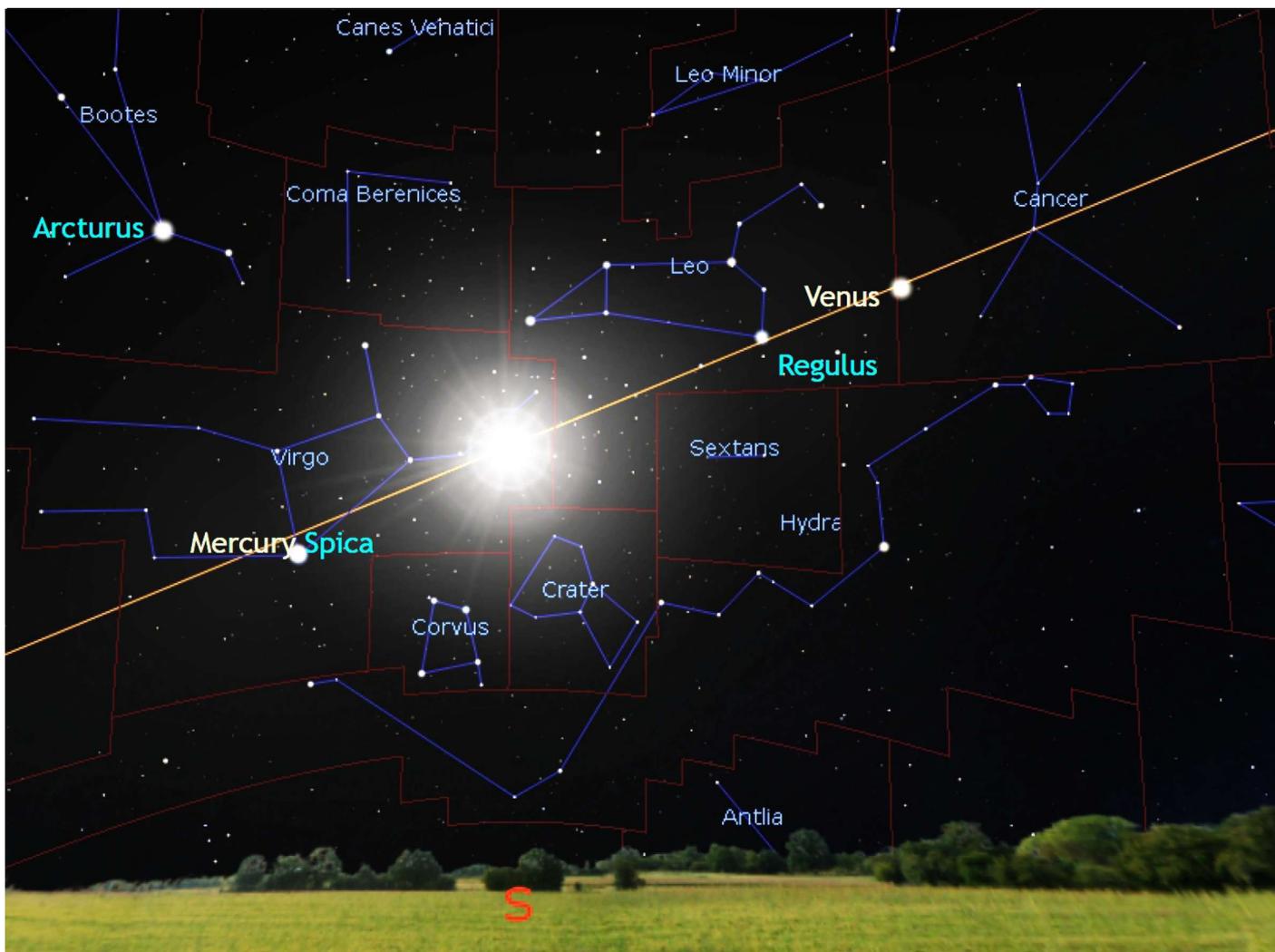


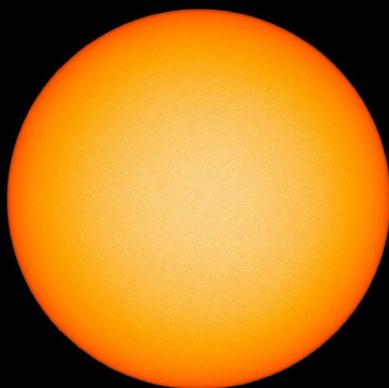
# Prime Meridian (130) September 30, 2020

On September 22, 2020, we passed through the Autumn Equinox. Carbon dioxide rises, sea ice melts and aviation looks for new technology. We argue that space must be a new frontier for environmentalists.

Above: Sun through yellowing leaves on the morning of the Equinox. New Ash Green, Kent, UK.



## Autumn Equinox: September 22, 2020



The Equinox occurred at 13:31 Coordinated Universal Time (UTC). The chart above shows the view of the Sun, planets, stars and constellation maps for local roughly around midday (modified from *Stellarium*). Coincidentally, Venus slid from the constellation of Cancer into Leo (according to astronomer's boundaries) around 19:30 UTC in the evening. Mercury, innermost planet to the Sun, was very close as seen in the sky to Spica, brightest star in Virgo (about 250 light years away). This, consists of two massive bright stars, orbiting each other in 4 days.

Left: The Sun from NASA's Solar Dynamics Observatory at 01:45:00 UTC. There were 33 days without sunspots, until Sept. 24, 2020.

This was the Vernal Equinox for the Southern Hemisphere. After half a year of night, the Sun had risen at the South Pole. Amundsen-Scott South Polar Station at 18:35:06 UTC.

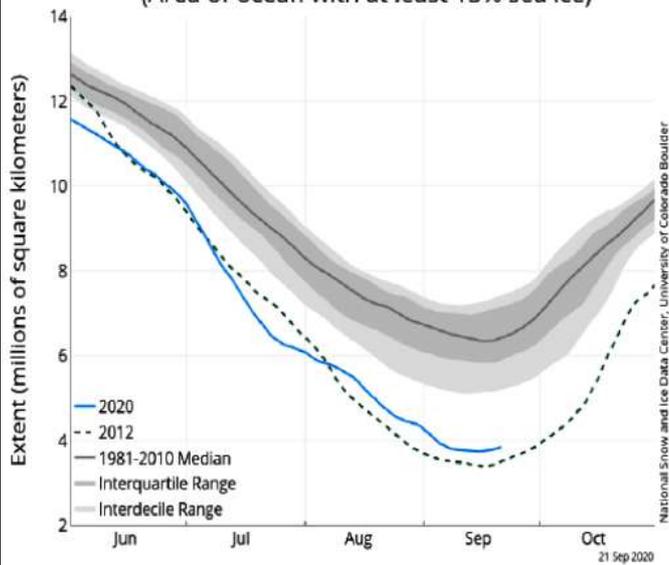


The aviation industry, a major cause of CO<sub>2</sub>, is pursuing research to eliminate its emissions. This Airbus concept (published Sept 21, 2020) has a blended-wing design and is powered by hydrogen.



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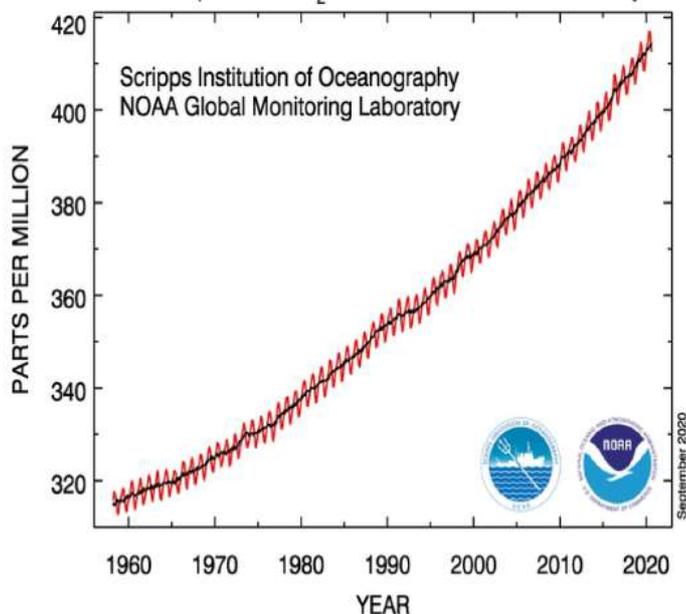
Arctic Sea Ice Extent  
(Area of ocean with at least 15% sea ice)



Carbon dioxide and temperatures rise, extreme melting of Arctic sea ice threatens to undermine global climate, but aviation is among the industries working to eliminate its CO<sub>2</sub> emissions.

Arctic weather conditions meant that 2020 saw the second smallest ice extent on record - but not as dramatic as 2012. On September 21, 2020, the USA's National Snow and Ice Data Center, announced that the Arctic Sea Ice shrank to its minimum summer size on September 15. This was only the second time in the satellite record (began 1979) sea ice extent fell below 4.0 million square kilometres. From September 8, daily melt began to level and a seasonal minimum extent of 3.74 million square kilometres was seen on September 15, apparently 2020's lowest extent. NSIDC said "In response to the setting sun and falling temperatures, ice extent will begin increasing through autumn and winter."

Atmospheric CO<sub>2</sub> at Mauna Loa Observatory

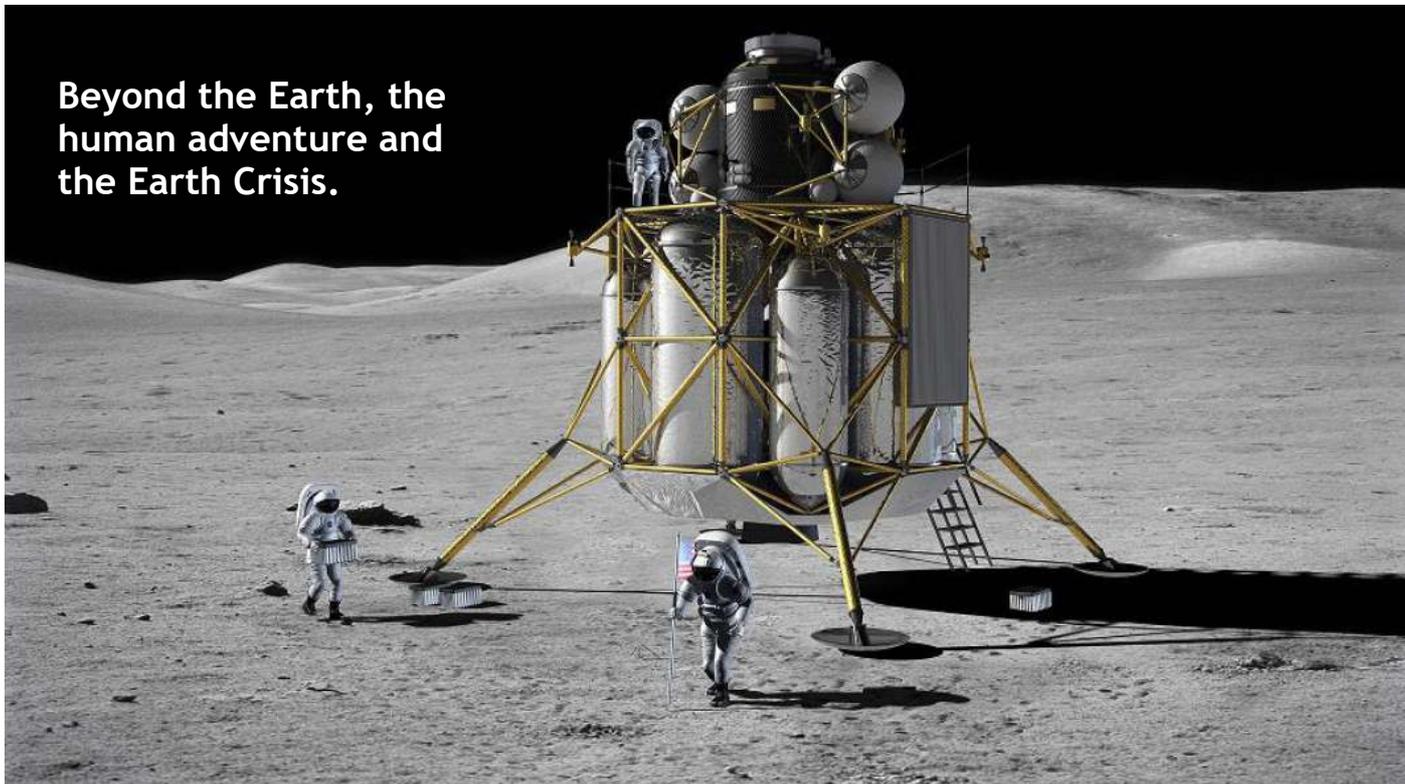


At the same time, measurements of the atmospheric carbon dioxide concentrations up on the Mauna Loa Observatory, Hawaii, revealed that CO<sub>2</sub> produced by human activity has continued to climb despite COVID-19 pandemic. In August 2019, CO<sub>2</sub> had reached 409.95 ppm, but in August 2020, it had risen to 412.55 ppm.

Concept aircraft explored by Airbus may be operational by 2035. This should reduce global emissions, but will technological advances move fast enough to combat our CO<sub>2</sub> output?

More info on last page

## Beyond the Earth, the human adventure and the Earth Crisis.



Half a century after the Apollo missions, the USA has plans to return to the Moon by 2024. NASA has made a formal announcement to pursue its £22 billion (\$28 billion) Artemis mission. The space age famously envisaged by Stanley Kubrick (1928-1999) in his 1968 film *2001: A Space Odyssey* never happened. Between 1969 and 1972, *Homo sapiens* stepped briefly on the surface of our Moon. Its average distance is 384,399 km from the Earth and that was an historic moment of geological time when life on Earth extended to another astronomical body. As our civilisation expands once again to the Moon, it's time for environmentalists to expand beyond the Earth with humanity's outreach. There will be the same arguments that we heard in the 1960s, about whether the money spent on the Apollo missions should have been spent here on Earth. Half a century of not going to the Moon has not seen a massive outpouring of global social justice or saving the Earth from human impact either.

### **It's time for a deep space vanguard for eco-protection.**

Here on Earth, scientists are still making fundamental discoveries about how ecosystems function on this planet, while accelerating human impacts are destroying them in many locations faster than they can be researched. What about potential human impact on other worlds in the Solar System? In the 21<sup>st</sup> Century, the role of environmentalism must look beyond the Earth because human capabilities are entering that arena. It is essential that our forays to distant worlds, beginning with national prestige and scientific curiosity, must not, unintentionally, extinguish native lifeforms in an expanding crisis.

Now is the time for environmentalists to look to the skies. To date, the scientific community as a whole has not been convinced about claims of life outside the Earth, but the search continues. As we explore the Solar System, the clouds of Venus, the Martian sub-surface, and the deep internal oceans of large moons and dwarf planets will become prime targets for the search for life beyond the Earth. At the same time, the liquid hydrocarbon and nitrogen lakes at the -179.5°C surface of Saturn's moon Titan have encouraged scientific speculation about relatively accessible xenobiology. We must proceed with immense caution. If we discover life on other worlds, that must not mean its death knell. It must not join Steller's sea cow, the Javan tiger, and the Western Black Rhinoceros, among the numerous inhabitants of our own world which have disappeared in humanity's wake.

## Some thoughts about July's visitor from deep space.

Comet C/2020 F3 (NEOWISE) wasn't easy to spot from New Ash Green, Kent. The image at left gives you a general idea of how faint it appears over here, where our night skies suffer from significant light pollution. When you finally found it through binoculars (left: July 19), one felt that one had achieved something.

This small Solar System object, may be 5 km wide, a combination mostly of rock, dust and water ice. As a comet comes in from deep space, around 3 to 4 AU from the Sun, it experiences heating and a "coma," a sort of atmosphere expanded. Tails develop, with gas tails being expelled away from the Sun, while dust is streaming along the comet's orbit. The comet was named from the near-Earth objects (NEO) project of NASA's probe Wide-field Infrared Survey Explorer (WISE).

The comet is estimated to have had its furthest distance from our star at 538 AU (1 AU - is the mean distance of the Earth from the Sun). It was not discovered until March 27, this year. There were very much better views than were available in New Ash Green with mere binoculars. The picture seen at centre is spectacular. Taken on July 14, 2020, the comet was taken with a 15 minute exposure on July 14, from 51°N 14°E (SimDe; info on Wikipedia).

One of the most thought provoking things about the comet is to remind ourselves of the huge changes that have taken place in human activity since its last close passage of the Sun. Its orbital period of 4400 years, meant that the last time that it approached the Sun, Sumerian cuneiform was state-of-the-art data storage (below: AO 4238; Department of Near Eastern Antiquities of the Louvre).

Comets are known for undergoing orbital changes: the gravity of planets can tug at them and as they suffer intense heating from the Sun, they can send jets of matter into space. As a result of its recent close encounter with the Sun, the comet's orbital period has been changed to 6700 years and it is heading outwards to 710 AU. It would be hard to predict how this planet may be transformed in the next 7 millennia.





## Prime Meridian.

Published by the Ecospheres Project, a research and media collaboration.

This newsletter looks outwards from the Prime Meridian. It follows the cycle of the seasons in South East England alongside global environmental issues. At the same time, it steps back to look at the Earth in its astronomical perspective and the search for other habitable worlds, which help us to understand the Earth in its larger context.

**Editor: Martin Heath.**

**Editorial assistance: Penelope Stanford & Laurance Doyle.**

Collaboration associates: Kelly ben-Maimon, Palash Dave, Lienkie Diedericks, Laura Elworthy, Elizabeth Gornall, Shaheen Komatsu, Veronica Mariqueo and Ashleigh Wise.

Email: [prime-meridian01@hotmail.com](mailto:prime-meridian01@hotmail.com)  
Website: [www.ecospheresproject.org](http://www.ecospheresproject.org)

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Left: Reeds in the seasonal wet area at Beacon Wood, Bean, Kent. Sept. 28, 2020.

Please note: Do not look at the Sun, particularly through cameras, binoculars or telescopes!

More info from page 3.

<https://nsidc.org/arcticseaicenews/>

<https://www.esrl.noaa.gov/gmd/ccgg/trends/>

<https://www.airbus.com/newsroom/press-releases/en/2020/09/airbus-reveals-new-zeroemission-concept-aircraft.html>