RIP Katherine Johnson

March 2020

On the 24th February 2020 we lost one of the true icons of international science. Katherine Johnson was an African American mathematician who worked for NASA for 35 years.

She was part of a team of women, known as the 'West Computers' who were responsible for calculating trajectories, launch windows, and emergency return paths for the Apollo missions which first put astronauts on the Moon.

She also calculated the safe return of the fated Apollo mission in 1970.

Katherine Johnson will always be remembered as a pioneer in her field and an inspirations to generations of scientists around the world.

Biography | NASA Biography | A Human Computer | Changing the World | Hidden Figures

Global Biodiversity

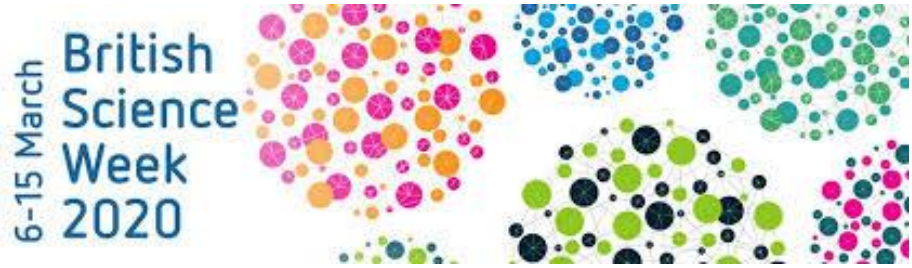
Planet Earth has incredible biodiversity, about 8.7 million different species. As part of British Science week check out these inspiring clips.

Wonderful World | What is Biodiversity
Earth's Biodiversity | BBC Earth | Eyewitness

British Science Week

Friday 6th March 2020 is the start of British Science Week. This annual celebration of science has the theme 'Our Diverse Planet' this year.

As always there are fantastic activity packs you can download from https://www.britishscienceweek.org/



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The Sun and Earth

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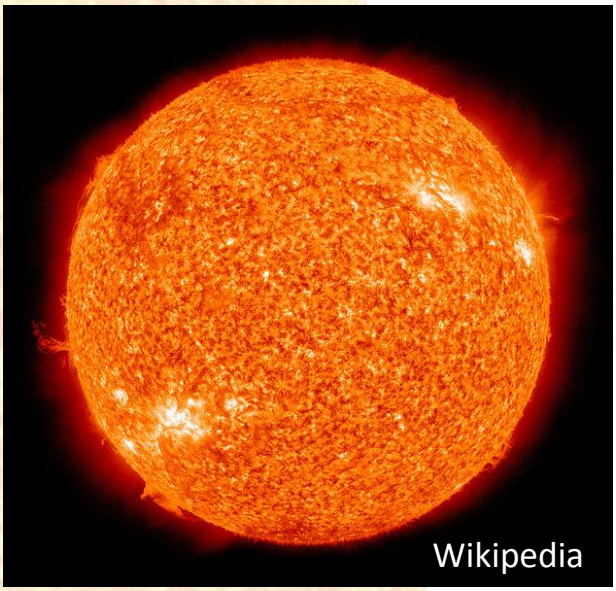
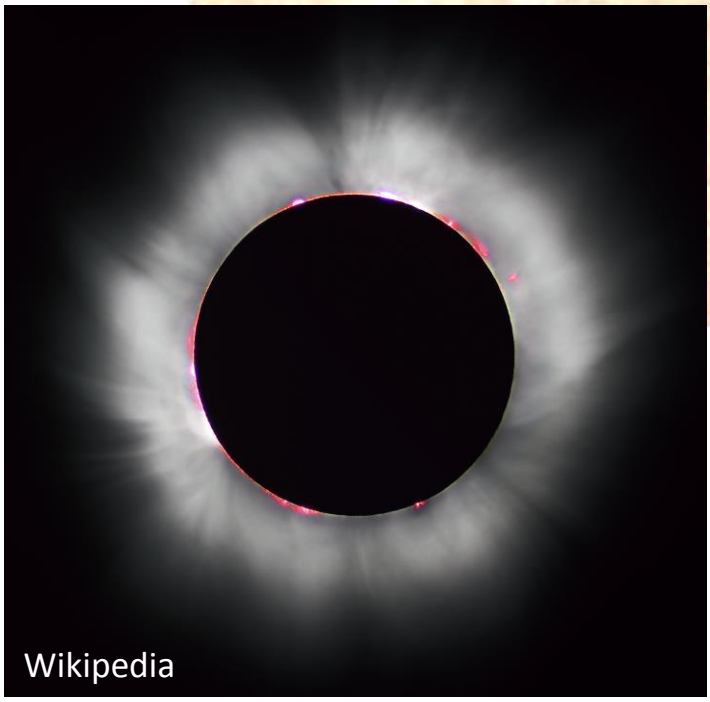
The Sun, our star, gives us energy, light, heat, everything we need for life here on Earth. It is important that we understand the Sun and how it interacts with the Earth. We can study the Sun from the Earth with solar telescopes, but we can also study the Sun from space, with dedicated solar satellites.

The Sun is very, very hot. The core, where energy is produced is around 15 million degrees Celsius. The energy is then transferred through a radiative zone, bouncing around like a pinball machine.



In the layer beneath the surface, energy is transferred by convection. The Sun's surface, the photosphere, is about 6000 degrees Celsius.

Recently, we have had a really close look at the Sun's surface, with a new telescope called DKIST. It is fascinating to see the Sun bubbling due to convection in the upper layers (like a pan of porridge on a cooker!). The energy from the Sun's surface is radiated away, some reaching us on Earth.



During a total eclipse of the Sun, the Moon exactly blocks out the very bright light from the Sun's disk, and we see a faint halo or crown of light (the solar atmosphere, called the corona). We can see beautiful structures where the gas traces out the Sun's magnetic field.

These stretch far out into space. The corona is very hot, around one million degrees Celsius, much hotter than the Sun's surface. This is very strange, and solar scientists are trying to understand why the corona is so hot. We have made some progress, but there remain some puzzles. Gas flows off the Sun continuously and we call this the solar wind.

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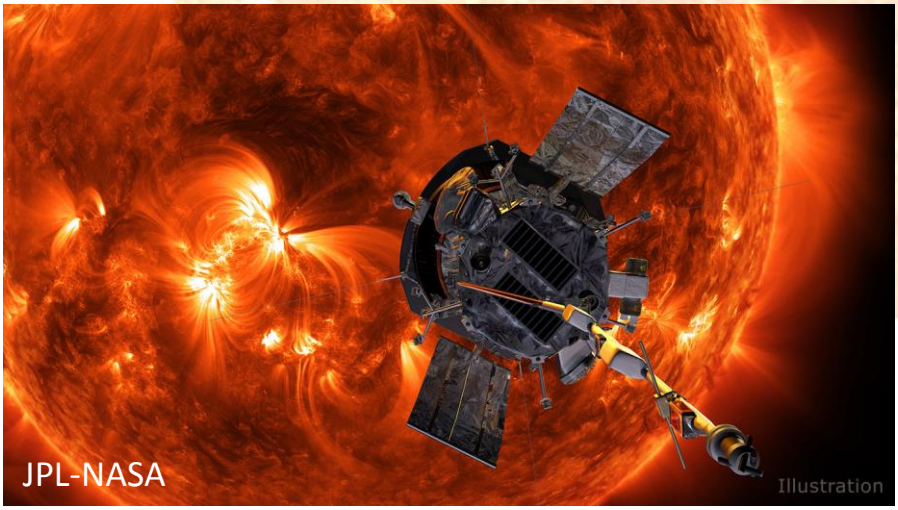
Sometimes on the surface of the Sun there are dark spots, called sunspots. These have been recorded since the time of Galileo.

When there are many sunspots, the Sun is very active, with explosions called solar flares, and material shoots out into space. When there are very few, the Sun is very quiet, as it is at the moment, but in just a few years time there will be a lot of solar activity.

The solar wind which flows from the Sun, out into the solar system, is charged (magnetised) and can interact with the Earth's environment. Fortunately, we are protected by a sort of magnetic blanket, but sometimes the Earth's magnetic field is disturbed, causing beautiful effects such as the Northern lights (aurora).

The Sun's violent activity can also cause unwelcome effects on out modern technology, such as damaging satellites, causing electricity blackouts, harming astronauts in space. We call the interaction between the Sun and the Earth 'space weather'.



Two satellites have recently been launched to help us better understand the Sun, solar wind and its interaction with the Earth's environment. NASA's Parker Solar Probe, PSP, was launched in August 2018, and is called the mission 'to touch the Sun'. It orbits round and round the Sun getting closer each time, using the gravity of Venus to pull it towards the Sun, sampling the solar wind and making other measurements.

The first science results were recently published in the international journal 'Science'. This is the first satellite to be named after someone (Eugene Parker) who is still living. He was able to watch it be launched. What a thrill that must have been!

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The second solar satellite to be launched recently, earlier this year, was ESA's (European Space Agency's) Solar Orbiter, SoLO. The satellite and its instruments have a great investment from the UK's engineers and scientists. SoLO will not go as close to the Sun as PSP, but it has a different set of instrument which will observe the Sun and also sample the solar wind. It will also go to higher latitudes (out of the plain of the solar system) to see closer to the Sun's polar regions. Both PSP and SoLO have needed very special technology and materials to protect them from the Sun's intense heat, and to guide them on their journey.

Wikipedia Commons

Nps.gov

These are very exciting times for solar science. Over the next few years we shall be able to learn so much more about our Sun and how it affects the Earth. The Sun is just an ordinary star, so finding out more about our Sun will help us to understand more about other stars, especially those which may have exoplanets orbiting around them which may host life, like our Earth.

WARNING: Never look at the Sun directly, or with sunglasses, or through binoculars or a telescope etc… this could damage your eyes, even make you go blind, it is much too bright. In order to study the Sun we use special solar telescopes or project an image.

Useful websites:

In Our Time: Solar Wind, with Helen Mason
https://www.bbc.co.uk/programmes/m000dg9n

Royal Institute – A Closer Look at the Sun - Helen Mason
https://www.youtube.com/watch?v=eptVGN9XQ68

NASA's Parker Solar Probe:
https://www.nasa.gov/content/goddard/parker-solar-probe

ESA's Solar Orbiter
https://www.esa.int/Science_Exploration/Space_Science/Solar_Orbiter

DKIST First Light
https://astronomynow.com/2020/01/29/daniel-k-inouye-solar-telescope-dazzles-with-first-light-images/

Sun|trek - Solar space satellites and resources – led by Helen Mason
http://www.suntrek.org/