SPACELINK LEARNING FOUNDATION

Link Up
March 2014

Welcome to our Newsletter

Figure 1

This months Article by
David Shelton

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Aurora and planet hunting

This month I thought I would talk about two recent events in the world of astronomy: The aurora Borealis and planet hunting with Kepler and PLATO.

On the night of the 27th February, some of us in the UK were lucky to see the aurora Borealis or the "Northern Lights" (figure 1). In fact, you could see them as far south as Reigate (please send in any pictures you may have of them) and I'm sure there a lot of people wondering how they happen. The aurorae we saw was actually caused by an event on the Sun. The Sun normally releases a stream of particles through the solar system called the solar wind and sometimes some of these particles are able to get through the Earth's magnetic field and interact with our atmosphere around the poles (figure 2). This is why some of the best places to see the aurora Borealis is around the arctic circle (there are also aurorae near the south pole called the aurora Australis). However on the 25th February, the Sun released a very large solar flare (we call it an X-class flare) and a large coronal mass ejection (CME). A CME is a massive release of particles and magnetic field from the Sun. So this huge cloud of particles heads into space and some of this cloud comes towards us. Once it reaches the Earth's magnetic field, it starts to interact with our magnetic field and some of the particles are able to get through to our atmosphere. In this case, the cloud of particles was so strong, they were able to interact with our atmosphere as far south as the UK.

The second thing I'm going to talk about is finding new planets around other stars. At the end of February, NASA announced that the Kepler spacecraft (figure 3) has found 715 new planets since it was launched in 2009 and there's still a potential 3,600 candidates that could be confirmed. This means that currently our exoplanet count stands at 1,700 and Kepler itself has discovered 960 of those 1,700 planets. Of these new confirmed planets, nearly all of them are planets that are smaller than Neptune and four of them lie in the goldilocks zone (so where there could be liquid water). The data from Kepler will keep scientists going for few years. That is until a new European mission called PLATO (figure 4, page 4) will launch.

PLATO will launch in 2024 and its aim is to find out what conditions are required for planet formation and life and how a Solar System works. PLATO will look at relatively nearby stars (approximately 1 million) and be able to measure a planet's mass and radius. PLATO will use the same technique of detecting planets as Kepler has done (by measuring the dip in brightness of a star when a planet moves in front of it).

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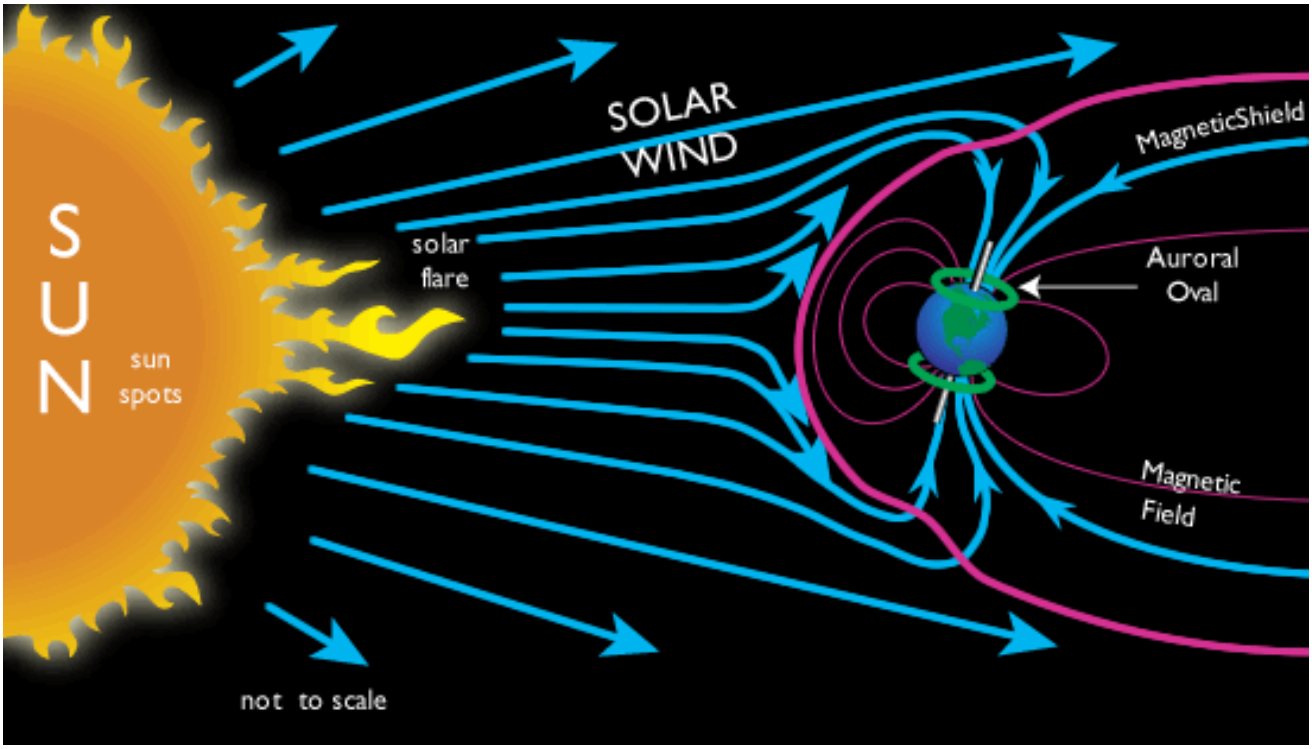

Figure 2

Figure 3

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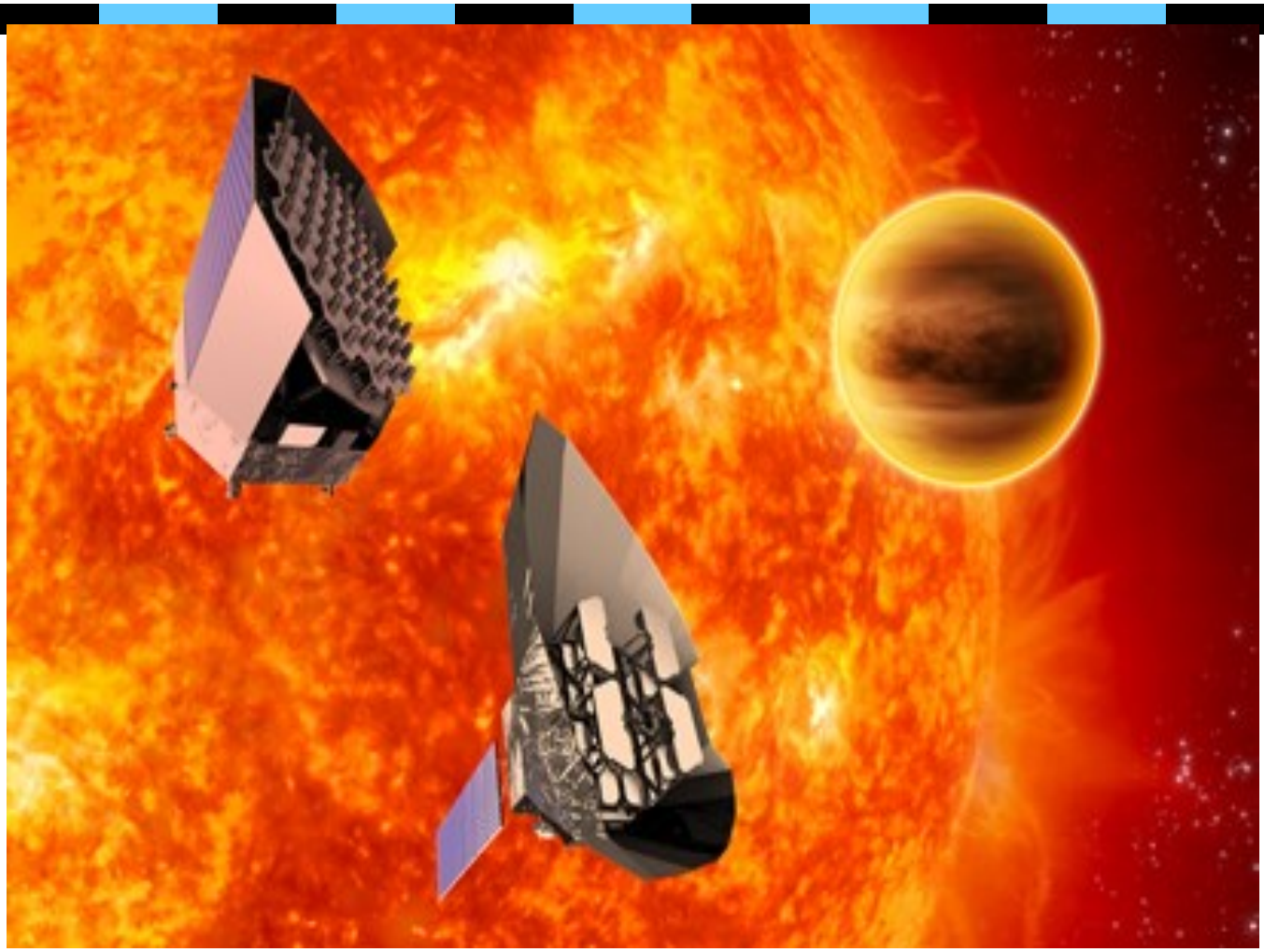


Figure 4

Many thanks for our next Article,

HOW MOST OF YOU WILL GO TO SPACE

by David Ashford.

David Ashford is the Managing Director Of Bristol Spaceplanes Ltd and the author of *Space Exploration: All That Matters Hodder 2013*

This is an artist's impression of the Spacecab project

HOW MOST OF YOU WILL GO TO SPACE

I guess that most of you would like to visit space. I also guess that not many of you think you actually will: space travel is very expensive and risky, isn't it? Well, this is how your trip is likely to come about.

Imagine a fleet of a dozen aeroplanes powered by rocket engines that can take off from an ordinary airport and climb and accelerate to orbit. There they dock with space hotels with facilities for looking at the view and playing around in zero-g. A visit of a few days will cost about one year's pay for an ordinary sort of person, which is about one thousand times less than it is today. This may sound like science fiction but could actually happen in about fifteen years. The main obstacle is that NASA and the other big space agencies are not showing much interest in spaceplanes. So I'll lay out the reasons why I think it will happen soon and let you judge for yourselves.

Early satellites were launched using converted ballistic missiles, as these were the first man-made objects capable of reaching space. These could fly once only, which could never become economical. So, in the early 1960s most large aircraft companies had teams studying spaceplanes. My first job was working on one of these. We thought that they were the obvious next step in space transportation and that we could just about build them with the technology of the day. Well, they have never been developed. Initially this was because of the intense pressures of the Cold War. The USA and the Soviet Union thought that there was not enough time to build spaceplanes and still win the race to the Moon. The mighty Saturn launchers were therefore still thrown away after each flight.

The next big project was the Space Shuttle. The early designs were fully reusable. They were also large, so that they could launch the big US spy satellites. Then President Nixon imposed a budget cut and this large spaceplane could no longer be afforded. The throwaway habit was by then strong enough for NASA to make the disastrous mistake of giving up on full reusability. As a result, the Shuttle was as expensive and risky as the throwaway launchers that it replaced. What NASA should have done was to build a much smaller but fully reusable launcher. This would have introduced the aeroplane approach to flying to space. It is this history of persisting with throwaway launchers that makes the space agencies so reluctant to discuss spaceplanes.

However, all is not lost. Several companies are building spaceplanes that can fly up and down briefly to space height, with just a few minutes in space. Richard Branson's Virgin Galactic is in the lead. It is very likely that one of these companies, or a new one, will eventually make a success of carrying passengers on brief flights to space. There will be a fleet of a dozen or more space-planes, each making several flights per day. The advantages of aeroplanes over missiles for everyday transport will then be clear for all to see. Then the space agencies will be very likely to support the development of a spaceplane that can fly all the way to orbit to launch satellites and carry crew and passengers (including you!) to space hotels at an affordable cost. Compared with spaceplanes that can provide just a few minutes in space on a basically up and down flight, a fully orbital spaceplane needs about eight times more speed, and will therefore be more difficult to develop. But we knew how to do it in the 1960s!

This future could be speeded up if the space agencies could be persuaded to overcome their preju-dices soon. So, there is a challenge for you!

DID YOU KNOW?

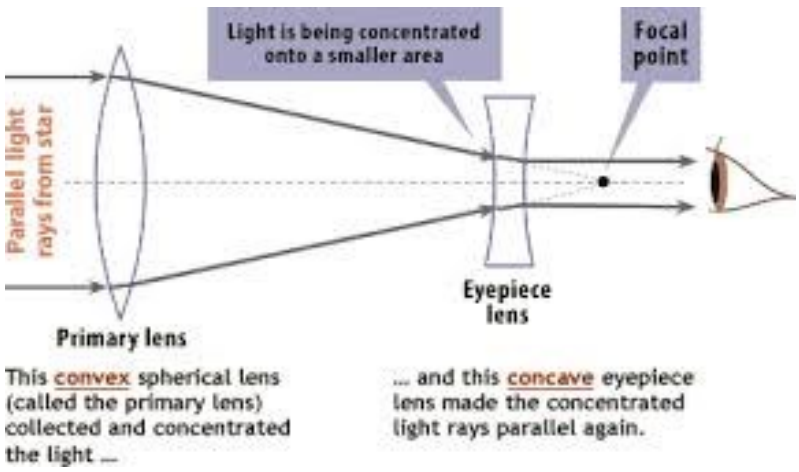
In last months *Newsletter we saw* how as long ago as the 1600s, Galileo was discovering the wonders of the night sky with his telescope.

Galileo also discovered that when he viewed Venus and Jupiter with the naked eye, Venus appeared much larger than Jupiter. But when viewed through his telescope , he saw Jupiter much larger than Venus.

This illusion Galilei realised must lay with the human eye—perhaps light is refracted in the moisture that covers the pupil, or because it is reflected from the edges of the eyelids and these reflected rays are diffused over the pupil.

Recently we have discovered that this is all to do with our brains.

Neuroscientists at the State University in New York research is that the brain responds to light and dark objects differently, the brightness of a planet distorts its apparent size when viewed against the darkness of space. This explains when it is easier to read this article with black lettering on a white background, rather than white lettering on a black background..



Galileo Refracting Telescope

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