

## Society News

### Membership

There have been some problems collecting annual subscriptions in the last few months. It seems that some standing orders have gone astray - maybe you have moved or changed your bank account. Could I ask members to please check that their fees have been paid and if not, to please correct the situation. This may otherwise be your last copy of NZ!

### Monthly Meetings

The calendar for 2020 is looking really good at the moment our September speaker has offered more than one talk.

Here is the list which Greg has asked us to select from:

- **Life in the Universe**
- **Can we live on Mars**
- **The History of Longitude at ROG**
- **Uranus** - a story of Planetary Catastrophe
- **Myths & Illusions**
- **12742** (a talk about the Earth)
- **Timings** (why time is important and how it affects our everyday lives)
- **Perseid Meteor Shower**
- **All About Pluto**
- **Space, so what's it all about** (general talk about space and things)
- **Craig Telescope** (for short while it was the largest telescope in the world - Wandsworth!)

Please forward your choice to:

Simon Gardner

progorg@wightastronomy.org

Brian Curd  
Observatory Director and NZ Editor

## VAS Website: wightastronomy.org

Submissions or letters to New Zenith are always welcome and should be sent to:

**The Editor, New Zenith**  
**Carpenter's Cottage**  
**Dennett Road**  
**Bembridge**  
**Isle of Wight PO35 5XF**

Tel: **01983 872875** or email: **editor@wightastronomy.org**

Material for the next issue by the 6th of the month please.

The Vectis Astronomical Society and the Editor of the New Zenith accept no responsibility for advice, information or opinion expressed by contributors.

**Registered Charity No 1046091**

## Observatory Diary

Monday, 19.30hrs	Members Only and by arrangement Telescope and night sky training. Please contact Martyn Weaver 07855 116490
Thursday	Members (19.30hrs) and Public (20.00hrs). Informal meeting and observing

## VAS Website: wightastronomy.org

## Contents this Month

Society News .....	1
February 2020 Sky Map .....	3
February 2020 Night Sky .....	4
A second planet may orbit Proxima Centauri .....	5
2019 Second Warmest Year on Record .....	5
Book Review - Isn't one Universe enough? .....	6
Ron Maddison .....	7
Members Astro Photos .....	8
How the solar system got its 'Great Divide,' .....	9
Betelgeuse: Star's weird dimming .....	10
The oldest material on Earth .....	11
The Back Page .....	12

## 2020 Monthly Meetings

Check <http://www.wightastronomy.org/meetings/> for the latest information

Date	Subject	Speaker
24 Jan	Euclid and LSST paving the way for the next decade in Astrophysics	Prof. Adam Amara
28 Feb	Dark Skies Update with AONB and CPRE	
27 Mar	Hoys-Caps Citizen Science Project	Dirk Froebrich
24 Apr	The Astronomy of Robert Hooke	Paul Bingham
22 May	James Webb Space Telescope	Dr Stephen Wilkins
26 Jun	Space Traffic Control	Dr Stuart Eves
25 Jul	Young Astronomer's Event	
28 Aug	AGM	
25 Sep	TBA	Greg Smye-Rumsby
22 Oct	Dark Skies Event VAS with AONB and CPRE	
27 Nov	TBA	Owen Brazell

## Observatory Visits Booked

No bookings so far

***Please phone me for the current situation (number on the front page)***

It would be appreciated if members could avoid using the observatory at these times.

## IMPORTANT

**Could all VAS members please ensure they notify the Membership Secretary of any change of address. To ensure our compliance with GDPR rules, we must maintain accurate membership records.**

## VAS Contacts 2020

<b>President</b>	Barry Bates president@wightastronomy.org
<b>Chairman</b>	Bryn Davis chairman@wightastronomy.org
<b>Secretary</b>	Richard Flux secretary@wightastronomy.org
<b>Treasurer</b>	Stewart Chambers treasurer@wightastronomy.org
<b>Observatory Director</b>	Brian Curd director@wightastronomy.org
<b>Programme Organiser</b>	Simon Gardner progorg@wightastronomy.org
<b>Astro Photography</b>	Simon Plumley ap@wightastronomy.org
<b>Outreach</b>	Elaine Spear outreach@wightastronomy.org
<b>NZ Editor</b>	Brian Curd editor@wightastronomy.org
<b>Membership Secretary</b>	Mark Williams members@wightastronomy.org
<b>NZ Distribution</b>	Graham Osborne distribution@wightastronomy.org
<b>Others</b>	Dudley Johnson

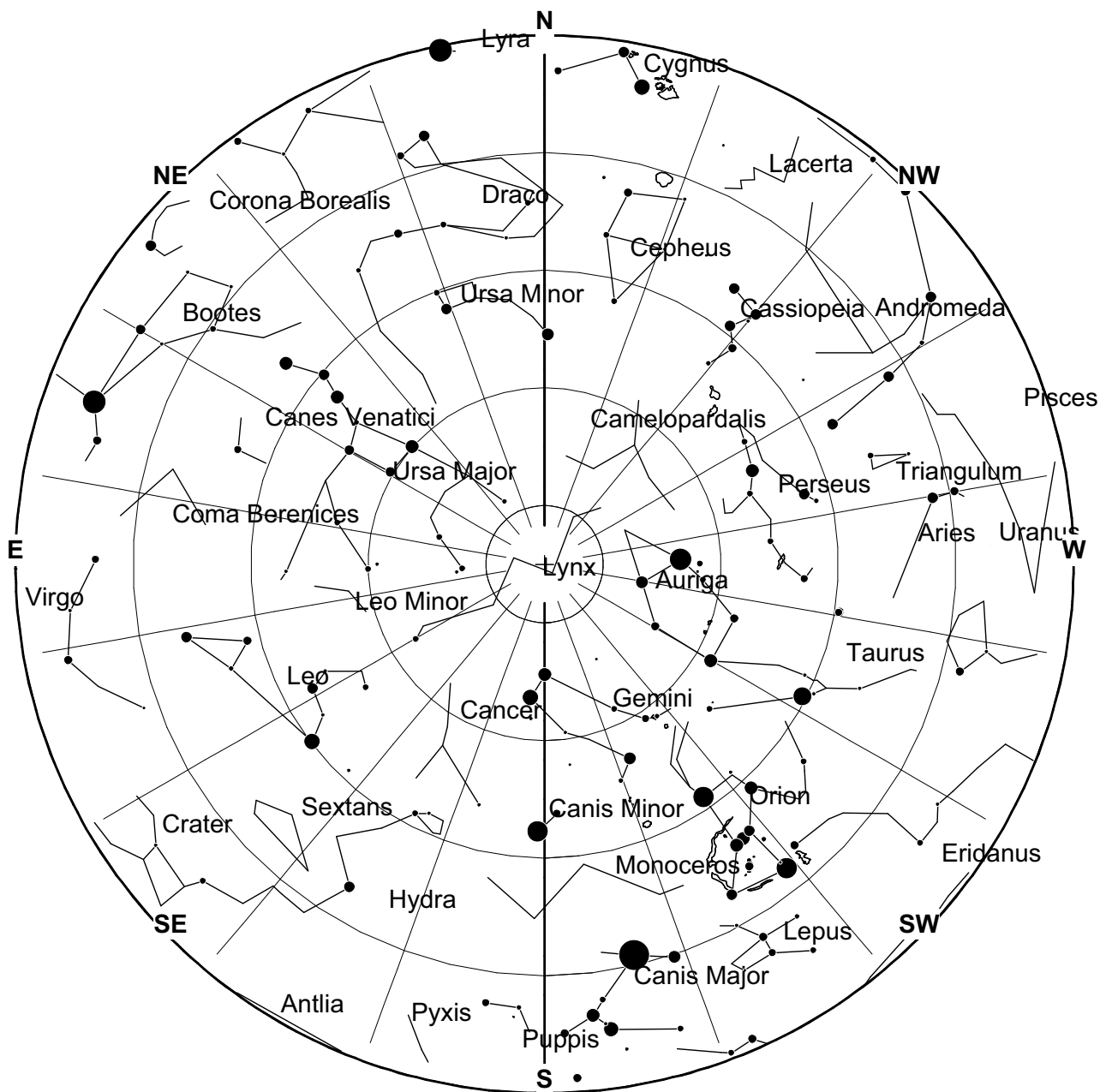
## Important

Members using the observatory **MUST** enter a line or two in the Observatory Log Book.

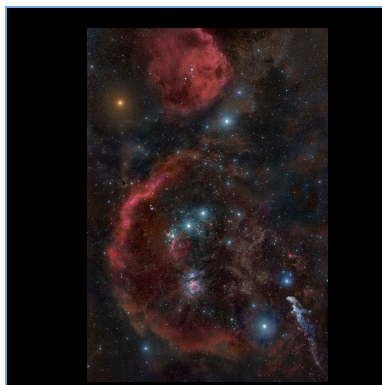
On several occasions, lights, heaters and the Meade LX200 have been left on!

When leaving, please ensure all is secure and all lights, heaters and telescopes are **TURNT OFF**.

## February 2020 Sky Map



*View from Newchurch Isle of Wight UK - 2200hrs - 15 February 2020*



**Orion** is a prominent constellation located on the celestial equator and visible throughout the world. It is one of the most conspicuous and recognizable constellations in the night sky. It is named after Orion, a hunter in Greek mythology.

Its brightest stars are blue-white Rigel (Beta Orionis) and red Betelgeuse (Alpha Orionis).





This article is licensed under the [GNU Free Documentation License](https://www.gnu.org/licenses/fdl.html).

It uses material from the Wikipedia article "Orion".

Image Credit: By Henryk Kowalewski - <http://www.ccd.neostrada.pl/HTM/NGC457.htm>, CC BY-SA 2.5, <https://commons.wikimedia.org/w/index.php?curid=1286300>

## February 2020 Night Sky

### Moon Phases

New	First Qtr	Full	Last Qtr
			
23rd	2nd	9th	15th

### Planets

#### Mercury

Mercury makes a fairly good evening apparition during the first two weeks on the month. Follow a line from the very much brighter Venus towards the point at which the Sun has set to find this elusive world. Even though Mercury is quite bright, a pair of binoculars will help find it against the bright sunset sky.

Date	Az	Elev	Date	Az	Elev
1st	240	5	11th	242	12
3rd	240	7	13th	244	13
5th	240	9	15th	245	12
7th	241	10	17th	248	12
9th	241	11	19th	249	11

*Azimuth and Elevation for Mercury at 17:30*

#### Venus

Venus improves its position in the evening sky throughout the month. At the start of the month it sets at about 20:00 and by the end of the month at about 21:00. It is very bright in the southwestern sky and can be seen quite easily as the sky starts to darken just after sunset. It is a brilliant white colour when high in the sky and reddens noticeably as it approaches the horizon and sets.

#### Mars

Mars is a challenging object low down in the south eastern sky before sunrise. It is only about magnitude 1, so can be difficult to see against the brightening pre-dawn sky. On the 18th the waning crescent moon is about 3 degrees to the right of Mars.

#### Jupiter

During the last week of the month Jupiter becomes visible low down in the south eastern sky in the hour before sunrise. It is quite bright and can be spotted against the bright sky, it is however too low down for serious observation.

#### Saturn

Saturn is still too close to the Sun for observation this month, it is potentially visible in the final days of the month, but is very low down in a fast brightening sky.

#### Uranus

After the end of this month Uranus will be getting rather too low to the western horizon before the sky is sufficiently dark for observation. If you have not yet seen this ice giant now is the time. Unfortunately there are no easy to find bright guide stars nearby, but Uranus is relatively bright, being just at the limit of naked eye visibility makes it an easy target in binoculars. It can be found about 5 degrees (around the width of four fingers at arms length) above the fourth magnitude star Omicron Piscium, and about 4 degrees to the right of the Xi1 Ceti, another fourth magnitude star. Uranus, Omicron Piscium and Xi1 Ceti form a right angle triangle with Omicron and Xi1 forming the hypotenuse.

#### Neptune

Neptune is almost in conjunction with the Sun this month so is not visible.

### Deep Sky

#### **M1 Crab Nebula, Supernova Remnant** **RA 5h 35m Dec 22° 1' mag 8.4**

It must be remembered that Charles Messier's catalogue is a list of objects that could be mistaken for comets, not a list of must see objects in the night sky. Many of them can be a disappointment to the casual observer. The first entry in the catalogue the Crab Nebula is one of these, it could easily be taken for a tailless comet. In a small telescope it appears as an oval smudge with no detail, larger instruments do however show some mottling. The remains of the star which exploded in 1054 and was recorded by the Chinese is a 16th magnitude neutron star in the heart of the nebula spinning at 30 times per second. Despite its visual appearance this object is one of the most studied in the night sky, it is a nearby natural particle accelerator that dwarfs anything we can create here on Earth.

#### **M42 Orion Nebula** **RA 5h 35m Dec -5° 25' mag 4**

Visible to the naked eye as the sword of Orion the light we see is a glimpse into a large, relatively nearby star forming region. We are looking into a hollowed out shell of gas that is glowing from the intense radiation emitted by the newly formed stars. Four of these bright stars are closely grouped near the centre of the nebula forming an asterism known as the Trapezium. There is detail to be seen in all sizes of telescope and binoculars making this probably the most observed object in the night sky.

## **M47 Open Cluster** **RA 7h 37m Dec -14° 31' mag 4.5**

In a clear sky M47 may be seen with the naked eye, but optical aid is required to show the full splendour of this cluster. The cluster stars have a wide range of brightness from about magnitude 6 and beyond. This together with a few bright foreground stars allows the imagination to run free with all the different star patterns

*Peter Burgess*

---

## **A second planet may orbit Proxima Centauri**

The star closest to the sun appears to host another world much colder than Earth

The planet orbiting the star closest to the sun may have a neighbor.

Proxima Centauri, a dim red star just 4.2 light-years away, is already known to host one potentially habitable planet, Proxima b, that's a bit more massive than Earth. Now, astronomers see hints of a second planet, this one much larger and farther from the star.

If it exists, Proxima c appears to be at least 5.8 times as massive as Earth and orbits its star about once every five Earth years, researchers report January 15 in *Science Advances*. Given its distance from Proxima Centauri, the planet is also much too cold to have liquid water, a key test for habitability.

Clues to the planet's existence showed up in spectroscopic data of Proxima Centauri from two telescopes in Chile, Mario Damasso, an astrophysicist at the Astrophysical Observatory of Turin in Italy, and colleagues report. The data, which span 17 years, record the star's back-and-forth motion relative to Earth. After accounting for the known planet, the researchers found hints of an additional unexplained wobble, likely caused by a second planet gravitationally tugging on the star.

Damasso's team emphasizes that additional data are needed to confirm the planet's existence. Given its proximity to Earth, Proxima c could be a prime candidate for direct imaging with next-generation supersized telescopes, the scientists say.

<https://www.sciencenews.org/>

## **NASA, NOAA Analyses Reveal 2019 Second Warmest Year on Record**

According to independent analyses by NASA and the National Oceanic and Atmospheric Administration (NOAA), Earth's global surface temperatures in 2019 were the second warmest since modern record keeping began in 1880.

Globally, 2019 temperatures were second only to those of 2016 and continued the planet's long-term warming trend: the past five years have been the warmest of the last 140 years.

This past year, they were 1.8° F (0.98° C) warmer than the 1951 to 1980 mean, according to scientists at NASA's Goddard Institute for Space Studies (GISS) in New York.

"The decade that just ended is clearly the warmest decade on record," said GISS Director Gavin Schmidt. "Every decade since the 1960s clearly has been warmer than the one before."

Since the 1880s, the average global surface temperature has risen and the average temperature is now more than 2° F (a bit more than 1° C) above that of the late 19th century. For reference, the last Ice Age was about 10° F colder than pre-industrial temperatures.

Using climate models and statistical analysis of global temperature data, scientists have concluded that this increase mostly has been driven by increased emissions into the atmosphere of carbon dioxide and other greenhouse gases produced by human activities.

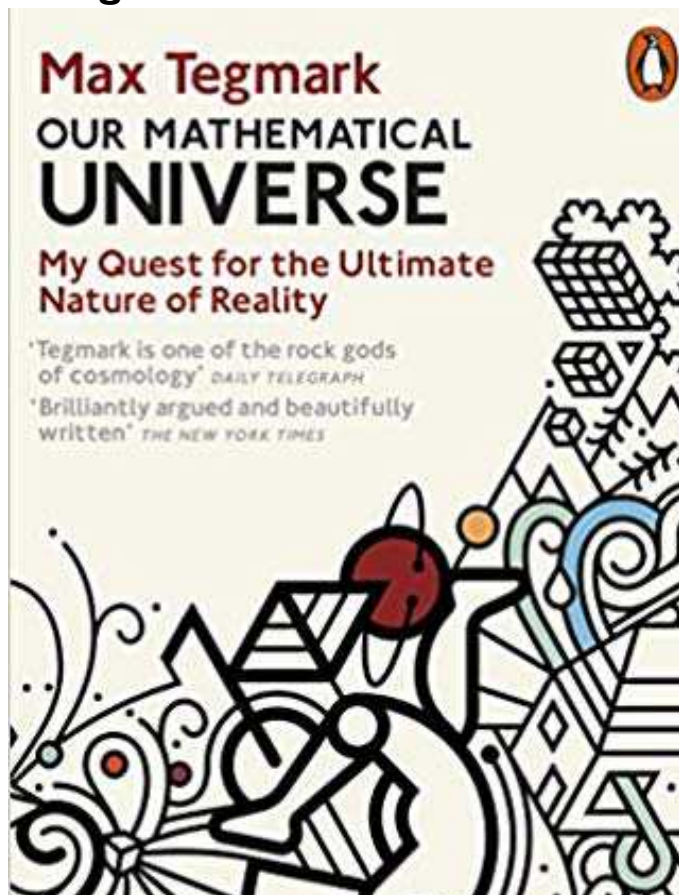
"We crossed over into more than 2° F warming territory in 2015 and we are unlikely to go back. This shows that what's happening is persistent, not a fluke due to some weather phenomenon: we know that the long-term trends are being driven by the increasing levels of greenhouse gases in the atmosphere," Schmidt said.

Because weather station locations and measurement practices change over time, the interpretation of specific year-to-year global mean temperature differences has some uncertainties. Taking this into account, NASA estimates that 2019's global mean change is accurate to within 0.1° F, with a 95% certainty level.

*Much More at: <https://www.nasa.gov/>*



## Book Review - Isn't one Universe enough?



*Max Tegmark, Our Mathematical Universe - My Quest for the Ultimate Nature of Reality (Penguin/Random House, 2014, 421 pages, paperback)*

If you are looking for mind-expanding controversy, then *Our Mathematical Universe* is the book for you! Tegmark is a Swedish mathematician-turned-physicist who played an important role in the analysis of the Cosmic Microwave Background (CMB) discoveries of the 1990s and 2000s. His innovative data analysis techniques helped to uncover the details of the remnants of the Big Bang, and the conclusions from that work provide the starting point for some extraordinary speculative physics.

The first 4 or 5 chapters are a very readable account of the history of cosmology, addressing some of the great questions: What is space? How big is it? How did galaxies form? How do we know? He lays out not just the development of our understanding of the Universe and its origins, but also tackles the problems, the history of disbelief and scepticism as new concepts were invented to account for each new revolutionary observation. He writes of "... dark matter, which is little more than a name for our ignorance" - he tells it like he sees it.

The hinge on which the book turns is his account of the theory of "inflation" - the process in the early universe which gives rise to very fast expansion (much faster than the universe is expanding more recently). Using the evidence from the CMB, Tegmark concludes that accepting inflation theory means you have to accept the existence of an infinity of parallel universes. And this in turn is the springboard for the rest of the book, a large part of which is a development of the concept of the "multiverse" into a hierarchy of Level I to Level IV Multiverses.

The author knows he is being provocative- in fact he openly courts controversy but he does try to lead readers through what I can promise is a genuine sense that this is thinking that has become unhitched from reality. But then again, it is bound to be tricky talking about the nature of reality when we know that at the smallest scale the world defies human understanding. And it is to the world of quantum mechanics that he then turns to challenge "orthodox" physics. Ever since the 1920s one of the problems at the heart of physics has been the apparent randomness with every measurement at the quantum scale. And once again, instead of the long-accepted "Copenhagen" interpretation that the wave equation "collapses" when you observe it (remember poor old Schrödinger's Cat?), he is an enthusiastic advocate of the "Many Worlds" interpretation - yes, another level of Multiverse.

Anyone who has thought hard about cosmology or quantum theory would probably agree with Tegmark that "If my life as a physicist has taught me anything at all, it's that Plato was right: modern physics has made abundantly clear that the ultimate nature of reality isn't what it seems." However there is one more big theme in the book that I find even harder to swallow, which is the Mathematical Universe Hypothesis (MUH), which holds that not only can our universe only be adequately described using mathematics, but that ultimate reality IS mathematics. So a story which is anchored in astronomy - a history of observations and theories to account for them - leads the author (and a minority of other scientists) to MUH, a philosophy that says the only way to account for the amazing success of maths in describing the world is by saying the world is maths. I mean ... really?! I have to confess that it feels like what Daniel Dennett calls greedy Reductionism (or "nothing-buttery") to me, but I'd be delighted to hear if you can grasp it better than I can.

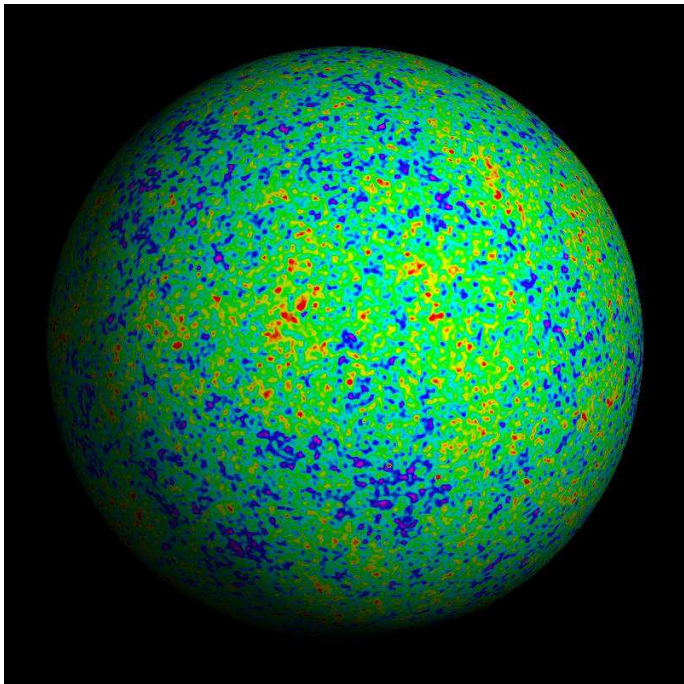
And there is another fascinating layer to this engaging - if sometimes infuriating - book, which is the "My Quest" of the subtitle. He includes the very human story of his work: meetings with his heroes; the respect and admiration he has for many great minds he has collaborated with; the struggles to write conference and journal papers to meet tight deadlines; the tricks of the trade to get his ideas noticed, and the excitement and rivalry involved with

trying to publish before a rival. It is an insight to hear of how he juggles his work and family relationships and the ranges of emotion in the working life of a researcher - from the exhilaration of discovery or dejection of having been “scooped” by someone publishing ahead of him, to the sheer plod of a long project.

This is a book to enjoy, mull over, agree or disagree with. But it is never dull, and Tegmark dares his readers to consider how it has been the unconventional thinkers in the history of cosmology that have often pushed science beyond our present horizons and into new fields - and just possibly into different parallel universes!

### **Additional note:**

*In the New Zenith December 2019 edition, there was an article about some recent but highly contested interpretation of the CMB which hints at the Universe being “closed”, i.e. not “flat” as Tegmark's Type I multiverse would require - that's one way in which the outcome of current research is crucial to our understanding of cosmology.*



*Projection of the temperature fluctuations of the Cosmic Microwave Background, projected onto a sphere. Taken from the 2003 paper “A high resolution foreground cleaned CMB map from WMAP” by Max Tegmark, Angélica de Oliveira-Costa, and Andrew J. S. Hamilton.*

*Simon Gardner*

## **Ron Maddison**



Ron Maddison (Dr R C Maddison) the British astronomer, has passed away at the age of 84 in Florida USA. Ron founded the University of Keele Observatory in the early 1960s, was BAA Lunar Section Director 1968-1971. He was a friend of Sir Patrick Moore, often appearing on BBC's *The Sky at Night* from the 1970s to 2009, see links below and YouTube. I am so grateful to have known Ron as an inspiration since the late 1960s when we both worked at Keele University, and where I attended his monthly astronomy evening classes. After a gap of many years, it was an even greater joy to reconnect with Ron and his wife Margaret in 2012 in Florida USA, to have been invited by Ron to attend the all day celebration of 50th anniversary of Keele University Observatory at Keele University and Observatory May 2012, and to have a personal guided tour by Ron of The Astronaut Memorial Planetarium and Observatory at the Eastern Florida State College late 2012. Ron became Planetarium Director there in the late 1990s. Sadly, this site was devastated in 2018 by hurricane IRMA. Having moved to the USA, I was pleased to introduce my American wife Sherry to Ron and Margaret in 2017. We will miss everything about Ron, he was a stellar person in so many ways.

### **For further information, see these links:**

IMDB: <https://www.imdb.com/name/nm2644755/>

BAA: <https://britastro.org/node/9904>

Keele University Observatory:

<https://www.keele.ac.uk/observatory/history/1980s/>

<https://www.bbc.com/news/uk-england-stoke-staffordshire-18129702>

Florida:

[https://en.wikipedia.org/wiki/Astronaut\\_Memorial\\_Planetarium\\_and\\_Observatory](https://en.wikipedia.org/wiki/Astronaut_Memorial_Planetarium_and_Observatory)

<https://easternflorida.edu/community-resources/planetarium/>

<https://easternflorida.edu/community-resources/planetarium/>

Amazon: <https://www.amazon.com/Imagination-Stars-Common-Sense-God/dp/1480926493>

*Chris Wood*



## Members Astro Photos

### Dudley Johnson

- Atik monochrome cooled camera:
- Telescope APM107 107mm Apo refractor
- Atik filter wheel using R, G, B and Ha filters
- NEQ6 mount under ASCOM control.
- Carte du Ciel planetarium software
- Sequence Generator Pro controlling the filter sequence, camera cooling, focusing etc
- 90mm Maksutov Cassegrain guide scope with QHY 5-II camera and PH2 guiding software.



### IC405 - The Flaming Star Nebula

IC 405 (also known as the Flaming Star Nebula, SH 2-229, or Caldwell 31) is an emission and reflection nebula in the constellation Auriga, surrounding the bluish star AE Aurigae.

It shines at magnitude +6.0. Its celestial coordinates are RA 05h 16.2m dec +34° 28'. It surrounds the irregular variable star AE Aurigae and is located near the emission nebula IC 410, the open clusters M38 and M36, and the K-class star Iota Aurigae.

The nebula measures approximately 37.0' x 19.0', and lies about 1,500 light-years away from Earth. It is believed that the proper motion of the central star can be traced back to the Orion's Belt area.



### IC410 - The Tadpoles Nebula

This patch of sky in the constellation of Auriga is home to a cluster of young stars and the remainder of the cloud of gas and dust from which they were hatched. The ultraviolet light produced by these stars powers the nebula. Atoms of hydrogen and other elements in the nebula are made to emit their own light after being excited by this starlight, a sort of cosmic black-light effect.

The nebula itself is known as IC 410, and is home to a pair of intriguing structures popularly known as the “tadpoles.” These are clumps of gas and dust left over from the formation of the cluster, and are likely forming yet new stars within them. The tails of the tadpoles are caused by the radiation pressure and solar wind from the stars of NGC 1893.



## How the solar system got its 'Great Divide,' and why it matters for life on Earth

Scientists, including those from the University of Colorado Boulder, have finally scaled the solar system's equivalent of the Rocky Mountain range.

In a study published today in *Nature Astronomy*, researchers from the United States and Japan unveil the possible origins of our cosmic neighborhood's "Great Divide." This well-known schism may have separated the solar system just after the sun first formed.

The phenomenon is a bit like how the Rocky Mountains divide North America into east and west. On the one side are "terrestrial" planets, such as Earth and Mars. They are made up of fundamentally different types of materials than the more distant "jovians," such as Jupiter and Saturn.

"The question is: How do you create this compositional dichotomy?" said lead author Ramon Brasser, a researcher at the Earth-Life Science Institute (ELSI) at the Tokyo Institute of Technology in Japan. "How do you ensure that material from the inner and outer solar system didn't mix from very early on in its history?"

Brasser and coauthor Stephen Mojzsis, a professor in CU Boulder's Department of Geological Sciences, think they have the answer, and it may just shed new light on how life originated on Earth.

### A sun disk holds vital clues

The duo suggests that the early solar system was partitioned into at least two regions by a ring-like structure that formed a disk around the young sun. This disk might have held major implications for the evolution of planets and asteroids, and even the history of life on Earth.

"The most likely explanation for that compositional difference is that it emerged from an intrinsic structure of this disk of gas and dust," Mojzsis said.

Mojzsis noted that the Great Divide, a term that he and Brasser coined, does not look like much today. It is a relatively empty stretch of space that sits near Jupiter, just beyond what astronomers call the asteroid belt.

But you can still detect its presence throughout the solar system. Move sunward from that line, and most planets and asteroids tend to carry relatively low abundances of organic molecules. Go the other direction toward Jupiter and beyond, however, and a different picture emerges: Almost everything in this distant part of the solar system is made up of materials that are rich in carbon.

This dichotomy "was really a surprise when it was first found," Mojzsis said.

Many scientists assumed that Jupiter was the agent responsible for that surprise. The thinking went that the planet is so massive that it may have acted as a gravitational barrier, preventing pebbles and dust from the outer solar system from spiralling toward the sun.

But Mojzsis and Brasser were not convinced. The scientists used a series of computer simulations to explore Jupiter's role in the evolving solar system. They found that while Jupiter is big, it was probably never big enough early in its formation to entirely block the flow of rocky material from moving sunward.

"We banged our head against the wall," Brasser said. "If Jupiter wasn't the agent responsible for creating and maintaining that compositional dichotomy, what else could be?"

### A solution in plain sight

For years, scientists operating the ALMA observatory in Chile had noticed something unusual around distant stars: Young stellar systems were often surrounded by disks of gas and dust that, in infrared light, looked a bit like a tiger's eye.

If a similar ring existed in our own solar system billions of years ago, Brasser and Mojzsis reasoned, it could theoretically be responsible for the Great Divide.

That's because such a ring would create alternating bands of high- and low-pressure gas and dust. Those bands, in turn, might pull the solar system's earliest building blocks into several distinct sinks -- one that would have given rise to Jupiter and Saturn, and another Earth and Mars.

In the mountains, "the Great Divide causes water to drain one way or another," Mojzsis said. "It's similar to how this pressure bump would have divided material" in the solar system.

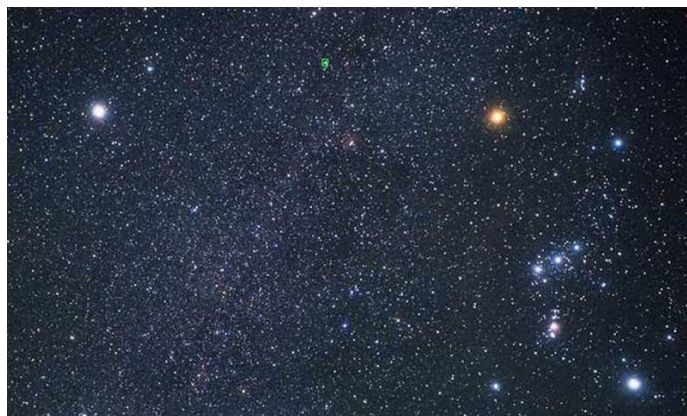
But, he added, there's a caveat: That barrier in space likely was not perfect. Some outer solar system material may still have climbed across the divide. And those fugitives could have been important for the evolution of our own world.

"Those materials that might go to the Earth would be those volatile, carbon-rich materials," Mojzsis said. "And that gives you water. It gives you organics."

The rest is Earth history.

<https://www.sciencedaily.com/>

## Betelgeuse: Star's weird dimming sparks rumours that its death is imminent



*Betelgeuse is the red star in the top right quarter of the picture. Credit: Hubble European Space Agency*

Every season has its characteristic star constellations in the night sky. Orion - one of the most recognizable - is distinctly visible on crisp, clear winter nights in the northern hemisphere. The constellation is easy to spot even in light-polluted cities, with its bright stars representing the shape of a person.

Betelgeuse, marking Orion's top left shoulder, is often its brightest star. Red in color, this star is usually the 12th brightest in the entire sky. But it has recently dimmed dramatically to an all time low of 21st brightest star in the sky. As a result, many have started speculating about whether it could be about to explode. But could it? And what would that look like?

Betelgeuse is what astronomers call a red supergiant, up to 20 times more massive than our sun. Red supergiant stars have neared the end of their lifetime and have substantially expanded. Betelgeuse has a radius of approximately 900 times that of our sun. If the sun was this size, its surface would nearly reach Jupiter.

Betelgeuse, which is 640 light years away, is the only star other than our own whose surface we can directly picture in detail. Luckily, that can help us understand why it varies so much in brightness. At this size, stars transport their energy or heat generated in their core to the surface via convection - a method of transport we experience when we boil eggs. As the water boils, it moves up while cold water moves down to be heated. These rising and falling currents are known as convection cells.

Each of these cells is only a few centimeters across in this example, but in Betelgeuse they are gigantic and moving much more slowly while interacting with the star's substantial magnetic field. Since the heat of the surface of

the star determines its brightness, Betelgeuse shows a rather large variation of darker and brighter patches on its surface. As the star bubbles and rotates, we will see a slowly variable brightness, as we do now.

Another interesting feature is that the surface of Betelgeuse is rather cool, hence its red color. Because it has a huge radius, it also has a diminished gravitational grip on its outer surfaces. This means it loses some of its material - creating dusty clouds in its surroundings which could cause dimming as they move in front of the star.

You can monitor Betelgeuse's change in brightness yourself using only your eyes and no telescopes at all. In the northern hemisphere, Orion is observable during the first half of the night well into February. Compare Betelgeuse to other stars of different brightness to determine how bright it is. Pollux in Gemini is currently of similar brightness and Bellatrix in Orion is a bit fainter.

### Imminent Supernova?

While watching this star you might wonder if this supergiant is about to go supernova (a star explosion) and end its life in a spectacular show of light. Indeed, this star is the closest known candidate to soon go supernova in astronomical timescales - anytime within the next 100,000 years.

But this current substantial dimming is not necessarily a sign of its imminent death. That's because, at this stage, we do not know enough about how a star's brightness develops before such an event. That said, this makes Betelgeuse rather interesting for astronomers.

If it did occur, it would become the brightest supernova ever observed. In a matter of days, it would become as bright as the full moon, be visible during day time and be bright enough at night to cast shadows on Earth.

Betelgeuse would then start a phase of final, rapid dimming and again reach its current brightness level after possibly three years. After six years, it would be too faint to see with the naked eye. This would forever alter the visual appearance of Orion and we might need to think of another object the remaining constellation might represent.

There are many amazing stars out there that show stunning variability that can be far more impressive than Betelgeuse's, but they are not as easy to spot. One example is the variable star Mira that varies its brightness by a factor of 630, compared to a mere three times for Betelgeuse. But Mira is located in the rather hard-to-spot constellation of Cetus (the Whale) below Pisces (the Fishes) and never shines as bright as Betelgeuse.

<https://phys.org/news/>

## Meteorite contains the oldest material on Earth: 7-billion-year-old stardust

### The ancient stardust reveals a 'baby boom' in star formation



Stars have life cycles. They're born when bits of dust and gas floating through space find each other and collapse in on each other and heat up. They burn for millions to billions of years, and then they die. When they die, they pitch the particles that formed in their winds out into space, and those bits of stardust eventually form new stars, along with new planets and moons and meteorites. And in a meteorite that fell fifty years ago in Australia, scientists have now discovered stardust that formed 5 to 7 billion years ago -- the oldest solid material ever found on Earth.

"This is one of the most exciting studies I've worked on," says Philipp Heck, a curator at the Field Museum, associate professor at the University of Chicago, and lead author of a paper describing the findings in the *Proceedings of the National Academy of Sciences*. "These are the oldest solid materials ever found, and they tell us about how stars formed in our galaxy."

The materials Heck and his colleagues examined are called presolar grains—minerals formed before the Sun was born. "They're solid samples of stars, real stardust," says Heck. These bits of stardust became trapped in meteorites where they remained unchanged for billions of years, making them time capsules of the time before the solar system.

But presolar grains are hard to come by. They're rare, found only in about five percent of meteorites that have fallen to Earth, and they're tiny—a hundred of the biggest ones would fit on the period at the end of this sentence. But the Field Museum has the largest portion of the Murchison meteorite, a treasure trove of presolar grains that fell in Australia in 1969 and that the people of Murchison,

Victoria, made available to science. Presolar grains for this study were isolated from the Murchison meteorite for this study about 30 years ago at the University of Chicago.

"It starts with crushing fragments of the meteorite down into a powder," explains Jennika Greer, a graduate student at the Field Museum and the University of Chicago and co-author of the study. "Once all the pieces are segregated, it's a kind of paste, and it has a pungent characteristic—it smells like rotten peanut butter."

This "rotten-peanut-butter-meteorite paste" was then dissolved with acid, until only the presolar grains remained. "It's like burning down the haystack to find the needle," says Heck.

Once the presolar grains were isolated, the researchers figured out from what types of stars they came and how old they were. "We used exposure age data, which basically measures their exposure to cosmic rays, which are high-energy particles that fly through our galaxy and penetrate solid matter," explains Heck. "Some of these cosmic rays interact with the matter and form new elements. And the longer they get exposed, the more those elements form.

"I compare this with putting out a bucket in a rainstorm. Assuming the rainfall is constant, the amount of water that accumulates in the bucket tells you how long it was exposed," he adds. By measuring how many of these new cosmic-ray produced elements are present in a presolar grain, we can tell how long it was exposed to cosmic rays, which tells us how old it is.

The researchers learned that some of the presolar grains in their sample were the oldest ever discovered—based on how many cosmic rays they'd soaked up, most of the grains had to be 4.6 to 4.9 billion years old, and some grains were even older than 5.5 billion years. For context, our Sun is 4.6 billion years old, and Earth is 4.5 billion.

But the age of the presolar grains wasn't the end of the discovery. Since presolar grains are formed when a star dies, they can tell us about the history of stars. And 7 billion years ago, there was apparently a bumper crop of new stars forming—a sort of astral baby boom.

"We have more young grains that we expected," says Heck. "Our hypothesis is that the majority of those grains, which are 4.9 to 4.6 billion years old, formed in an episode of enhanced star formation. There was a time before the start of the Solar System when more stars formed than normal."...

"It's the next best thing to being able to take a sample directly from a star," says Greer.

More at: <https://www.sciencedaily.com/>





## Brighstone Christmas Tree Festival 2019



*A festival of over 250 Christmas in and around Brighstone and Mottistone.*

Trees from various charities and businesses around the Island enter a suitably decorated tree to raise awareness of their organisation. Donations from visitors reached just over £14,000, of which we at VAS shall receive a small slice.

Our tree was very popular as there were lots of comments about Santa on the Rocket.

*Elaine Spear*

### At The Observatory

For your own safety, please bring a torch.

Make sure you close and lock the car park gate if you are the last to leave.

### Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy. Contact details on page 1.

*“Never memorize something that you can look up”*

***Albert Einstein***

*“The fact that we live at the bottom of a deep gravity well, on the surface of a gas covered planet going around a nuclear fireball 90 million miles away and think this to be normal is obviously some indication of how skewed our perspective tends to be”*

***Douglas Adams***

*“The first principle is that you must not fool yourself and you are the easiest person to fool”*

***Richard P. Feynman***

*“Religion is a culture of faith; science is a culture of doubt”*

***Richard P. Feynman***

*“How inappropriate to call this planet ‘Earth,’ when it is clearly ‘Ocean’”*

***Arthur C. Clarke***

*“To invent, you need a good imagination and a pile of junk”*

***Thomas A. Edison***