Vol. 70: No 6 AUGUST 2021 Issue Number 793

# CASMAG

The official magazine of the Canterbury Astronomical Society

www.cas.org.nz www.facebook.com/CanterburyAstronomicalSociety

**Monthly Meeting:** Our Monthly Meetings are held in ER225 Ernest Rutherford Building

6.30-7.30pm - CAStronauts & Introduction to Astronomy for Beginner's
7.30 - 8pm - Refreshments
8pm - Meeting Starts

**PLEASE REMEMBER TO SIGN THE ATTENDANCE BOOK AS WE STILL NEED TO KEEP A RECORD FOR CONTACT TRACING AS WELL AS USING THE NZ COVID SCAN WE HAVE AVAILABLE.**

## JUNE MEETING: 17TH AUGUST 2021

## MEMBERS SOAPBOX

If you are planning on giving a talk please contact Carol at **member2@cas.org.nz** so she can set out the program


## *CAS Membership Subscriptions for 2021*

***THIS YEARS MEMBERSHIP SUBSCRIPTIONS ARE NOW OVERDUE***

Please use your name and member number as a reference when banking, then email membership@cas.org.nz to advise so payments can be matched to you correctly. **PLEASE also include any changes to your details (eg: phone, email, address)**

**IT IS VERY IMPORTANT THESE DETAILS ARE KEPT UP TO DATE.**

Full details are included on the last page of this newsletter.
You are also welcome to pay by cash at our monthly meetings.
**NOTE: We can no longer accept cheques for payments**

## IN THIS MONTHS ISSUE



## From Your Editor

This is your Casmag, for YOU our members,
So I welcome any ideas or articles you would like to share with the other members. Please email your Article or favourite photo with details so I can include it in future issues.
Deadline for each issue is 1st of each month
Remember you can have your advert added in the future casmag's,
(see page 23 for details)
Any questions, Ideas or suggestions please email to editor@cas.org.nz
Dale Kershaw

*From 7.2.4.6 on page 15 of Constitution of the Society*
"Any member wishing to have an article or paper published in CASMAG or other publications of the society shall in the first instance, forward a copy to the editor who may request the approval of the committee before publication."

## COMING UP IN NEXT MONTHS ISSUE

New Puzzles
Next part of A Beginners Guide to Astrophotography

## CAS Calendar AUGUST-OCTOBER 2021


### AUGUST 2021

| | |
|---|---|
| Saturday 7th | New Members training at Observatory |
| Monday 9th | New Moon |
| Tuesday 10th | Committee Meeting |
| Monday 16th | First Quarter |
| Tuesday 17th | Castronauts meeting 6.30-7.30pm |
| | Members Meeting at University from 7.30pm |
| Saturday 21st | Members Night at Observatory |
| Monday 23rd | Full Moon |
| Monday 30th | Last Quarter |

### SEPTEMBER 2021

| | |
|---|---|
| Saturday 4th | New Members training at Observatory |
| Tuesday 7th | New Moon |
| Tuesday 14th | First Quarter |
| | Committee Meeting |
| Tuesday 21st | Full Moon |
| | Castronauts meeting 6.30-7.30pm |
| | Members Meeting at University from 7.30pm |
| Saturday 25th | Members Night at Observatory |
| Wednesday 29th | Last Quarter |

### OCTOBER 2021

| | |
|---|---|
| Saturday 2nd | New Members training at Observatory |
| Thursday 7th | New Moon |
| Tuesday 12th | Committee Meeting |
| Wednesday 13th | First Quarter |
| Tuesday 19th | Castronauts meeting 6.30-7.30pm |
| | Members Meeting at University from 7.30pm |
| Thursday 21st | Full Moon |
| Saturday 23rd | Members Night at Observatory |
| Monday 25th | Labour Day Holiday |
| Friday 29th | Last Quarter |

## PUBLIC OPEN NIGHTS

Our public open night season has started and we have managed to hold 2 Friday nights plus some Wednesday groups, We always welcome your help on these nights.

We ask all who are able to help out to advise us by using *https://cas.ivolunteer.com/2021*

*Open nights this year are set as follows:*

August:6th,13th,20th,27th

September: 3rd,10th,17th,24th

Any changes to Open Nights will be published on our Facebook public page and our website. Training is always available & this works towards your accreditation

# UPCOMING EVENTS: *2021 Calendar:*

## KIDSFEST 2021


This years kidsfest was off to a great start with the 1st 4 nights fully booked, then the weather/ clouds hit until the 2nd Friday which again was fully booked, giving us 5 nights in total, All nights were fully booked again proving how popular this event is each year.
Many thanks go to those members who came along to help on these evenings.


## *Changes to our Monthly Observatory Nights for 2021*

Some of the observant amongst you may have noticed a change to our CAS calendar, which has been updated for our winter 2021 programme.
This year to accommodate the growing number of new members we have added an additional observatory night to our programme.
Members nights are now tagged in the calendar as Training or General:
***Members Nights (Training)*** – held on the **1st Saturday of each month** -specifically aimed at induction training and members training. We will have accredited members onsite to support training aimed at adult and kids. Session starts earlier to allow the younger members some telescope time before bed! All members are welcome to attend and bring along gear. The intention of this session is to encourage all members to become familiar with observatory scopes and encourage usage of the observatory with a focus on training our new junior members. These sessions start earlier than normal to accommodate this.
***Members Nights (General)*** – held on the Saturday following our Tuesday members meeting' Free for All' – no specific training planned – All members welcome to bring along gear or use CAS gear if accredited or accredited members are in attendance.
Members nights are a great time to get out and enjoy a night under the stars at the observatory and do a little socialising. Many members bring out their dinner and enjoy that on the terraces before dark. Come out stay a while or stay all night, the observatory is warm and you can dip in and out all night as you like.
Reminder: Our members nights at the observatory go ahead regardless of the weather!
Enquiries regarding members nights can be posted on the CAS Members forum:
https://cas.org.nz/forums/forum/canterbury-astronomical-society-forums/cas-members

## *Changes to UC Members Meetings (3rd Tuesday each month)*

From March onwards there are some changes to the members meetings at the UC to accommodate the new CAStronauts kids and beginners to astronomy programme:

| | |
|---|---|
| 6.30pm – 7.30pm | CAStronauts & Introduction to Astronomy for beginner's session. |
| 7.30pm – 8pm | Tea/Coffee Break. |
| 8pm – 9pm | Normal CAS members meeting, general business and talk by Our Guest Speaker |

The earlier session is designed for our newcomers to astronomy and our kids CAStronaut programme and content will be pitched at this level.
More seasoned astronomers are requested to join the 8-9pm session as spaces are limited.
Enquires about the CAStronaut and beginner's session should be sent to the CAS Vice President, Simon Lewis, at vice-president@cas.org.nz
General information on our UC members nights and lecture topic will be posted in the CASMAG and on our CAS website

## MONTHLY MEETINGS:

### *Meeting Venue:*

**Room ER 225 in the Ernest Rutherford Building, University of Canterbury,**
**(1 building over from the east building we used last year)**
**Entrance to the building will be via the north side entrance,**
**Then using the lift or stairs up to level 2**

**Carol McAlavey is asking you, our members to make suggestions or offer to give a talk at our monthly meetings.**
PLEASE CONTACT CAROL WITH YOUR SUGGESTIONS OR IF YOU CAN GIVE A TALK via **member2@cas.org.nz**

### Upcoming Members Meetings

17th August: **Soapbox**

21st September: **Antonio Herrera Martin**
Postdoc working under Prof Micheal Albrow
"Gravitational Lensing as a Astronomical Tool"

19th October: **John Pickering**
"Searching for Alien Worlds"

16th November: **Simon Lewis**
"Interpreting Astronomical Images'

(correct as at 1st July 2021, Subject to change as required)

Many thanks go to Sharlene Wilson and Orlon Petterson from the School of Physical and Chemical Sciences, University of Canterbury for arranging the meeting room for CAS this year.
Also Thanks to Associate Professor Karen Pollard for organising the Lecture theatres for our public talks

**PLEASE Remember we are only able to hold our meetings at the University at Covid-19 Level 1**
**We will update the website if there are any changes and will host meetings via ZOOM if possible:**

## CAS YOUTUBE CHANNEL

Have a look at our new you tube channel
https://www.youtube.com/channel/UChLhFm7yaLUTIgH3IJvA11g

## WELCOME TO OUR NEW MEMBERS:

A warm welcome to our new members, We look forward to meeting you at our meetings and/or events, Please make yourselves known to others. We like to welcome our new members here after the membership is accepted by the committee at the meeting following memberships are received.

*Welcome to:*
Jessie Wealleons
Domica Oyrodniczac
Herwyn Bongers
Mike Cloake
Kristen Fisher
Jenny Bronsen
Chris Alexdener
Gabiel Perano
Jack Minardi
Hanna Kim
Jim Park


*Apologies if your name is not spelled correctly, ED)*

It is always great to see our new members coming along to our Members Meetings, Members Nights and Events.

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## CASMAG PUZZLE PAGE

### Jupiter

1. In 1994 a _____ hit Jupiter
2. The moon _____ may have a ocean under its icy surface
3. Jupiter is the _____ planet from the Sun
4. The four largest moons of Jupiter are called the _____ moons
5. The _____ space craft has given us a lot of new information about Jupiter
6. The moon _____ is the largest moon in the solar system
7. Jupiter is the _____ planet is our solar system
8. Jupiter's atmosphere has _____ like thunderstorms here on Earth
9. The Great ___ ____ is a storm on Jupiter that can be seen from Earth
10. The moon _____ orbits Jupiter from 14,220,000 miles away
11. Jupiter's atmosphere has _____ separate layers of clouds
12. A year on Jupiter is _____ Earth years long
13. The _____ missions showed us that Jupiter has rings
14. Io is the only moon in the solar system with active _____

# CAS 2022 CALENDAR

Your committee has decided to create a “CAS 2022 Calendar” to sell as a Fundraiser,
We are asking for our members to submit any photos they would like to be considered for this publication.
Full credit will be given to you as who took the photo and with any details re equipment used.
If you have a photo or 2 you would like to be considered for this publication please post on the website using

* **MY GALLERY**
* **select Post Image**
* **Select Calendar 2022 and up load your image**


*You are submitting on the understanding that images may be selected for publication in our calendar -*
*IP remains the ownership of the author*

## TABLE OF SOUTHERN METEOR SHOWERS 2021

| Shower | Dates | | Moon | Peak Rate | RA | Dec | Near Star |
|---|---|---|---|---|---|---|---|
| | Active | Peak | 2021 | | | | |
| Centaurids | Jan 28 - Feb 21 | Feb 8 | 3 days after Last quarter | 5 (-25) | 14.1 | -59 | β Cen |
| gamma-Normids | Feb 25 - Mar 22 | Mar 13 | New moon | 8 | 16.6 | -51 | γ Nor |
| pi-Puppids | Apr 15 - Apr 28 | Apr 23 | 3 days after First quarter | var to 40 | 7.3 | -45 | σ Pup |
| eta-Aquariads | Apr 19 - May 28 | May 5 | 1 day after Last quarter | 60 | 22.5 | -1 | η Aqr |
| Pisces Austrinids | Jul 15 - Aug 10 | Jul 27 | 3 days after Full moon | 5 | 22.7 | -30 | α PsA |
| alpha-Capricornids | Jul 3 - Aug 15 | Jul 30 | 2 days before Last quarter | 4 | 20.5 | -10 | α Cap |
| Southern delta-Aquarids | Jul 15 - Aug 25 | Jul 27 | 5 days before Last quarter | 20 | 22.6 | -16 | δ Aqr |
| Southern iota-Aquarids | Jul 25 - Aug 15 | Aug 4 | 3 days after Last quarter | 2 | 22.3 | -15 | ι Aqr |
| Northern delta-Aquarids | Jul 15 - Aug 25 | Aug 13 | 3 days before First quarter | 4 | 22.3 | -5 | θ Aqr |
| Northern iota-Aquarids | Aug 11 - Aug 31 | Aug 19 | 3 days after First quarter | 3 | 21.8 | -6 | β Aqr |
| Piscids | Sep 1 - Sep 30 | Sep 19 | 2 days before Full moon | 3 | 0.3 | -1 | λ Psc |
| Orionids | Oct 2 - Nov 7 | Oct 21 | Full moon | 20 | 6.3 | +16 | γ Gem |
| Leonids | Nov 14 - Nov 21 | Nov 17 | 2 days before Full moon | 100+ | 10.2 | +22 | γ Leo |
| alpha-Monocerotids | Nov 15 - Nov 25 | Nov 22 | 3 days after Full moon | var to 5 | 7.9 | +1 | δ Mon |
| Pheonicids | Nov 28 - Dec 9 | Dec 6 | 2 days after New moon | var | 1.2 | +53 | Achernar |
| Geminids | Dec 7 - Dec 14 | Dec 14 | 3 days after First quarter | 120 | 7.3 | +33 | Castor |

# THE SELWYN AWARDS 2021

The Selwyn Awards recognise the outstanding work and achievements of businesses, not-for-profit organisations and individuals who live or work within the Selwyn district

We were entered in the Tourism category

*The Tourism Award recognises the outstanding contribution an operator or group has made by providing excellent visitor experiences in the Selwyn district for domestic and/or international visitors as well as contributing to the wider Selwyn tourism sector.*

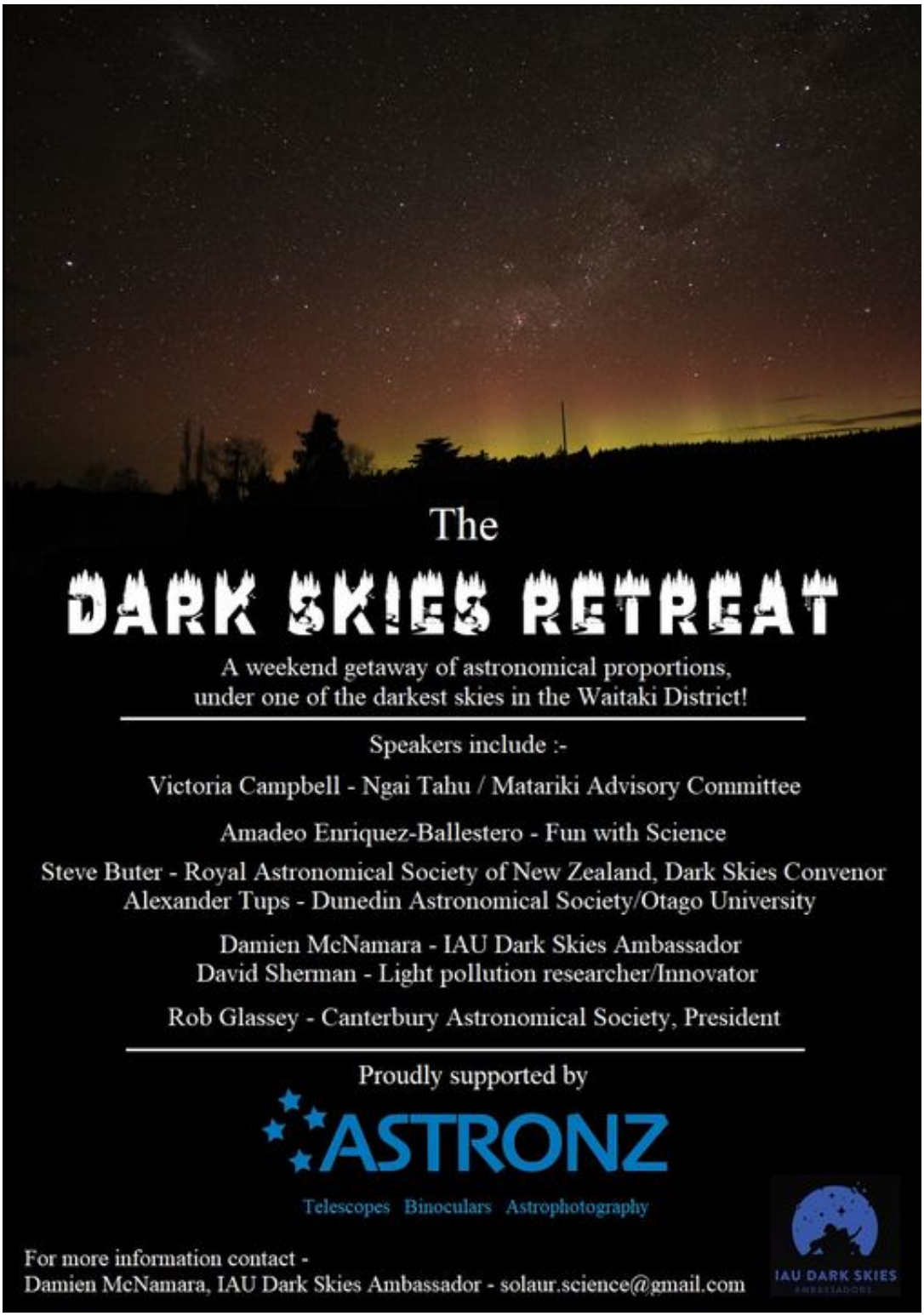
The winners were announced at the Gala dinner last weekend and we are pleased to announce we achieved

## Tourism
## Silver
## Canterbury Astronomical Society

# The Dark Skies Retreat,
## proudly supported by AstroNZ

A weekend getaway of astronomical proportions, under one of the darkest night skies in the Waitaki District! Held at Camp Iona, Herbert
Friday 10th –Sunday 12th September 2021

For more information please check out the facebook page
"The Dark Skies Retreat"
or contact Damien at solaur.science@gmail.com



# NOTES FROM YOUR COMMITTEE

## SIGNING IN WHEN YOU ARE AT THE OBSERVATORY

**Please remember to sign in the book** on the table in the Lodge whenever you are out at the observatory, This helps give us an idea of who has been using the equipment etc, even if you are out there to do gardening or the like PLEASE SIGN THE BOOK and add what you have been doing,
Also please note and issues that have happened or that need fixing, and its good to follow that up with a email or phone call to Terry or the committee

## CAS COFFEE MUGS & PENS


With our new logo we have had Coffee Mugs printed and also Pens which we have for sale to our members,
Coffee Mugs are $15.00 each
Pens are also available to members
Waterproof Stickers with our new logo are also available
Payment can be cash or bank deposit

They are available from Editor (Dale),
contact via editor @cas.org.nz
or 0272426376

# OBSERVATORY NEWS
# IMPORTANT INFORMATION

## DOOR CODE & ALARM AT THE OBSERVATORY

The door code and Alarm code has been changed since our March AGM
Ask a committee member for the passwords.

## INTERNET WI-FI:

Ask a committee member for the password

## LASER POINTERS:

*There is a legal requirement when importing them, and information is on our website and at the observatory, CAS has a drafted a set of guidelines which we were presented at our AGM and were voted and added to our By-Laws,*
*If you need a letter confirming your membership for your application, please contact either membership secretary or secretary, (This letter will state you are a current financial member of our society)*

## ACCREDITATION

A reminder that unless you have full accreditation on the equipment you are not to use the equipment unless there is an accredited person with you.
Full training is available
There is a full list of accredited person's on the wall above the kitchen sink inside the lodge
contact Terry (our Observatory directory via his email listed on our website or the inside back page casmag

# Westmorland Heights Observatory.

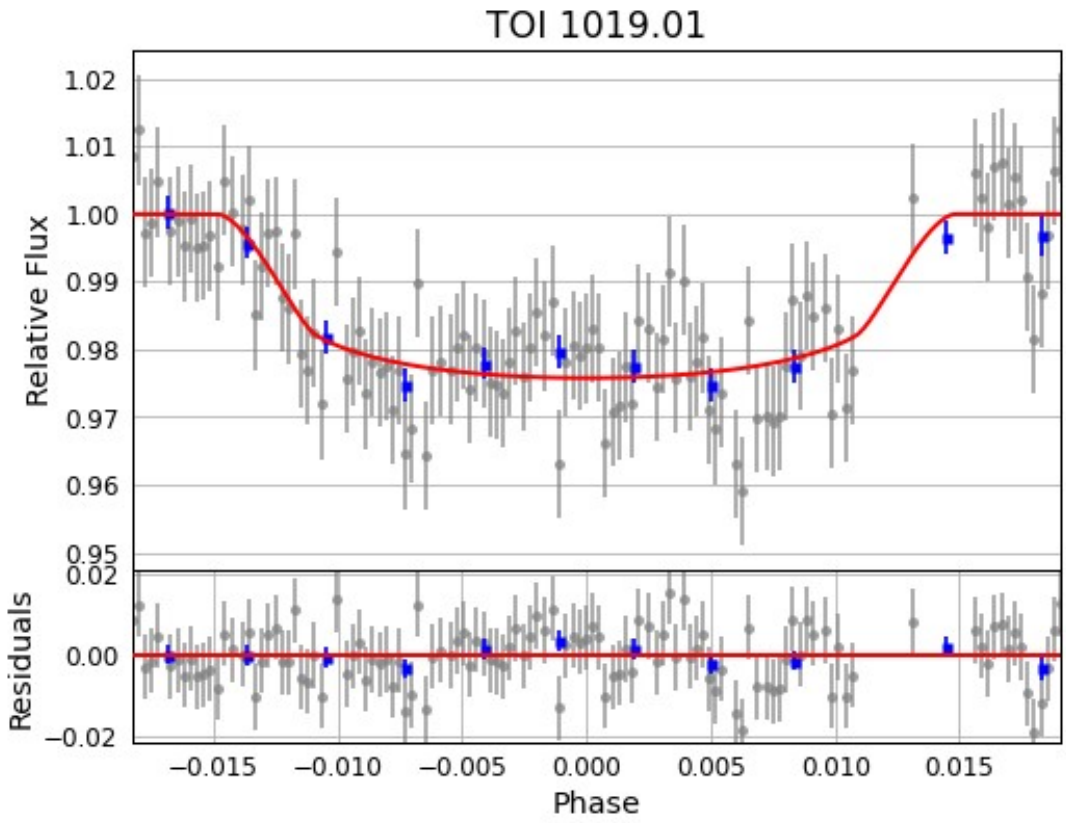
From John Pickering

Having invited people on a local facebook group to observe the conjunction of Saturn and Jupiter before Christmas (about 50 did) I was contacted by someone who had been given a second hand telescope for their children and wanted some help setting it up. Eventually, I found a night to do that. Alas, it was one of those "cheap and nasty" equatorial mounted refractors. It wasn't in good condition and was only going to put them off. I felt sorry for the girls (aged about 10 & 11) so arranged to take my eVscope for a visit. What a hit! All the family was there and a friend of the girls. It was a great hour or so exploring some galaxies. clusters and nebulae.
The three girls & their mother each drew me a picture of what they saw. Here it is:

# Westmorland Heights Observatory. cont

## MY FIRST EXOPLANET.

One night in April I pointed my little 4.5" enhanced vision telescope (eVsope) at a dim, magnitude 10.89, non-descript star somewhere on the edge of the Carina constellation.
The star, in the Gaia survey called DR2 5296160254722839296 is about 1.79 times the mass of our sun, and radius 1.56 times has a temperature of 7645K, so a little hotter. It's certainly nothing to write about, except for one thing. It is one of about 4000 stars that the TESS, NASA's Transiting Exoplanet Survey Satellite (https://www.nasa.gov/content/about-tess) has identified as having a candidate planet orbiting it. The planet is a large "hot Jupiter" orbiting close in to the star with a period ("year") of just 5.23 days and estimated radius of about 24 times that of the earth.
So, TESS identifies candidate planets, it is up to ground based telescopes to confirm them and refine their parameters. This is a big deal – 30 years ago no planet had been detected around another star. Now, several thousand have been discovered and even amateurs like myself can monitor them helping refine their physical characteristics.
My little reflector is one of a new breed of scopes developed by Unistellar. Instead of having a secondary mirror there is a small camera (Sony IMX 224 for those who care). The magic is in the software that as pictures are taken about every ~4s it rejects dodgy ones, rotates them a little and stacks them, thus instead of gathering more photons with a wider aperture it gathers more over time while still giving a "live" view.
Unistellar have partnered with SETI to undertake some citizen science with as many users of these scopes who are willing. The app comes with a number of citizen science modes including exoplanet transits (https://unistellaroptics.com/citizen-science/exoplanets/).
Every month a calendar for the users part of the world is updated with possible candidates. Instructions are provided and one can observe. For me this meant pointing the telescope in the right direction, taking a few dark frames at the beginning and ending of the observing run, and realigning every 30 mins for about 6h.
I then sent the data to Unistellar to reduce. They have invited us to learn how to process the data ourselves, so they did some of the work and sent back a whole stack of fits files. I then learnt how to use the EXOTIC program (https://github.com/rzellem/EXOTIC) to produce some graphs myself (see figure).
**Success!**
The planet, **TOI 1019.01,** transited the star in 0.15 +/- 00064 days, and dimmed the light reaching earth by 2% (red line). It's radius was 14.2% +/- 0.6% that of the star (that's BIG!) & it was orbiting at a distance of about 12 +/- 1 times the star's radius (that's CLOSE!). Imagine the tidal forces and heat on the gases!




Citizen science is fun!

John Pickering
July 2021.

# OBSERVATORY NEWS
# IMPORTANT INFORMATION

## New Security System in Lodge

We are trialling a new security system in the Lodge. This takes the form of an intrusion sensor outside, and a Wifi cam inside the lodge in the back corner at the car park end. The intention is to add another camera outside the lodge overlooking the car park area. The advantage of these is that they will trigger on intrusion alert and can be viewed remotely in real time or reviewed within 2 weeks. These are not for the purpose of watching people, but rather to check that entry to the lodge is by legitimate members. Given the assets we have on site, this is necessary for any insurance claims. Access to these cameras is limited to Webmaster, Vice President and Observatory director only. We already have a surveillance network installed (several years ago) which records to a hard drive but cannot be remotely viewed in real time.

If anybody needs to know more please feel free to email me
observatory.director@cas.org.nz
*Terry Richardson*

## SECURITY FOR OBSERVATORY KEYS– Accredited Members

Committee have decided that we need improved security for access to the observatory equipment. From now all keys are stored in a lock box in the library. Any accredited member will be given the combination (just ask me). This includes the key to the equipment room and for the dobs.
Although the dobs do not require formal accreditation, they are precision instruments that can be damaged if not used correctly.
A member accredited on any of the scopes can open these for you.
Members still have free access to the lodge and its facilities, but any other access will require an accredited person to be present.
Any accredited member can get access to the keys, but of course can only use (or supervise) the instrument they are accredited for.
This sounds a bit restrictive, but has become necessary due to recent misuse and possible damage to some instruments.

Any questions please email me
observatory.director@cas.org.nz
*Terry Richardson*

# A Beginners Guide to Astrophotography – Part 3

Simon Lewis – CAS Vice President

## Welcome to Part 3

In part one and two of our series "A Beginners Guide to Astrophotography" we looked at the basics of our imaging systems, some of the key components used and started to piece together what our sensors are doing when collecting the light from the night sky and the process of how they turn this into usable data.
This understanding will really help you as we move forward into the intricacies of imaging and post processing. But do not worry, we will continue in small steps before we get into the complicated world of image processing!
In part three of this series, we are going to explore some more about what our sensors are doing inside our cameras and in particular the effect of focal length on camera choice and imaging. This understanding will help you understand how we choose cameras to suit certain telescopes and imaging targets.

### The effects of Focal Length

You will quite often hear people in astronomy quote that 'Aperture is King' and for visual astronomy it certainly is the case. The larger the aperture of your telescope, the more light it will gather and the finer detail it can resolve. While aperture cannot be completely ignored in astrophotography, often what we care about more is the focal ratio of the telescope.
The focal ratio is a unitless number and can be found by dividing the focal length of the telescope by the aperture.


For example, if a telescope has an 80mm Aperture and a focal length of 500mm, then the focal ratio of the scope would be 500mm/80mm = f/6.25.
We can see the effects on this change if we alter one or the other of these measurements at a time.
Say that we keep the 80mm aperture the same but increase the focal length to 800mm. Our focal ratio then becomes f/10. If we keep the focal length constant at 500mm but increase the aperture to 125mm, then the focal ratio then becomes f/4.

*Cont next page*

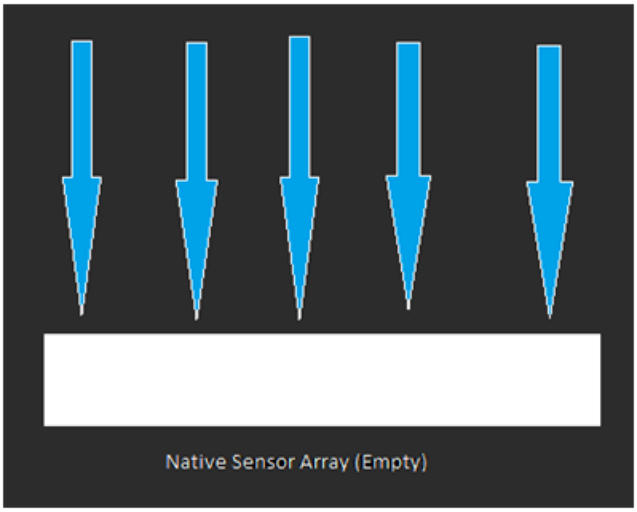
# A Beginners Guide to Astrophotography – Part 3 cont

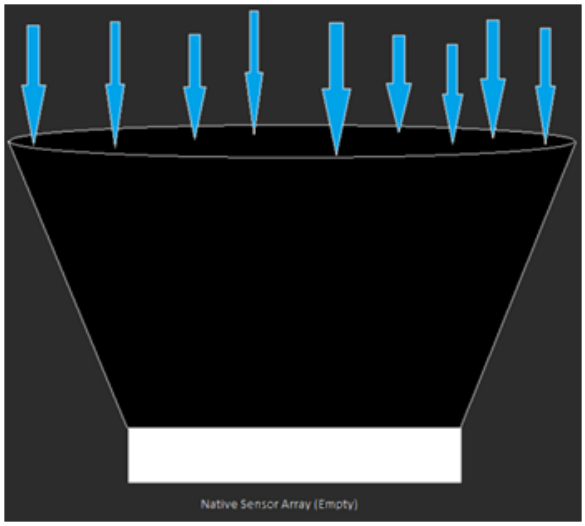
**Well that is a decent bit of maths!**

Let's apply this idea back to our bucket analogy.

With our buckets out on the lawn collecting rain, they just collect however much rainwater would fall on their exact position.

But what if we could increase the rate at which our buckets collected the water? That is exactly what a telescope does.

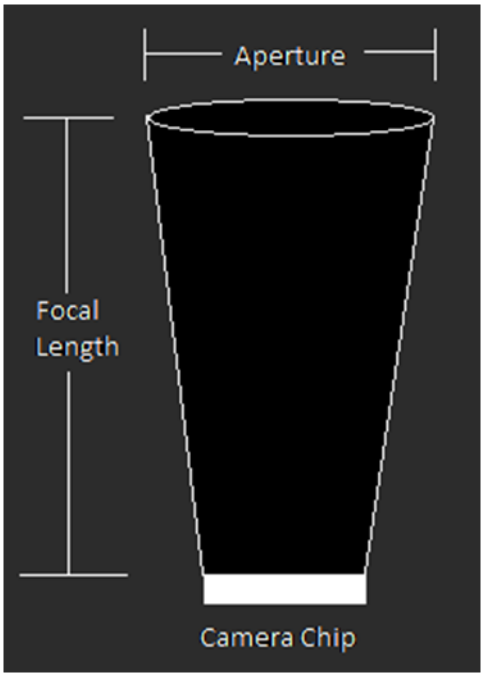



**Sensor with no telescopeSensor with telescope attached**

Recall that in this analogy, each bucket is a single pixel, and our array of all the buckets is the entire camera sensor, and incoming rainwater is the light coming in from our astronomical object we are imaging. A telescope acts like a big funnel: it gathers more light over a given amount of time to put on the sensor.

If aperture is king for visual astronomy, then why in astrophotography do we care more about the f/ratio? The short answer is that the f/ratio is what determines how much light falls onto each of our pixels. We definitely want to maximize the amount of light gathered by each pixel since the objects we are imaging are so very comparatively dimand the lower the f/ratio, the more light hits each pixel.




Let's shrink down our sensor from before and see what happens when we change one part of our imaging train at a time that affects the focal ratio.

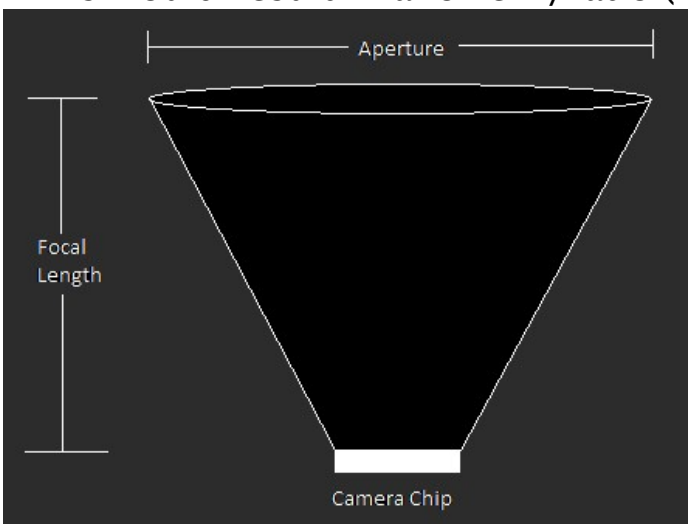
Take the following diagram as the starting point. As we can see, we are still gathering more light (rain) on our sensor (all of our buckets in an array) than without a scope at all.

Now let's change some of the measurements on this starting point to see their effects.

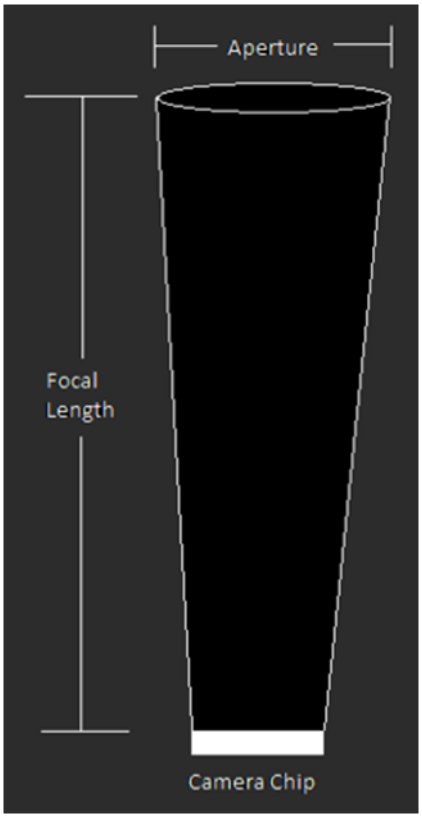
*Cont next page*

# A Beginners Guide to Astrophotography – Part 3 cont

**We'll begin by keeping** the same focal length but increasing the aperture of the telescope.
This would result in a lower f/ratio (recall that the f/ratio is focal length divided by aperture), or a system that gathers more light for the sensor over the same amount of time.




Each pixel-bucket is getting more light as compared to the base example.
It should be clear that moving in the other direction (keeping the focal length the same, but decreasing the aperture) results in a higher f/ratio, which is a slower system because there is less light hitting each pixel in the same amount of time.
So how about changing the other measurement that is tied to focal ratio? Let's look at what happens when we keep the aperture the same but increase the focal length. This results in a higher f/ratio
So how about changing the other measurement that is tied to focal ratio? Let's look at what happens when we keep the aperture the same but increase the focal length. This results in a higher f/ratio and a slower system.
It may be a little less intuitive to see, but by keeping the opening the same but basically increasing the distance, we are making the system become closer to vertical.
A perfectly "vertical" system would be the exact same as having no telescope helping you gather light on your sensor. The takeaway from all of this is that we want to have a fast scope for astrophotography because it allows us to gather light more quickly. This lets us either get more light for the same duration of shot, or we can lower our exposure duration to gather the equivalent amount of light as a slower focal ratio system which eases the burden on our imaging system.
Each full f/stop change helps (or harms) your signal to noise ratio by 41%. This is ultimately why we care about focal ratio so much in astrophotography.
There is one further aspect to consider here with this 41% increase and focal ratio effects: all of the above assumed a straight through optical path like you would find in refractor telescopes.




What do you think would happen if there were a central obstruction such as on a Schmidt-Cassegrain or a Newtonian telescope?

*Cont next page*

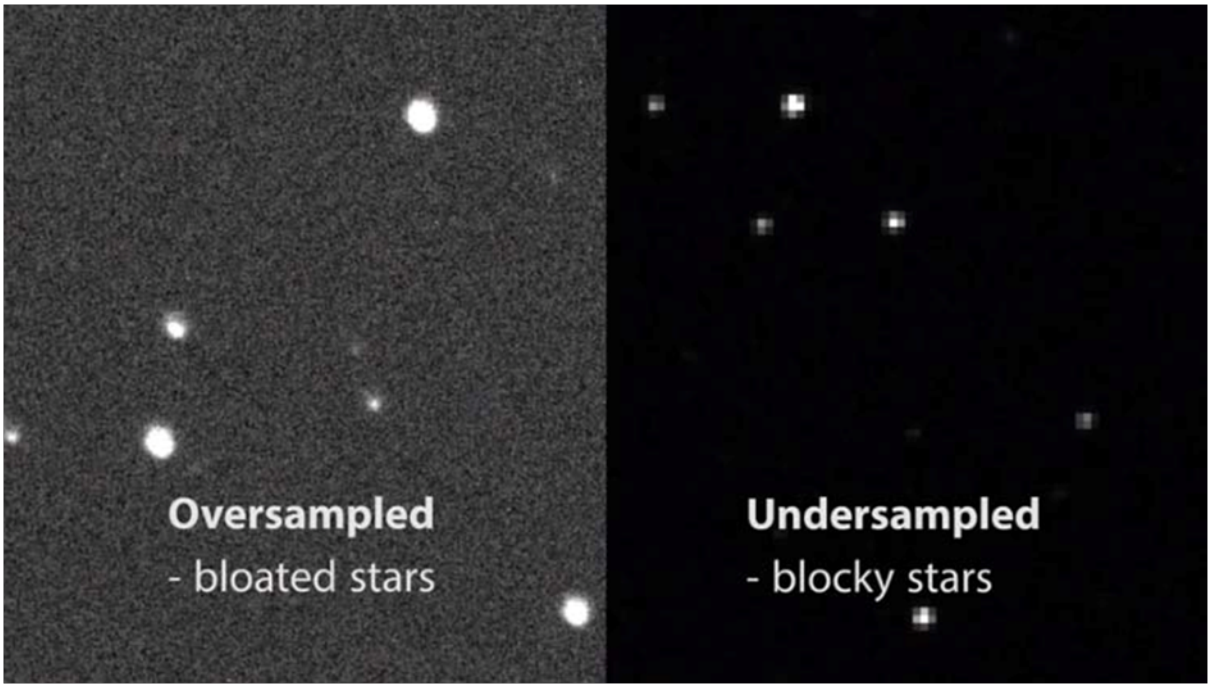
# A Beginners Guide to Astrophotography – Part 3 cont

## Pixel Scale – the camera/scope juggling act

Astrophotography is by its nature a complex subject, so several 'rules' have developed by knowledgeable people to try reduce complexity by applying simple guidelines to some common occurrences. And while we are on the subject of focal length its worth looking at one that you will want to think about when choosing a camera – that is known as pixel scale.
What we are describing by pixel scale is the amount of sky which will cover one pixel on your camera's sensor. To get a sense of scale the moon is approximately half a degree wide. You can also gauge one degree by holding your arm out with your palm facing away from you raise your little finger, the width of this finger is about 1 degree.
You should be able to completely hide the moon behind your little finger with your arm outstretched. Angles are traditionally split into minutes and seconds. In this case we are not talking about time but a fraction of an angle. 1 arc minute is 1/60th of a degree. While 1 arc second is 1/60th of an arc minute. To imagine this (which is not easy!) think of a small coin at 3-4km. It's small!
The reason that astronomers are interested in arc seconds is that the earth's atmosphere limits the resolution we can achieve in our images.
For most locations on a good still night the 'seeing' will be about
2 arc seconds, i.e. objects smaller than 2 arc sec will be blurred to a size of 2 arc seconds by the atmosphere.
It's worth remembering that all stars are so far away that their angular size is always much smaller than 1 arc second. However, we will see them as having a size of at least 2 arc seconds due to the blurring effect of the atmosphere.
The telescope and camera combination will give us the arc seconds per pixel value. It's a pretty easy value to calculate.
The formulae is:
(Pixel Size (μm) / Focal length ) * 206.3 = angular resolution(arcseconds/pixel)
The longer the focal length of the telescope the smaller the arc seconds per pixel. Conversely the shorter the focal length the larger the number of arc seconds covering each pixel.
The pixel size also plays a role. The smaller the pixel the less arc seconds cover each pixel and larger pixels have more arc seconds.

*Cont next page*

# A Beginners Guide to Astrophotography – Part 3 cont




If you choose a camera telescope combination that gives a small number of arc seconds per pixel (think long focal length telescope and small pixels) stars will cover many pixels and appear large or 'bloated'.
As you are spreading out the light from the star over many pixels the sensitivity of your imaging will also decrease.
Also any shortcomings or defects in your optical train will be magnified; for example non-round stars at corners of image or elongated stars due to imperfect tracking.
Looking at the opposite end of the scale. A low arc seconds per pixel value will mean most of the light from a star will fall on a single pixel. This will lead to stars appearing blocky, as not enough pixels are used to convey a round shape to a star.
Also, if a One ShotColour camera is used the star light will need to fall on separate red green and blue pixels for a true colour to be recorded. If all the light falls on a single green pixel, then you end up with a green star, which will look strange.
Sensitivity is also affected. If arc sec per pixel is very low (below 1) then more sky background is also mixed in with the light reaching the pixel. This again decreases sensitivity.
So what is the best value to aim for?
For reasons outline above regards sensitivity and image quality, the rule of 1-2 arc seconds per pixel is a good guide.
Sticking to the rule should get you the most detail and the most sensitivity.

*Cont next page*

# A Beginners Guide to Astrophotography – Part 3 cont

## Here's a handy table:

| PIXEL SIZE | TELESCOPE FOCAL LENGTH IN mm | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| um | 300 | 350 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 800 | 850 | 900 | 950 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 |
| 3 | 2.06 | 1.77 | 1.37 | 1.24 | 1.12 | 1.03 | 0.95 | 0.88 | 0.82 | 0.77 | 0.73 | 0.69 | 0.65 | 0.62 | 0.52 | 0.44 | 0.39 | 0.34 | 0.31 |
| 3.5 | 2.40 | 2.06 | 1.60 | 1.44 | 1.31 | 1.20 | 1.11 | 1.03 | 0.96 | 0.90 | 0.85 | 0.80 | 0.76 | 0.72 | 0.60 | 0.52 | 0.45 | 0.40 | 0.36 |
| 4 | 2.75 | 2.35 | 1.83 | 1.65 | 1.50 | 1.37 | 1.27 | 1.18 | 1.10 | 1.03 | 0.97 | 0.92 | 0.87 | 0.82 | 0.69 | 0.59 | 0.52 | 0.46 | 0.41 |
| 4.5 | 3.09 | 2.65 | 2.06 | 1.85 | 1.69 | 1.55 | 1.43 | 1.32 | 1.24 | 1.16 | 1.09 | 1.03 | 0.98 | 0.93 | 0.77 | 0.66 | 0.58 | 0.52 | 0.46 |
| 5 | 3.43 | 2.94 | 2.29 | 2.06 | 1.87 | 1.72 | 1.58 | 1.47 | 1.37 | 1.29 | 1.21 | 1.14 | 1.08 | 1.03 | 0.86 | 0.74 | 0.64 | 0.57 | 0.52 |
| 5.5 | 3.78 | 3.24 | 2.52 | 2.27 | 2.06 | 1.89 | 1.74 | 1.62 | 1.51 | 1.42 | 1.33 | 1.26 | 1.19 | 1.13 | 0.94 | 0.81 | 0.71 | 0.63 | 0.57 |
| 6 | 4.12 | 3.53 | 2.75 | 2.47 | 2.25 | 2.06 | 1.90 | 1.77 | 1.65 | 1.55 | 1.45 | 1.37 | 1.30 | 1.24 | 1.03 | 0.88 | 0.77 | 0.69 | 0.62 |
| 6.5 | 4.46 | 3.83 | 2.98 | 2.68 | 2.43 | 2.23 | 2.06 | 1.91 | 1.79 | 1.67 | 1.58 | 1.49 | 1.41 | 1.34 | 1.12 | 0.96 | 0.84 | 0.74 | 0.67 |
| 7 | 4.81 | 4.12 | 3.20 | 2.88 | 2.62 | 2.40 | 2.22 | 2.06 | 1.92 | 1.80 | 1.70 | 1.60 | 1.52 | 1.44 | 1.20 | 1.03 | 0.90 | 0.80 | 0.72 |
| 7.5 | 5.15 | 4.41 | 3.43 | 3.09 | 2.81 | 2.58 | 2.38 | 2.21 | 2.06 | 1.93 | 1.82 | 1.72 | 1.63 | 1.55 | 1.29 | 1.10 | 0.97 | 0.86 | 0.77 |
| 8 | 5.49 | 4.71 | 3.66 | 3.30 | 3.00 | 2.75 | 2.54 | 2.35 | 2.20 | 2.06 | 1.94 | 1.83 | 1.73 | 1.65 | 1.37 | 1.18 | 1.03 | 0.92 | 0.82 |
| 8.5 | 5.84 | 5.00 | 3.89 | 3.50 | 3.18 | 2.92 | 2.69 | 2.50 | 2.33 | 2.19 | 2.06 | 1.95 | 1.84 | 1.75 | 1.46 | 1.25 | 1.09 | 0.97 | 0.88 |
| 9 | 6.18 | 5.30 | 4.12 | 3.71 | 3.37 | 3.09 | 2.85 | 2.65 | 2.47 | 2.32 | 2.18 | 2.06 | 1.95 | 1.85 | 1.55 | 1.32 | 1.16 | 1.03 | 0.93 |
| 9.5 | 6.52 | 5.59 | 4.35 | 3.91 | 3.56 | 3.26 | 3.01 | 2.80 | 2.61 | 2.45 | 2.30 | 2.17 | 2.06 | 1.96 | 1.63 | 1.40 | 1.22 | 1.09 | 0.98 |
| 10 | 6.87 | 5.89 | 4.58 | 4.12 | 3.75 | 3.43 | 3.17 | 2.94 | 2.75 | 2.58 | 2.42 | 2.29 | 2.17 | 2.06 | 1.72 | 1.47 | 1.29 | 1.14 | 1.03 |

The ideal resolution for deep sky objects imaging.
Objects could be over sampled and guiding and sky conditions will cause issues.
Objects are under sampled and not enough detail will be seen in the images.

The area marked in orange is the general best area to stay in but the question is always can you bend or break the rules and the answer is sure… as long as you know the consequences!

First with short focal length telescopes or lenses. These will have big fields of view and allow is to take large, wide field nebula shots. Also, with these wide field type images we can place a terrestrial object in the image.
Typically, short focal length scopes make focusing, tracking, and guiding easier.
You might not be taking the most detailed images but lots of enjoyable imaging can be had above 2 arc sec per pixel.

Undersampling at short focal lengths can be managed in software to some extent using a technique called 'drizzle' where data is sampled and recreated to match data alongside it. I will go into drizzle more in future more advanced image processing articles but for now, simply note that being undersampled someway isn't too much of an issue.
How about longer focal lengths? These give smaller fields of view and allows us to image smaller, less common objects.

Imaging at low arc seconds per pixel values is called over sampling. Again, software post processing can help here using a process called deconvolution to reveal extra detail.
Planetary imagers will image at very high arc seconds per pixel and use very short exposures (fractions of a second) to 'beat the seeing'. This type of imaging is termed 'lucky imaging'. While its often used by amateurs for planets its use for deep sky is more limited to professionals using electron multiplication CCDs.
However recently some people are trying the technique using CMOS cameras with low read noise.

So, to conclude. It is easier to capture great images by sticking to the 1-2 arc seconds per pixel rule. However, a lot of fun and enjoyment, along with some level of frustration, can be had by breaking this rule. And again, it's a guideline more than a rule – feel free to push the envelope either way!

*Cont next page*

## A Beginners Guide to Astrophotography – Part 3 cont

Part 4 to follow in the September Casmag

### Don't Forget - Competition Time

During this winter season we invite you to get out and take your first astro images.
At the end of the season in October we will judge the entries and award some prizes for best adult and junior member's image.
This competition is only for newcomers not yet imaging or only just starting imaging.
Images may be submitted by logging into the website.
Follow the My Gallery menu drop down found on the My Account tab.
Use the Post Image button and choose Competition as the gallery type.

### Reminder - CAS Calendar Image Submission

For the old hands our calendar submission is already open for entries.
You can go to the CAS site and submit your entries.
We will select the best images in August and the top 12 will appear as image of the month on next year's calendar.
Lucky winners will each receive a calendar as a prize.
Images may be submitted by logging into the website.
Follow the My Gallery menu drop down found on the My Account tab.
Use the Post Image button and choose Calendar 2021 as the gallery type.
*You are submitting on the understanding that images may be selected for publication in our calendar -*
*IP remains the ownership of the author*

# The Evening Sky in September 2021

Four bright planets light up the evening sky along with some of the brightest stars.
**Venus** the brilliant 'evening star', appears in the west soon after sunset. Below Venus is **Mercury**, making its best evening sky appearance of the year. In the east is golden **Jupiter**. It becomes the brightest 'star' in the night sky after Venus sets. Above Jupiter is **Saturn**, looking like a medium bright star.

**Venus** is bright enough to be seen by eye in daylight. It is north of overhead (60˚ elevation) at 3 pm. It is best to look for it from a shady spot, particularly if you are using binoculars. Venus will be 5˚ (a binocular field) above the crescent Moon at 3 pm on the 10th.

Around the 20th **Mercury** will make a close pair with **Spica**, the brightest star in Virgo. The two stay close as both set earlier. At first Mercury is the brighter of the two but it fades. By the end of the month Mercury, above and left of Spica, will be fainter than Spica as it begins to pass between us and the Sun.

**Jupiter** and **Saturn** are worth a look in any telescope. A small telescope shows Jupiter's disk and the four 'Galilean' moons lined up on each side of it. A larger telescope shows stripes across the planet made by warm and cold clouds on Jupiter. Occasionally the shadow of a moon crosses
Jupiter, making a tiny black spot. Binoculars show Saturn as an oval, the planet and rings blended together. Almost any telescope will separate the planet and the ring. The Moon will be near Saturn on the 17th and near Jupiter on the 18th.

**Arcturus** is on the northwest skyline. **Canopus**, the brightest true star in the sky, skims along the southern skyline. Both stars are shining through a lot of air which makes them twinkle colourfully. Canopus, being white, shows all colours like a diamond. Orange Arcturus twinkles red and green.Canopus is matched on the northern skyline by **Vega**, the second-brightest northern star
after Arcturus.
From northern New Zealand the star **Deneb**can be seen near the north skyline in the Milky Way.
It is the brightest star in **Cygnus** the Swan.

Orange **Antares**,northwest of the zenith, marks the body of the Scorpion. The Scorpion's tail hooks toward the zenith like a back-to-front question mark. It is the 'fish-hook of Maui' in Maori star lore. Below or right of the Scorpion's tail is 'the teapot' made by the brightest stars of **Sagittarius**.
It is upside down in our southern hemisphere view.

Midway down the southwest sky are 'The Pointers ', Beta and **Alpha Centauri**. They point down to **Crux** the Southern Cross. Alpha Centauri is the third brightest star. It is also the closest of the naked-eye stars, 4.3 light years* away. Beta Centauri, along with most of the stars in Crux, is a blue-giant star hundreds of light years away.

The **Milky Way** spans the sky from north to south. It is brightest and broadest overhead in
Scorpius and Sagittarius. In a dark sky it can be traced down past the Pointers and Crux into the southwest. To the northeast it passes **Altair**, meeting the skyline right of **Vega**. The Milky Way is our edgewise view of the galaxy, the pancake of billions of stars of which the sun is just one.
The thick hub of the galaxy, 27 000 light years away, is in Sagittarius. Dust clouds near us appear as gaps and slots in the Milky Way. Binoculars show many clusters of stars and some glowing gas clouds in the Milky Way.

The Large and Small Clouds of Magellan, **LMC** and **SMC**, look like two misty patches of light in the southsky. They are easily seen by eye on a dark moonless night. They are galaxies like our Milky Way but much smaller. The LMC is about 160 000 light years away; the SMC about 200 000 light years away.

On moonless evenings in a dark sky the Zodiacal Light is visible in the west. It is a faint broad
column of light extending upward around Mercury and Venus. It is sunlight reflecting off meteoric dust in the plane of the solar system. The dust may have come from a big comet, many centuries ago.

*A **light year** (**l.y**.) is the distance that light travels in one year: nearly 10 million million km or $10^{13}$ km. Sunlight takes eight minutes to get here; moonlight about one second. Sunlight reaches Neptune, the outermost major planet, in four hours. It takes sunlight four years to reach the nearest star, Alpha Centauri.

Notes by Alan Gilmore, University of Canterbury's Mt John Observatory, P.O. Box 56, Lake Tekapo 7945, New Zealand.

# CAS COMMITTEE AND OFFICERS 2021/2022

| | | |
|---|---|---|
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For more specialized information please see the contact information page on www.cas.org.nz

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Web: www.cas.org.nz
Canterbury Astronomical Society Facebook Group:
www.facebook.com/groups/CanterburyAstronomicalSociety

**West Melton Observatory:** 43° 29' 55.5" S, 172° 20' 59.0" E 218 Bells Road, West Melton

**CAS Members Meetings**:

The *CAS monthly members* meetings are currently held from 7.30pm onwards every third Tuesday of the month (except December and January) at the University of Canterbury,
Room ER225 Ernest Rutherford Building (2nd floor)
*CAStronauts Meeting's* are 6.30-7.30, in the same venue on the same night (3rd Tuesday of the month)
Any member of the public who is considering in joining the society are most welcome to attend the meetings.
Members Nights at the Observatory are detailed on our website

**Observatory Members Nights:**

Cas holds these nights as follows
*Members Nights (Training)* on the 1st Saturday of the month
*Members Nights (General)* on the 3rd Saturday of the month after the Tuesday Members meeting at UC,
(be aware some months it is the 4th Saturday, depending on the start of the month) check the website for details

**CAS on Facebook:**

Cas has a Facebook presence, Useful to keep up to date with events, interesting articles, asking for advice,
For members please use the website forums for more detailed information etc

**CAS Membership:**

Subscriptions are due 1st April each year
Fees for current members shown on the membership form included on the back page of your Casmag,
Full details are included on our website.

**Contributions to CASMAG:**

Member contributions to CASMAG are always most welcome (letters, observing notes, articles, news)
Please submit articles by email to editor@cas.org.nz
The deadline for each issue is the 1st of each month
Small personal advertisements are free to financial members, (less than 8 lines in a column)
Charges for larger items range from $5 to $40, email the editor for more details.

**The Constitution of The Canterbury Astronomical Society Inc:**

This is available on request, Please ask for a copy if required

**DISCLAIMER:**

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Readers are advised not to rely solely on this information, and should seek independent advice before making any decision, CAS reserves the right to make changes at any time, as deemed necessary.

Canterbury Astronomical Society Inc

# APPLICATION FOR MEMBERSHIP

**To: Membership Secretary**
**Canterbury Astronomical Society Inc.**
**P.O.Box 25-137**
**City East**
**Christchurch 8141**

Applicants Name in Full_____

Address: (Note a P.O.Box is NOT a legal address)_____

_____

Home Phone:_____ Cell Phone:_____

Email: _____ Date of Birth: (if under 18)_____

**Membership Category *(tick, subscripton must accompany application)***

**Online Banking Details (Please identify your payment):** 03 0802 0098273 00

| | | Full |
|---|---|---|
| | Adult (any person 18years of age or over who is not eligile for any other category) | $70 |
| | Family (two or more persons living at the same address) | $105 |
| | Junior (under 18 years of age on 1st April in the current year) | $35 |
| | Senior (over 65 Years) | $35 |
| | Community Services Card Holder | $35 |
| | Student (any person studying full-time at a tertiary institution, must reapply annually) | $35 |
| | Corporate (members have voting rights of one member, but cannot take office) | $210 |

| Name: | Date of Birth(if Under 18yrs) | Signature |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

All CAS members receive CASMAG a monthly newsletter,

Do you have access to a telescope? What type and size? _____

I the undersigned declare that the information given herein is true.

Signature: _____ Date: _____

By signing this application the applicant agrees to comply with the Constitution and By-Laws of the Canterbury Astronomical Society Inc.

Date Approved:_____