theory at the time. However, a French astronomer called Le Verrier carried out a similar set of calculations and was initially credited with the discovery!

## **Week TWO: Exoplanets – Other star systems and their planets**

Over the last twenty years, new technologies have allowed science to discover planetary systems in orbit around other stars. Such planets are known as **EXOPLANETS**. This task involves you developing an understanding of the search for these objects and then considering the possibility of life existing in the Milky Way galaxy. From the methods used to find exoplanets and the necessary conditions for life to develop, we can learn the difficulties finding a habitable planet and the possible rarity of life existing. There is a great range of possibilities of life existing in our galaxy, but ultimately, we will not know whether intelligent life exists, until we find it.

Task 1 : Read the article ‘Exoplanets – Worlds beyond the Solar system’.

Then complete the question sheet on exoplanets.

Task 2 : Using the weblinks below, explore the different planets that we now have knowledge of.

Choose ONE exoplanet and write a short scientific piece on the planet and its surroundings.

### **Useful websites/links:**

<https://www.gresham.ac.uk/lectures-and-events/exoplanets-and-how-to-find-them>

<https://exoplanets.nasa.gov/>

<https://exoplanets.nasa.gov/alien-worlds/ways-to-find-a-planet/>

<https://eyes.jpl.nasa.gov/eyes-on-exoplanets.html>

<https://www.planetary.org/explore/space-topics/exoplanets/>

<https://exoplanetarchive.ipac.caltech.edu/>

Podcasts : BBC Sounds app - <https://www.bbc.co.uk/programmes/b03brwql>

<https://www.bbc.co.uk/programmes/p03jrv2t>

**Toot Hill Summer Project titles (students choose one):**

**Physics A Level Summer Task:** This task is the culmination of your hard work and research over the last four weeks. It is an opportunity to build upon your knowledge and present a detailed piece of work on a particular area that you have found most interesting. This task should be carefully prepared and include reference to your previous work, the use of diagrams and illustrations and be pitched at an appropriate level for your A level studies.

The complete project will be **between 1,200 – 1,500 words** and be of at least 3 pages in length (font 12). It should include your name and the project title in the heading.

The project will need to be completed by **midday (12:00pm) on Monday 4th September 2023** and emailed directly to [slawrence@toothillschool.co.uk](mailto:slawrence@toothillschool.co.uk).

**Please choose ONE of the project titles :**

1. Present a historical perspective on the Solar System and how the current model has been developed over the last millennium
2. Provide a clear understanding of the Solar system and the structures that are found throughout the realm.
3. Explain the ongoing development of space exploration. Describe the key benefits to humanity and the justification for spending billions of pounds in the pursuit of knowledge.
4. Consider the following quote 'Two possibilities exist: Either we are alone in the Universe or we are not. Both are equally terrifying'. [Arthur C. Clarke](#). Discuss the possibilities of life beyond our planet (i.e exoplanets) and the current scientific studies that explore this concept.