New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 27 Issue 4 — May 2019

When Printed, this Newsletter costs VAS at least £1

Society News

PLEASE NOTE

Due to availability and booking of the Pavilion and Field near our observatory we have changed our

Young Science and AstroFest to Saturday 27th July

Probably 6-10pm (maybe 6-9pm). We want it to finish late to try to get some Stargazing in

Tickets are already being reserved and the take up is good
We are expecting over 100 visitors on the day

Please let Elaine know if you are available to help with this event

We need as many helpers as possible

More details to follow

Contact Elaine at:
elainespear1@gmail.com

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.

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

2019 Monthly Meetings

Date	Subject	Speaker
Check *http://www.wightastronomy.org/meetings/* for the latest information		
24 May	The Rise and fall of the Herstmonceux Observatory	Keith Brackenborough
28 June	TBA	TBA
Sat 27 July	"Young Science and AstroFest" Young Astronomers' Event	
23 Aug	AGM and Social Evening	
27 Sept	A transportable/deployable radio telescope for hydrogen line observation	Alan and Martin Thompson
25 Oct	Dark Skies Event	
22 Nov	TBA	TBA

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.

This applies to all information held but is especially important for email and physical addresses.

VAS Contacts 2018/19

President	Barry Bates president@wightastronomy.org
Chairman	Bryn Davis chairman@wightastronomy.org
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Membership Secretary	Norman Osborn members@wightastronomy.org
NZ Distribution	Graham Osborne distribution@wightastronomy.org
Others	Mark Williams, Nigel Lee, Stewart Chambers, Elaine Spear

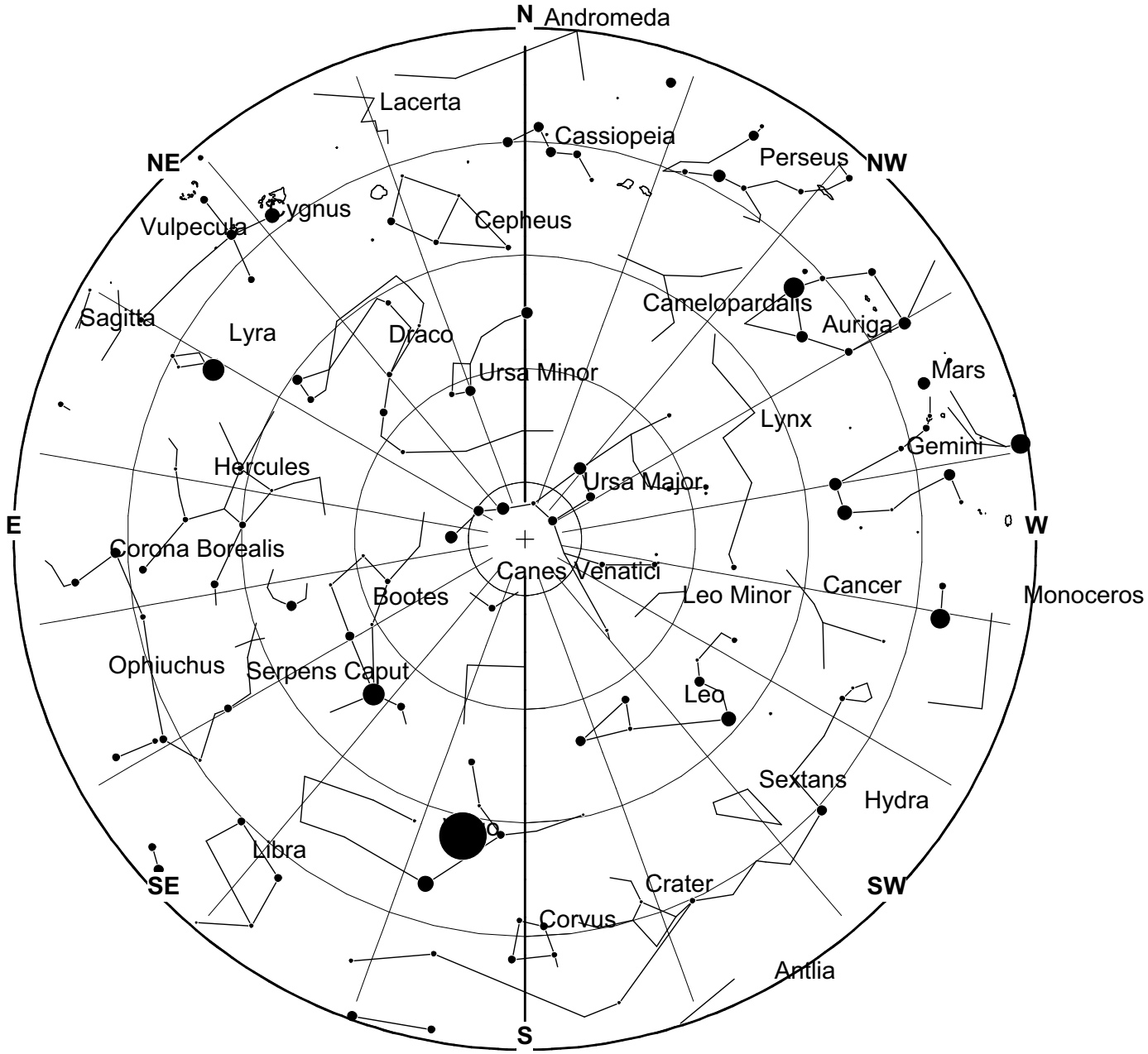
Important

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 TURNED OFF.

May 2019 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 May 2019

Leo is one of the constellations of the zodiac, lying between Cancer the crab to the west and Virgo the maiden to the east. Its name is Latin for lion, and to the ancient Greeks represented the Nemean Lion killed by the mythical Greek hero Heracles meaning 'Glory of Hera' (known to the ancient Romans as Hercules) as one of his twelve labors.

One of the 48 constellations described by the 2nd-century astronomer Ptolemy, Leo remains one of the 88 modern constellations today, and one of the most easily recognizable due to its many bright stars and a distinctive shape that is reminiscent of the crouching lion it depicts. The lion's mane and shoulders also form an asterism known as "The Sickle," which to modern observers may resemble a backwards "question mark."

May 2019 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
4th	12th	18th	26th

Planets

Mercury

In the last couple of days of the month Mercury may be spotted very low in the northwest just after sunset as it starts an evening apparition that continues into June.

Venus

Venus remains in the morning sky rising in the east just before the Sun and remaining a challenging object. **It is bright enough to be seen during the day if precautions are taken to avoid accidentally pointing at the Sun.**

Mars

Mars sets about two hours after the Sun, but with the bright twighlight sky now lasting well after sunset it is a challenging object.

Jupiter

Although Jupiter is close to opposition and about as well placed in the sky as it will be this year it not particularly well placed for our relatively high northern latitude. It can be found low in the south and can only be properly observed for a few hours either side of midnight when it is highest in the sky.

Saturn

Saturn can be observed in the southern sky from about midnight until daybreak, and like Jupiter is rather too low down for clear observation.

Uranus & Neptune

Both outer planets are currently lost in the morning twighlight.

Deep Sky

M53 Globular Cluster RA 13h 13m Dec 18° 7' mag 8.5

Lying some 60,000 light years away very few stars can be resolved in this cluster without the use of a large telescope. Through smaller instruments and binoculars it looks like a tailless comet.

M3 Globular Cluster RA 13h 42m, Dec 28° 22' mag 7

Messier's first original discovery, this is a showpiece globular cluster with stars extending across an area greater than that of the full Moon. M3 contains more variable stars than any other globular.

M63 Sunflower Galaxy RA 13 16m Dec 41° 58' mag 8.5

This is a barred spiral galaxy 37 million light years away. It was originally discovered by Pierre Mechain, a friend of Charles Messier and who went on to discover over 25 more objects that were subsequently added to Messier's catalogue. Through a small telescope it is visible as an elongated smudge, but with larger apertures and a dark sky some hint of detail in the spiral arms may be seen.

Peter Burgess

Isle of Wight Space Camps - Volunteers needed

A very innovative Island teacher who won, Science Teacher of the Year 2018, is working hard at promoting science and astronomy to all Isle of Wight school children.

She is in contact with many primary schools around the Island, and in the process of organising 'Space Camps' in conjunction with the Stephen Hawking Foundation.

She has been sent 5 celestron telescopes from the foundation and plans to run observing sessions in the evenings of all the Space Camps. She needs help to operate the telescopes - ***that's where you come in***. Please consider giving up some of your time to support this endeavour.

The list below shows the Camps organised so far

Date	Venue	VAS Members	Solar Scope	Talk
Thurs 21st March	Nineacres Primary School South View, Newport PO30 1QP	Bert Paice, Bryn Davis, Elaine Spear, Mark Taylor	No	Bryn Davis "Making Sense of the Night Sky"
Wed 27th March	St Helens Primary School Broomlands Close, St Helens, PO33 1XH	Brian Curd, Graham Osborne, Mark Taylor, John Slinn	Yes John Slinn	Brian Curd "Stellarium - your very own planetarium"
Thurs 4th April	Gurnard Primary School Baring Road, Cowes PO31 8DS	Elaine Spear, Bert Paice, Mark Taylor, John Slinn	Yes John Slinn	John Slinn "All about the Sun"
Thurs 25th April	Greenmount Primary School St Vincent's Road, Ryde PO33 3PT	Stuart Chambers, Bert Paice, Mark Taylor, John Slinn, Elaine Spear	Yes John Slinn	John Slinn "All about the Sun"
Thurs 9th May	Wootton Primary	Brian Curd		
Thurs 23rd May	Broadlea Primary School Newport Road, Lake PO36 9PE	Bryn Davis,		
Fri 7th June	Ryde School (Junior and Fiveways) 7 Queen's Road, Ryde P033 3BE	Brian Curd		
Fri 27th June	Broadlea Primary School Newport Road, Lake PO36 9PE			
Wed 3rd July	All Saints Primary School 79 School Green Road, Freshwater, PO40 9AX			

HELP!

Times are to be confirmed, but I'm guessing around 7-9pm, maybe later in the summer months of darker skies.

Please let me know which Camps you can attend. I hope to get three members for each camp.

Attending as many schools as possible will have a dual affect, as it gets the VAS name spread around, and we can promote our Young Astronomers events we are organising in July.

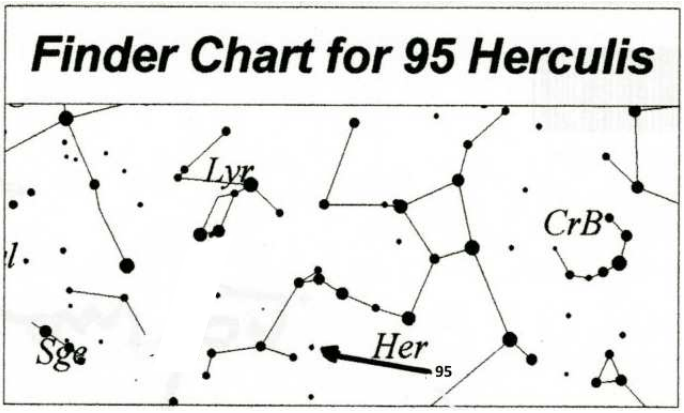
Contact me at elainespear1@gmail.com

Elaine Spear

My 100 Best Night Sky Sights

Double Star

Coordinates: RA 18h 01m 30s, Dec -21° 36'



It's early summer, you're up late and your telescope is pointing high in the sky at the constellation Hercules. 10 to 1 the object of your attention is a globular cluster (well, that seems to be the only reason most people visit the strong man). A pity really as he also sports several fine double stars among which is one of the best of all colour-contrast pairs.

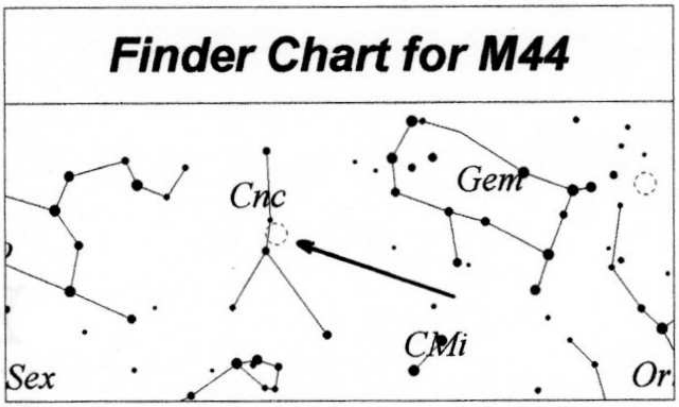
The two components of 95 Herculis are of almost equal brightness at magnitude 5.0 and 5.1, shining like beacons in any telescope. Being just 6.3" apart they would appear as close twins and be a grand sight if it were not for their colours. One is silvery blue, the other golden yellow, an exquisite combination that transforms this fine pair and turns the merely 'grand' into 'simply beautiful'.

95 Her will please whatever power you employ but I think you'll find the view at its best at around 100x, which in my opinion provides the optimum combination of colour intensity and separation. Locate it near the club with which Hercules is attacking poor Lyra (turn the chart upside down to witness this appalling act).

Galactic Cluster

Coordinates: RA 08h 40m 06s, Dec +19° 59'

So your telescope is a modest Dobsonian or you don't have one at all, just an old pair of binoculars. Well for once you're in pole position, as you'll see the magnificent open cluster, M44 in Cancer better than almost every one else. The Beehive Cluster as it's known can be seen as a misty patch without any optical aid in clean skies and reveals dozens of its stars to the smallest pair of binoculars. Telescopes up to 6" show many more as will larger instruments with short focal lengths but, as M44 covers an area three times that of the Moon, anything over 12" will give less impressive views as outer stars of the cluster become excluded from the field.

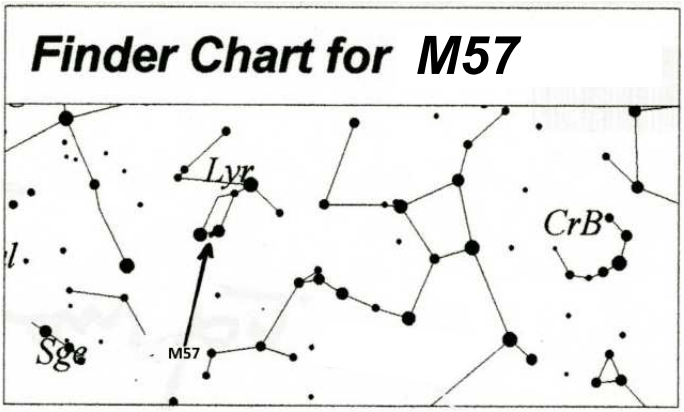


Four of the Beehive's brightest stars inhabit the very centre of the cluster appearing slightly yellow and there are several neat doubles, as well as triple stars in triangular formations, to be seen making M44 a fine cluster for extended exploration in late winter and early spring.

Cancer is a dim and sparse constellation and, whilst not easy to recognise at first, is not difficult to find in the wide field of binoculars, halfway between Gemini and the head of Leo.

Planetary Nebula

Coordinates: RA 18h 53m 36s, Dec +33° 02'



When it came to placing this one in my top 100 list it gave me a problem. Had I started writing these articles soon after I'd seen it for the first time it would have occupied a lowly position. After all the hype I'd read (terms like 'celebrated', 'showpiece' and 'most striking of all heavenly objects') I'd expected something really stunning but what did I see? - a tiddly little blob, so small I almost passed it by. It wasn't until I acquired some higher power eyepieces that I really 'discovered' this little beauty.

M57 in Lyra, the Ring Nebula is indeed worthy of its reputation. Use a low power to locate it between the southern pair of Lyra's parallelogram of 3rd and 4th magnitude stars then switch to the highest one conditions will permit. The view is quite stunning - an oval 'smoke ring' with thick 'walls' and a dark centre. The dying star

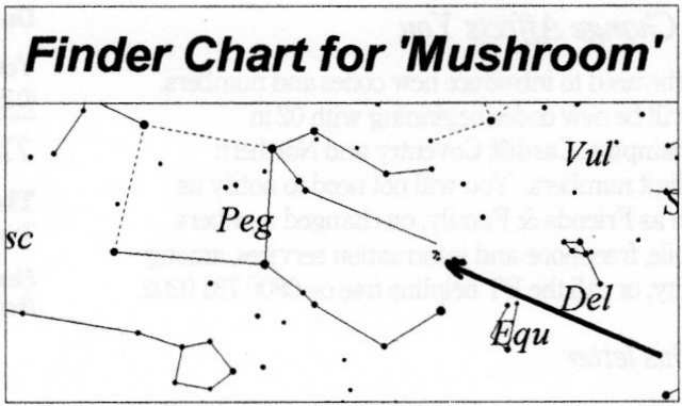
that puffed out its outer layers to form this nebula is only visible in large telescopes (theoretically the VAS 18" should see it but conditions would have to be superb). However if you use an 8" or larger telescope try to spot the 12th magnitude star sitting just off the eastern edge of the ring - at powers around 300-350x it could be the only other thing in view.

If you have an OIII filter then use it. Although it will extinguish any stars in the field the enhancement of the main objective is dramatic. The central 'hole' becomes really dark as does the surrounding sky but the nebula is unaffected with the result that it stands out with unprecedented clarity. Refer to the finder chart for 95 Herculis but hurry, before he completes his gruesome task.

Note this down as another 'must' for the Observatory main instrument next summer.

Magic Mushroom?

Coordinates: RA 21h 45m 30s, Dec +16° 45'



You're not going to believe this. There are some odd stellar arrangements in the sky but this one takes the biscuit. On a late summer evening fit your widest angle eyepiece to your telescope and look exactly 7° due north of Enif Pegasi, the horse's nose (he's upside down so you're actually below his snout). What do you see? Also upside down (in most telescopes anyway) but unmistakable for all that is the nearest you'll ever get to a celestial fungus. Don't take my word for it, see for yourself - a dozen stars forming a near-perfect fungal outline, complete with thick stem and flat cap. If you also invert this chart it looks like Pegasus has just knocked it flying with his hoof.

When you observe this oddball ask yourself this question - is it's positioning in the constellation of Pegasus accidental or is it by design? - for those who know about these things may recognise an uncanny resemblance to Psalliota arvensis - the horse mushroom!

Originally published October 1999
Bert Paice

Why are so Many Objects in Space Shaped Like Discs?

The universe is very good at making spinning discs. Our solar system is a disc, and all the planets go around in basically the same plane, and they all go around in the same direction. Why should that be?

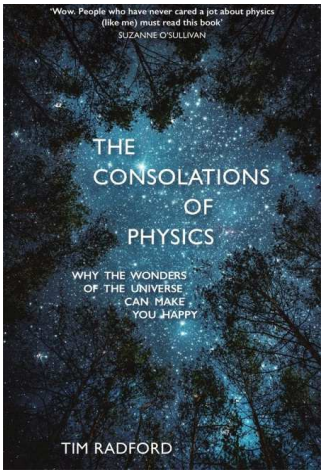
There are discs all over the place. I mean, think about the rings of Saturn. The rings of Saturn are also very, very thin, and they all go around in the same direction. Galaxies, spiral galaxies are one big disc with everything moving around a common center. Discs seem to be something that the universe likes to make. And, in fact, that really is true. And it has to do with a number of things. It has to do with the force of gravity and something called the conservation of angular momentum.

Now, gravity is very good at bringing stuff together and bringing it together so it becomes denser and denser and begins to fall into the center. Our solar system formed out of a giant cloud of dust and gas about 4 and 1/2 billion years ago. It was actually many trillions of miles across at first, but it had to get much smaller in order for the densities to get high enough and the temperatures also to get warm enough inside to give birth to the Sun, actually ignite a star. So you have this collapsing cloud of dust.

OK, well, you can sort of understand that gravity wants to bring all that together, but why does it start to spin up? There's something called the conservation of angular momentum. And that basically says that if anything has any spin at all, even just a little bit of motion, as gravity brings it together and makes it smaller, that spin is accelerated; it's sped up. And probably the example most people know best of all – you can actually feel this if you want to do this – but an ice skater. If you've seen an ice skater do a spin, usually what they do is that they have their arms outstretched, and they're spinning around relatively slowly. And then they bring their arms in, and they spin faster and faster. It's kind of amazing that any person can keep their balance when they do that. That is an application of the conservation of angular momentum. You have an extended body, your arms are out, and you're spinning slowly. In order to conserve the energy in that spin, as that body becomes smaller, the spin goes faster and faster. And so what happens in these clouds is that a cloud usually has just a tiny little bit of a drift velocity. It's going around the galaxy or maybe a nearby star exploded, and it's kind of all moving in one direction. The cloud itself has a little bit of velocity as a cloud, as a whole. Particles inside that cloud could be going any which way.

More at: https://bigthink.com/

Astronomy Can Make You Happy



Book Review: The Consolations of Physics: *Why the Wonders of the Universe Can Make You Happy* by Tim Radford (published by Sceptre, 2018; 192 pages; available in paperback in June 2019)

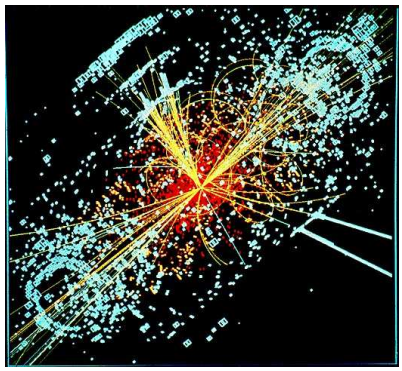
If you are a member of an astronomy society (since you're reading this!) then you probably already understand the subtitle of this book. And the key word is "Wonders". The more we see of the night sky, and the more we learn as instruments and space technology advance, the more we are confronted with the vast - unimaginably vast - distances, times, energies and sheer variety and beauty in the Universe. We not only learn about the planets, stars, galaxies etc., but we encounter them with our most natural response - a sense of wonder.

When the worlds of politics or society or relationships may seem stuck in endless cycles of chaos or irrationality or conflict, then a few minutes contemplating the night sky can re-set our perspective. We should never lose touch with those feelings that we might remember from childhood or teenage years, when we lay on the ground on a summer night and looked up at the stars, and felt the awe of a billion-year-old light show, and sense of feeling very small, and of trying to think about infinities of space or time. That's the same perspective of Carl Sagan's "Pale Blue Dot", as *Voyager 1* looked back at Earth in 1990.

Tim Radford writes about his encounters with some of the iconic scientific endeavours of our lifetime which allow us to study both the unimaginably large and the unimaginably small: the Voyager spacecraft, the LHC (Large Hadron Collider) and the LIGO (Laser Interferometer Gravity-Wave Observatory). He brings out the immensity of the human achievements of these extraordinary machines, triumphs of technical excellence and international scientific collaboration, to confirm the existence of the Higgs Boson, gravity waves etc. And with *Voyager 1* and *Voyager 2* he considers the visionary audacity to send these objects and their famous golden LP records, tokens of life on earth in the 1970s, to become the only man-made objects to leave the solar system. They are most likely to continue their journey long beyond the time the Earth along with other planets are engulfed by the red giant stage of our dying star, Sol. Six billions years from now, they could be the last (or even only) remnants of our little lives.

Voyager's Golden Record - The Sounds of Planet Earth (NASA)

This is a short book - you could read it in an evening - and doesn't need any hard science to understand. There are no equations or even pictures, but he explains some tremendous concepts in astrophysics, cosmology, plate tectonics and particle physics with infectious enthusiasm. There are mind-blowing facts, for example in the chapter "Adventures with the Time Machine" about the materials and engineering precision needed to build the LHC at CERN: did you know that when a small puff of hydrogen nuclei are accelerated to the speed of 0.999999991 of the speed of light for the collider, the relativistic energy of the tiny batch of protons is equivalent to that of an intercity train travelling at 200 km per hour! The precision and control has to be unprecedented, because "if any one thing went wrong in this machine, everything could go very wrong indeed".

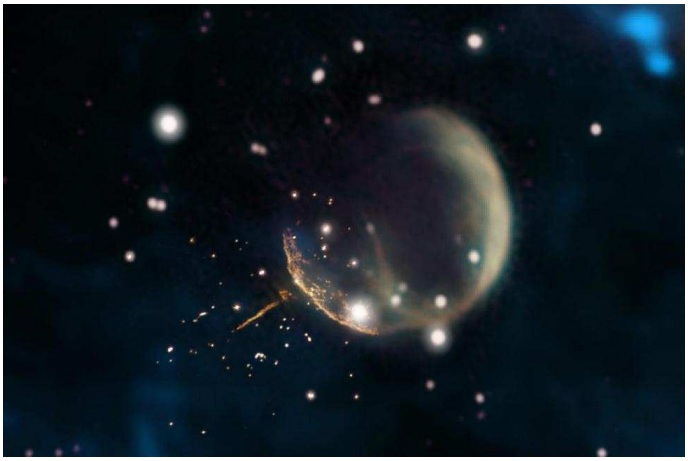


Simulation of Higgs Boson decay at the LHC CMS detector (By Lucas Taylor / CERN

And Radford writes well, as you'd expect from a former science editor of The Guardian. One reviewer says that his writing is "so beautiful, it reads like poetry", and I admire someone who can, without pretention, move from Dante's *"Divine Comedy"* and H. G Wells' "*War of the Worlds*" to the super-conductive magnets of the LHC and the collision of neutron stars. The book title is a variation on "*The Consolations of Philosophy"* by Boethius, a sixth century Roman official who wrote his contemplation on the big issues of life and death while in prison. In case we ever feel imprisoned in our everyday lives, gravity-bound to our little world, our imaginations and appreciation for the incredible things that contemporary physics and astronomy can reveal, should always be able to give us consolation and even joy.

Simon Gardner

Fermi Satellite Clocks Pulsar Going 2.5 million Mph



The composite images reveals the bright jet-like tail of the high-speed pulsar, J0002.
Photo by Jayanne English, University of Manitoba, using data from NRAO/F. Schinzel et al., DRAO/Canadian Galactic Plane Survey and NASA/IRAS

Astronomers have discovered a pulsar traveling at unprecedented speeds. Observations by NASA's Fermi Gamma-ray Space Telescope suggest the star is moving through space at 2.5 million miles per hour.

Pulsars are extremely dense neutron stars that spin rapidly, producing a pulsing jet. The pulsing radio-emitting jet, or tail, points toward the remnants of a recent supernova explosion.

“Thanks to its narrow dart-like tail and a fortuitous viewing angle, we can trace this pulsar straight back to its birthplace,” Frank Schinzel, a scientist at the National Radio Astronomy Observatory in New Mexico, told NASA. “Further study of this object will help us better understand how these explosions are able to 'kick' neutron stars to such high speed.”

Pulsars are named so because the star's spinning electromagnetic field shoots out pulses of energy in the form of radio waves, visible light, X-rays and gamma rays. Astronomers searching for pulsars look for the pulsing signals among telescope observations.

This particular pulsar was discovered by citizen scientists scanning Femi data. Participants in the Einstein@Home project have identified 13 gamma ray pulsars.

Scientists named the high-speed pulsing star PSR J0002+6216, or J0002 for short. The star is located in the Cassiopeia constellation, 6,500 light-years from Earth.

More at: https://www.upi.com/

A Neat Trick to Determine Your Dominant Eye

It turns out that not all eyes were born equal, and that most of us have one dominant eye. The dominant eye, is the one your brain prefers when it comes to processing visual input, and you should probably use that eye when looking through a telescope or shooting a gun.

Here is a neat trick you can use to discover which of your eyes is the dominant one.

Extend both hands forward of your body and place the hands together making a small triangle (approximately 2 or 3 cm per side) between your thumbs and the first knuckle like this.

With both eyes open, look through the triangle and centre something such as a doorknob in the triangle.

1. Close your left eye.

2. If the object remains in view, you are right eye dominant.

3. If closing your right eye keeps the object in view, you are left eye dominant.

It is as simple as that!

Chicxulub Asteroid Impact: Stunning Fossils Record Dinosaurs' Demise

Scientists have found an extraordinary snapshot of the fallout from the asteroid impact that wiped out the dinosaurs 66 million years ago.

Excavations in North Dakota reveal fossils of fish and trees that were sprayed with rocky, glassy fragments that fell from the sky.

The deposits show evidence also of having been swamped with water - the consequence of the colossal sea surge that was generated by the impact.

Robert DePalma, from the University of Kansas, and colleagues say the dig site, at a place called Tanis, gives an amazing glimpse into events that probably occurred perhaps only tens of minutes to a couple of hours after the giant asteroid hit the Earth.

When this 12km-wide object slammed into what is now the Gulf of Mexico, it would have hurled billions of tonnes of molten and vaporised rock into the sky in all directions - and across thousands of kilometres.

And at Tanis, the fossils record the moment this bead-sized material fell back down and strafed everything in its path.

Fish are found with the impact-induced debris embedded in their gills. They would have breathed in the fragments that filled the water around them.

There are also particles caught in amber, which is the preserved remnant of tree resin. It is even possible to discern the wake left by these tiny, glassy tektites, to use the technical term, as they entered the resin.

Geochemists have managed to link the fallout material directly to the so-called Chicxulub impact site in the Gulf. They have also dated the debris to 65.76 million years ago, which is in very good agreement with the timing for the event worked out from evidence at other sites around the world.

From the way the Tanis deposits are arranged, the scientists can see that the area was hit by a massive surge of water.

Although the impact is understood to have generated a huge tsunami, it would have taken many hours for this wave to travel the 3,000km from the Gulf to North Dakota, despite the likely presence back then of a seaway cutting directly across the American landmass.

Instead, the researchers believe local water could have been displaced much more quickly by the seismic shockwave - equivalent to a Magnitude 10 or 11 earthquake - that would have rippled around the Earth. It is a type of surge described as a seiche, which would have picked up everything in its path and dumped it into the jumbled collection of specimens now being reported by the team.

"A tangled mass of freshwater fish, terrestrial vertebrates, trees, branches, logs, marine ammonites and other marine creatures was all packed into this layer by the inland-directed surge," said Mr DePalma.

"A tsunami would have taken at least 17 or more hours to reach the site from the crater, but seismic waves - and a subsequent surge - would have reached it in tens of minutes," he added.

The PNAS paper, which will go online on Monday, includes among its authors Walter Alvarez, the Californian geologist who, with his father Luis Alvarez, is credited with helping to develop the impact theory for the demise of the dinosaurs.

The Alvarez pair identified a layer of sediment at the boundary of the Cretaceous and Palaeogene geological periods that was enriched with iridium, an element commonly found in asteroids and meteorites.

Iridium traces are also found to be capping the Tanis deposits.

"When we proposed the impact hypothesis to explain the great extinction, it was based just on finding an anomalous concentration of iridium - the fingerprint of an asteroid or comet," said Prof Alvarez. "Since then, the evidence has gradually built up. But it never crossed my mind that we would find a deathbed like this."

Phil Manning, from the University of Manchester, the only British author on the paper, commented: "It's one of the most important sites in the globe now. You know, if you truly wanted to understand the last day of the dinosaurs - this is it," he told BBC News.

More at: https://www.bbc.co.uk/

Physicists Predict a Way to Squeeze Light From the Vacuum of Empty Space

Charged particles zipping through water in a nuclear reactor produce Cherenkov radiation. (CC BY-SA 2.0)

Talk about getting something for nothing. Physicists predict that just by shooting charged particles through an electromagnetic field, it should be possible to generate light from the empty vacuum. In principle, the effect could provide a new way to test the fundamental theory of electricity and magnetism, known as quantum electrodynamics, the most precise theory in all of science. In practice, spotting the effect would require lasers and particle accelerators far more powerful than any that exist now.

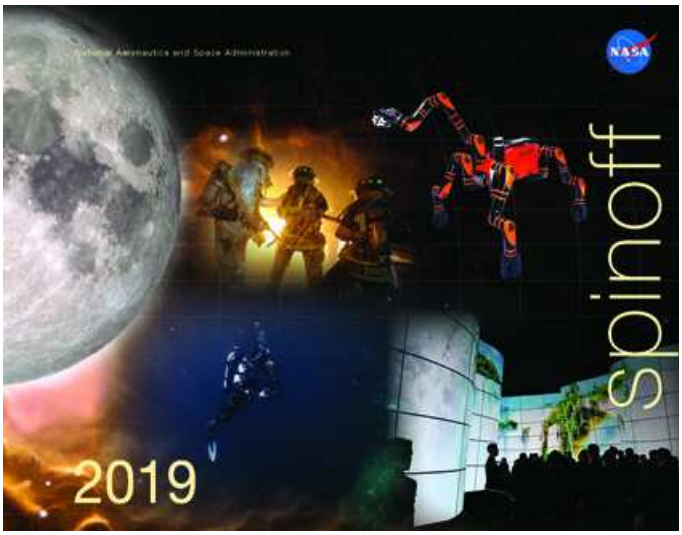
"I'm quite confident about [the prediction] simply because it combines effects that we understand pretty well," says Ben King, a laser particle physicist at the University of Plymouth in the United Kingdom, who was not involved in the new analysis. Still, he says, an experimental demonstration "is something for the future."

Physicists have long known that energetic charged particles can radiate light when they zip through a transparent medium such as water or a gas. In the medium, light travels slower than it does in empty space, allowing a particle such as an electron or proton to potentially fly faster than light. When that happens, the particle generates an electromagnetic shock wave, just as a supersonic jet creates a shock wave in air. But whereas the jet's shock wave creates a sonic boom, the electromagnetic shock wave creates light called Cherenkov radiation. That effect causes the water in the cores of nuclear reactors to glow blue, and it's been used to make particle detectors.

However, it should be possible to ditch the material and produce Cherenkov light straight from the vacuum, predict Dino Jaroszynski, a physicist at the University of Strathclyde in Glasgow, U.K., and colleagues. The trick is to shoot the particles through an extremely intense electromagnetic field instead.

More at: https://www.sciencemag.org/

NASA Spinoff



Since 1976, Spinoff has annually profiled an average of 50 commercial technologies with origins in NASA missions and research. Issues of Spinoff published since 1996 can be read online in HTML or downloaded in PDF. Scanned copies of Spinoff are available in PDF for issues published between 1976 and 1995.

Spinoff 2019 is also available on the iPad!

It features shortened versions of all the articles from the book, image galleries, videos, and more.

A 508-compliant PDF version of the iPad app is also available.

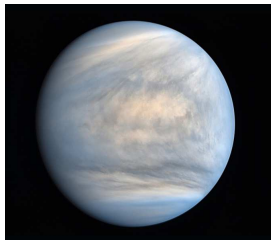
As well as the latest 2019 issue the site offers editions back to 1976.
Take a look here: https://spinoff.nasa.gov/

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

More Stuff!

Venus Reimagined: A New Image of an Active World



A new analysis of venusian lava flows shows they may have formed less than 250,000 years ago, suggesting a significant fraction of Venus' roughly 1,600 volcanoes are still active.

More at: http://www.astronomy.com/

Hubble Astronomers Assemble Wide View of the Evolving Universe

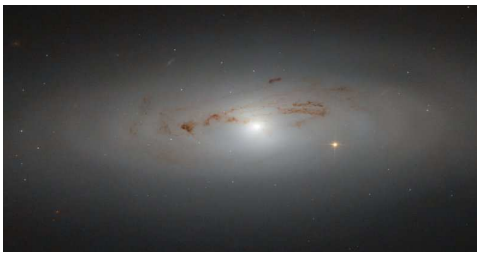
Astronomers have put together the largest and most comprehensive 'history book' of galaxies into one single image, using 16 years' worth of observations from NASA's Hubble Space Telescope.
More at: *https://www.sciencedaily.com/*

Two Neutron Stars Collided Near the Solar System Billions of Years Ago

Astrophysicists at the University of Florida, have identified a violent collision of two neutron stars 4.6 billion years ago as the likely source of some of the most coveted matter on Earth.

More at: https://phys.org/

A Strange Star Hidden in the Milky Way is Likely From Another Galaxy, Say Astronomers



One of the most recognisable star formations in our galaxy could be harbouring an intergalactic fugitive.

Hiding in the Ursa Major constellation, home of the Big Dipper, astronomers have recently ousted a strange star unlike any other in the Milky Way.

More at: https://www.sciencealert.com/

New Observations Find Universe Expanding too Fast for Science

Astronomers have discovered a discrepancy between how fast the universe is expanding and how fast theories predict it should grow.

More at: https://news.sky.com/

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 (if you need the combination to the lock, please contact a member of the committee)

Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy.

"Physics depends on a universe infinitely centred on an equals sign"
Mark Z. Danielewski

"Every line is the perfect length if you don't measure it"
Marty Rubin

"I did the math. (I presume Americans don't pluralise mathematics because they only plan to do it once.)"
Sheridan Jobbins

"'Zero and Infinity both are very difficult to understand and explain but at the same time both are key assumption of Mathematics..."
Brajesh Kumar

"Mathematics brought rigor to economics. Unfortunately it also brought mortis"
Kenneth Boulding

"In real life, I assure you, there is no such thing as algebra"
Fran Lebowitz

New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 27 Issue 4 — May 2019

When Printed, this Newsletter costs VAS at least £1

Society News

PLEASE NOTE

Due to availability and booking of the Pavilion and Field near our observatory we have changed our

Young Science and AstroFest to Saturday 27th July

Probably 6-10pm (maybe 6-9pm). We want it to finish late to try to get some Stargazing in

Tickets are already being reserved and the take up is good
We are expecting over 100 visitors on the day

Please let Elaine know if you are available to help with this event

We need as many helpers as possible

More details to follow

Contact Elaine at:
elainespear1@gmail.com

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.

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

2019 Monthly Meetings

Date	Subject	Speaker
Check *http://www.wightastronomy.org/meetings/* for the latest information		
24 May	The Rise and fall of the Herstmonceux Observatory	Keith Brackenborough
28 June	TBA	TBA
Sat 27 July	"Young Science and AstroFest" Young Astronomers' Event	
23 Aug	AGM and Social Evening	
27 Sept	A transportable/deployable radio telescope for hydrogen line observation	Alan and Martin Thompson
25 Oct	Dark Skies Event	
22 Nov	TBA	TBA

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.

This applies to all information held but is especially important for email and physical addresses.

VAS Contacts 2018/19

President	Barry Bates president@wightastronomy.org
Chairman	Bryn Davis chairman@wightastronomy.org
Secretary	Richard Flux secretary@wightastronomy.org
Treasurer	Simon Plumley treasurer@wightastronomy.org
Observatory Director	Brian Curd director@wightastronomy.org
Programme Organiser	Vacant Position progorg@wightastronomy.org
Astro Photography	Simon Plumley ap@wightastronomy.org
Outreach	Elaine Spear outreach@wightastronomy.org
NZ Editor	Brian Curd editor@wightastronomy.org
Membership Secretary	Norman Osborn members@wightastronomy.org
NZ Distribution	Graham Osborne distribution@wightastronomy.org
Others	Mark Williams, Nigel Lee, Stewart Chambers, Elaine Spear

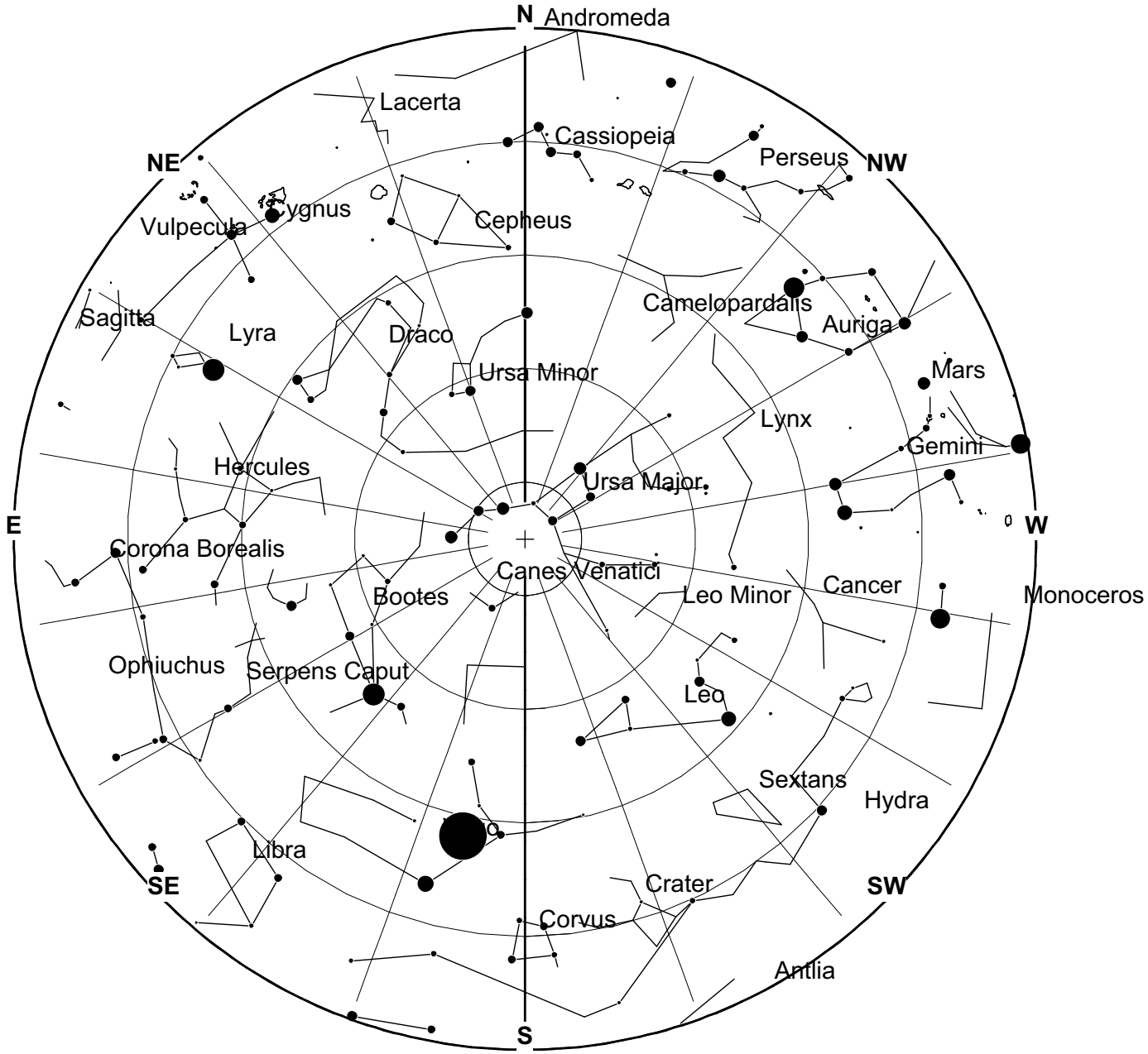
Important

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 TURNED OFF.

May 2019 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 May 2019

Leo is one of the constellations of the zodiac, lying between Cancer the crab to the west and Virgo the maiden to the east. Its name is Latin for lion, and to the ancient Greeks represented the Nemean Lion killed by the mythical Greek hero Heracles meaning 'Glory of Hera' (known to the ancient Romans as Hercules) as one of his twelve labors.

One of the 48 constellations described by the 2nd-century astronomer Ptolemy, Leo remains one of the 88 modern constellations today, and one of the most easily recognizable due to its many bright stars and a distinctive shape that is reminiscent of the crouching lion it depicts. The lion's mane and shoulders also form an asterism known as "The Sickle," which to modern observers may resemble a backwards "question mark."

May 2019 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
4th	12th	18th	26th

Planets

Mercury

In the last couple of days of the month Mercury may be spotted very low in the northwest just after sunset as it starts an evening apparition that continues into June.

Venus

Venus remains in the morning sky rising in the east just before the Sun and remaining a challenging object. **It is bright enough to be seen during the day if precautions are taken to avoid accidentally pointing at the Sun.**

Mars

Mars sets about two hours after the Sun, but with the bright twighlight sky now lasting well after sunset it is a challenging object.

Jupiter

Although Jupiter is close to opposition and about as well placed in the sky as it will be this year it not particularly well placed for our relatively high northern latitude. It can be found low in the south and can only be properly observed for a few hours either side of midnight when it is highest in the sky.

Saturn

Saturn can be observed in the southern sky from about midnight until daybreak, and like Jupiter is rather too low down for clear observation.

Uranus & Neptune

Both outer planets are currently lost in the morning twighlight.

Deep Sky

M53 Globular Cluster RA 13h 13m Dec 18° 7' mag 8.5

Lying some 60,000 light years away very few stars can be resolved in this cluster without the use of a large telescope. Through smaller instruments and binoculars it looks like a tailless comet.

M3 Globular Cluster RA 13h 42m, Dec 28° 22' mag 7

Messier's first original discovery, this is a showpiece globular cluster with stars extending across an area greater than that of the full Moon. M3 contains more variable stars than any other globular.

M63 Sunflower Galaxy RA 13 16m Dec 41° 58' mag 8.5

This is a barred spiral galaxy 37 million light years away. It was originally discovered by Pierre Mechain, a friend of Charles Messier and who went on to discover over 25 more objects that were subsequently added to Messier's catalogue. Through a small telescope it is visible as an elongated smudge, but with larger apertures and a dark sky some hint of detail in the spiral arms may be seen.

Peter Burgess

Isle of Wight Space Camps - Volunteers needed

A very innovative Island teacher who won, Science Teacher of the Year 2018, is working hard at promoting science and astronomy to all Isle of Wight school children.

She is in contact with many primary schools around the Island, and in the process of organising 'Space Camps' in conjunction with the Stephen Hawking Foundation.

She has been sent 5 celestron telescopes from the foundation and plans to run observing sessions in the evenings of all the Space Camps. She needs help to operate the telescopes - ***that's where you come in***. Please consider giving up some of your time to support this endeavour.

The list below shows the Camps organised so far

Date	Venue	VAS Members	Solar Scope	Talk
Thurs 21st March	Nineacres Primary School South View, Newport PO30 1QP	Bert Paice, Bryn Davis, Elaine Spear, Mark Taylor	No	Bryn Davis "Making Sense of the Night Sky"
Wed 27th March	St Helens Primary School Broomlands Close, St Helens, PO33 1XH	Brian Curd, Graham Osborne, Mark Taylor, John Slinn	Yes John Slinn	Brian Curd "Stellarium - your very own planetarium"
Thurs 4th April	Gurnard Primary School Baring Road, Cowes PO31 8DS	Elaine Spear, Bert Paice, Mark Taylor, John Slinn	Yes John Slinn	John Slinn "All about the Sun"
Thurs 25th April	Greenmount Primary School St Vincent's Road, Ryde PO33 3PT	Stuart Chambers, Bert Paice, Mark Taylor, John Slinn, Elaine Spear	Yes John Slinn	John Slinn "All about the Sun"
Thurs 9th May	Wootton Primary	Brian Curd		
Thurs 23rd May	Broadlea Primary School Newport Road, Lake PO36 9PE	Bryn Davis,		
Fri 7th June	Ryde School (Junior and Fiveways) 7 Queen's Road, Ryde P033 3BE	Brian Curd		
Fri 27th June	Broadlea Primary School Newport Road, Lake PO36 9PE			
Wed 3rd July	All Saints Primary School 79 School Green Road, Freshwater, PO40 9AX			

HELP!

Times are to be confirmed, but I'm guessing around 7-9pm, maybe later in the summer months of darker skies.

Please let me know which Camps you can attend. I hope to get three members for each camp.

Attending as many schools as possible will have a dual affect, as it gets the VAS name spread around, and we can promote our Young Astronomers events we are organising in July.

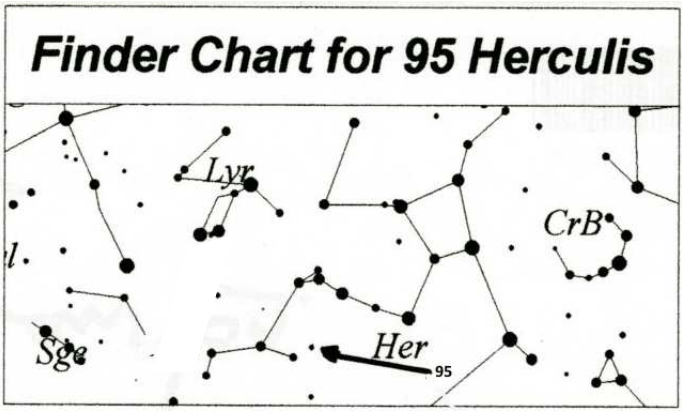
Contact me at elainespear1@gmail.com

Elaine Spear

My 100 Best Night Sky Sights

Double Star

Coordinates: RA 18h 01m 30s, Dec -21° 36'



It's early summer, you're up late and your telescope is pointing high in the sky at the constellation Hercules. 10 to 1 the object of your attention is a globular cluster (well, that seems to be the only reason most people visit the strong man). A pity really as he also sports several fine double stars among which is one of the best of all colour-contrast pairs.

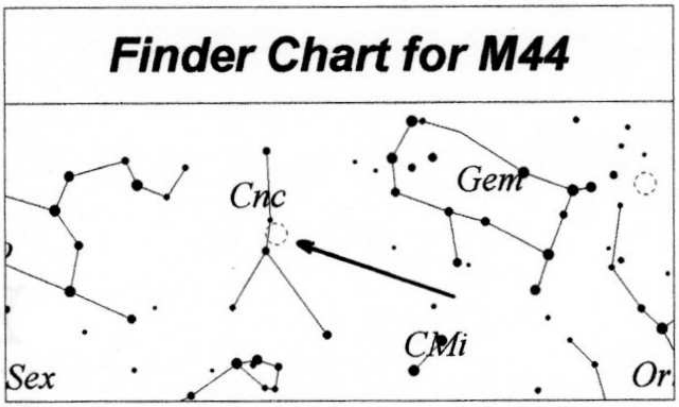
The two components of 95 Herculis are of almost equal brightness at magnitude 5.0 and 5.1, shining like beacons in any telescope. Being just 6.3" apart they would appear as close twins and be a grand sight if it were not for their colours. One is silvery blue, the other golden yellow, an exquisite combination that transforms this fine pair and turns the merely 'grand' into 'simply beautiful'.

95 Her will please whatever power you employ but I think you'll find the view at its best at around 100x, which in my opinion provides the optimum combination of colour intensity and separation. Locate it near the club with which Hercules is attacking poor Lyra (turn the chart upside down to witness this appalling act).

Galactic Cluster

Coordinates: RA 08h 40m 06s, Dec +19° 59'

So your telescope is a modest Dobsonian or you don't have one at all, just an old pair of binoculars. Well for once you're in pole position, as you'll see the magnificent open cluster, M44 in Cancer better than almost every one else. The Beehive Cluster as it's known can be seen as a misty patch without any optical aid in clean skies and reveals dozens of its stars to the smallest pair of binoculars. Telescopes up to 6" show many more as will larger instruments with short focal lengths but, as M44 covers an area three times that of the Moon, anything over 12" will give less impressive views as outer stars of the cluster become excluded from the field.

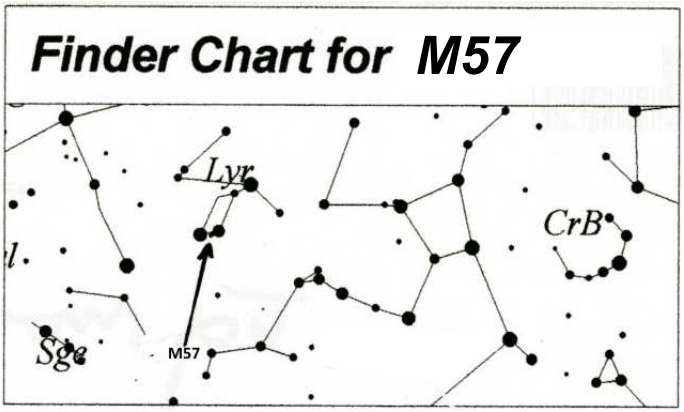


Four of the Beehive's brightest stars inhabit the very centre of the cluster appearing slightly yellow and there are several neat doubles, as well as triple stars in triangular formations, to be seen making M44 a fine cluster for extended exploration in late winter and early spring.

Cancer is a dim and sparse constellation and, whilst not easy to recognise at first, is not difficult to find in the wide field of binoculars, halfway between Gemini and the head of Leo.

Planetary Nebula

Coordinates: RA 18h 53m 36s, Dec +33° 02'



When it came to placing this one in my top 100 list it gave me a problem. Had I started writing these articles soon after I'd seen it for the first time it would have occupied a lowly position. After all the hype I'd read (terms like 'celebrated', 'showpiece' and 'most striking of all heavenly objects') I'd expected something really stunning but what did I see? - a tiddly little blob, so small I almost passed it by. It wasn't until I acquired some higher power eyepieces that I really 'discovered' this little beauty.

M57 in Lyra, the Ring Nebula is indeed worthy of its reputation. Use a low power to locate it between the southern pair of Lyra's parallelogram of 3rd and 4th magnitude stars then switch to the highest one conditions will permit. The view is quite stunning - an oval 'smoke ring' with thick 'walls' and a dark centre. The dying star

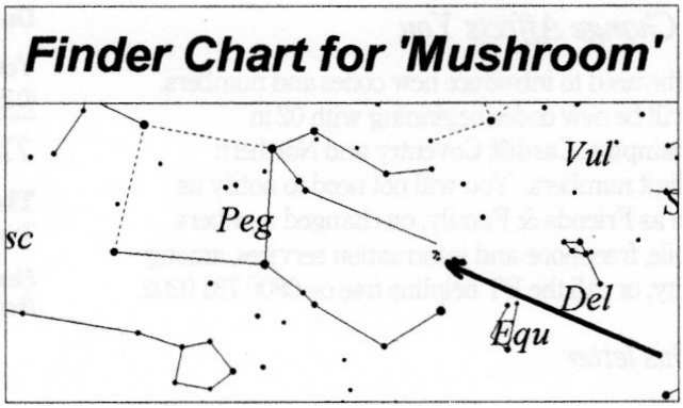
that puffed out its outer layers to form this nebula is only visible in large telescopes (theoretically the VAS 18" should see it but conditions would have to be superb). However if you use an 8" or larger telescope try to spot the 12th magnitude star sitting just off the eastern edge of the ring - at powers around 300-350x it could be the only other thing in view.

If you have an OIII filter then use it. Although it will extinguish any stars in the field the enhancement of the main objective is dramatic. The central 'hole' becomes really dark as does the surrounding sky but the nebula is unaffected with the result that it stands out with unprecedented clarity. Refer to the finder chart for 95 Herculis but hurry, before he completes his gruesome task.

Note this down as another 'must' for the Observatory main instrument next summer.

Magic Mushroom?

Coordinates: RA 21h 45m 30s, Dec +16° 45'



You're not going to believe this. There are some odd stellar arrangements in the sky but this one takes the biscuit. On a late summer evening fit your widest angle eyepiece to your telescope and look exactly 7° due north of Enif Pegasi, the horse's nose (he's upside down so you're actually below his snout). What do you see? Also upside down (in most telescopes anyway) but unmistakable for all that is the nearest you'll ever get to a celestial fungus. Don't take my word for it, see for yourself - a dozen stars forming a near-perfect fungal outline, complete with thick stem and flat cap. If you also invert this chart it looks like Pegasus has just knocked it flying with his hoof.

When you observe this oddball ask yourself this question - is it's positioning in the constellation of Pegasus accidental or is it by design? - for those who know about these things may recognise an uncanny resemblance to Psalliota arvensis - the horse mushroom!

Originally published October 1999
Bert Paice

Why are so Many Objects in Space Shaped Like Discs?

The universe is very good at making spinning discs. Our solar system is a disc, and all the planets go around in basically the same plane, and they all go around in the same direction. Why should that be?

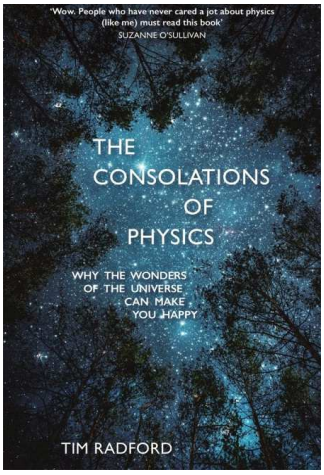
There are discs all over the place. I mean, think about the rings of Saturn. The rings of Saturn are also very, very thin, and they all go around in the same direction. Galaxies, spiral galaxies are one big disc with everything moving around a common center. Discs seem to be something that the universe likes to make. And, in fact, that really is true. And it has to do with a number of things. It has to do with the force of gravity and something called the conservation of angular momentum.

Now, gravity is very good at bringing stuff together and bringing it together so it becomes denser and denser and begins to fall into the center. Our solar system formed out of a giant cloud of dust and gas about 4 and 1/2 billion years ago. It was actually many trillions of miles across at first, but it had to get much smaller in order for the densities to get high enough and the temperatures also to get warm enough inside to give birth to the Sun, actually ignite a star. So you have this collapsing cloud of dust.

OK, well, you can sort of understand that gravity wants to bring all that together, but why does it start to spin up? There's something called the conservation of angular momentum. And that basically says that if anything has any spin at all, even just a little bit of motion, as gravity brings it together and makes it smaller, that spin is accelerated; it's sped up. And probably the example most people know best of all – you can actually feel this if you want to do this – but an ice skater. If you've seen an ice skater do a spin, usually what they do is that they have their arms outstretched, and they're spinning around relatively slowly. And then they bring their arms in, and they spin faster and faster. It's kind of amazing that any person can keep their balance when they do that. That is an application of the conservation of angular momentum. You have an extended body, your arms are out, and you're spinning slowly. In order to conserve the energy in that spin, as that body becomes smaller, the spin goes faster and faster. And so what happens in these clouds is that a cloud usually has just a tiny little bit of a drift velocity. It's going around the galaxy or maybe a nearby star exploded, and it's kind of all moving in one direction. The cloud itself has a little bit of velocity as a cloud, as a whole. Particles inside that cloud could be going any which way.

More at: https://bigthink.com/

Astronomy Can Make You Happy



Book Review: The Consolations of Physics: *Why the Wonders of the Universe Can Make You Happy* by Tim Radford (published by Sceptre, 2018; 192 pages; available in paperback in June 2019)

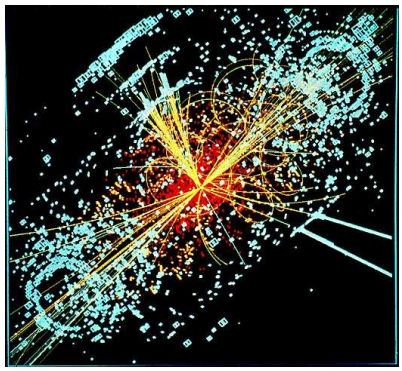
If you are a member of an astronomy society (since you're reading this!) then you probably already understand the subtitle of this book. And the key word is "Wonders". The more we see of the night sky, and the more we learn as instruments and space technology advance, the more we are confronted with the vast - unimaginably vast - distances, times, energies and sheer variety and beauty in the Universe. We not only learn about the planets, stars, galaxies etc., but we encounter them with our most natural response - a sense of wonder.

When the worlds of politics or society or relationships may seem stuck in endless cycles of chaos or irrationality or conflict, then a few minutes contemplating the night sky can re-set our perspective. We should never lose touch with those feelings that we might remember from childhood or teenage years, when we lay on the ground on a summer night and looked up at the stars, and felt the awe of a billion-year-old light show, and sense of feeling very small, and of trying to think about infinities of space or time. That's the same perspective of Carl Sagan's "Pale Blue Dot", as *Voyager 1* looked back at Earth in 1990.

Tim Radford writes about his encounters with some of the iconic scientific endeavours of our lifetime which allow us to study both the unimaginably large and the unimaginably small: the Voyager spacecraft, the LHC (Large Hadron Collider) and the LIGO (Laser Interferometer Gravity-Wave Observatory). He brings out the immensity of the human achievements of these extraordinary machines, triumphs of technical excellence and international scientific collaboration, to confirm the existence of the Higgs Boson, gravity waves etc. And with *Voyager 1* and *Voyager 2* he considers the visionary audacity to send these objects and their famous golden LP records, tokens of life on earth in the 1970s, to become the only man-made objects to leave the solar system. They are most likely to continue their journey long beyond the time the Earth along with other planets are engulfed by the red giant stage of our dying star, Sol. Six billions years from now, they could be the last (or even only) remnants of our little lives.

Voyager's Golden Record - The Sounds of Planet Earth (NASA)

This is a short book - you could read it in an evening - and doesn't need any hard science to understand. There are no equations or even pictures, but he explains some tremendous concepts in astrophysics, cosmology, plate tectonics and particle physics with infectious enthusiasm. There are mind-blowing facts, for example in the chapter "Adventures with the Time Machine" about the materials and engineering precision needed to build the LHC at CERN: did you know that when a small puff of hydrogen nuclei are accelerated to the speed of 0.999999991 of the speed of light for the collider, the relativistic energy of the tiny batch of protons is equivalent to that of an intercity train travelling at 200 km per hour! The precision and control has to be unprecedented, because "if any one thing went wrong in this machine, everything could go very wrong indeed".

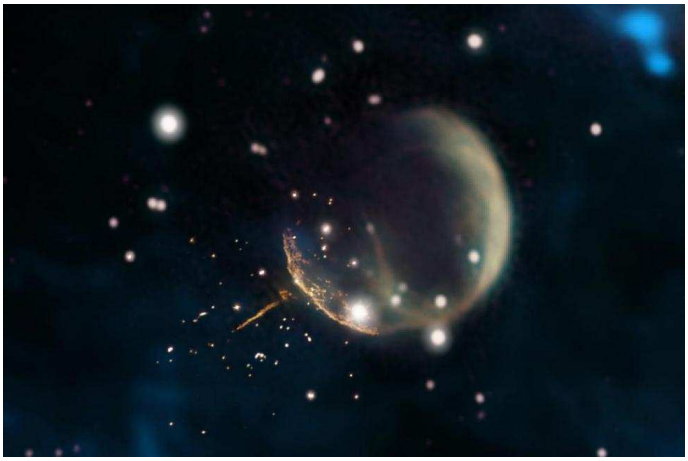


Simulation of Higgs Boson decay at the LHC CMS detector (By Lucas Taylor / CERN

And Radford writes well, as you'd expect from a former science editor of The Guardian. One reviewer says that his writing is "so beautiful, it reads like poetry", and I admire someone who can, without pretention, move from Dante's *"Divine Comedy"* and H. G Wells' "*War of the Worlds*" to the super-conductive magnets of the LHC and the collision of neutron stars. The book title is a variation on "*The Consolations of Philosophy"* by Boethius, a sixth century Roman official who wrote his contemplation on the big issues of life and death while in prison. In case we ever feel imprisoned in our everyday lives, gravity-bound to our little world, our imaginations and appreciation for the incredible things that contemporary physics and astronomy can reveal, should always be able to give us consolation and even joy.

Simon Gardner

Fermi Satellite Clocks Pulsar Going 2.5 million Mph



The composite images reveals the bright jet-like tail of the high-speed pulsar, J0002.
Photo by Jayanne English, University of Manitoba, using data from NRAO/F. Schinzel et al., DRAO/Canadian Galactic Plane Survey and NASA/IRAS

Astronomers have discovered a pulsar traveling at unprecedented speeds. Observations by NASA's Fermi Gamma-ray Space Telescope suggest the star is moving through space at 2.5 million miles per hour.

Pulsars are extremely dense neutron stars that spin rapidly, producing a pulsing jet. The pulsing radio-emitting jet, or tail, points toward the remnants of a recent supernova explosion.

“Thanks to its narrow dart-like tail and a fortuitous viewing angle, we can trace this pulsar straight back to its birthplace,” Frank Schinzel, a scientist at the National Radio Astronomy Observatory in New Mexico, told NASA. “Further study of this object will help us better understand how these explosions are able to 'kick' neutron stars to such high speed.”

Pulsars are named so because the star's spinning electromagnetic field shoots out pulses of energy in the form of radio waves, visible light, X-rays and gamma rays. Astronomers searching for pulsars look for the pulsing signals among telescope observations.

This particular pulsar was discovered by citizen scientists scanning Femi data. Participants in the Einstein@Home project have identified 13 gamma ray pulsars.

Scientists named the high-speed pulsing star PSR J0002+6216, or J0002 for short. The star is located in the Cassiopeia constellation, 6,500 light-years from Earth.

More at: https://www.upi.com/

A Neat Trick to Determine Your Dominant Eye

It turns out that not all eyes were born equal, and that most of us have one dominant eye. The dominant eye, is the one your brain prefers when it comes to processing visual input, and you should probably use that eye when looking through a telescope or shooting a gun.

Here is a neat trick you can use to discover which of your eyes is the dominant one.

Extend both hands forward of your body and place the hands together making a small triangle (approximately 2 or 3 cm per side) between your thumbs and the first knuckle like this.

With both eyes open, look through the triangle and centre something such as a doorknob in the triangle.

1. Close your left eye.

2. If the object remains in view, you are right eye dominant.

3. If closing your right eye keeps the object in view, you are left eye dominant.

It is as simple as that!

Chicxulub Asteroid Impact: Stunning Fossils Record Dinosaurs' Demise

Scientists have found an extraordinary snapshot of the fallout from the asteroid impact that wiped out the dinosaurs 66 million years ago.

Excavations in North Dakota reveal fossils of fish and trees that were sprayed with rocky, glassy fragments that fell from the sky.

The deposits show evidence also of having been swamped with water - the consequence of the colossal sea surge that was generated by the impact.

Robert DePalma, from the University of Kansas, and colleagues say the dig site, at a place called Tanis, gives an amazing glimpse into events that probably occurred perhaps only tens of minutes to a couple of hours after the giant asteroid hit the Earth.

When this 12km-wide object slammed into what is now the Gulf of Mexico, it would have hurled billions of tonnes of molten and vaporised rock into the sky in all directions - and across thousands of kilometres.

And at Tanis, the fossils record the moment this bead-sized material fell back down and strafed everything in its path.

Fish are found with the impact-induced debris embedded in their gills. They would have breathed in the fragments that filled the water around them.

There are also particles caught in amber, which is the preserved remnant of tree resin. It is even possible to discern the wake left by these tiny, glassy tektites, to use the technical term, as they entered the resin.

Geochemists have managed to link the fallout material directly to the so-called Chicxulub impact site in the Gulf. They have also dated the debris to 65.76 million years ago, which is in very good agreement with the timing for the event worked out from evidence at other sites around the world.

From the way the Tanis deposits are arranged, the scientists can see that the area was hit by a massive surge of water.

Although the impact is understood to have generated a huge tsunami, it would have taken many hours for this wave to travel the 3,000km from the Gulf to North Dakota, despite the likely presence back then of a seaway cutting directly across the American landmass.

Instead, the researchers believe local water could have been displaced much more quickly by the seismic shockwave - equivalent to a Magnitude 10 or 11 earthquake - that would have rippled around the Earth. It is a type of surge described as a seiche, which would have picked up everything in its path and dumped it into the jumbled collection of specimens now being reported by the team.

"A tangled mass of freshwater fish, terrestrial vertebrates, trees, branches, logs, marine ammonites and other marine creatures was all packed into this layer by the inland-directed surge," said Mr DePalma.

"A tsunami would have taken at least 17 or more hours to reach the site from the crater, but seismic waves - and a subsequent surge - would have reached it in tens of minutes," he added.

The PNAS paper, which will go online on Monday, includes among its authors Walter Alvarez, the Californian geologist who, with his father Luis Alvarez, is credited with helping to develop the impact theory for the demise of the dinosaurs.

The Alvarez pair identified a layer of sediment at the boundary of the Cretaceous and Palaeogene geological periods that was enriched with iridium, an element commonly found in asteroids and meteorites.

Iridium traces are also found to be capping the Tanis deposits.

"When we proposed the impact hypothesis to explain the great extinction, it was based just on finding an anomalous concentration of iridium - the fingerprint of an asteroid or comet," said Prof Alvarez. "Since then, the evidence has gradually built up. But it never crossed my mind that we would find a deathbed like this."

Phil Manning, from the University of Manchester, the only British author on the paper, commented: "It's one of the most important sites in the globe now. You know, if you truly wanted to understand the last day of the dinosaurs - this is it," he told BBC News.

More at: https://www.bbc.co.uk/

Physicists Predict a Way to Squeeze Light From the Vacuum of Empty Space

Charged particles zipping through water in a nuclear reactor produce Cherenkov radiation. (CC BY-SA 2.0)

Talk about getting something for nothing. Physicists predict that just by shooting charged particles through an electromagnetic field, it should be possible to generate light from the empty vacuum. In principle, the effect could provide a new way to test the fundamental theory of electricity and magnetism, known as quantum electrodynamics, the most precise theory in all of science. In practice, spotting the effect would require lasers and particle accelerators far more powerful than any that exist now.

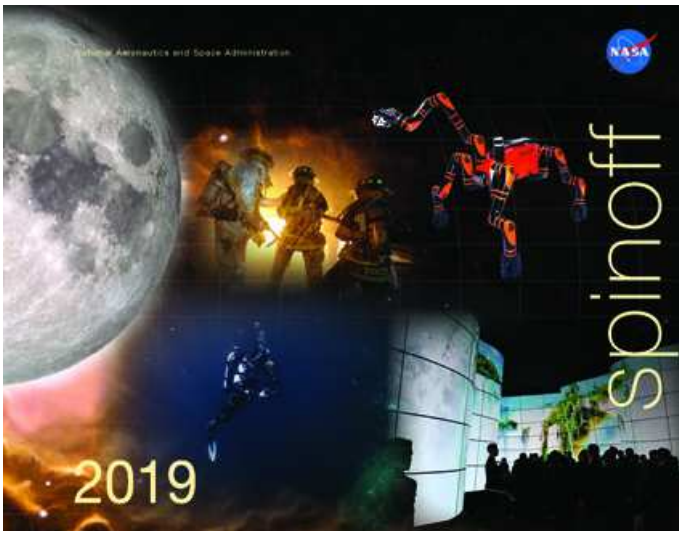
"I'm quite confident about [the prediction] simply because it combines effects that we understand pretty well," says Ben King, a laser particle physicist at the University of Plymouth in the United Kingdom, who was not involved in the new analysis. Still, he says, an experimental demonstration "is something for the future."

Physicists have long known that energetic charged particles can radiate light when they zip through a transparent medium such as water or a gas. In the medium, light travels slower than it does in empty space, allowing a particle such as an electron or proton to potentially fly faster than light. When that happens, the particle generates an electromagnetic shock wave, just as a supersonic jet creates a shock wave in air. But whereas the jet's shock wave creates a sonic boom, the electromagnetic shock wave creates light called Cherenkov radiation. That effect causes the water in the cores of nuclear reactors to glow blue, and it's been used to make particle detectors.

However, it should be possible to ditch the material and produce Cherenkov light straight from the vacuum, predict Dino Jaroszynski, a physicist at the University of Strathclyde in Glasgow, U.K., and colleagues. The trick is to shoot the particles through an extremely intense electromagnetic field instead.

More at: https://www.sciencemag.org/

NASA Spinoff



Since 1976, Spinoff has annually profiled an average of 50 commercial technologies with origins in NASA missions and research. Issues of Spinoff published since 1996 can be read online in HTML or downloaded in PDF. Scanned copies of Spinoff are available in PDF for issues published between 1976 and 1995.

Spinoff 2019 is also available on the iPad!

It features shortened versions of all the articles from the book, image galleries, videos, and more.

A 508-compliant PDF version of the iPad app is also available.

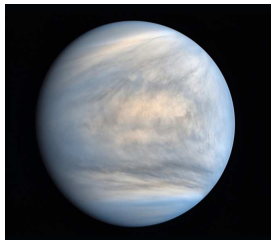
As well as the latest 2019 issue the site offers editions back to 1976.
Take a look here: https://spinoff.nasa.gov/

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

More Stuff!

Venus Reimagined: A New Image of an Active World



A new analysis of venusian lava flows shows they may have formed less than 250,000 years ago, suggesting a significant fraction of Venus' roughly 1,600 volcanoes are still active.

More at: http://www.astronomy.com/

Hubble Astronomers Assemble Wide View of the Evolving Universe

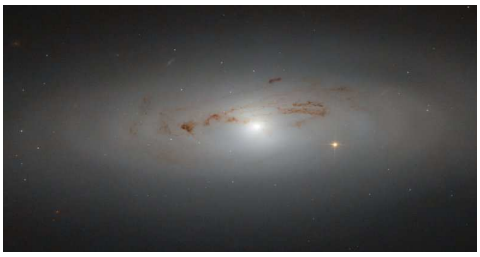
Astronomers have put together the largest and most comprehensive 'history book' of galaxies into one single image, using 16 years' worth of observations from NASA's Hubble Space Telescope.
More at: *https://www.sciencedaily.com/*

Two Neutron Stars Collided Near the Solar System Billions of Years Ago

Astrophysicists at the University of Florida, have identified a violent collision of two neutron stars 4.6 billion years ago as the likely source of some of the most coveted matter on Earth.

More at: https://phys.org/

A Strange Star Hidden in the Milky Way is Likely From Another Galaxy, Say Astronomers



One of the most recognisable star formations in our galaxy could be harbouring an intergalactic fugitive.

Hiding in the Ursa Major constellation, home of the Big Dipper, astronomers have recently ousted a strange star unlike any other in the Milky Way.

More at: https://www.sciencealert.com/

New Observations Find Universe Expanding too Fast for Science

Astronomers have discovered a discrepancy between how fast the universe is expanding and how fast theories predict it should grow.

More at: https://news.sky.com/

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 (if you need the combination to the lock, please contact a member of the committee)

Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy.

"Physics depends on a universe infinitely centred on an equals sign"
Mark Z. Danielewski

"Every line is the perfect length if you don't measure it"
Marty Rubin

"I did the math. (I presume Americans don't pluralise mathematics because they only plan to do it once.)"
Sheridan Jobbins

"'Zero and Infinity both are very difficult to understand and explain but at the same time both are key assumption of Mathematics..."
Brajesh Kumar

"Mathematics brought rigor to economics. Unfortunately it also brought mortis"
Kenneth Boulding

"In real life, I assure you, there is no such thing as algebra"
Fran Lebowitz

New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 27 Issue 4 — May 2019

When Printed, this Newsletter costs VAS at least £1

Society News

PLEASE NOTE

Due to availability and booking of the Pavilion and Field near our observatory we have changed our

Young Science and AstroFest to Saturday 27th July

Probably 6-10pm (maybe 6-9pm). We want it to finish late to try to get some Stargazing in

Tickets are already being reserved and the take up is good
We are expecting over 100 visitors on the day

Please let Elaine know if you are available to help with this event

We need as many helpers as possible

More details to follow

Contact Elaine at:
elainespear1@gmail.com

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.

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

2019 Monthly Meetings

Date	Subject	Speaker
Check *http://www.wightastronomy.org/meetings/* for the latest information		
24 May	The Rise and fall of the Herstmonceux Observatory	Keith Brackenborough
28 June	TBA	TBA
Sat 27 July	"Young Science and AstroFest" Young Astronomers' Event	
23 Aug	AGM and Social Evening	
27 Sept	A transportable/deployable radio telescope for hydrogen line observation	Alan and Martin Thompson
25 Oct	Dark Skies Event	
22 Nov	TBA	TBA

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.

This applies to all information held but is especially important for email and physical addresses.

VAS Contacts 2018/19

President	Barry Bates president@wightastronomy.org
Chairman	Bryn Davis chairman@wightastronomy.org
Secretary	Richard Flux secretary@wightastronomy.org
Treasurer	Simon Plumley treasurer@wightastronomy.org
Observatory Director	Brian Curd director@wightastronomy.org
Programme Organiser	Vacant Position progorg@wightastronomy.org
Astro Photography	Simon Plumley ap@wightastronomy.org
Outreach	Elaine Spear outreach@wightastronomy.org
NZ Editor	Brian Curd editor@wightastronomy.org
Membership Secretary	Norman Osborn members@wightastronomy.org
NZ Distribution	Graham Osborne distribution@wightastronomy.org
Others	Mark Williams, Nigel Lee, Stewart Chambers, Elaine Spear

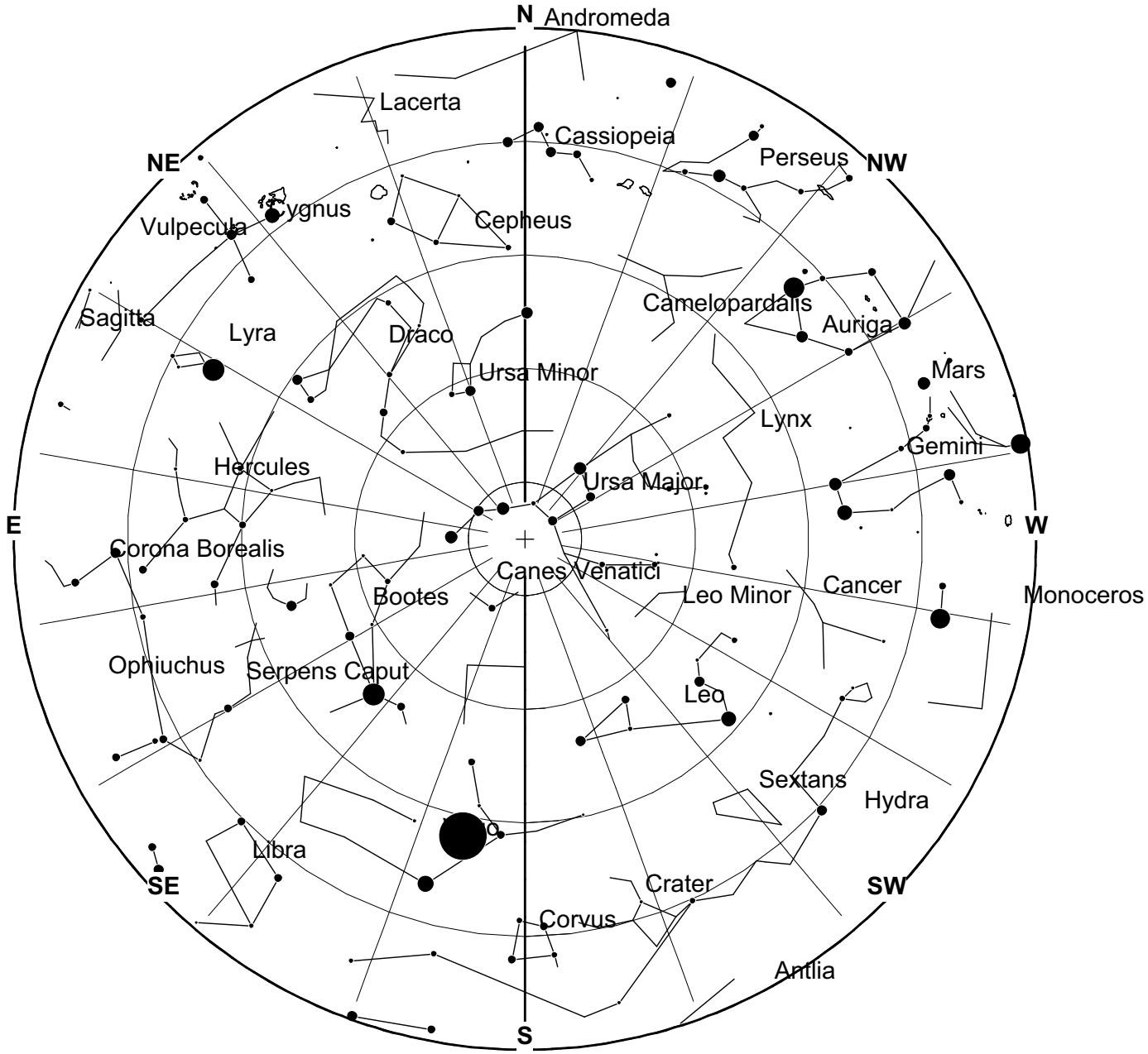
Important

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 TURNED OFF.

May 2019 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 May 2019

Leo is one of the constellations of the zodiac, lying between Cancer the crab to the west and Virgo the maiden to the east. Its name is Latin for lion, and to the ancient Greeks represented the Nemean Lion killed by the mythical Greek hero Heracles meaning 'Glory of Hera' (known to the ancient Romans as Hercules) as one of his twelve labors.

One of the 48 constellations described by the 2nd-century astronomer Ptolemy, Leo remains one of the 88 modern constellations today, and one of the most easily recognizable due to its many bright stars and a distinctive shape that is reminiscent of the crouching lion it depicts. The lion's mane and shoulders also form an asterism known as "The Sickle," which to modern observers may resemble a backwards "question mark."

May 2019 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
4th	12th	18th	26th

Planets

Mercury

In the last couple of days of the month Mercury may be spotted very low in the northwest just after sunset as it starts an evening apparition that continues into June.

Venus

Venus remains in the morning sky rising in the east just before the Sun and remaining a challenging object. **It is bright enough to be seen during the day if precautions are taken to avoid accidentally pointing at the Sun.**

Mars

Mars sets about two hours after the Sun, but with the bright twighlight sky now lasting well after sunset it is a challenging object.

Jupiter

Although Jupiter is close to opposition and about as well placed in the sky as it will be this year it not particularly well placed for our relatively high northern latitude. It can be found low in the south and can only be properly observed for a few hours either side of midnight when it is highest in the sky.

Saturn

Saturn can be observed in the southern sky from about midnight until daybreak, and like Jupiter is rather too low down for clear observation.

Uranus & Neptune

Both outer planets are currently lost in the morning twighlight.

Deep Sky

M53 Globular Cluster RA 13h 13m Dec 18° 7' mag 8.5

Lying some 60,000 light years away very few stars can be resolved in this cluster without the use of a large telescope. Through smaller instruments and binoculars it looks like a tailless comet.

M3 Globular Cluster RA 13h 42m, Dec 28° 22' mag 7

Messier's first original discovery, this is a showpiece globular cluster with stars extending across an area greater than that of the full Moon. M3 contains more variable stars than any other globular.

M63 Sunflower Galaxy RA 13 16m Dec 41° 58' mag 8.5

This is a barred spiral galaxy 37 million light years away. It was originally discovered by Pierre Mechain, a friend of Charles Messier and who went on to discover over 25 more objects that were subsequently added to Messier's catalogue. Through a small telescope it is visible as an elongated smudge, but with larger apertures and a dark sky some hint of detail in the spiral arms may be seen.

Peter Burgess

Isle of Wight Space Camps - Volunteers needed

A very innovative Island teacher who won, Science Teacher of the Year 2018, is working hard at promoting science and astronomy to all Isle of Wight school children.

She is in contact with many primary schools around the Island, and in the process of organising 'Space Camps' in conjunction with the Stephen Hawking Foundation.

She has been sent 5 celestron telescopes from the foundation and plans to run observing sessions in the evenings of all the Space Camps. She needs help to operate the telescopes - ***that's where you come in***. Please consider giving up some of your time to support this endeavour.

The list below shows the Camps organised so far

Date	Venue	VAS Members	Solar Scope	Talk
Thurs 21st March	Nineacres Primary School South View, Newport PO30 1QP	Bert Paice, Bryn Davis, Elaine Spear, Mark Taylor	No	Bryn Davis "Making Sense of the Night Sky"
Wed 27th March	St Helens Primary School Broomlands Close, St Helens, PO33 1XH	Brian Curd, Graham Osborne, Mark Taylor, John Slinn	Yes John Slinn	Brian Curd "Stellarium - your very own planetarium"
Thurs 4th April	Gurnard Primary School Baring Road, Cowes PO31 8DS	Elaine Spear, Bert Paice, Mark Taylor, John Slinn	Yes John Slinn	John Slinn "All about the Sun"
Thurs 25th April	Greenmount Primary School St Vincent's Road, Ryde PO33 3PT	Stuart Chambers, Bert Paice, Mark Taylor, John Slinn, Elaine Spear	Yes John Slinn	John Slinn "All about the Sun"
Thurs 9th May	Wootton Primary	Brian Curd		
Thurs 23rd May	Broadlea Primary School Newport Road, Lake PO36 9PE	Bryn Davis,		
Fri 7th June	Ryde School (Junior and Fiveways) 7 Queen's Road, Ryde P033 3BE	Brian Curd		
Fri 27th June	Broadlea Primary School Newport Road, Lake PO36 9PE			
Wed 3rd July	All Saints Primary School 79 School Green Road, Freshwater, PO40 9AX			

HELP!

Times are to be confirmed, but I'm guessing around 7-9pm, maybe later in the summer months of darker skies.

Please let me know which Camps you can attend. I hope to get three members for each camp.

Attending as many schools as possible will have a dual affect, as it gets the VAS name spread around, and we can promote our Young Astronomers events we are organising in July.

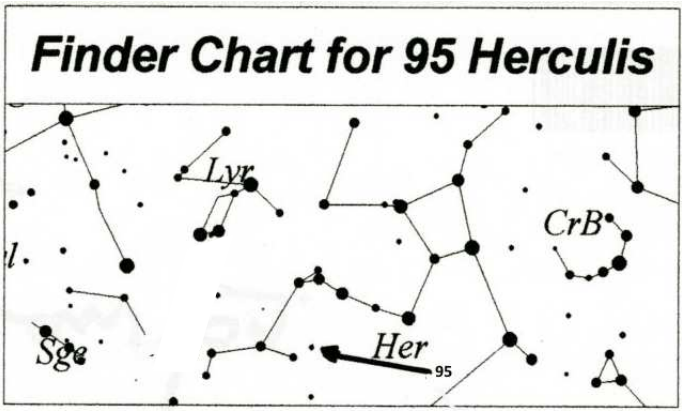
Contact me at elainespear1@gmail.com

Elaine Spear

My 100 Best Night Sky Sights

Double Star

Coordinates: RA 18h 01m 30s, Dec -21° 36'



It's early summer, you're up late and your telescope is pointing high in the sky at the constellation Hercules. 10 to 1 the object of your attention is a globular cluster (well, that seems to be the only reason most people visit the strong man). A pity really as he also sports several fine double stars among which is one of the best of all colour-contrast pairs.

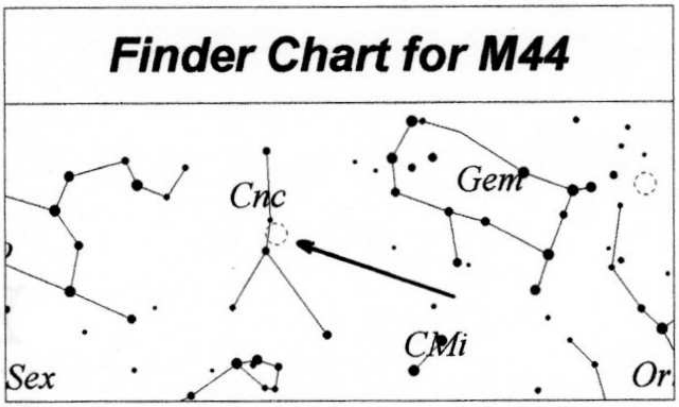
The two components of 95 Herculis are of almost equal brightness at magnitude 5.0 and 5.1, shining like beacons in any telescope. Being just 6.3" apart they would appear as close twins and be a grand sight if it were not for their colours. One is silvery blue, the other golden yellow, an exquisite combination that transforms this fine pair and turns the merely 'grand' into 'simply beautiful'.

95 Her will please whatever power you employ but I think you'll find the view at its best at around 100x, which in my opinion provides the optimum combination of colour intensity and separation. Locate it near the club with which Hercules is attacking poor Lyra (turn the chart upside down to witness this appalling act).

Galactic Cluster

Coordinates: RA 08h 40m 06s, Dec +19° 59'

So your telescope is a modest Dobsonian or you don't have one at all, just an old pair of binoculars. Well for once you're in pole position, as you'll see the magnificent open cluster, M44 in Cancer better than almost every one else. The Beehive Cluster as it's known can be seen as a misty patch without any optical aid in clean skies and reveals dozens of its stars to the smallest pair of binoculars. Telescopes up to 6" show many more as will larger instruments with short focal lengths but, as M44 covers an area three times that of the Moon, anything over 12" will give less impressive views as outer stars of the cluster become excluded from the field.

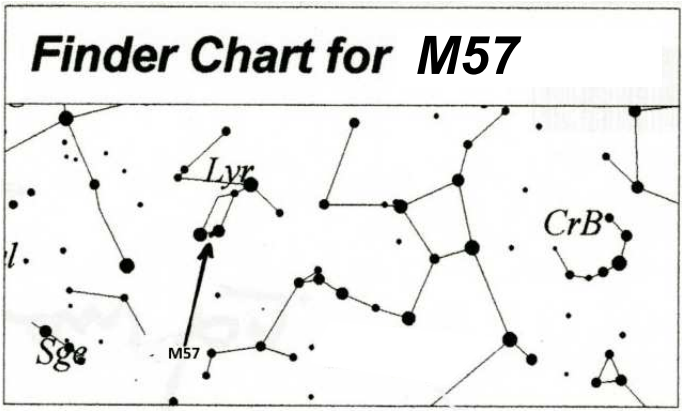


Four of the Beehive's brightest stars inhabit the very centre of the cluster appearing slightly yellow and there are several neat doubles, as well as triple stars in triangular formations, to be seen making M44 a fine cluster for extended exploration in late winter and early spring.

Cancer is a dim and sparse constellation and, whilst not easy to recognise at first, is not difficult to find in the wide field of binoculars, halfway between Gemini and the head of Leo.

Planetary Nebula

Coordinates: RA 18h 53m 36s, Dec +33° 02'



When it came to placing this one in my top 100 list it gave me a problem. Had I started writing these articles soon after I'd seen it for the first time it would have occupied a lowly position. After all the hype I'd read (terms like 'celebrated', 'showpiece' and 'most striking of all heavenly objects') I'd expected something really stunning but what did I see? - a tiddly little blob, so small I almost passed it by. It wasn't until I acquired some higher power eyepieces that I really 'discovered' this little beauty.

M57 in Lyra, the Ring Nebula is indeed worthy of its reputation. Use a low power to locate it between the southern pair of Lyra's parallelogram of 3rd and 4th magnitude stars then switch to the highest one conditions will permit. The view is quite stunning - an oval 'smoke ring' with thick 'walls' and a dark centre. The dying star

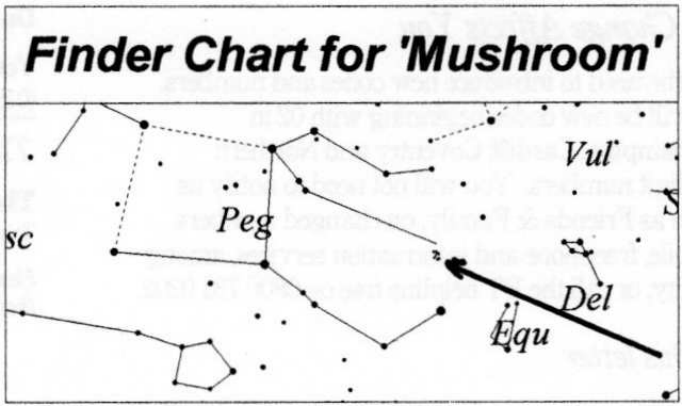
that puffed out its outer layers to form this nebula is only visible in large telescopes (theoretically the VAS 18" should see it but conditions would have to be superb). However if you use an 8" or larger telescope try to spot the 12th magnitude star sitting just off the eastern edge of the ring - at powers around 300-350x it could be the only other thing in view.

If you have an OIII filter then use it. Although it will extinguish any stars in the field the enhancement of the main objective is dramatic. The central 'hole' becomes really dark as does the surrounding sky but the nebula is unaffected with the result that it stands out with unprecedented clarity. Refer to the finder chart for 95 Herculis but hurry, before he completes his gruesome task.

Note this down as another 'must' for the Observatory main instrument next summer.

Magic Mushroom?

Coordinates: RA 21h 45m 30s, Dec +16° 45'



You're not going to believe this. There are some odd stellar arrangements in the sky but this one takes the biscuit. On a late summer evening fit your widest angle eyepiece to your telescope and look exactly 7° due north of Enif Pegasi, the horse's nose (he's upside down so you're actually below his snout). What do you see? Also upside down (in most telescopes anyway) but unmistakable for all that is the nearest you'll ever get to a celestial fungus. Don't take my word for it, see for yourself - a dozen stars forming a near-perfect fungal outline, complete with thick stem and flat cap. If you also invert this chart it looks like Pegasus has just knocked it flying with his hoof.

When you observe this oddball ask yourself this question - is it's positioning in the constellation of Pegasus accidental or is it by design? - for those who know about these things may recognise an uncanny resemblance to Psalliota arvensis - the horse mushroom!

Originally published October 1999
Bert Paice

Why are so Many Objects in Space Shaped Like Discs?

The universe is very good at making spinning discs. Our solar system is a disc, and all the planets go around in basically the same plane, and they all go around in the same direction. Why should that be?

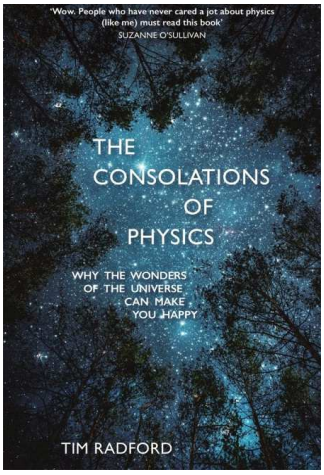
There are discs all over the place. I mean, think about the rings of Saturn. The rings of Saturn are also very, very thin, and they all go around in the same direction. Galaxies, spiral galaxies are one big disc with everything moving around a common center. Discs seem to be something that the universe likes to make. And, in fact, that really is true. And it has to do with a number of things. It has to do with the force of gravity and something called the conservation of angular momentum.

Now, gravity is very good at bringing stuff together and bringing it together so it becomes denser and denser and begins to fall into the center. Our solar system formed out of a giant cloud of dust and gas about 4 and 1/2 billion years ago. It was actually many trillions of miles across at first, but it had to get much smaller in order for the densities to get high enough and the temperatures also to get warm enough inside to give birth to the Sun, actually ignite a star. So you have this collapsing cloud of dust.

OK, well, you can sort of understand that gravity wants to bring all that together, but why does it start to spin up? There's something called the conservation of angular momentum. And that basically says that if anything has any spin at all, even just a little bit of motion, as gravity brings it together and makes it smaller, that spin is accelerated; it's sped up. And probably the example most people know best of all – you can actually feel this if you want to do this – but an ice skater. If you've seen an ice skater do a spin, usually what they do is that they have their arms outstretched, and they're spinning around relatively slowly. And then they bring their arms in, and they spin faster and faster. It's kind of amazing that any person can keep their balance when they do that. That is an application of the conservation of angular momentum. You have an extended body, your arms are out, and you're spinning slowly. In order to conserve the energy in that spin, as that body becomes smaller, the spin goes faster and faster. And so what happens in these clouds is that a cloud usually has just a tiny little bit of a drift velocity. It's going around the galaxy or maybe a nearby star exploded, and it's kind of all moving in one direction. The cloud itself has a little bit of velocity as a cloud, as a whole. Particles inside that cloud could be going any which way.

More at: https://bigthink.com/

Astronomy Can Make You Happy



Book Review: The Consolations of Physics: *Why the Wonders of the Universe Can Make You Happy* by Tim Radford (published by Sceptre, 2018; 192 pages; available in paperback in June 2019)

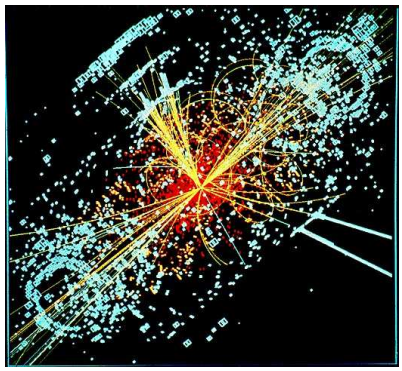
If you are a member of an astronomy society (since you're reading this!) then you probably already understand the subtitle of this book. And the key word is "Wonders". The more we see of the night sky, and the more we learn as instruments and space technology advance, the more we are confronted with the vast - unimaginably vast - distances, times, energies and sheer variety and beauty in the Universe. We not only learn about the planets, stars, galaxies etc., but we encounter them with our most natural response - a sense of wonder.

When the worlds of politics or society or relationships may seem stuck in endless cycles of chaos or irrationality or conflict, then a few minutes contemplating the night sky can re-set our perspective. We should never lose touch with those feelings that we might remember from childhood or teenage years, when we lay on the ground on a summer night and looked up at the stars, and felt the awe of a billion-year-old light show, and sense of feeling very small, and of trying to think about infinities of space or time. That's the same perspective of Carl Sagan's "Pale Blue Dot", as *Voyager 1* looked back at Earth in 1990.

Tim Radford writes about his encounters with some of the iconic scientific endeavours of our lifetime which allow us to study both the unimaginably large and the unimaginably small: the Voyager spacecraft, the LHC (Large Hadron Collider) and the LIGO (Laser Interferometer Gravity-Wave Observatory). He brings out the immensity of the human achievements of these extraordinary machines, triumphs of technical excellence and international scientific collaboration, to confirm the existence of the Higgs Boson, gravity waves etc. And with *Voyager 1* and *Voyager 2* he considers the visionary audacity to send these objects and their famous golden LP records, tokens of life on earth in the 1970s, to become the only man-made objects to leave the solar system. They are most likely to continue their journey long beyond the time the Earth along with other planets are engulfed by the red giant stage of our dying star, Sol. Six billions years from now, they could be the last (or even only) remnants of our little lives.

Voyager's Golden Record - The Sounds of Planet Earth (NASA)

This is a short book - you could read it in an evening - and doesn't need any hard science to understand. There are no equations or even pictures, but he explains some tremendous concepts in astrophysics, cosmology, plate tectonics and particle physics with infectious enthusiasm. There are mind-blowing facts, for example in the chapter "Adventures with the Time Machine" about the materials and engineering precision needed to build the LHC at CERN: did you know that when a small puff of hydrogen nuclei are accelerated to the speed of 0.999999991 of the speed of light for the collider, the relativistic energy of the tiny batch of protons is equivalent to that of an intercity train travelling at 200 km per hour! The precision and control has to be unprecedented, because "if any one thing went wrong in this machine, everything could go very wrong indeed".

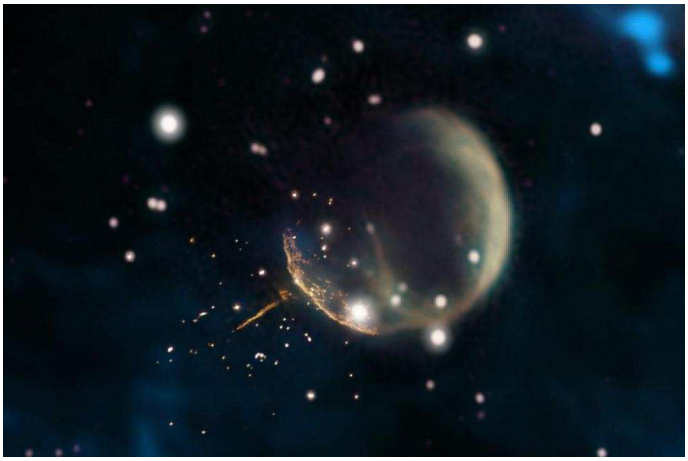


Simulation of Higgs Boson decay at the LHC CMS detector (By Lucas Taylor / CERN

And Radford writes well, as you'd expect from a former science editor of The Guardian. One reviewer says that his writing is "so beautiful, it reads like poetry", and I admire someone who can, without pretention, move from Dante's *"Divine Comedy"* and H. G Wells' "*War of the Worlds*" to the super-conductive magnets of the LHC and the collision of neutron stars. The book title is a variation on "*The Consolations of Philosophy"* by Boethius, a sixth century Roman official who wrote his contemplation on the big issues of life and death while in prison. In case we ever feel imprisoned in our everyday lives, gravity-bound to our little world, our imaginations and appreciation for the incredible things that contemporary physics and astronomy can reveal, should always be able to give us consolation and even joy.

Simon Gardner

Fermi Satellite Clocks Pulsar Going 2.5 million Mph



The composite images reveals the bright jet-like tail of the high-speed pulsar, J0002.
Photo by Jayanne English, University of Manitoba, using data from NRAO/F. Schinzel et al., DRAO/Canadian Galactic Plane Survey and NASA/IRAS

Astronomers have discovered a pulsar traveling at unprecedented speeds. Observations by NASA's Fermi Gamma-ray Space Telescope suggest the star is moving through space at 2.5 million miles per hour.

Pulsars are extremely dense neutron stars that spin rapidly, producing a pulsing jet. The pulsing radio-emitting jet, or tail, points toward the remnants of a recent supernova explosion.

“Thanks to its narrow dart-like tail and a fortuitous viewing angle, we can trace this pulsar straight back to its birthplace,” Frank Schinzel, a scientist at the National Radio Astronomy Observatory in New Mexico, told NASA. “Further study of this object will help us better understand how these explosions are able to 'kick' neutron stars to such high speed.”

Pulsars are named so because the star's spinning electromagnetic field shoots out pulses of energy in the form of radio waves, visible light, X-rays and gamma rays. Astronomers searching for pulsars look for the pulsing signals among telescope observations.

This particular pulsar was discovered by citizen scientists scanning Femi data. Participants in the Einstein@Home project have identified 13 gamma ray pulsars.

Scientists named the high-speed pulsing star PSR J0002+6216, or J0002 for short. The star is located in the Cassiopeia constellation, 6,500 light-years from Earth.

More at: https://www.upi.com/

A Neat Trick to Determine Your Dominant Eye

It turns out that not all eyes were born equal, and that most of us have one dominant eye. The dominant eye, is the one your brain prefers when it comes to processing visual input, and you should probably use that eye when looking through a telescope or shooting a gun.

Here is a neat trick you can use to discover which of your eyes is the dominant one.

Extend both hands forward of your body and place the hands together making a small triangle (approximately 2 or 3 cm per side) between your thumbs and the first knuckle like this.

With both eyes open, look through the triangle and centre something such as a doorknob in the triangle.

1. Close your left eye.

2. If the object remains in view, you are right eye dominant.

3. If closing your right eye keeps the object in view, you are left eye dominant.

It is as simple as that!

Chicxulub Asteroid Impact: Stunning Fossils Record Dinosaurs' Demise

Scientists have found an extraordinary snapshot of the fallout from the asteroid impact that wiped out the dinosaurs 66 million years ago.

Excavations in North Dakota reveal fossils of fish and trees that were sprayed with rocky, glassy fragments that fell from the sky.

The deposits show evidence also of having been swamped with water - the consequence of the colossal sea surge that was generated by the impact.

Robert DePalma, from the University of Kansas, and colleagues say the dig site, at a place called Tanis, gives an amazing glimpse into events that probably occurred perhaps only tens of minutes to a couple of hours after the giant asteroid hit the Earth.

When this 12km-wide object slammed into what is now the Gulf of Mexico, it would have hurled billions of tonnes of molten and vaporised rock into the sky in all directions - and across thousands of kilometres.

And at Tanis, the fossils record the moment this bead-sized material fell back down and strafed everything in its path.

Fish are found with the impact-induced debris embedded in their gills. They would have breathed in the fragments that filled the water around them.

There are also particles caught in amber, which is the preserved remnant of tree resin. It is even possible to discern the wake left by these tiny, glassy tektites, to use the technical term, as they entered the resin.

Geochemists have managed to link the fallout material directly to the so-called Chicxulub impact site in the Gulf. They have also dated the debris to 65.76 million years ago, which is in very good agreement with the timing for the event worked out from evidence at other sites around the world.

From the way the Tanis deposits are arranged, the scientists can see that the area was hit by a massive surge of water.

Although the impact is understood to have generated a huge tsunami, it would have taken many hours for this wave to travel the 3,000km from the Gulf to North Dakota, despite the likely presence back then of a seaway cutting directly across the American landmass.

Instead, the researchers believe local water could have been displaced much more quickly by the seismic shockwave - equivalent to a Magnitude 10 or 11 earthquake - that would have rippled around the Earth. It is a type of surge described as a seiche, which would have picked up everything in its path and dumped it into the jumbled collection of specimens now being reported by the team.

"A tangled mass of freshwater fish, terrestrial vertebrates, trees, branches, logs, marine ammonites and other marine creatures was all packed into this layer by the inland-directed surge," said Mr DePalma.

"A tsunami would have taken at least 17 or more hours to reach the site from the crater, but seismic waves - and a subsequent surge - would have reached it in tens of minutes," he added.

The PNAS paper, which will go online on Monday, includes among its authors Walter Alvarez, the Californian geologist who, with his father Luis Alvarez, is credited with helping to develop the impact theory for the demise of the dinosaurs.

The Alvarez pair identified a layer of sediment at the boundary of the Cretaceous and Palaeogene geological periods that was enriched with iridium, an element commonly found in asteroids and meteorites.

Iridium traces are also found to be capping the Tanis deposits.

"When we proposed the impact hypothesis to explain the great extinction, it was based just on finding an anomalous concentration of iridium - the fingerprint of an asteroid or comet," said Prof Alvarez. "Since then, the evidence has gradually built up. But it never crossed my mind that we would find a deathbed like this."

Phil Manning, from the University of Manchester, the only British author on the paper, commented: "It's one of the most important sites in the globe now. You know, if you truly wanted to understand the last day of the dinosaurs - this is it," he told BBC News.

More at: https://www.bbc.co.uk/

Physicists Predict a Way to Squeeze Light From the Vacuum of Empty Space

Charged particles zipping through water in a nuclear reactor produce Cherenkov radiation. (CC BY-SA 2.0)

Talk about getting something for nothing. Physicists predict that just by shooting charged particles through an electromagnetic field, it should be possible to generate light from the empty vacuum. In principle, the effect could provide a new way to test the fundamental theory of electricity and magnetism, known as quantum electrodynamics, the most precise theory in all of science. In practice, spotting the effect would require lasers and particle accelerators far more powerful than any that exist now.

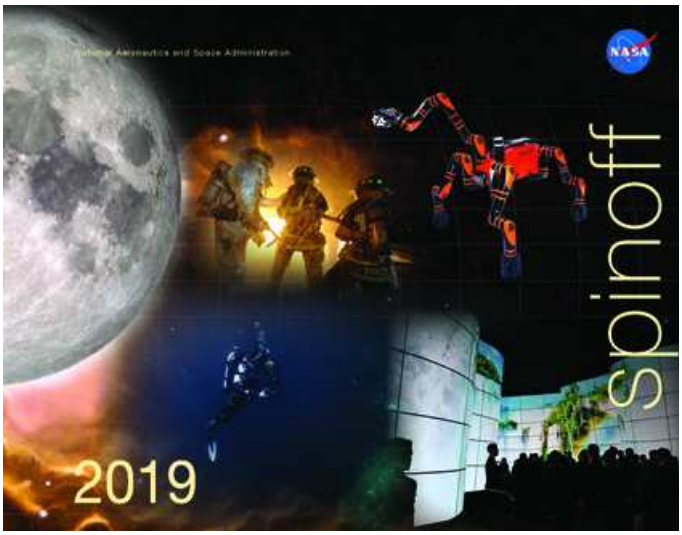
"I'm quite confident about [the prediction] simply because it combines effects that we understand pretty well," says Ben King, a laser particle physicist at the University of Plymouth in the United Kingdom, who was not involved in the new analysis. Still, he says, an experimental demonstration "is something for the future."

Physicists have long known that energetic charged particles can radiate light when they zip through a transparent medium such as water or a gas. In the medium, light travels slower than it does in empty space, allowing a particle such as an electron or proton to potentially fly faster than light. When that happens, the particle generates an electromagnetic shock wave, just as a supersonic jet creates a shock wave in air. But whereas the jet's shock wave creates a sonic boom, the electromagnetic shock wave creates light called Cherenkov radiation. That effect causes the water in the cores of nuclear reactors to glow blue, and it's been used to make particle detectors.

However, it should be possible to ditch the material and produce Cherenkov light straight from the vacuum, predict Dino Jaroszynski, a physicist at the University of Strathclyde in Glasgow, U.K., and colleagues. The trick is to shoot the particles through an extremely intense electromagnetic field instead.

More at: https://www.sciencemag.org/

NASA Spinoff



Since 1976, Spinoff has annually profiled an average of 50 commercial technologies with origins in NASA missions and research. Issues of Spinoff published since 1996 can be read online in HTML or downloaded in PDF. Scanned copies of Spinoff are available in PDF for issues published between 1976 and 1995.

Spinoff 2019 is also available on the iPad!

It features shortened versions of all the articles from the book, image galleries, videos, and more.

A 508-compliant PDF version of the iPad app is also available.

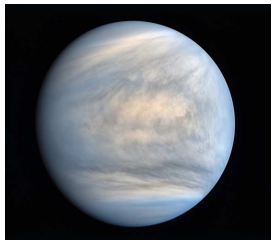
As well as the latest 2019 issue the site offers editions back to 1976.
Take a look here: https://spinoff.nasa.gov/

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

More Stuff!

Venus Reimagined: A New Image of an Active World



A new analysis of venusian lava flows shows they may have formed less than 250,000 years ago, suggesting a significant fraction of Venus' roughly 1,600 volcanoes are still active.

More at: http://www.astronomy.com/

Hubble Astronomers Assemble Wide View of the Evolving Universe

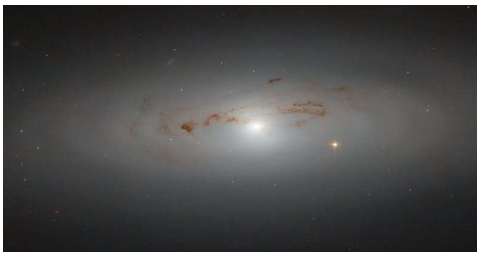
Astronomers have put together the largest and most comprehensive 'history book' of galaxies into one single image, using 16 years' worth of observations from NASA's Hubble Space Telescope.
More at: *https://www.sciencedaily.com/*

Two Neutron Stars Collided Near the Solar System Billions of Years Ago

Astrophysicists at the University of Florida, have identified a violent collision of two neutron stars 4.6 billion years ago as the likely source of some of the most coveted matter on Earth.

More at: https://phys.org/

A Strange Star Hidden in the Milky Way is Likely From Another Galaxy, Say Astronomers



One of the most recognisable star formations in our galaxy could be harbouring an intergalactic fugitive.

Hiding in the Ursa Major constellation, home of the Big Dipper, astronomers have recently ousted a strange star unlike any other in the Milky Way.

More at: https://www.sciencealert.com/

New Observations Find Universe Expanding too Fast for Science

Astronomers have discovered a discrepancy between how fast the universe is expanding and how fast theories predict it should grow.

More at: https://news.sky.com/

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 (if you need the combination to the lock, please contact a member of the committee)

Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy.

"Physics depends on a universe infinitely centred on an equals sign"
Mark Z. Danielewski

"Every line is the perfect length if you don't measure it"
Marty Rubin

"I did the math. (I presume Americans don't pluralise mathematics because they only plan to do it once.)"
Sheridan Jobbins

"'Zero and Infinity both are very difficult to understand and explain but at the same time both are key assumption of Mathematics..."
Brajesh Kumar

"Mathematics brought rigor to economics. Unfortunately it also brought mortis"
Kenneth Boulding

"In real life, I assure you, there is no such thing as algebra"
Fran Lebowitz

New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 27 Issue 4 — May 2019

When Printed, this Newsletter costs VAS at least £1

Society News

PLEASE NOTE

Due to availability and booking of the Pavilion and Field near our observatory we have changed our

Young Science and AstroFest to Saturday 27th July

Probably 6-10pm (maybe 6-9pm). We want it to finish late to try to get some Stargazing in

Tickets are already being reserved and the take up is good
We are expecting over 100 visitors on the day

Please let Elaine know if you are available to help with this event

We need as many helpers as possible

More details to follow

Contact Elaine at:
elainespear1@gmail.com

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.

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

2019 Monthly Meetings

Date	Subject	Speaker
Check *http://www.wightastronomy.org/meetings/* for the latest information		
24 May	The Rise and fall of the Herstmonceux Observatory	Keith Brackenborough
28 June	TBA	TBA
Sat 27 July	"Young Science and AstroFest" Young Astronomers' Event	
23 Aug	AGM and Social Evening	
27 Sept	A transportable/deployable radio telescope for hydrogen line observation	Alan and Martin Thompson
25 Oct	Dark Skies Event	
22 Nov	TBA	TBA

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.

This applies to all information held but is especially important for email and physical addresses.

VAS Contacts 2018/19

President	Barry Bates president@wightastronomy.org
Chairman	Bryn Davis chairman@wightastronomy.org
Secretary	Richard Flux secretary@wightastronomy.org
Treasurer	Simon Plumley treasurer@wightastronomy.org
Observatory Director	Brian Curd director@wightastronomy.org
Programme Organiser	Vacant Position progorg@wightastronomy.org
Astro Photography	Simon Plumley ap@wightastronomy.org
Outreach	Elaine Spear outreach@wightastronomy.org
NZ Editor	Brian Curd editor@wightastronomy.org
Membership Secretary	Norman Osborn members@wightastronomy.org
NZ Distribution	Graham Osborne distribution@wightastronomy.org
Others	Mark Williams, Nigel Lee, Stewart Chambers, Elaine Spear

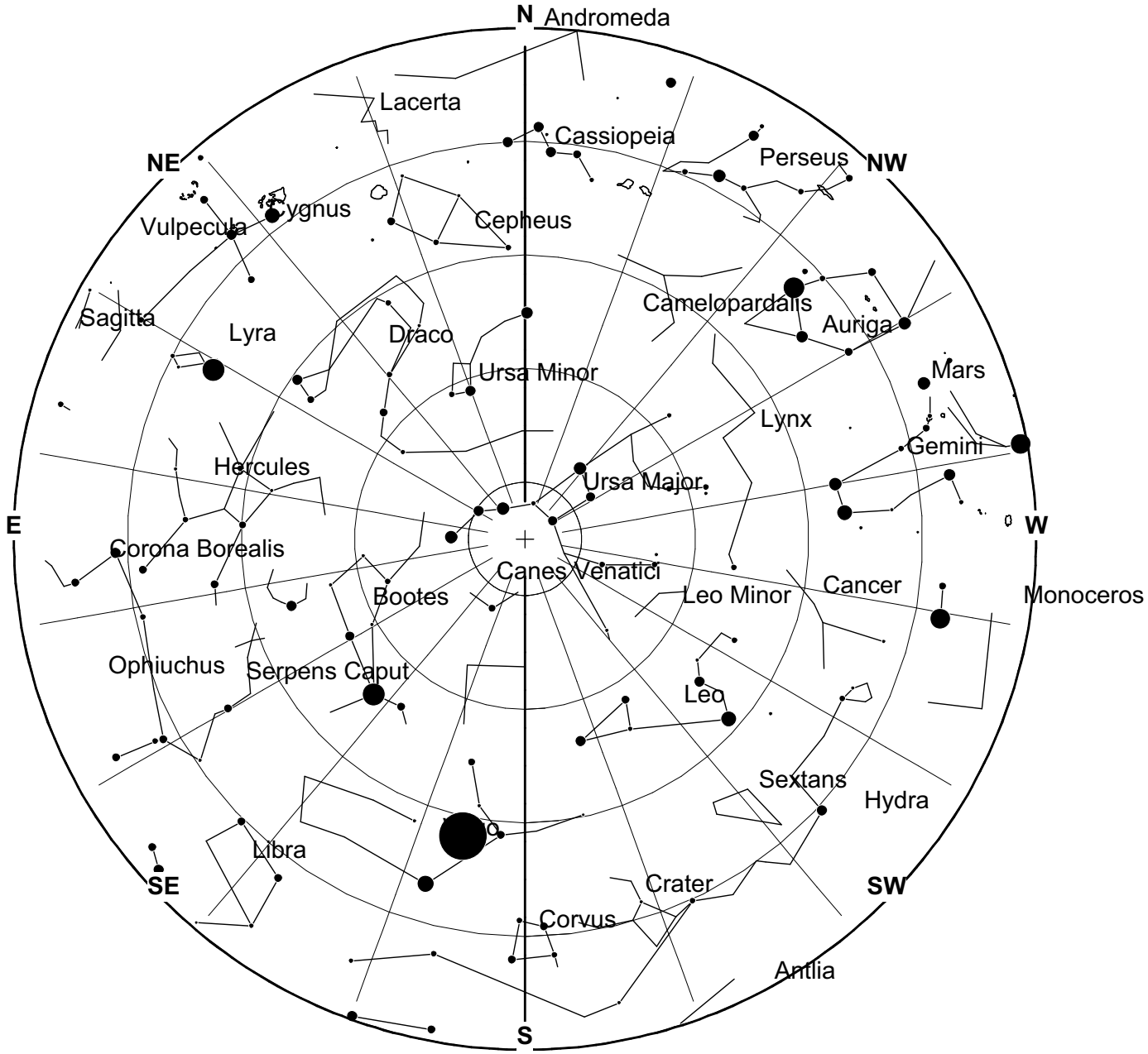
Important

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 TURNED OFF.

May 2019 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 May 2019

Leo is one of the constellations of the zodiac, lying between Cancer the crab to the west and Virgo the maiden to the east. Its name is Latin for lion, and to the ancient Greeks represented the Nemean Lion killed by the mythical Greek hero Heracles meaning 'Glory of Hera' (known to the ancient Romans as Hercules) as one of his twelve labors.

One of the 48 constellations described by the 2nd-century astronomer Ptolemy, Leo remains one of the 88 modern constellations today, and one of the most easily recognizable due to its many bright stars and a distinctive shape that is reminiscent of the crouching lion it depicts. The lion's mane and shoulders also form an asterism known as "The Sickle," which to modern observers may resemble a backwards "question mark."

May 2019 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
4th	12th	18th	26th

Planets

Mercury

In the last couple of days of the month Mercury may be spotted very low in the northwest just after sunset as it starts an evening apparition that continues into June.

Venus

Venus remains in the morning sky rising in the east just before the Sun and remaining a challenging object. **It is bright enough to be seen during the day if precautions are taken to avoid accidentally pointing at the Sun.**

Mars

Mars sets about two hours after the Sun, but with the bright twighlight sky now lasting well after sunset it is a challenging object.

Jupiter

Although Jupiter is close to opposition and about as well placed in the sky as it will be this year it not particularly well placed for our relatively high northern latitude. It can be found low in the south and can only be properly observed for a few hours either side of midnight when it is highest in the sky.

Saturn

Saturn can be observed in the southern sky from about midnight until daybreak, and like Jupiter is rather too low down for clear observation.

Uranus & Neptune

Both outer planets are currently lost in the morning twighlight.

Deep Sky

M53 Globular Cluster RA 13h 13m Dec 18° 7' mag 8.5

Lying some 60,000 light years away very few stars can be resolved in this cluster without the use of a large telescope. Through smaller instruments and binoculars it looks like a tailless comet.

M3 Globular Cluster RA 13h 42m, Dec 28° 22' mag 7

Messier's first original discovery, this is a showpiece globular cluster with stars extending across an area greater than that of the full Moon. M3 contains more variable stars than any other globular.

M63 Sunflower Galaxy RA 13 16m Dec 41° 58' mag 8.5

This is a barred spiral galaxy 37 million light years away. It was originally discovered by Pierre Mechain, a friend of Charles Messier and who went on to discover over 25 more objects that were subsequently added to Messier's catalogue. Through a small telescope it is visible as an elongated smudge, but with larger apertures and a dark sky some hint of detail in the spiral arms may be seen.

Peter Burgess

Isle of Wight Space Camps - Volunteers needed

A very innovative Island teacher who won, Science Teacher of the Year 2018, is working hard at promoting science and astronomy to all Isle of Wight school children.

She is in contact with many primary schools around the Island, and in the process of organising 'Space Camps' in conjunction with the Stephen Hawking Foundation.

She has been sent 5 celestron telescopes from the foundation and plans to run observing sessions in the evenings of all the Space Camps. She needs help to operate the telescopes - ***that's where you come in***. Please consider giving up some of your time to support this endeavour.

The list below shows the Camps organised so far

Date	Venue	VAS Members	Solar Scope	Talk
Thurs 21st March	Nineacres Primary School South View, Newport PO30 1QP	Bert Paice, Bryn Davis, Elaine Spear, Mark Taylor	No	Bryn Davis "Making Sense of the Night Sky"
Wed 27th March	St Helens Primary School Broomlands Close, St Helens, PO33 1XH	Brian Curd, Graham Osborne, Mark Taylor, John Slinn	Yes John Slinn	Brian Curd "Stellarium - your very own planetarium"
Thurs 4th April	Gurnard Primary School Baring Road, Cowes PO31 8DS	Elaine Spear, Bert Paice, Mark Taylor, John Slinn	Yes John Slinn	John Slinn "All about the Sun"
Thurs 25th April	Greenmount Primary School St Vincent's Road, Ryde PO33 3PT	Stuart Chambers, Bert Paice, Mark Taylor, John Slinn, Elaine Spear	Yes John Slinn	John Slinn "All about the Sun"
Thurs 9th May	Wootton Primary	Brian Curd		
Thurs 23rd May	Broadlea Primary School Newport Road, Lake PO36 9PE	Bryn Davis,		
Fri 7th June	Ryde School (Junior and Fiveways) 7 Queen's Road, Ryde P033 3BE	Brian Curd		
Fri 27th June	Broadlea Primary School Newport Road, Lake PO36 9PE			
Wed 3rd July	All Saints Primary School 79 School Green Road, Freshwater, PO40 9AX			

HELP!

Times are to be confirmed, but I'm guessing around 7-9pm, maybe later in the summer months of darker skies.

Please let me know which Camps you can attend. I hope to get three members for each camp.

Attending as many schools as possible will have a dual affect, as it gets the VAS name spread around, and we can promote our Young Astronomers events we are organising in July.

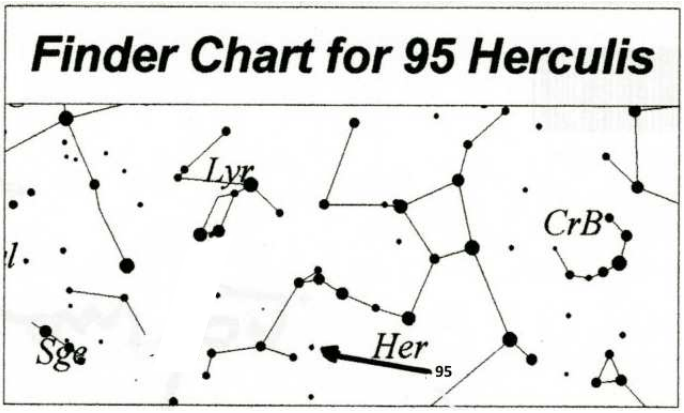
Contact me at elainespear1@gmail.com

Elaine Spear

My 100 Best Night Sky Sights

Double Star

Coordinates: RA 18h 01m 30s, Dec -21° 36'



It's early summer, you're up late and your telescope is pointing high in the sky at the constellation Hercules. 10 to 1 the object of your attention is a globular cluster (well, that seems to be the only reason most people visit the strong man). A pity really as he also sports several fine double stars among which is one of the best of all colour-contrast pairs.

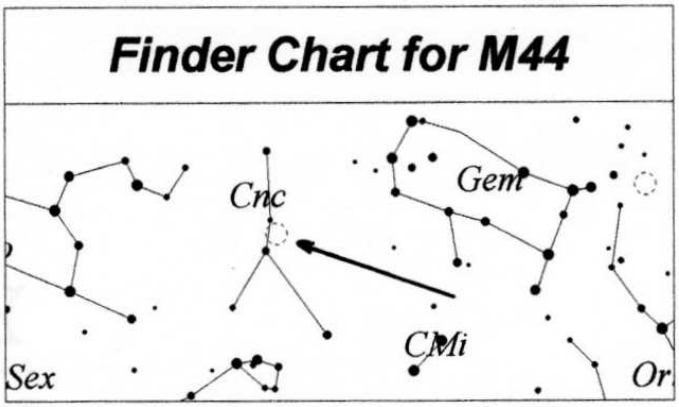
The two components of 95 Herculis are of almost equal brightness at magnitude 5.0 and 5.1, shining like beacons in any telescope. Being just 6.3" apart they would appear as close twins and be a grand sight if it were not for their colours. One is silvery blue, the other golden yellow, an exquisite combination that transforms this fine pair and turns the merely 'grand' into 'simply beautiful'.

95 Her will please whatever power you employ but I think you'll find the view at its best at around 100x, which in my opinion provides the optimum combination of colour intensity and separation. Locate it near the club with which Hercules is attacking poor Lyra (turn the chart upside down to witness this appalling act).

Galactic Cluster

Coordinates: RA 08h 40m 06s, Dec +19° 59'

So your telescope is a modest Dobsonian or you don't have one at all, just an old pair of binoculars. Well for once you're in pole position, as you'll see the magnificent open cluster, M44 in Cancer better than almost every one else. The Beehive Cluster as it's known can be seen as a misty patch without any optical aid in clean skies and reveals dozens of its stars to the smallest pair of binoculars. Telescopes up to 6" show many more as will larger instruments with short focal lengths but, as M44 covers an area three times that of the Moon, anything over 12" will give less impressive views as outer stars of the cluster become excluded from the field.

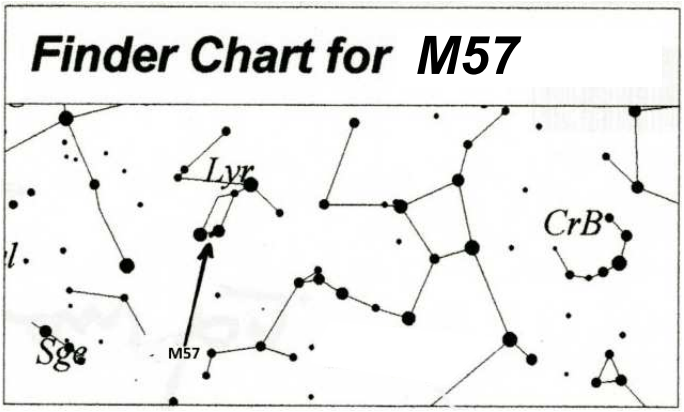


Four of the Beehive's brightest stars inhabit the very centre of the cluster appearing slightly yellow and there are several neat doubles, as well as triple stars in triangular formations, to be seen making M44 a fine cluster for extended exploration in late winter and early spring.

Cancer is a dim and sparse constellation and, whilst not easy to recognise at first, is not difficult to find in the wide field of binoculars, halfway between Gemini and the head of Leo.

Planetary Nebula

Coordinates: RA 18h 53m 36s, Dec +33° 02'



When it came to placing this one in my top 100 list it gave me a problem. Had I started writing these articles soon after I'd seen it for the first time it would have occupied a lowly position. After all the hype I'd read (terms like 'celebrated', 'showpiece' and 'most striking of all heavenly objects') I'd expected something really stunning but what did I see? - a tiddly little blob, so small I almost passed it by. It wasn't until I acquired some higher power eyepieces that I really 'discovered' this little beauty.

M57 in Lyra, the Ring Nebula is indeed worthy of its reputation. Use a low power to locate it between the southern pair of Lyra's parallelogram of 3rd and 4th magnitude stars then switch to the highest one conditions will permit. The view is quite stunning - an oval 'smoke ring' with thick 'walls' and a dark centre. The dying star

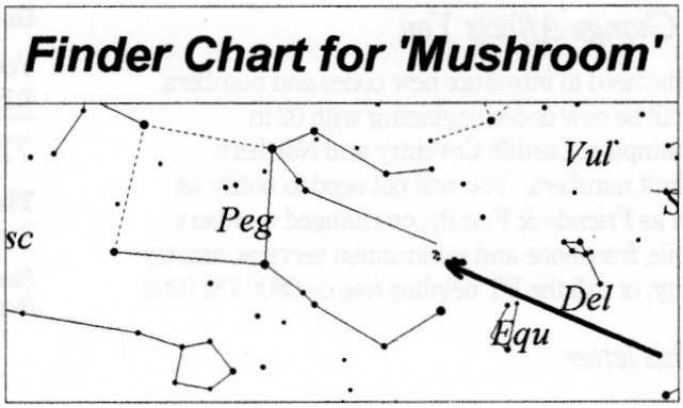
that puffed out its outer layers to form this nebula is only visible in large telescopes (theoretically the VAS 18" should see it but conditions would have to be superb). However if you use an 8" or larger telescope try to spot the 12th magnitude star sitting just off the eastern edge of the ring - at powers around 300-350x it could be the only other thing in view.

If you have an OIII filter then use it. Although it will extinguish any stars in the field the enhancement of the main objective is dramatic. The central 'hole' becomes really dark as does the surrounding sky but the nebula is unaffected with the result that it stands out with unprecedented clarity. Refer to the finder chart for 95 Herculis but hurry, before he completes his gruesome task.

Note this down as another 'must' for the Observatory main instrument next summer.

Magic Mushroom?

Coordinates: RA 21h 45m 30s, Dec +16° 45'



You're not going to believe this. There are some odd stellar arrangements in the sky but this one takes the biscuit. On a late summer evening fit your widest angle eyepiece to your telescope and look exactly 7° due north of Enif Pegasi, the horse's nose (he's upside down so you're actually below his snout). What do you see? Also upside down (in most telescopes anyway) but unmistakable for all that is the nearest you'll ever get to a celestial fungus. Don't take my word for it, see for yourself - a dozen stars forming a near-perfect fungal outline, complete with thick stem and flat cap. If you also invert this chart it looks like Pegasus has just knocked it flying with his hoof.

When you observe this oddball ask yourself this question - is it's positioning in the constellation of Pegasus accidental or is it by design? - for those who know about these things may recognise an uncanny resemblance to Psalliota arvensis - the horse mushroom!

Originally published October 1999
Bert Paice

Why are so Many Objects in Space Shaped Like Discs?

The universe is very good at making spinning discs. Our solar system is a disc, and all the planets go around in basically the same plane, and they all go around in the same direction. Why should that be?

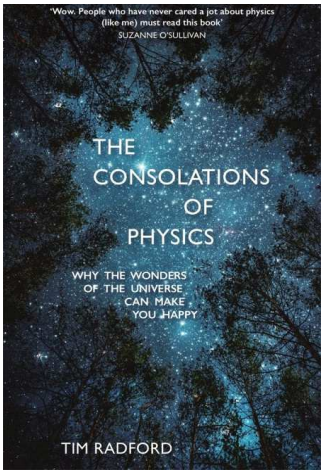
There are discs all over the place. I mean, think about the rings of Saturn. The rings of Saturn are also very, very thin, and they all go around in the same direction. Galaxies, spiral galaxies are one big disc with everything moving around a common center. Discs seem to be something that the universe likes to make. And, in fact, that really is true. And it has to do with a number of things. It has to do with the force of gravity and something called the conservation of angular momentum.

Now, gravity is very good at bringing stuff together and bringing it together so it becomes denser and denser and begins to fall into the center. Our solar system formed out of a giant cloud of dust and gas about 4 and 1/2 billion years ago. It was actually many trillions of miles across at first, but it had to get much smaller in order for the densities to get high enough and the temperatures also to get warm enough inside to give birth to the Sun, actually ignite a star. So you have this collapsing cloud of dust.

OK, well, you can sort of understand that gravity wants to bring all that together, but why does it start to spin up? There's something called the conservation of angular momentum. And that basically says that if anything has any spin at all, even just a little bit of motion, as gravity brings it together and makes it smaller, that spin is accelerated; it's sped up. And probably the example most people know best of all – you can actually feel this if you want to do this – but an ice skater. If you've seen an ice skater do a spin, usually what they do is that they have their arms outstretched, and they're spinning around relatively slowly. And then they bring their arms in, and they spin faster and faster. It's kind of amazing that any person can keep their balance when they do that. That is an application of the conservation of angular momentum. You have an extended body, your arms are out, and you're spinning slowly. In order to conserve the energy in that spin, as that body becomes smaller, the spin goes faster and faster. And so what happens in these clouds is that a cloud usually has just a tiny little bit of a drift velocity. It's going around the galaxy or maybe a nearby star exploded, and it's kind of all moving in one direction. The cloud itself has a little bit of velocity as a cloud, as a whole. Particles inside that cloud could be going any which way.

More at: https://bigthink.com/

Astronomy Can Make You Happy



Book Review: The Consolations of Physics: *Why the Wonders of the Universe Can Make You Happy* by Tim Radford (published by Sceptre, 2018; 192 pages; available in paperback in June 2019)

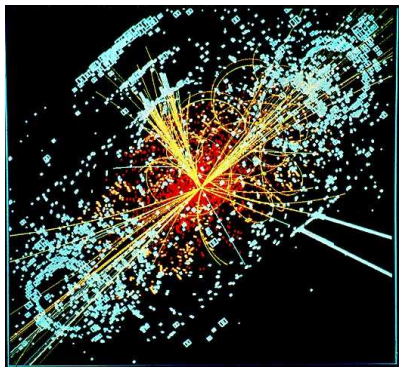
If you are a member of an astronomy society (since you're reading this!) then you probably already understand the subtitle of this book. And the key word is "Wonders". The more we see of the night sky, and the more we learn as instruments and space technology advance, the more we are confronted with the vast - unimaginably vast - distances, times, energies and sheer variety and beauty in the Universe. We not only learn about the planets, stars, galaxies etc., but we encounter them with our most natural response - a sense of wonder.

When the worlds of politics or society or relationships may seem stuck in endless cycles of chaos or irrationality or conflict, then a few minutes contemplating the night sky can re-set our perspective. We should never lose touch with those feelings that we might remember from childhood or teenage years, when we lay on the ground on a summer night and looked up at the stars, and felt the awe of a billion-year-old light show, and sense of feeling very small, and of trying to think about infinities of space or time. That's the same perspective of Carl Sagan's "Pale Blue Dot", as *Voyager 1* looked back at Earth in 1990.

Tim Radford writes about his encounters with some of the iconic scientific endeavours of our lifetime which allow us to study both the unimaginably large and the unimaginably small: the Voyager spacecraft, the LHC (Large Hadron Collider) and the LIGO (Laser Interferometer Gravity-Wave Observatory). He brings out the immensity of the human achievements of these extraordinary machines, triumphs of technical excellence and international scientific collaboration, to confirm the existence of the Higgs Boson, gravity waves etc. And with *Voyager 1* and *Voyager 2* he considers the visionary audacity to send these objects and their famous golden LP records, tokens of life on earth in the 1970s, to become the only man-made objects to leave the solar system. They are most likely to continue their journey long beyond the time the Earth along with other planets are engulfed by the red giant stage of our dying star, Sol. Six billions years from now, they could be the last (or even only) remnants of our little lives.

Voyager's Golden Record - The Sounds of Planet Earth (NASA)

This is a short book - you could read it in an evening - and doesn't need any hard science to understand. There are no equations or even pictures, but he explains some tremendous concepts in astrophysics, cosmology, plate tectonics and particle physics with infectious enthusiasm. There are mind-blowing facts, for example in the chapter "Adventures with the Time Machine" about the materials and engineering precision needed to build the LHC at CERN: did you know that when a small puff of hydrogen nuclei are accelerated to the speed of 0.999999991 of the speed of light for the collider, the relativistic energy of the tiny batch of protons is equivalent to that of an intercity train travelling at 200 km per hour! The precision and control has to be unprecedented, because "if any one thing went wrong in this machine, everything could go very wrong indeed".

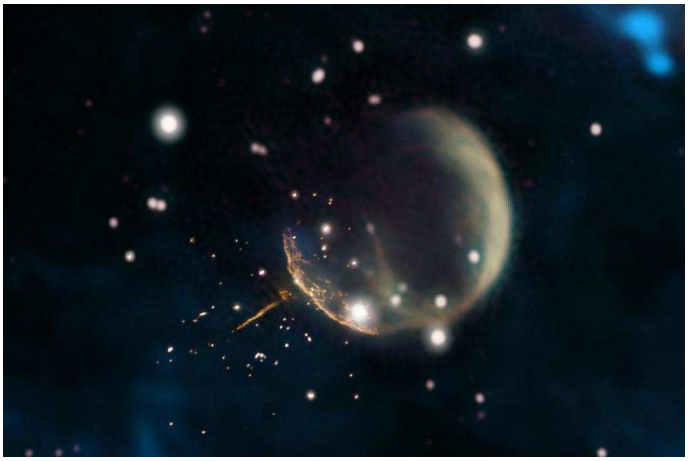


Simulation of Higgs Boson decay at the LHC CMS detector (By Lucas Taylor / CERN

And Radford writes well, as you'd expect from a former science editor of The Guardian. One reviewer says that his writing is "so beautiful, it reads like poetry", and I admire someone who can, without pretention, move from Dante's *"Divine Comedy"* and H. G Wells' "*War of the Worlds*" to the super-conductive magnets of the LHC and the collision of neutron stars. The book title is a variation on "*The Consolations of Philosophy"* by Boethius, a sixth century Roman official who wrote his contemplation on the big issues of life and death while in prison. In case we ever feel imprisoned in our everyday lives, gravity-bound to our little world, our imaginations and appreciation for the incredible things that contemporary physics and astronomy can reveal, should always be able to give us consolation and even joy.

Simon Gardner

Fermi Satellite Clocks Pulsar Going 2.5 million Mph



The composite images reveals the bright jet-like tail of the high-speed pulsar, J0002.
Photo by Jayanne English, University of Manitoba, using data from NRAO/F. Schinzel et al., DRAO/Canadian Galactic Plane Survey and NASA/IRAS

Astronomers have discovered a pulsar traveling at unprecedented speeds. Observations by NASA's Fermi Gamma-ray Space Telescope suggest the star is moving through space at 2.5 million miles per hour.

Pulsars are extremely dense neutron stars that spin rapidly, producing a pulsing jet. The pulsing radio-emitting jet, or tail, points toward the remnants of a recent supernova explosion.

“Thanks to its narrow dart-like tail and a fortuitous viewing angle, we can trace this pulsar straight back to its birthplace,” Frank Schinzel, a scientist at the National Radio Astronomy Observatory in New Mexico, told NASA. “Further study of this object will help us better understand how these explosions are able to 'kick' neutron stars to such high speed.”

Pulsars are named so because the star's spinning electromagnetic field shoots out pulses of energy in the form of radio waves, visible light, X-rays and gamma rays. Astronomers searching for pulsars look for the pulsing signals among telescope observations.

This particular pulsar was discovered by citizen scientists scanning Femi data. Participants in the Einstein@Home project have identified 13 gamma ray pulsars.

Scientists named the high-speed pulsing star PSR J0002+6216, or J0002 for short. The star is located in the Cassiopeia constellation, 6,500 light-years from Earth.

More at: https://www.upi.com/

A Neat Trick to Determine Your Dominant Eye

It turns out that not all eyes were born equal, and that most of us have one dominant eye. The dominant eye, is the one your brain prefers when it comes to processing visual input, and you should probably use that eye when looking through a telescope or shooting a gun.

Here is a neat trick you can use to discover which of your eyes is the dominant one.

Extend both hands forward of your body and place the hands together making a small triangle (approximately 2 or 3 cm per side) between your thumbs and the first knuckle like this.

With both eyes open, look through the triangle and centre something such as a doorknob in the triangle.

1. Close your left eye.

2. If the object remains in view, you are right eye dominant.

3. If closing your right eye keeps the object in view, you are left eye dominant.

It is as simple as that!

Chicxulub Asteroid Impact: Stunning Fossils Record Dinosaurs' Demise

Scientists have found an extraordinary snapshot of the fallout from the asteroid impact that wiped out the dinosaurs 66 million years ago.

Excavations in North Dakota reveal fossils of fish and trees that were sprayed with rocky, glassy fragments that fell from the sky.

The deposits show evidence also of having been swamped with water - the consequence of the colossal sea surge that was generated by the impact.

Robert DePalma, from the University of Kansas, and colleagues say the dig site, at a place called Tanis, gives an amazing glimpse into events that probably occurred perhaps only tens of minutes to a couple of hours after the giant asteroid hit the Earth.

When this 12km-wide object slammed into what is now the Gulf of Mexico, it would have hurled billions of tonnes of molten and vaporised rock into the sky in all directions - and across thousands of kilometres.

And at Tanis, the fossils record the moment this bead-sized material fell back down and strafed everything in its path.

Fish are found with the impact-induced debris embedded in their gills. They would have breathed in the fragments that filled the water around them.

There are also particles caught in amber, which is the preserved remnant of tree resin. It is even possible to discern the wake left by these tiny, glassy tektites, to use the technical term, as they entered the resin.

Geochemists have managed to link the fallout material directly to the so-called Chicxulub impact site in the Gulf. They have also dated the debris to 65.76 million years ago, which is in very good agreement with the timing for the event worked out from evidence at other sites around the world.

From the way the Tanis deposits are arranged, the scientists can see that the area was hit by a massive surge of water.

Although the impact is understood to have generated a huge tsunami, it would have taken many hours for this wave to travel the 3,000km from the Gulf to North Dakota, despite the likely presence back then of a seaway cutting directly across the American landmass.

Instead, the researchers believe local water could have been displaced much more quickly by the seismic shockwave - equivalent to a Magnitude 10 or 11 earthquake - that would have rippled around the Earth. It is a type of surge described as a seiche, which would have picked up everything in its path and dumped it into the jumbled collection of specimens now being reported by the team.

"A tangled mass of freshwater fish, terrestrial vertebrates, trees, branches, logs, marine ammonites and other marine creatures was all packed into this layer by the inland-directed surge," said Mr DePalma.

"A tsunami would have taken at least 17 or more hours to reach the site from the crater, but seismic waves - and a subsequent surge - would have reached it in tens of minutes," he added.

The PNAS paper, which will go online on Monday, includes among its authors Walter Alvarez, the Californian geologist who, with his father Luis Alvarez, is credited with helping to develop the impact theory for the demise of the dinosaurs.

The Alvarez pair identified a layer of sediment at the boundary of the Cretaceous and Palaeogene geological periods that was enriched with iridium, an element commonly found in asteroids and meteorites.

Iridium traces are also found to be capping the Tanis deposits.

"When we proposed the impact hypothesis to explain the great extinction, it was based just on finding an anomalous concentration of iridium - the fingerprint of an asteroid or comet," said Prof Alvarez. "Since then, the evidence has gradually built up. But it never crossed my mind that we would find a deathbed like this."

Phil Manning, from the University of Manchester, the only British author on the paper, commented: "It's one of the most important sites in the globe now. You know, if you truly wanted to understand the last day of the dinosaurs - this is it," he told BBC News.

More at: https://www.bbc.co.uk/

Physicists Predict a Way to Squeeze Light From the Vacuum of Empty Space

Charged particles zipping through water in a nuclear reactor produce Cherenkov radiation. (CC BY-SA 2.0)

Talk about getting something for nothing. Physicists predict that just by shooting charged particles through an electromagnetic field, it should be possible to generate light from the empty vacuum. In principle, the effect could provide a new way to test the fundamental theory of electricity and magnetism, known as quantum electrodynamics, the most precise theory in all of science. In practice, spotting the effect would require lasers and particle accelerators far more powerful than any that exist now.

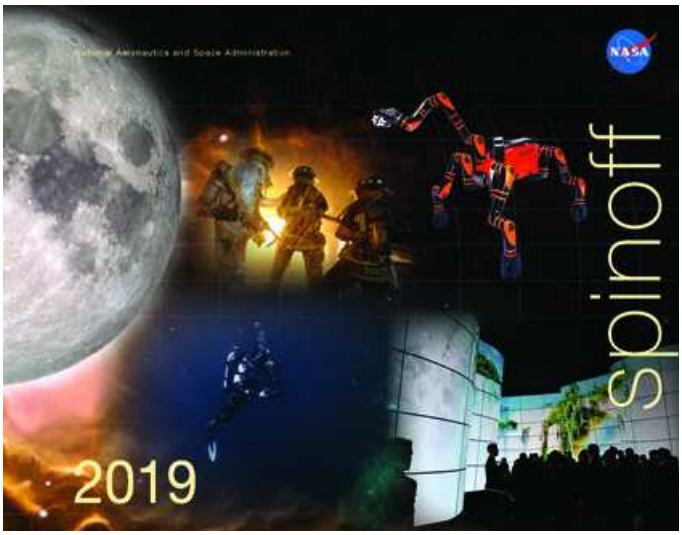
"I'm quite confident about [the prediction] simply because it combines effects that we understand pretty well," says Ben King, a laser particle physicist at the University of Plymouth in the United Kingdom, who was not involved in the new analysis. Still, he says, an experimental demonstration "is something for the future."

Physicists have long known that energetic charged particles can radiate light when they zip through a transparent medium such as water or a gas. In the medium, light travels slower than it does in empty space, allowing a particle such as an electron or proton to potentially fly faster than light. When that happens, the particle generates an electromagnetic shock wave, just as a supersonic jet creates a shock wave in air. But whereas the jet's shock wave creates a sonic boom, the electromagnetic shock wave creates light called Cherenkov radiation. That effect causes the water in the cores of nuclear reactors to glow blue, and it's been used to make particle detectors.

However, it should be possible to ditch the material and produce Cherenkov light straight from the vacuum, predict Dino Jaroszynski, a physicist at the University of Strathclyde in Glasgow, U.K., and colleagues. The trick is to shoot the particles through an extremely intense electromagnetic field instead.

More at: https://www.sciencemag.org/

NASA Spinoff



Since 1976, Spinoff has annually profiled an average of 50 commercial technologies with origins in NASA missions and research. Issues of Spinoff published since 1996 can be read online in HTML or downloaded in PDF. Scanned copies of Spinoff are available in PDF for issues published between 1976 and 1995.

Spinoff 2019 is also available on the iPad!

It features shortened versions of all the articles from the book, image galleries, videos, and more.

A 508-compliant PDF version of the iPad app is also available.

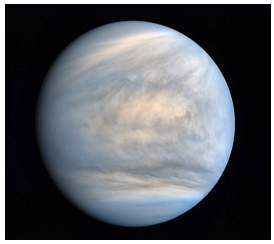
As well as the latest 2019 issue the site offers editions back to 1976.
Take a look here: https://spinoff.nasa.gov/

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

More Stuff!

Venus Reimagined: A New Image of an Active World



A new analysis of venusian lava flows shows they may have formed less than 250,000 years ago, suggesting a significant fraction of Venus' roughly 1,600 volcanoes are still active.

More at: http://www.astronomy.com/

Hubble Astronomers Assemble Wide View of the Evolving Universe

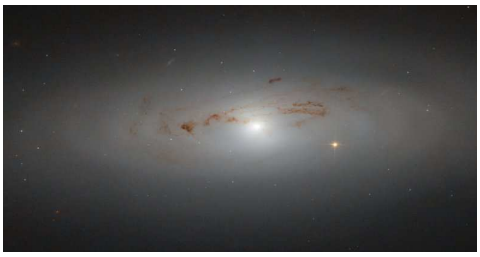
Astronomers have put together the largest and most comprehensive 'history book' of galaxies into one single image, using 16 years' worth of observations from NASA's Hubble Space Telescope.
More at: *https://www.sciencedaily.com/*

Two Neutron Stars Collided Near the Solar System Billions of Years Ago

Astrophysicists at the University of Florida, have identified a violent collision of two neutron stars 4.6 billion years ago as the likely source of some of the most coveted matter on Earth.

More at: https://phys.org/

A Strange Star Hidden in the Milky Way is Likely From Another Galaxy, Say Astronomers



One of the most recognisable star formations in our galaxy could be harbouring an intergalactic fugitive.

Hiding in the Ursa Major constellation, home of the Big Dipper, astronomers have recently ousted a strange star unlike any other in the Milky Way.

More at: https://www.sciencealert.com/

New Observations Find Universe Expanding too Fast for Science

Astronomers have discovered a discrepancy between how fast the universe is expanding and how fast theories predict it should grow.

More at: https://news.sky.com/

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 (if you need the combination to the lock, please contact a member of the committee)

Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy.

"Physics depends on a universe infinitely centred on an equals sign"
Mark Z. Danielewski

"Every line is the perfect length if you don't measure it"
Marty Rubin

"I did the math. (I presume Americans don't pluralise mathematics because they only plan to do it once.)"
Sheridan Jobbins

"'Zero and Infinity both are very difficult to understand and explain but at the same time both are key assumption of Mathematics..."
Brajesh Kumar

"Mathematics brought rigor to economics. Unfortunately it also brought mortis"
Kenneth Boulding

"In real life, I assure you, there is no such thing as algebra"
Fran Lebowitz

New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 27 Issue 4 — May 2019

When Printed, this Newsletter costs VAS at least £1

Society News

PLEASE NOTE

Due to availability and booking of the Pavilion and Field near our observatory we have changed our

Young Science and AstroFest to Saturday 27th July

Probably 6-10pm (maybe 6-9pm). We want it to finish late to try to get some Stargazing in

Tickets are already being reserved and the take up is good
We are expecting over 100 visitors on the day

Please let Elaine know if you are available to help with this event

We need as many helpers as possible

More details to follow

Contact Elaine at:
elainespear1@gmail.com

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.

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

2019 Monthly Meetings

Date	Subject	Speaker
Check *http://www.wightastronomy.org/meetings/* for the latest information		
24 May	The Rise and fall of the Herstmonceux Observatory	Keith Brackenborough
28 June	TBA	TBA
Sat 27 July	"Young Science and AstroFest" Young Astronomers' Event	
23 Aug	AGM and Social Evening	
27 Sept	A transportable/deployable radio telescope for hydrogen line observation	Alan and Martin Thompson
25 Oct	Dark Skies Event	
22 Nov	TBA	TBA

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.

This applies to all information held but is especially important for email and physical addresses.

VAS Contacts 2018/19

President	Barry Bates president@wightastronomy.org
Chairman	Bryn Davis chairman@wightastronomy.org
Secretary	Richard Flux secretary@wightastronomy.org
Treasurer	Simon Plumley treasurer@wightastronomy.org
Observatory Director	Brian Curd director@wightastronomy.org
Programme Organiser	Vacant Position progorg@wightastronomy.org
Astro Photography	Simon Plumley ap@wightastronomy.org
Outreach	Elaine Spear outreach@wightastronomy.org
NZ Editor	Brian Curd editor@wightastronomy.org
Membership Secretary	Norman Osborn members@wightastronomy.org
NZ Distribution	Graham Osborne distribution@wightastronomy.org
Others	Mark Williams, Nigel Lee, Stewart Chambers, Elaine Spear

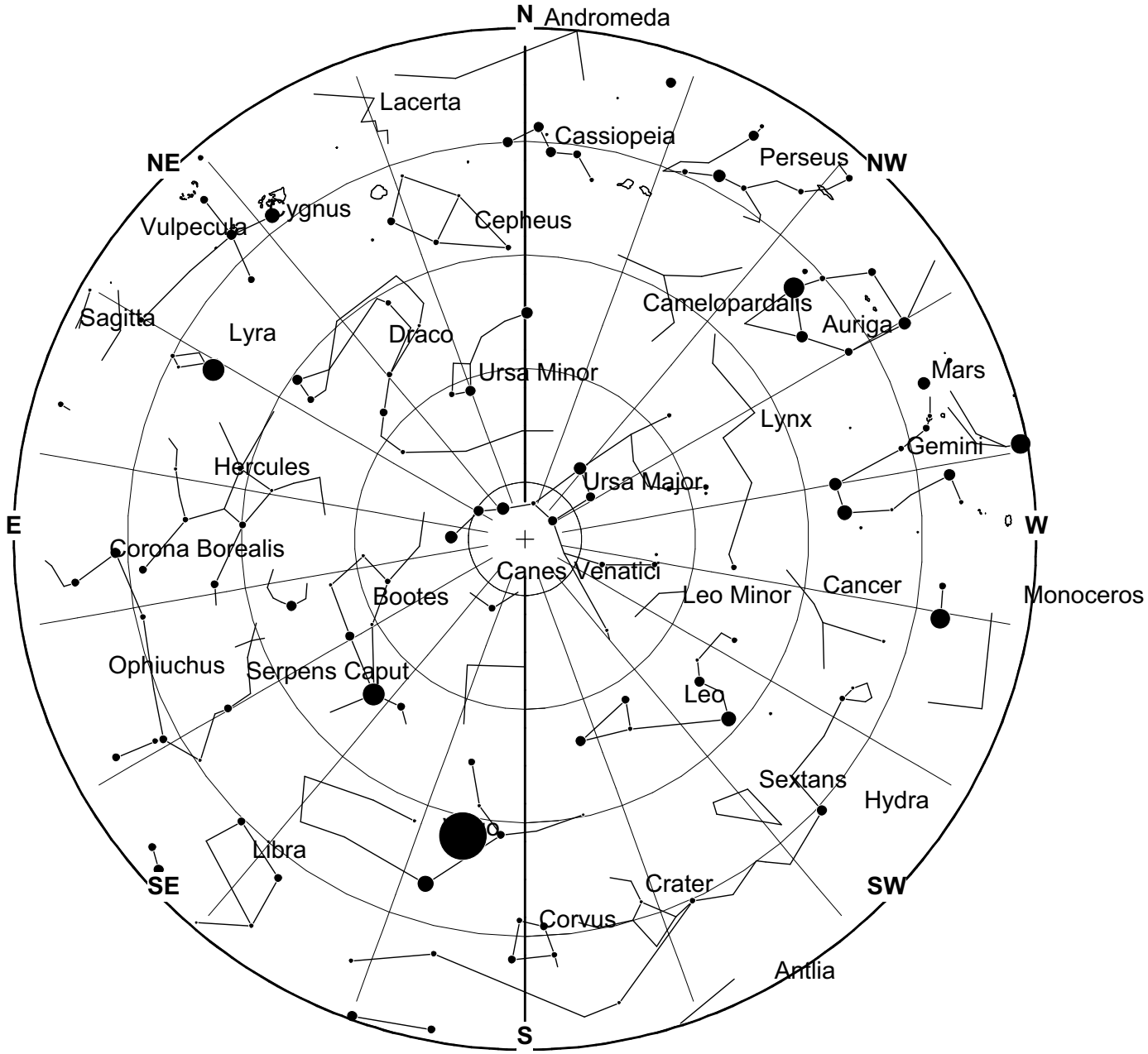
Important

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 TURNED OFF.

May 2019 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 May 2019

Leo is one of the constellations of the zodiac, lying between Cancer the crab to the west and Virgo the maiden to the east. Its name is Latin for lion, and to the ancient Greeks represented the Nemean Lion killed by the mythical Greek hero Heracles meaning 'Glory of Hera' (known to the ancient Romans as Hercules) as one of his twelve labors.

One of the 48 constellations described by the 2nd-century astronomer Ptolemy, Leo remains one of the 88 modern constellations today, and one of the most easily recognizable due to its many bright stars and a distinctive shape that is reminiscent of the crouching lion it depicts. The lion's mane and shoulders also form an asterism known as "The Sickle," which to modern observers may resemble a backwards "question mark."

May 2019 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
4th	12th	18th	26th

Planets

Mercury

In the last couple of days of the month Mercury may be spotted very low in the northwest just after sunset as it starts an evening apparition that continues into June.

Venus

Venus remains in the morning sky rising in the east just before the Sun and remaining a challenging object. **It is bright enough to be seen during the day if precautions are taken to avoid accidentally pointing at the Sun.**

Mars

Mars sets about two hours after the Sun, but with the bright twighlight sky now lasting well after sunset it is a challenging object.

Jupiter

Although Jupiter is close to opposition and about as well placed in the sky as it will be this year it not particularly well placed for our relatively high northern latitude. It can be found low in the south and can only be properly observed for a few hours either side of midnight when it is highest in the sky.

Saturn

Saturn can be observed in the southern sky from about midnight until daybreak, and like Jupiter is rather too low down for clear observation.

Uranus & Neptune

Both outer planets are currently lost in the morning twighlight.

Deep Sky

M53 Globular Cluster RA 13h 13m Dec 18° 7' mag 8.5

Lying some 60,000 light years away very few stars can be resolved in this cluster without the use of a large telescope. Through smaller instruments and binoculars it looks like a tailless comet.

M3 Globular Cluster RA 13h 42m, Dec 28° 22' mag 7

Messier's first original discovery, this is a showpiece globular cluster with stars extending across an area greater than that of the full Moon. M3 contains more variable stars than any other globular.

M63 Sunflower Galaxy RA 13 16m Dec 41° 58' mag 8.5

This is a barred spiral galaxy 37 million light years away. It was originally discovered by Pierre Mechain, a friend of Charles Messier and who went on to discover over 25 more objects that were subsequently added to Messier's catalogue. Through a small telescope it is visible as an elongated smudge, but with larger apertures and a dark sky some hint of detail in the spiral arms may be seen.

Peter Burgess

Isle of Wight Space Camps - Volunteers needed

A very innovative Island teacher who won, Science Teacher of the Year 2018, is working hard at promoting science and astronomy to all Isle of Wight school children.

She is in contact with many primary schools around the Island, and in the process of organising 'Space Camps' in conjunction with the Stephen Hawking Foundation.

She has been sent 5 celestron telescopes from the foundation and plans to run observing sessions in the evenings of all the Space Camps. She needs help to operate the telescopes - ***that's where you come in***. Please consider giving up some of your time to support this endeavour.

The list below shows the Camps organised so far

Date	Venue	VAS Members	Solar Scope	Talk
Thurs 21st March	Nineacres Primary School South View, Newport PO30 1QP	Bert Paice, Bryn Davis, Elaine Spear, Mark Taylor	No	Bryn Davis "Making Sense of the Night Sky"
Wed 27th March	St Helens Primary School Broomlands Close, St Helens, PO33 1XH	Brian Curd, Graham Osborne, Mark Taylor, John Slinn	Yes John Slinn	Brian Curd "Stellarium - your very own planetarium"
Thurs 4th April	Gurnard Primary School Baring Road, Cowes PO31 8DS	Elaine Spear, Bert Paice, Mark Taylor, John Slinn	Yes John Slinn	John Slinn "All about the Sun"
Thurs 25th April	Greenmount Primary School St Vincent's Road, Ryde PO33 3PT	Stuart Chambers, Bert Paice, Mark Taylor, John Slinn, Elaine Spear	Yes John Slinn	John Slinn "All about the Sun"
Thurs 9th May	Wootton Primary	Brian Curd		
Thurs 23rd May	Broadlea Primary School Newport Road, Lake PO36 9PE	Bryn Davis,		
Fri 7th June	Ryde School (Junior and Fiveways) 7 Queen's Road, Ryde P033 3BE	Brian Curd		
Fri 27th June	Broadlea Primary School Newport Road, Lake PO36 9PE			
Wed 3rd July	All Saints Primary School 79 School Green Road, Freshwater, PO40 9AX			

HELP!

Times are to be confirmed, but I'm guessing around 7-9pm, maybe later in the summer months of darker skies.

Please let me know which Camps you can attend. I hope to get three members for each camp.

Attending as many schools as possible will have a dual affect, as it gets the VAS name spread around, and we can promote our Young Astronomers events we are organising in July.

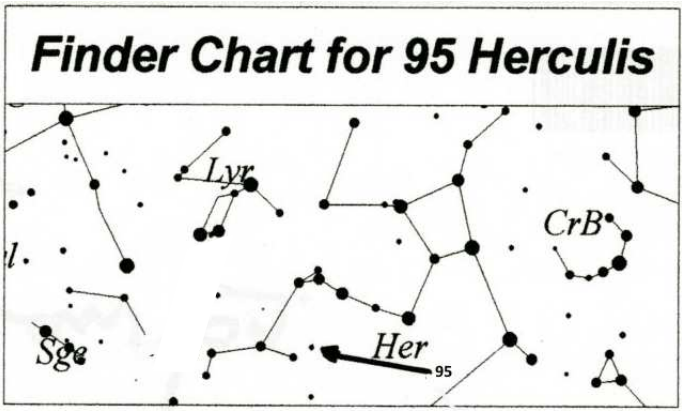
Contact me at elainespear1@gmail.com

Elaine Spear

My 100 Best Night Sky Sights

Double Star

Coordinates: RA 18h 01m 30s, Dec -21° 36'



It's early summer, you're up late and your telescope is pointing high in the sky at the constellation Hercules. 10 to 1 the object of your attention is a globular cluster (well, that seems to be the only reason most people visit the strong man). A pity really as he also sports several fine double stars among which is one of the best of all colour-contrast pairs.

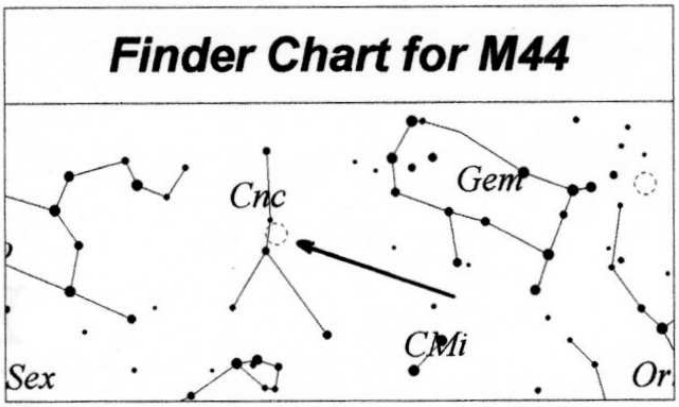
The two components of 95 Herculis are of almost equal brightness at magnitude 5.0 and 5.1, shining like beacons in any telescope. Being just 6.3" apart they would appear as close twins and be a grand sight if it were not for their colours. One is silvery blue, the other golden yellow, an exquisite combination that transforms this fine pair and turns the merely 'grand' into 'simply beautiful'.

95 Her will please whatever power you employ but I think you'll find the view at its best at around 100x, which in my opinion provides the optimum combination of colour intensity and separation. Locate it near the club with which Hercules is attacking poor Lyra (turn the chart upside down to witness this appalling act).

Galactic Cluster

Coordinates: RA 08h 40m 06s, Dec +19° 59'

So your telescope is a modest Dobsonian or you don't have one at all, just an old pair of binoculars. Well for once you're in pole position, as you'll see the magnificent open cluster, M44 in Cancer better than almost every one else. The Beehive Cluster as it's known can be seen as a misty patch without any optical aid in clean skies and reveals dozens of its stars to the smallest pair of binoculars. Telescopes up to 6" show many more as will larger instruments with short focal lengths but, as M44 covers an area three times that of the Moon, anything over 12" will give less impressive views as outer stars of the cluster become excluded from the field.

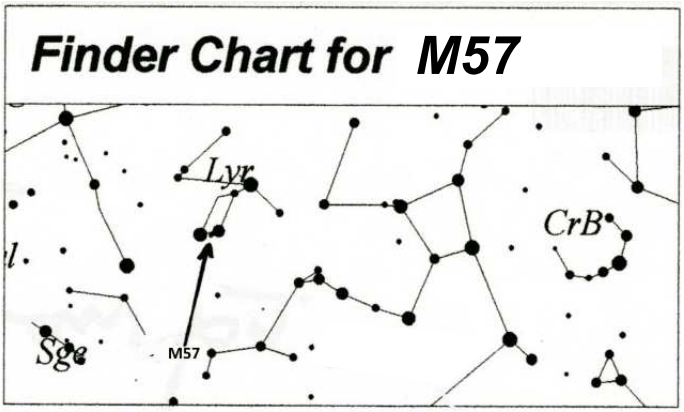


Four of the Beehive's brightest stars inhabit the very centre of the cluster appearing slightly yellow and there are several neat doubles, as well as triple stars in triangular formations, to be seen making M44 a fine cluster for extended exploration in late winter and early spring.

Cancer is a dim and sparse constellation and, whilst not easy to recognise at first, is not difficult to find in the wide field of binoculars, halfway between Gemini and the head of Leo.

Planetary Nebula

Coordinates: RA 18h 53m 36s, Dec +33° 02'



When it came to placing this one in my top 100 list it gave me a problem. Had I started writing these articles soon after I'd seen it for the first time it would have occupied a lowly position. After all the hype I'd read (terms like 'celebrated', 'showpiece' and 'most striking of all heavenly objects') I'd expected something really stunning but what did I see? - a tiddly little blob, so small I almost passed it by. It wasn't until I acquired some higher power eyepieces that I really 'discovered' this little beauty.

M57 in Lyra, the Ring Nebula is indeed worthy of its reputation. Use a low power to locate it between the southern pair of Lyra's parallelogram of 3rd and 4th magnitude stars then switch to the highest one conditions will permit. The view is quite stunning - an oval 'smoke ring' with thick 'walls' and a dark centre. The dying star

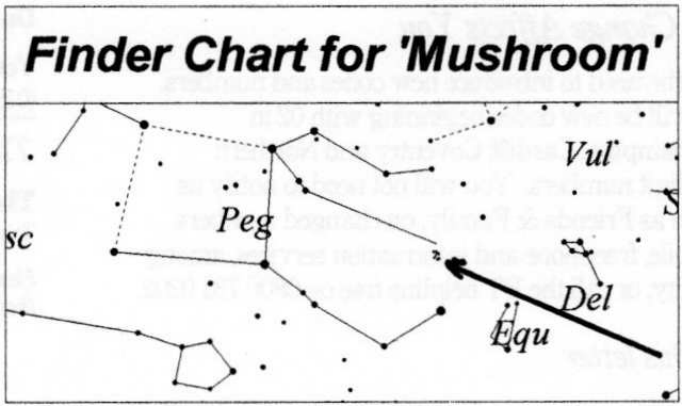
that puffed out its outer layers to form this nebula is only visible in large telescopes (theoretically the VAS 18" should see it but conditions would have to be superb). However if you use an 8" or larger telescope try to spot the 12th magnitude star sitting just off the eastern edge of the ring - at powers around 300-350x it could be the only other thing in view.

If you have an OIII filter then use it. Although it will extinguish any stars in the field the enhancement of the main objective is dramatic. The central 'hole' becomes really dark as does the surrounding sky but the nebula is unaffected with the result that it stands out with unprecedented clarity. Refer to the finder chart for 95 Herculis but hurry, before he completes his gruesome task.

Note this down as another 'must' for the Observatory main instrument next summer.

Magic Mushroom?

Coordinates: RA 21h 45m 30s, Dec +16° 45'



You're not going to believe this. There are some odd stellar arrangements in the sky but this one takes the biscuit. On a late summer evening fit your widest angle eyepiece to your telescope and look exactly 7° due north of Enif Pegasi, the horse's nose (he's upside down so you're actually below his snout). What do you see? Also upside down (in most telescopes anyway) but unmistakable for all that is the nearest you'll ever get to a celestial fungus. Don't take my word for it, see for yourself - a dozen stars forming a near-perfect fungal outline, complete with thick stem and flat cap. If you also invert this chart it looks like Pegasus has just knocked it flying with his hoof.

When you observe this oddball ask yourself this question - is it's positioning in the constellation of Pegasus accidental or is it by design? - for those who know about these things may recognise an uncanny resemblance to Psalliota arvensis - the horse mushroom!

Originally published October 1999
Bert Paice

Why are so Many Objects in Space Shaped Like Discs?

The universe is very good at making spinning discs. Our solar system is a disc, and all the planets go around in basically the same plane, and they all go around in the same direction. Why should that be?

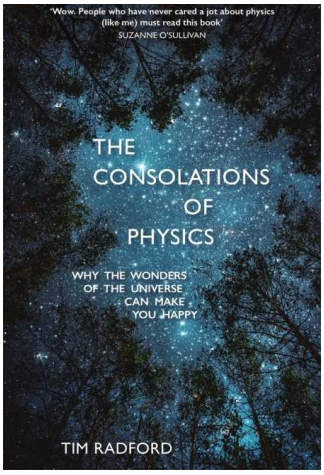
There are discs all over the place. I mean, think about the rings of Saturn. The rings of Saturn are also very, very thin, and they all go around in the same direction. Galaxies, spiral galaxies are one big disc with everything moving around a common center. Discs seem to be something that the universe likes to make. And, in fact, that really is true. And it has to do with a number of things. It has to do with the force of gravity and something called the conservation of angular momentum.

Now, gravity is very good at bringing stuff together and bringing it together so it becomes denser and denser and begins to fall into the center. Our solar system formed out of a giant cloud of dust and gas about 4 and 1/2 billion years ago. It was actually many trillions of miles across at first, but it had to get much smaller in order for the densities to get high enough and the temperatures also to get warm enough inside to give birth to the Sun, actually ignite a star. So you have this collapsing cloud of dust.

OK, well, you can sort of understand that gravity wants to bring all that together, but why does it start to spin up? There's something called the conservation of angular momentum. And that basically says that if anything has any spin at all, even just a little bit of motion, as gravity brings it together and makes it smaller, that spin is accelerated; it's sped up. And probably the example most people know best of all – you can actually feel this if you want to do this – but an ice skater. If you've seen an ice skater do a spin, usually what they do is that they have their arms outstretched, and they're spinning around relatively slowly. And then they bring their arms in, and they spin faster and faster. It's kind of amazing that any person can keep their balance when they do that. That is an application of the conservation of angular momentum. You have an extended body, your arms are out, and you're spinning slowly. In order to conserve the energy in that spin, as that body becomes smaller, the spin goes faster and faster. And so what happens in these clouds is that a cloud usually has just a tiny little bit of a drift velocity. It's going around the galaxy or maybe a nearby star exploded, and it's kind of all moving in one direction. The cloud itself has a little bit of velocity as a cloud, as a whole. Particles inside that cloud could be going any which way.

More at: https://bigthink.com/

Astronomy Can Make You Happy



Book Review: The Consolations of Physics: *Why the Wonders of the Universe Can Make You Happy* by Tim Radford (published by Sceptre, 2018; 192 pages; available in paperback in June 2019)

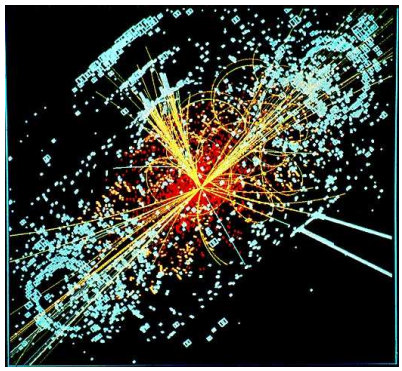
If you are a member of an astronomy society (since you're reading this!) then you probably already understand the subtitle of this book. And the key word is "Wonders". The more we see of the night sky, and the more we learn as instruments and space technology advance, the more we are confronted with the vast - unimaginably vast - distances, times, energies and sheer variety and beauty in the Universe. We not only learn about the planets, stars, galaxies etc., but we encounter them with our most natural response - a sense of wonder.

When the worlds of politics or society or relationships may seem stuck in endless cycles of chaos or irrationality or conflict, then a few minutes contemplating the night sky can re-set our perspective. We should never lose touch with those feelings that we might remember from childhood or teenage years, when we lay on the ground on a summer night and looked up at the stars, and felt the awe of a billion-year-old light show, and sense of feeling very small, and of trying to think about infinities of space or time. That's the same perspective of Carl Sagan's "Pale Blue Dot", as *Voyager 1* looked back at Earth in 1990.

Tim Radford writes about his encounters with some of the iconic scientific endeavours of our lifetime which allow us to study both the unimaginably large and the unimaginably small: the Voyager spacecraft, the LHC (Large Hadron Collider) and the LIGO (Laser Interferometer Gravity-Wave Observatory). He brings out the immensity of the human achievements of these extraordinary machines, triumphs of technical excellence and international scientific collaboration, to confirm the existence of the Higgs Boson, gravity waves etc. And with *Voyager 1* and *Voyager 2* he considers the visionary audacity to send these objects and their famous golden LP records, tokens of life on earth in the 1970s, to become the only man-made objects to leave the solar system. They are most likely to continue their journey long beyond the time the Earth along with other planets are engulfed by the red giant stage of our dying star, Sol. Six billions years from now, they could be the last (or even only) remnants of our little lives.

Voyager's Golden Record - The Sounds of Planet Earth (NASA)

This is a short book - you could read it in an evening - and doesn't need any hard science to understand. There are no equations or even pictures, but he explains some tremendous concepts in astrophysics, cosmology, plate tectonics and particle physics with infectious enthusiasm. There are mind-blowing facts, for example in the chapter "Adventures with the Time Machine" about the materials and engineering precision needed to build the LHC at CERN: did you know that when a small puff of hydrogen nuclei are accelerated to the speed of 0.999999991 of the speed of light for the collider, the relativistic energy of the tiny batch of protons is equivalent to that of an intercity train travelling at 200 km per hour! The precision and control has to be unprecedented, because "if any one thing went wrong in this machine, everything could go very wrong indeed".

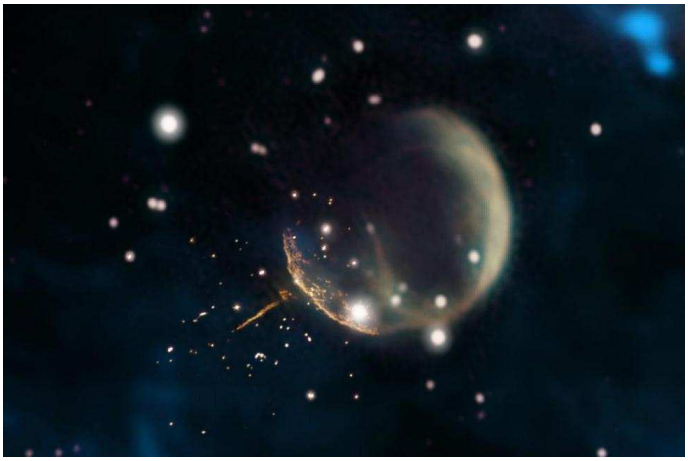


Simulation of Higgs Boson decay at the LHC CMS detector (By Lucas Taylor / CERN

And Radford writes well, as you'd expect from a former science editor of The Guardian. One reviewer says that his writing is "so beautiful, it reads like poetry", and I admire someone who can, without pretention, move from Dante's *"Divine Comedy"* and H. G Wells' "*War of the Worlds*" to the super-conductive magnets of the LHC and the collision of neutron stars. The book title is a variation on "*The Consolations of Philosophy"* by Boethius, a sixth century Roman official who wrote his contemplation on the big issues of life and death while in prison. In case we ever feel imprisoned in our everyday lives, gravity-bound to our little world, our imaginations and appreciation for the incredible things that contemporary physics and astronomy can reveal, should always be able to give us consolation and even joy.

Simon Gardner

Fermi Satellite Clocks Pulsar Going 2.5 million Mph



The composite images reveals the bright jet-like tail of the high-speed pulsar, J0002.
Photo by Jayanne English, University of Manitoba, using data from NRAO/F. Schinzel et al., DRAO/Canadian Galactic Plane Survey and NASA/IRAS

Astronomers have discovered a pulsar traveling at unprecedented speeds. Observations by NASA's Fermi Gamma-ray Space Telescope suggest the star is moving through space at 2.5 million miles per hour.

Pulsars are extremely dense neutron stars that spin rapidly, producing a pulsing jet. The pulsing radio-emitting jet, or tail, points toward the remnants of a recent supernova explosion.

“Thanks to its narrow dart-like tail and a fortuitous viewing angle, we can trace this pulsar straight back to its birthplace,” Frank Schinzel, a scientist at the National Radio Astronomy Observatory in New Mexico, told NASA. “Further study of this object will help us better understand how these explosions are able to 'kick' neutron stars to such high speed.”

Pulsars are named so because the star's spinning electromagnetic field shoots out pulses of energy in the form of radio waves, visible light, X-rays and gamma rays. Astronomers searching for pulsars look for the pulsing signals among telescope observations.

This particular pulsar was discovered by citizen scientists scanning Femi data. Participants in the Einstein@Home project have identified 13 gamma ray pulsars.

Scientists named the high-speed pulsing star PSR J0002+6216, or J0002 for short. The star is located in the Cassiopeia constellation, 6,500 light-years from Earth.

More at: https://www.upi.com/

A Neat Trick to Determine Your Dominant Eye

It turns out that not all eyes were born equal, and that most of us have one dominant eye. The dominant eye, is the one your brain prefers when it comes to processing visual input, and you should probably use that eye when looking through a telescope or shooting a gun.

Here is a neat trick you can use to discover which of your eyes is the dominant one.

Extend both hands forward of your body and place the hands together making a small triangle (approximately 2 or 3 cm per side) between your thumbs and the first knuckle like this.

With both eyes open, look through the triangle and centre something such as a doorknob in the triangle.

1. Close your left eye.

2. If the object remains in view, you are right eye dominant.

3. If closing your right eye keeps the object in view, you are left eye dominant.

It is as simple as that!

Chicxulub Asteroid Impact: Stunning Fossils Record Dinosaurs' Demise

Scientists have found an extraordinary snapshot of the fallout from the asteroid impact that wiped out the dinosaurs 66 million years ago.

Excavations in North Dakota reveal fossils of fish and trees that were sprayed with rocky, glassy fragments that fell from the sky.

The deposits show evidence also of having been swamped with water - the consequence of the colossal sea surge that was generated by the impact.

Robert DePalma, from the University of Kansas, and colleagues say the dig site, at a place called Tanis, gives an amazing glimpse into events that probably occurred perhaps only tens of minutes to a couple of hours after the giant asteroid hit the Earth.

When this 12km-wide object slammed into what is now the Gulf of Mexico, it would have hurled billions of tonnes of molten and vaporised rock into the sky in all directions - and across thousands of kilometres.

And at Tanis, the fossils record the moment this bead-sized material fell back down and strafed everything in its path.

Fish are found with the impact-induced debris embedded in their gills. They would have breathed in the fragments that filled the water around them.

There are also particles caught in amber, which is the preserved remnant of tree resin. It is even possible to discern the wake left by these tiny, glassy tektites, to use the technical term, as they entered the resin.

Geochemists have managed to link the fallout material directly to the so-called Chicxulub impact site in the Gulf. They have also dated the debris to 65.76 million years ago, which is in very good agreement with the timing for the event worked out from evidence at other sites around the world.

From the way the Tanis deposits are arranged, the scientists can see that the area was hit by a massive surge of water.

Although the impact is understood to have generated a huge tsunami, it would have taken many hours for this wave to travel the 3,000km from the Gulf to North Dakota, despite the likely presence back then of a seaway cutting directly across the American landmass.

Instead, the researchers believe local water could have been displaced much more quickly by the seismic shockwave - equivalent to a Magnitude 10 or 11 earthquake - that would have rippled around the Earth. It is a type of surge described as a seiche, which would have picked up everything in its path and dumped it into the jumbled collection of specimens now being reported by the team.

"A tangled mass of freshwater fish, terrestrial vertebrates, trees, branches, logs, marine ammonites and other marine creatures was all packed into this layer by the inland-directed surge," said Mr DePalma.

"A tsunami would have taken at least 17 or more hours to reach the site from the crater, but seismic waves - and a subsequent surge - would have reached it in tens of minutes," he added.

The PNAS paper, which will go online on Monday, includes among its authors Walter Alvarez, the Californian geologist who, with his father Luis Alvarez, is credited with helping to develop the impact theory for the demise of the dinosaurs.

The Alvarez pair identified a layer of sediment at the boundary of the Cretaceous and Palaeogene geological periods that was enriched with iridium, an element commonly found in asteroids and meteorites.

Iridium traces are also found to be capping the Tanis deposits.

"When we proposed the impact hypothesis to explain the great extinction, it was based just on finding an anomalous concentration of iridium - the fingerprint of an asteroid or comet," said Prof Alvarez. "Since then, the evidence has gradually built up. But it never crossed my mind that we would find a deathbed like this."

Phil Manning, from the University of Manchester, the only British author on the paper, commented: "It's one of the most important sites in the globe now. You know, if you truly wanted to understand the last day of the dinosaurs - this is it," he told BBC News.

More at: https://www.bbc.co.uk/

Physicists Predict a Way to Squeeze Light From the Vacuum of Empty Space

Charged particles zipping through water in a nuclear reactor produce Cherenkov radiation. (CC BY-SA 2.0)

Talk about getting something for nothing. Physicists predict that just by shooting charged particles through an electromagnetic field, it should be possible to generate light from the empty vacuum. In principle, the effect could provide a new way to test the fundamental theory of electricity and magnetism, known as quantum electrodynamics, the most precise theory in all of science. In practice, spotting the effect would require lasers and particle accelerators far more powerful than any that exist now.

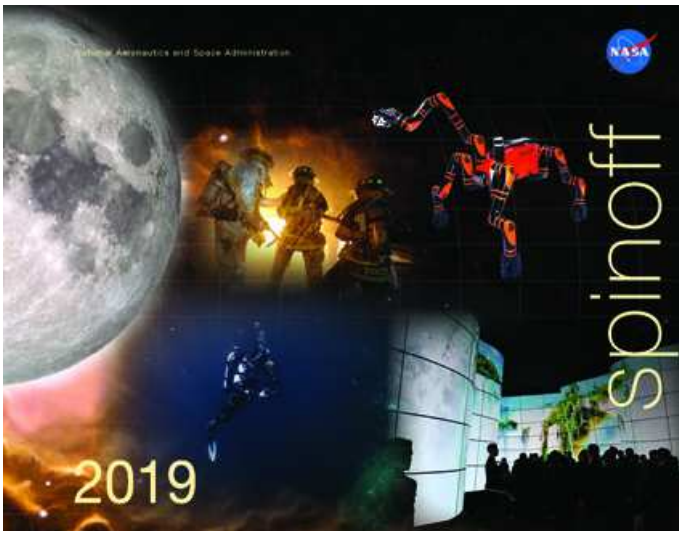
"I'm quite confident about [the prediction] simply because it combines effects that we understand pretty well," says Ben King, a laser particle physicist at the University of Plymouth in the United Kingdom, who was not involved in the new analysis. Still, he says, an experimental demonstration "is something for the future."

Physicists have long known that energetic charged particles can radiate light when they zip through a transparent medium such as water or a gas. In the medium, light travels slower than it does in empty space, allowing a particle such as an electron or proton to potentially fly faster than light. When that happens, the particle generates an electromagnetic shock wave, just as a supersonic jet creates a shock wave in air. But whereas the jet's shock wave creates a sonic boom, the electromagnetic shock wave creates light called Cherenkov radiation. That effect causes the water in the cores of nuclear reactors to glow blue, and it's been used to make particle detectors.

However, it should be possible to ditch the material and produce Cherenkov light straight from the vacuum, predict Dino Jaroszynski, a physicist at the University of Strathclyde in Glasgow, U.K., and colleagues. The trick is to shoot the particles through an extremely intense electromagnetic field instead.

More at: https://www.sciencemag.org/

NASA Spinoff



Since 1976, Spinoff has annually profiled an average of 50 commercial technologies with origins in NASA missions and research. Issues of Spinoff published since 1996 can be read online in HTML or downloaded in PDF. Scanned copies of Spinoff are available in PDF for issues published between 1976 and 1995.

Spinoff 2019 is also available on the iPad!

It features shortened versions of all the articles from the book, image galleries, videos, and more.

A 508-compliant PDF version of the iPad app is also available.

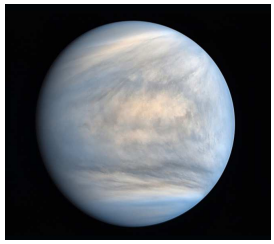
As well as the latest 2019 issue the site offers editions back to 1976.
Take a look here: https://spinoff.nasa.gov/

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

More Stuff!

Venus Reimagined: A New Image of an Active World



A new analysis of venusian lava flows shows they may have formed less than 250,000 years ago, suggesting a significant fraction of Venus' roughly 1,600 volcanoes are still active.

More at: http://www.astronomy.com/

Hubble Astronomers Assemble Wide View of the Evolving Universe

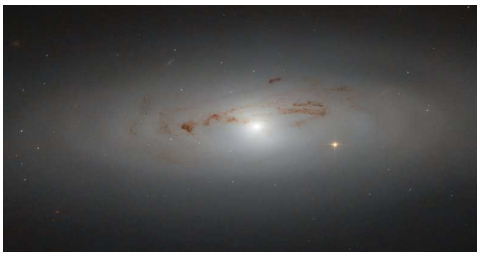
Astronomers have put together the largest and most comprehensive 'history book' of galaxies into one single image, using 16 years' worth of observations from NASA's Hubble Space Telescope.
More at: *https://www.sciencedaily.com/*

Two Neutron Stars Collided Near the Solar System Billions of Years Ago

Astrophysicists at the University of Florida, have identified a violent collision of two neutron stars 4.6 billion years ago as the likely source of some of the most coveted matter on Earth.

More at: https://phys.org/

A Strange Star Hidden in the Milky Way is Likely From Another Galaxy, Say Astronomers



One of the most recognisable star formations in our galaxy could be harbouring an intergalactic fugitive.

Hiding in the Ursa Major constellation, home of the Big Dipper, astronomers have recently ousted a strange star unlike any other in the Milky Way.

More at: https://www.sciencealert.com/

New Observations Find Universe Expanding too Fast for Science

Astronomers have discovered a discrepancy between how fast the universe is expanding and how fast theories predict it should grow.

More at: https://news.sky.com/

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 (if you need the combination to the lock, please contact a member of the committee)

Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy.

"Physics depends on a universe infinitely centred on an equals sign"
Mark Z. Danielewski

"Every line is the perfect length if you don't measure it"
Marty Rubin

"I did the math. (I presume Americans don't pluralise mathematics because they only plan to do it once.)"
Sheridan Jobbins

"'Zero and Infinity both are very difficult to understand and explain but at the same time both are key assumption of Mathematics..."
Brajesh Kumar

"Mathematics brought rigor to economics. Unfortunately it also brought mortis"
Kenneth Boulding

"In real life, I assure you, there is no such thing as algebra"
Fran Lebowitz