



ASTRONOMY TALK

Astronomical Society of South Australia | assa.org.au

Connecting South Australians with the Universe since 1892



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Kym Thalassoudis

President, ASSA

Exploring the Universe

from the Suburbs

Monday 30 May 2022
PS Superannuants



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Image Credit: Kym T, ASSA



The Astronomical Society of South Australia acknowledges and pays our respects to the Kaurna people, the traditional custodians whose ancestral lands we gather on. We acknowledge the deep feelings of attachment and relationship of the Kaurna people to country and we respect and value their past, present and ongoing connection to the land, sky and cultural beliefs.



Overview

- About the ASSA
- How to observe the night sky
- Finding celestial objects
- Light pollution
- Electronically Assisted Astronomy (EAA)
- EAA equipment
- EAA Images of celestial objects



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Astronomical Society of South Australia

Connecting South Australians with the Universe since 1892

Our Mission

To observe, understand, share and to enjoy the wonders of the Universe

Our Vision

To inspire & enrich the Astronomer in everyone



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Number	Comet	Hours	Date	Mag
1	C/1972 E1	260	Mar 12.81	10
2	C/1974 C1	306	Feb 12.49	9
3	C/1975 E1	145	Mar 12.45	9
4	C/1975 V2	106	Nov 11.74	10
5	C/1976 D1	57	Feb 19.49	9
6	C/1976 E1	9	Mar 3.778	9
7	C/1978 C1	360	Feb 4.755	8
8	C/1978 T3	75	Oct 10.785	9
9	C/1979 M1	98	Jun 24.417	10
10	C/1979 Y1	67	Dec 24.753	5
11	C/1980 Y1	113	Dec 17.751	6
12	P/1984 A1	384	Jan 7.733	11
13	C/1987 P1	307	Aug 11.437	10
14	P/1989 A3	164	Jan 6.514	12
15	C/1992 B1	129	Jan 31.736	10
16	C/1992 J2	30	May 3.806	10
17	C/1995 Q1	289	Aug 17.410	6
18	C/2004 F4		Mar 23.43	8

Bill Bradfield (1927–2014), Comet Discoverer



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About ASSA

- Founded in 1892. First Society of its kind in Australia.
- One of the largest Astronomy clubs in Australia: 750+ members.
- Membership open to anyone with an interest in Astronomy.
- Support members and promote the science of Astronomy in SA.
- Only representative body for Amateur Astronomy in SA.

Membership Benefits: assa.org.au/join



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ASSA Information Sources

The Bulletin

- Monthly newsletter sent to all members

ASSA Library

- Large collection of Astronomy books for loan

ASSA Website

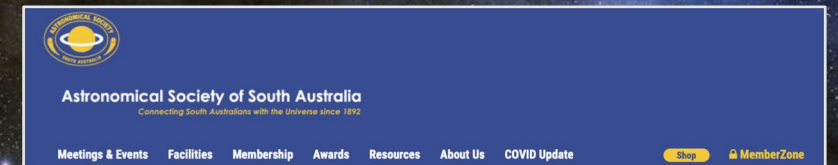
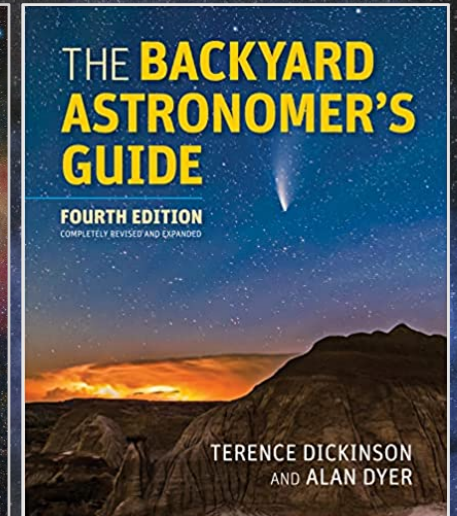
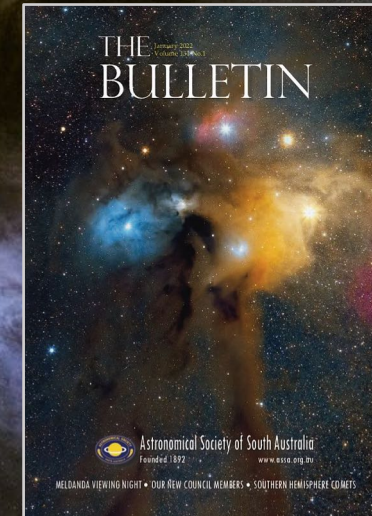
- Upcoming meetings, viewing nights, resources, etc...

ASSA-Chat (sign-up at assa.org.au/assa-chat)

- Mailing List for members to share info & ask questions

ASSA Social Media

- YouTube, Facebook, Instagram, Twitter



@astronomysa



@astronomysa



@astronomysa



@assa

Image Credit: Jarrod Koh, ASSA



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Monthly Meetings & Events

General Meetings

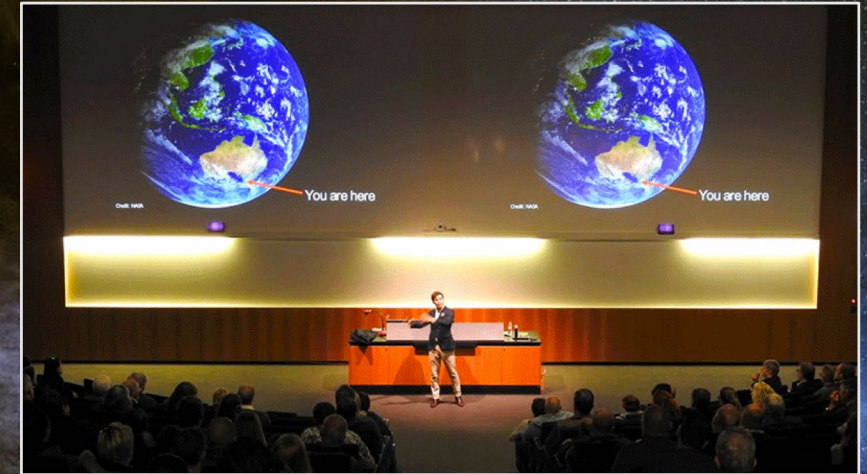
- Presentations on Astronomy by guest speakers
- Society news & any business
- Socialise with members & friends

Astronomy Education

- Introduction to Astronomy & Amateur Astronomy

ASSA@Home & Casual Friday

- Members sharing their knowledge on-line



The Braggs Lecture Theatre, University of Adelaide



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Meetings – First Wednesday each Month

**ASTRONOMY EDUCATION**
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Book at: assa.org.au/tickets

Mary Adam
Astronomy Education Officer, ASSA

Stellar Evolution

Part 1

Wednesday 1 June 2022, 7pm ACST
The Braggs Lecture Theatre, University of Adelaide

Attend in-person or watch online  **YouTube**  **LIVE**
youtube.com/astronomysa • facebook.com/astronomysa

Image Credit: Paul Haese

**FREE PUBLIC LECTURE**
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Book at: assa.org.au/tickets

Thomas Burke
PhD Candidate, Earth Sciences Department, University of Adelaide

Pallasite Meteorites

A Rare Glimpse into Planetary Formation

Wednesday 1 June 2022, 8pm ACST
The Braggs Lecture Theatre, The University of Adelaide

Attend in-person or watch online  **YouTube**  **LIVE**
youtube.com/astronomysa • facebook.com/astronomysa


Thomas Burke

Image Credit: NASA

Book free tickets at: assa.org.au/tickets

or

Watch online at: youtube.com/astronomysa or facebook.com/astronomysa

Image Credit: Jarrod Koh, ASSA



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General Meetings • Astronomy Education • ASSA@Home

<http://youtube.com/astronomysa/>

FREE PUBLIC LECTURE
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Professor Alan Duffy
Lead Scientist, Royal Institution of Australia
Director, Space Technology and Industry Institute
Astronomer, Swinburne University of Technology

Darkness Visible Down Under
Australia's role in uncovering the nature of Dark Matter

Wednesday 7 July 2021, 8pm ACST
The Braggs Lecture Theatre, University of Adelaide

Attend in-person or watch online **LIVE**
youtube.com/astronomysa/ • facebook.com/astronomysa/

Eventbrite
Book at: assa.org.au/tickets

ASSA GENERAL MEETING
FEATURING
Apollo 13@50

The Parkes Observatory's support of NASA's finest hour

John Sarkissian OAM, CSIRO Parkes Radio Observatory

LIVE 8:00pm ACST Wednesday 1 July 2020
(ONLINE EVENT ONLY)

ASSA GENERAL MEETING
FEATURING A FREE PUBLIC LECTURE
GRAVITATIONAL WAVE ASTRONOMY
LISTENING TO THE UNIVERSE

Georgia Bolingbroke
ARC Centre of Excellence for Gravitational Wave Discovery

8:00pm Wednesday 2 June 2021
The Braggs Lecture Theatre, University of Adelaide

MONTHLY MEETINGS
The ASSA meets on the first Wednesday of each month. Meetings are free and open to the public who are most welcome to attend.

LIVE
ATTEND IN-PERSON OR WATCH ONLINE

Eventbrite
Book at: assa.org.au/tickets

national science week #scienceweek

OBSERVING WITH GALILEO
How the first telescopic views of the celestial sphere changed the world

by Prof David Jamieson, Professor of Physics, The University of Melbourne

LIVE 8:00pm ACST Wednesday 2 September 2020

<http://assa.org.au>
A free online public lecture hosted by the Astronomical Society of South Australia

FREE PUBLIC LECTURE
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Dr. Rod Hill
Former Chief Research Scientist & Group Executive at CSIRO

Are We Alone?
The Search For Extra-terrestrial Life

Wednesday 6 April 2022, 8pm ACST
ONLINE ONLY

Watch online **LIVE**
youtube.com/astronomysa/ • facebook.com/astronomysa/

Eventbrite
Book at: assa.org.au/tickets

Image Credit: Twinkl, NASA

FREE PUBLIC LECTURE
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Prof. Geraint F. Lewis
Professor of Astrophysics
Sydney Institute for Astronomy, University of Sydney

The End of Time
THE FUTURE HISTORY OF THE UNIVERSE

Wednesday 4 May 2022, 8pm ACST
The Braggs Lecture Theatre, The University of Adelaide

Attend in-person or watch online **LIVE**
youtube.com/astronomysa/ • facebook.com/astronomysa/

Eventbrite
Book at: assa.org.au/tickets

Image Credit: Paul Hargis

Image Credit: Jarrod Koh, ASSA



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Special Interest Groups

<https://www.assa.org.au/membership/groups/>

- **Astro-Imaging**
- **Variable Stars**
- **Radio Astronomy**
- **Astronomy Outreach**



Image Credit: Jarrod Koh, ASSA



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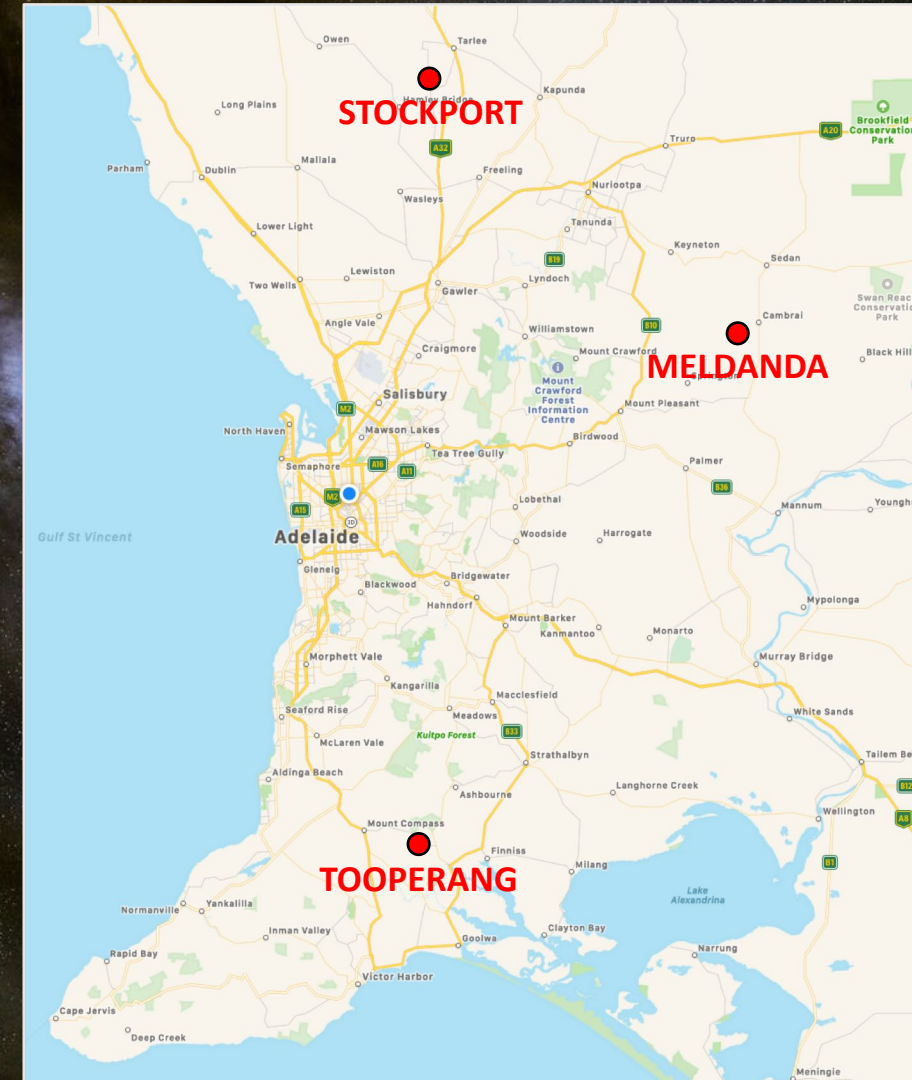
Member Viewing Nights

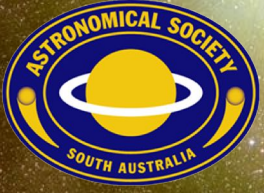
<https://www.assa.org.au/facilities/>

- **Stockport Observatory**
- **Tooperang Site**
- **Meldanda Site**

Public Viewing Nights

- **Stockport Observatory**
- **Metro South (Hawthorndene)**
- **Metro North (The Heights)**





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Telescopes in the Park

3-7pm Sunday, 12 June 2022. Book tickets at: assa.org.au/park





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ASSA Membership

Join from only \$25/year at: assa.org.au/join

INFORMATION

- The Bulletin ●
- Library Books ●
- ASSA Mailing Lists ●
- ASSA Website ●
- ASSA Social Media ●

MEETINGS & EVENTS

- General Meetings ●
- Astronomy Education ●
- Special Interest Groups ●
- ASSA@Home: Online Shows ●
- New Members Night ●
- Telescope Clinics ●

VIEWING NIGHTS – MEMBERS

- Stockport Observatory ●
- Tooperang Observing Site ●
- Meldanda: Dark Sky Reserve ●

VIEWING NIGHTS – PUBLIC

- Stockport Observatory ●
- Northern Metro, The Heights ●
- Southern Metro, Hawthorndene ●

SPECIAL EVENTS

- Annual Dinner ●
- Dark Sky AstroCamps ●
- Telescopes in the Park ●

● = Exclusive to Members

● = Accessible to Non-Members

Image Credit: Jarrod Koh, ASSA

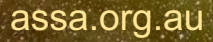


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How to Observe the Night Sky

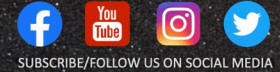


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ASTRONOMY EDUCATION

LIVE 7:00pm ACST Wednesday 5 August 2020
(ONLINE EVENT ONLY)

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Connecting South Australians with the Universe since 1892



Beginner's Councillor, ASSA

Wednesday 1 September 2021, 7pm ACST
The Braggs Lecture Theatre, University of Adelaide

 **YouTube**  **LIVE**



• Image Credit: Anthea Wills



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Visually Observing the Night Sky



Unaided Eye
5 - 7mm diameter
1.0 – 2.0x LGP



Binoculars
50mm diameter
100x LGP



Telescope
80 - 300mm diameter
250 – 3,500x LGP



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Dobsonian Telescope Variations



Classic Dobsonian



Collapsible Dobsonian



GoTo Collapsible Dobsonian

Best low-cost, visual telescope & mount design for beginners



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Common Types of Telescopes (OTAs)



Refractor
~500mm FL
Wide Field of View



Reflector
~1,000mm FL
Medium Field of View



Compound
~2,000mm FL
Narrow Field of View



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Telescope Mounts



Alt-Azimuth

*Grab & Go Visual Mount
Small Telescope
Manual Control*



Alt-Azimuth

*Small Visual & Imaging Mount
DSLR or Small Telescope
Smartphone Control (WiFi)*



Equatorial

*Classic Imaging Mount
Small or Large Telescope
Computer/Hand Controller*



Alt-Azimuth & Equatorial

*Visual & Imaging Mount
Small or Large Telescope
Computer/Hand Controller*



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Finding Celestial Objects



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Beginner Star Charts

The Evening Sky Map

FREE* EACH MONTH FOR YOU TO EXPLORE, LEARN & ENJOY THE NIGHT SKY

Sky Calendar – August 2021

- 2 **Saturn at opposition** (opposite the Sun) at 6h UT. The ringed planet is at its closest and brightest at mag. +0.2. Saturn's rings are spectacular even in a small telescope.
- 2 **Moon at apogee** (farthest from Earth) at 8h UT (distance 404,410 km; angular size 29.5").
- 2 **Moon near the Pleiades** (morning sky) at 11h UT.
- 3 **Moon near Aldebaran** at 5h UT (morning sky).
- 8 **New Moon** at 13:50 UT. Start of lunation 1220.
- 9 **Moon near Regulus** at 16h UT (evening sky).
- 10 **Moon near Mars** (evening sky) at 4h UT. Mag. 1.8.
- 11 **Moon near Venus** (evening sky) at 11h UT. Mag. -4.0.
- 12 **Persid meteor shower peaks** at 12h UT. Peak lasts about 12 hours. Active from July 17 to August 24. Produces swift, bright meteors (50-100 per hour) many with persistent trains. Best viewed after midnight.
- 13 **Moon near Spica** at 15h UT (evening sky).
- 15 **First Quarter Moon** at 15:20 UT.
- 16 **Moon near Antares** at 22h UT (evening sky).
- 17 **Moon at perigee** (closest to Earth) at 9:20 UT (distance 369,124 km; angular size 32.4").
- 19 **Mercury 0.08° S of Mars** (from Sun, evening sky) at 4h UT. Mags. -0.5 and 1.8.
- 20 **Jupiter at opposition** at 0h UT. Best time to observe the largest planet in the solar system. Mag. -2.9.
- 21 **Moon near Saturn** (evening sky) at 0h UT. Mag. 0.3.
- 22 **Moon near Jupiter** (midnight sky) at 8h UT. Mag. -2.9.
- 22 **Full Moon** at 12:01 UT.
- 29 **Moon near the Pleiades** (morning sky) at 19h UT.
- 30 **Moon at apogee** (farthest from Earth) at 2h UT (distance 404,100 km; angular size 29.6").
- 30 **Last Quarter Moon** at 7:14 UT.
- 30 **Moon near Aldebaran** at 13h UT (morning sky).

All times in Universal Time (UT). (Australian Central Standard Time = UT + 9.5 hours.)



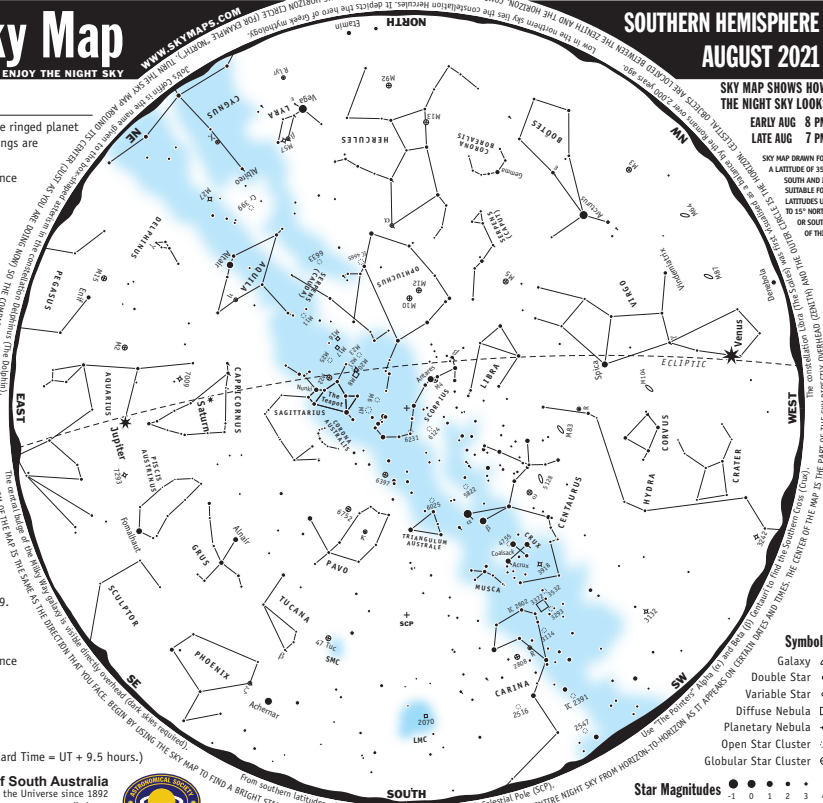
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Southern Hemisphere AUGUST 2021

SKY MAP SHOWS HOW
THE NIGHT SKY LOOKS
EARLY AUG 8 PM
LATE AUG 7 PM

SKY MAP DRAWN FOR
A LATITUDE OF 35° S
SOUTH AND IS
SUITABLE FOR
LATITUDES UP
TO 15° NORTH
OR SOUTH
OF THIS



Symbols

- Galaxy
- Double Star
- Variable Star
- Diffuse Nebula
- Planetary Nebula
- Open Star Cluster
- Globular Star Cluster

Star Magnitudes

- 1 2 3 4

From southern latitudes, stars appear to rotate around the South Celestial Pole (SCP).

INSTRUCTIONS: (THE SKY MAP SHOWS THE ENTIRE NIGHT SKY FROM HORIZON TO HORIZON AS IT APPEARS FROM A GIVEN LOCATION ON THE EARTH.)

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About the Celestial Objects

Listed on this page are several of the brighter, more interesting celestial objects visible in the evening sky this month (refer to the monthly sky map). The objects are grouped into three categories. Those that can be easily seen with the naked eye (that is, without optical aid), those easily seen with binoculars, and those requiring a telescope to be appreciated. **Note, all of the objects (except single stars) will appear more impressive when viewed through a telescope or very large binoculars.** They are grouped in this way to highlight objects that can be seen using the optical equipment that may be available to the star gazer.

Tips for Observing the Night Sky

When observing the night sky, and in particular deep-sky objects such as star clusters, nebulae, and galaxies, it's always best to observe from a dark location. Avoid direct light from street lights and other sources. If possible observe from a dark location away from the light pollution that surrounds many of today's large cities.

You will see more stars after your eyes adapt to the darkness—usually about 10 to 20 minutes after you go outside. Also, if you need to use a torch to view the sky map, cover the light bulb with red cellophane. This will preserve your dark vision.

Finally, even though the Moon is one of the most stunning objects to view through a telescope, its light is so bright that it brightens the sky and makes many of the fainter objects very difficult to see. So try to observe the evening sky on moonless nights around either New Moon or Last Quarter.

Astronomical Glossary

Conjunction – An alignment of two celestial bodies such that they present the least angular separation as viewed from Earth.

Constellation – A defined area of the sky containing a star pattern.

Diffuse Nebula – A cloud of gas illuminated by nearby stars.

Double Star – Two stars that appear close to each other in the sky; either linked by gravity so that they orbit each other (binary star) or lying at different distances from Earth (optical double). Apparent separation of stars is given in seconds of arc (").

Ecliptic – The path of the Sun's center on the celestial sphere as seen from Earth.

Elongation – The angular separation of two celestial bodies. For Mercury and Venus the greatest elongation occurs when they are at their most angular distance from the Sun as viewed from Earth.

Galaxy – A mass of up to several billion stars held together by gravity.

Globular Star Cluster – A ball-shaped group of several thousand old stars.

Light Year (ly) – The distance a beam of light travels at 300,000 km/sec in one year.

Magnitude – The brightness of a celestial object as it appears in the sky.

Open Star Cluster – A group of tens or hundreds of relatively young stars.

Opposition – When a celestial body is opposite the Sun in the sky.

Planetary Nebula – The remnants of a shell of gas blown off by a star.

Universal Time (UT) – A time system used by astronomers. Also known as Greenwich Mean Time. Australian Eastern Standard Time (Sydney, Australia) is UT plus 10 hours.

Variable Star – A star that changes brightness over a period of time.

Easy Seen with the Naked Eye

- | | | |
|------------|--|---|
| Altair | Aql | • Brightest star in Aquila. Name means "the flying eagle". Dist=16.7 ly. |
| Arcturus | Boo | • Orange, giant K star. Name means "bear watcher". Dist=36.7 ly. |
| β Centauri | • With Alpha Centauri, forms the so-called "Pointers-to-the-Cross". Dist=525 ly. | |
| α Centauri | Cen | • Nearest bright star to Sun at 4.4 ly. Brilliant double star in a telescope. 80 year period. |
| Coalsack | Cru | • Most famous naked-eye dark nebula. Requires dark sky. Dist=600 ly. |
| Achernar | Eri | • Brightest star in Eridanus, The River. Arabic name meaning "end of river". Dist=140 ly. |
| α Herculis | Her | • Semi-regular variable. Magnitude varies between 3.1 & 3.9 over 90 days. Mag 5.4 companion. |
| Vega | Lyr | • The 5th brightest star in the sky. A blue-white star. Dist=25.0 ly. |
| Fomalhaut | Psa | • Brightest star in Piscis Austrinus. In Arabic the "fish's mouth". Dist=25 ly. |
| Antares | Scor | • Red, supergiant star. Name means "rival of Mars". Dist=135.0 ly. |
| Spica | Vir | • Latin name means "ear of wheat" and shown held in Virgo's left hand. Dist=250 ly. |

Easy Seen with Binoculars

- | | | |
|------------|------|--|
| γ Aquilae | Aql | • Bright Cepheid variable. Mag varies between 3.6 & 4.5 over 7.166 days. Dist=1,200 ly. |
| 6397 | Ara | • Thought to be the nearest globular. Dist=7,000 ly. |
| IC 2602 | Car | • The "Five of Diamonds". Bright cluster twice diameter of full Moon. Dist=491 ly. |
| 3372 | Car | • Eta Carinae Nebula. Enormous glowing cloud in rich star field. Dist=8,000 ly. |
| 3552 | Car | • Herschel - "most brilliant cluster". 60+ stars in 7x binoculars. Dist=1,300 ly. |
| ω Centauri | Cen | • Largest and brightest globular star cluster in sky. 1 million stars. Dist=17,000 ly. |
| 4755 | Cru | • Jewel Box. Outstanding star cluster. Many contrasting colours. Dist=7,600 ly. |
| LMC | Dor | • Large Magellanic Cloud. A neighbouring galaxy of the Milky Way. Dist=180,000 ly. |
| M13 | Her | • Best globular in northern skies. Discovered by Halley in 1714. Dist=23,000 ly. |
| R Hydrae | Hya | • Long period variable. Mag varies between 3.0 & 11.0 over 390 days. Brilliant red. |
| ε Lyrae | Lyr | • Famous Double Double. Binoculars show a double star. High power reveals each a double. |
| M12 | Oph | • Close to the brighter M10. Dist=18,000 ly. |
| M10 | Oph | • 3 degrees from the fainter M12. Both may be glimpsed in binoculars. Dist=14,000 ly. |
| κ Pavonis | Pav | • Cepheid-type. Magnitude varies between 3.9 & 4.8 over 9.088 days. |
| 6752 | Pav | • One of the better globular star clusters in the sky. Dist=14,000 ly. |
| M8 | Sgr | • Lagoon Nebula. Bright nebula bisected by a dark lane. Dist=5,200 ly. |
| M25 | Sgr | • Bright cluster located about 6 deg N of "teapot's" lid. Dist=1,900 ly. |
| M22 | Sgr | • A spectacular globular star cluster. Telescope will show stars. Dist=10,000 ly. |
| M4 | Scor | • A close globular. May just be visible without optical aid. Dist=7,000 ly. |
| M6 | Scor | • Butterfly Cluster. 30+ stars in 7x binoculars. Dist=1,960 ly. |
| M7 | Scor | • Superb open cluster. Visible to the naked eye. Age=260 million years. Dist=780 ly. |
| M5 | Ser | • Fine globular star cluster. Telescope will reveal individual stars. Dist=25,000 ly. |
| 6025 | TrA | • A small open star cluster in Milky Way. Dist=2,700 ly. |
| 47 Tucanae | Tuc | • Spectacular object. Telescope will reveal stars. Near edge of SMC. Dist=15,000 ly. |
| SMC | Tuc | • Small Magellanic Cloud. Companion galaxy to Milky Way. Requires dark sky. Dist=210,000 ly. |

Telescopic Objects

- | | | |
|---------|------|---|
| 7009 | Aqr | • Saturn Nebula. Requires 8-inch telescope to see Saturn-like appendages. |
| 3918 | Cen | • The Blue Planetary. Visible in a small telescope as a round blue disk. |
| 5128 | Cen | • Bisected by a wide obscuring lane. Strong radio source. Dist=14 million ly. |
| Albireo | Cyg | • Beautiful double star. Contrasting colours of orange and blue-green. Sep=34". |
| M3 | Del | • Appear yellow & white. Mags 4.3 & 5.2. Dist=100 ly. Struve 2725 double in same field. |
| Hya | Hya | • Classic face-on spiral. Discovered in 1752 by Lacaille. In attractive star field. |
| 5822 | Lup | • Large, attractive cluster. Dist=1,800 ly. Open cluster NGC 5823 to the south. |
| M57 | Lyr | • Ring Nebula. Magnificent object. Smoke-ring shape. Dist=4,100 ly. |
| M23 | Sgr | • Elongated star cluster. Telescope required to show stars. Dist=2,100 ly. |
| M20 | Sgr | • Trifid Nebula. A telescope shows 3 dust lanes intersecting nebula. Dist=5,200 ly. |
| M21 | Sgr | • A fine and impressive cluster. Dist=4,200 ly. |
| M17 | Sgr | • Omega Nebula. Contains the star cluster NGC 6618. Dist=4,900 ly. |
| 5124 | Scor | • Contains 5 bright tightly packed stars near centre. 7 star chain. Dist=1,600 ly. |
| M11 | Scor | • Wild Duck Cluster. Resembles a globular through binoculars. V-shaped. Dist=5,600 ly. |
| M16 | Scor | • Eagle Nebula. Requires a telescope of large aperture. Dist=8,150 ly. |
| M104 | Vir | • Sombrero Galaxy. Almost edge-on spiral galaxy. Protruding central core. |
| M27 | Vul | • Dumbbell Nebula. Large, twin-lobed shape. Most spectacular planetary. Dist=975 ly. |

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Pickup a copy at ASSA monthly meetings

Image Credit: Jarrod Koh, ASSA



FREE* EACH MONTH FOR YOU TO EXPLORE, LEARN & ENJOY THE NIGHT SKY

Get Sky Calendar on Twitter
<http://twitter.com/skymaps>

- All times in Universal Time (UT). (Australian Eastern Standard Time = UT + 10 hours.)

The logo for Sky maps, featuring the word "Sky" in a blue script font, "maps" in a bold black sans-serif font, and ".com" in a smaller black sans-serif font. There are four yellow stars of varying sizes above the text.

- STAR ATLASES & PLANISPHERES
- BOOKS FOR SKY WATCHERS
- STAR CHARTS & ASTRO POSTERS
- TELESCOPES & BINOCULARS

All sales support the production and free distribution of The Evening Sky Map. Thank you!



SKY MAP SHOWS HOW THE NIGHT SKY LOOKS

EARLY JUN	8 PM
LATE JUN	7 PM

SKY MAP DRAWN FOR
A LATITUDE OF 35°
SOUTH AND IS
SUITABLE FOR
LATITUDES UP
TO 15° NORTH
OR SOUTH
OF THIS

Symbols

- Galaxy 
- Double Star 
- Variable Star 
- Diffuse Nebula 
- Planetary Nebula 
- Open Star Cluster 
- Globular Star Cluster 

Star Magnitudes ● ● ● ● ● ●

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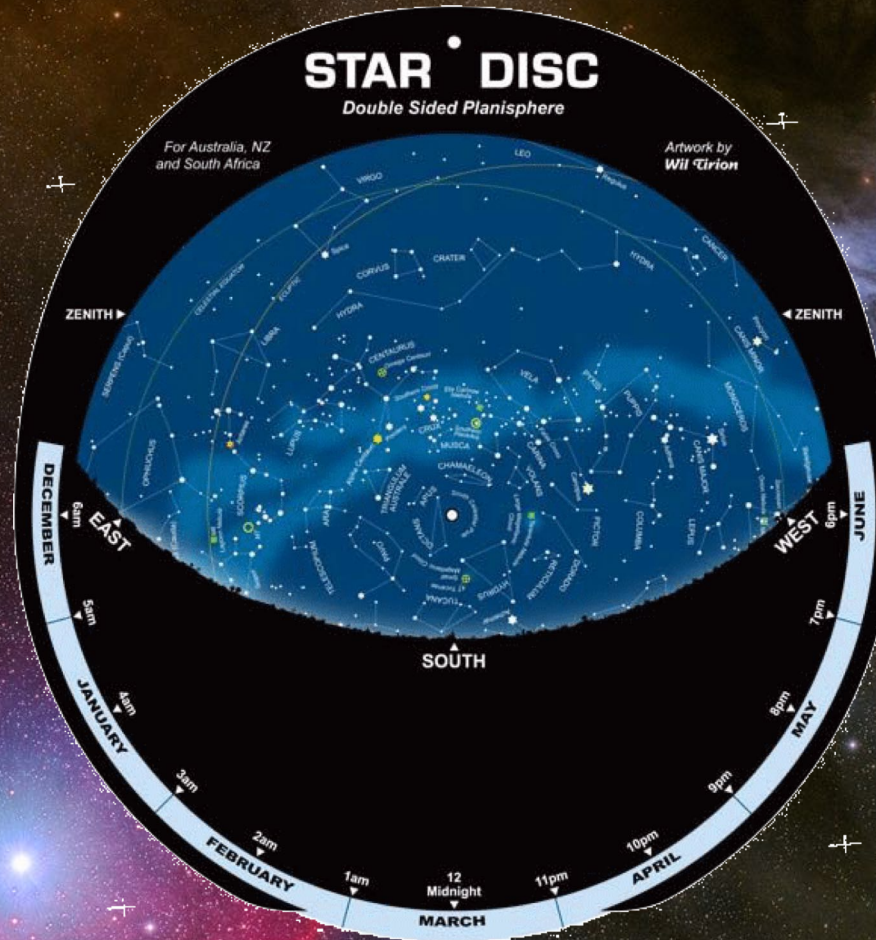


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Planispheres



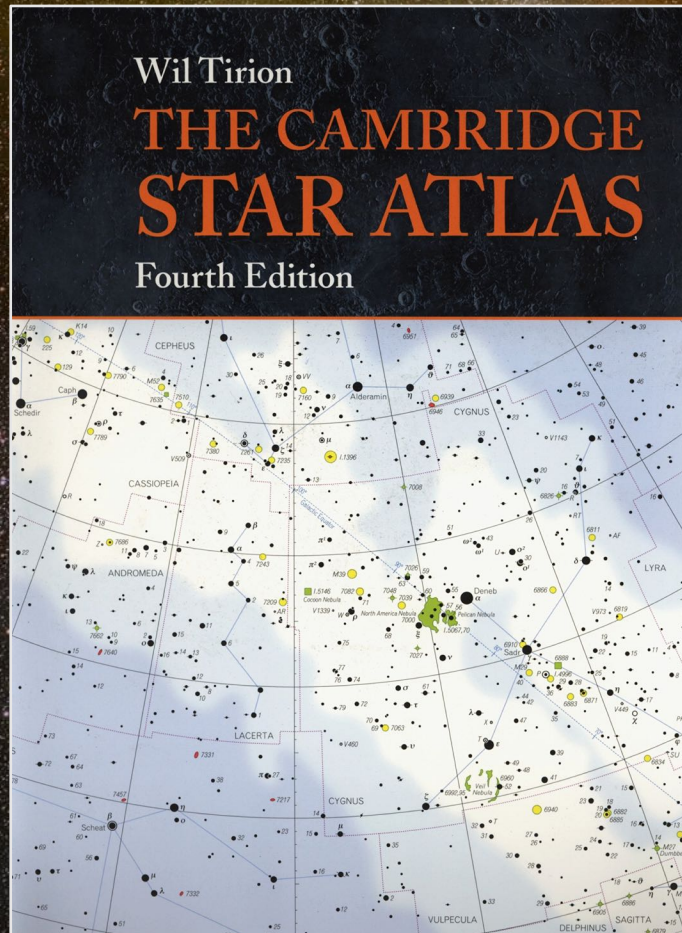


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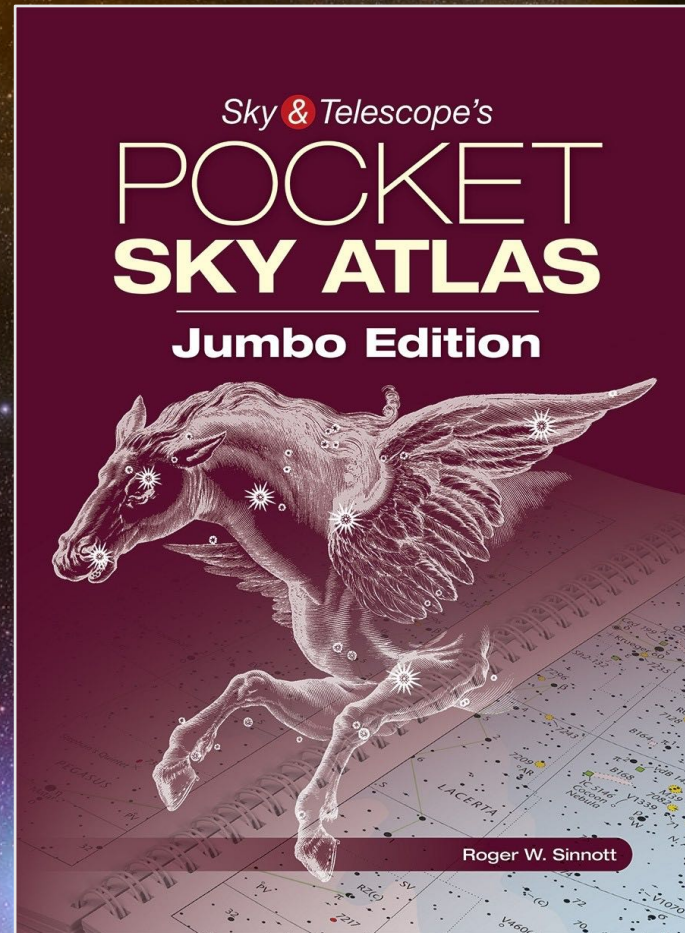
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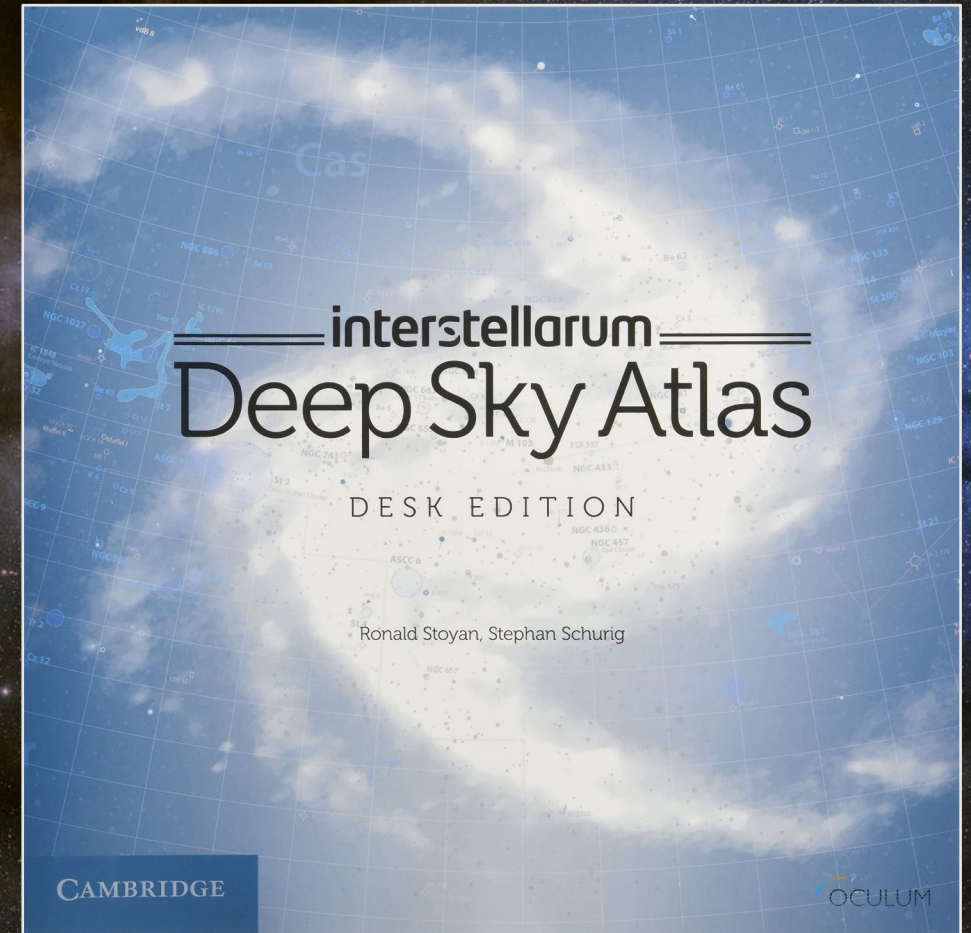
Excellent Star Atlases



8,800 stars, 921 DSOs



30,000+ stars, 1,500 DSOs



200,000+ stars, 14,835 DSOs

Image Credit: Jarrod Koh, ASSA

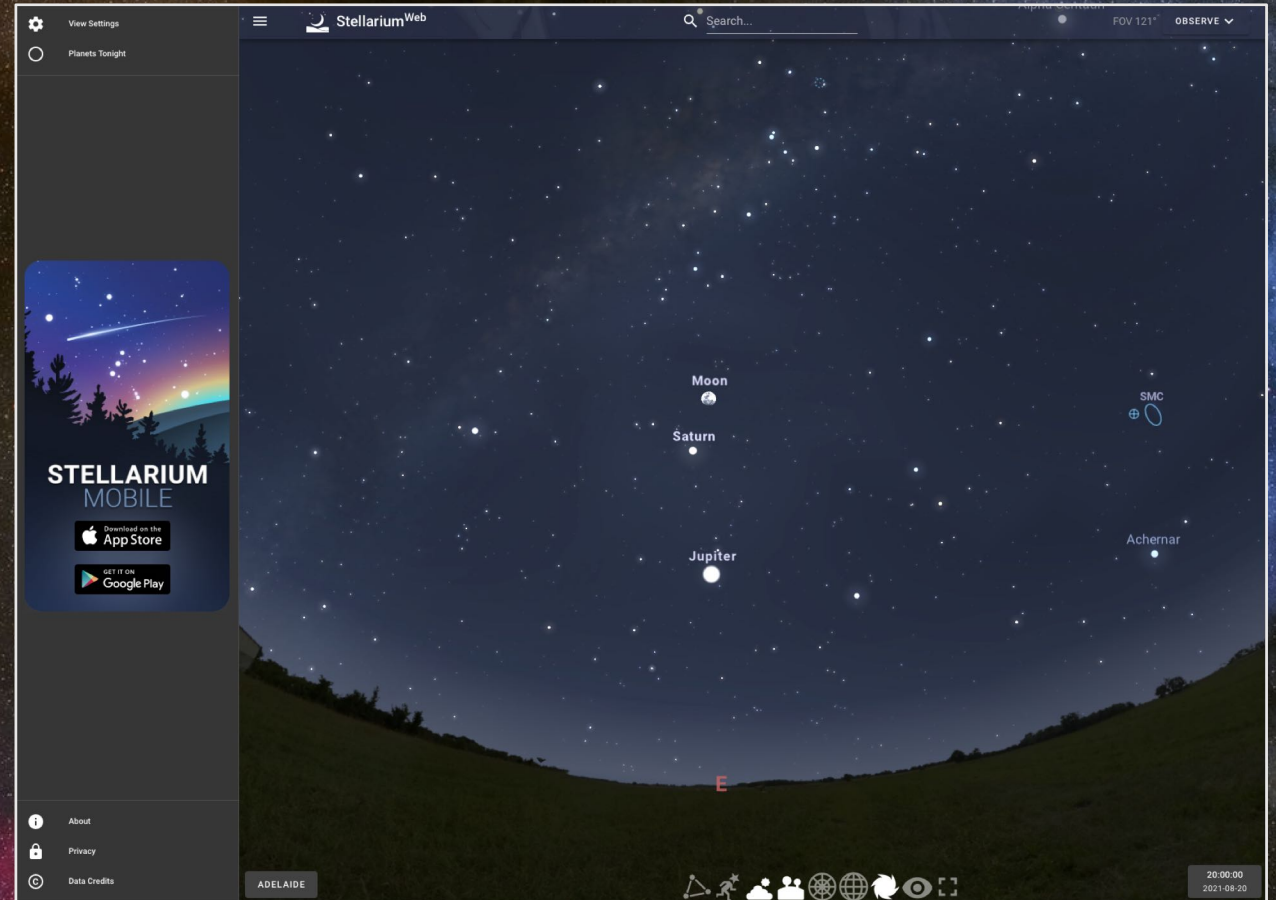


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Sky Simulation & Astronomy Apps



<https://stellarium-web.org>

Image Credit: Jarrod Koh, ASSA

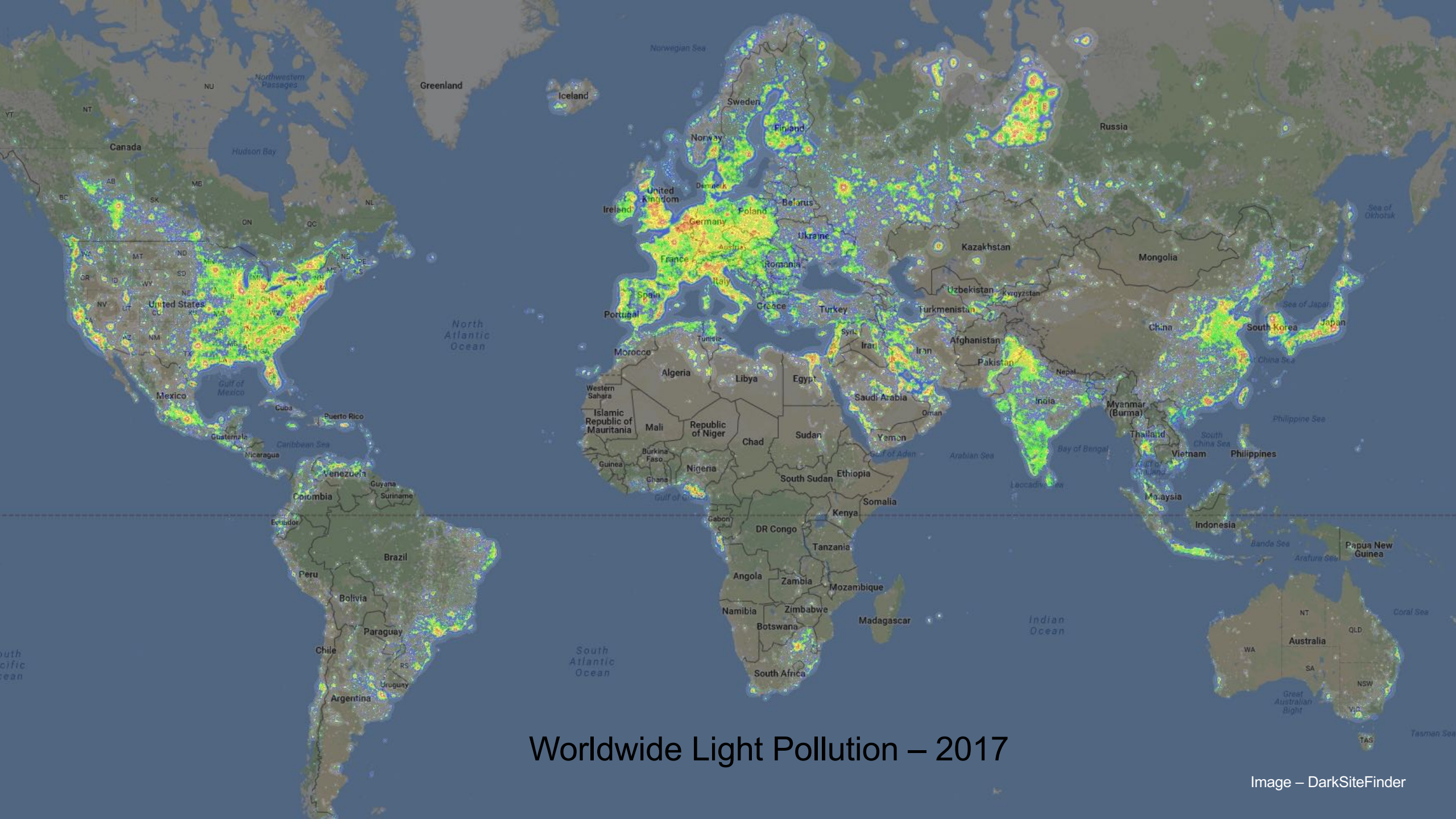


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Light Pollution



Worldwide Light Pollution – 2017

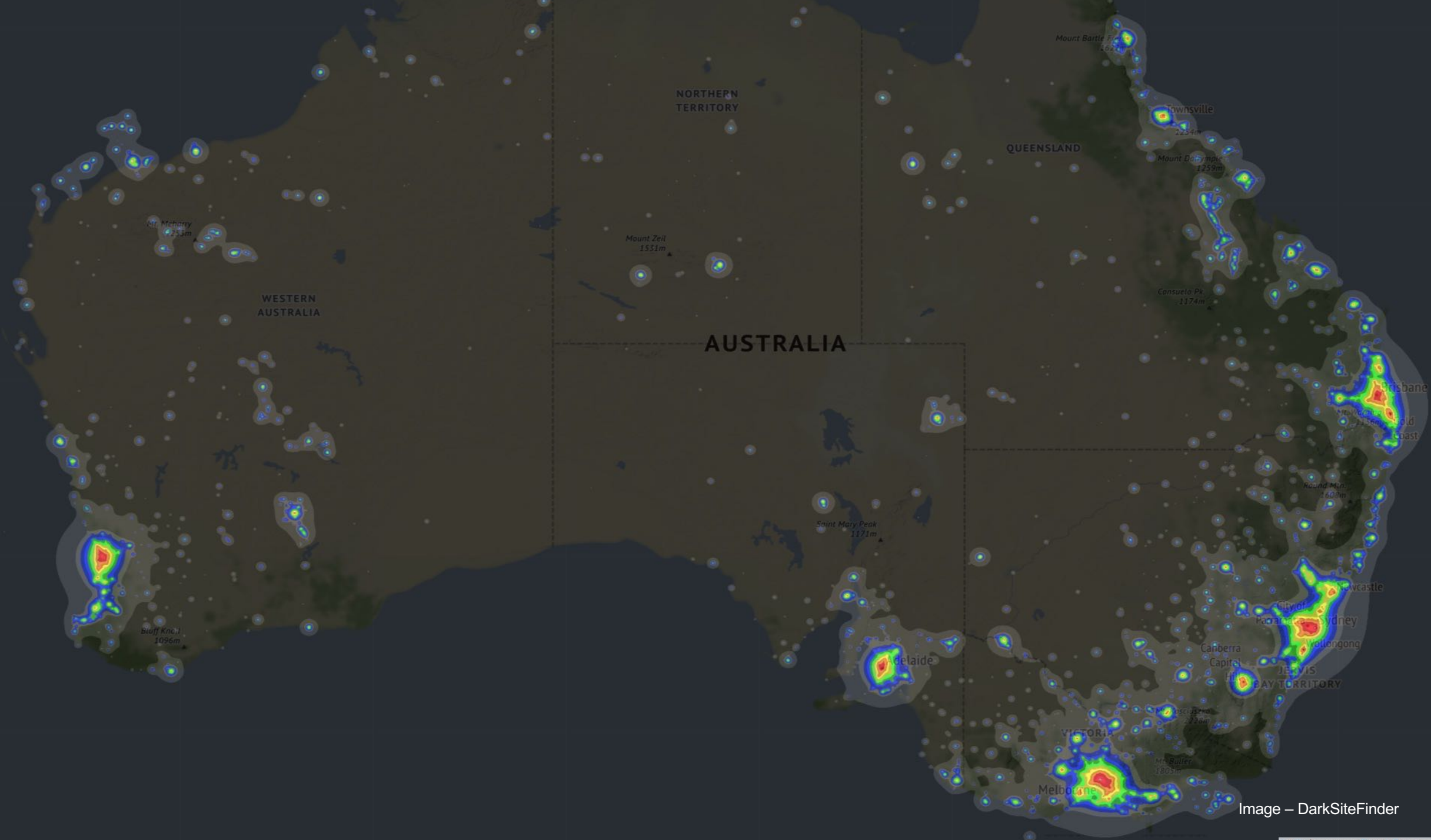


Image – DarkSiteFinder

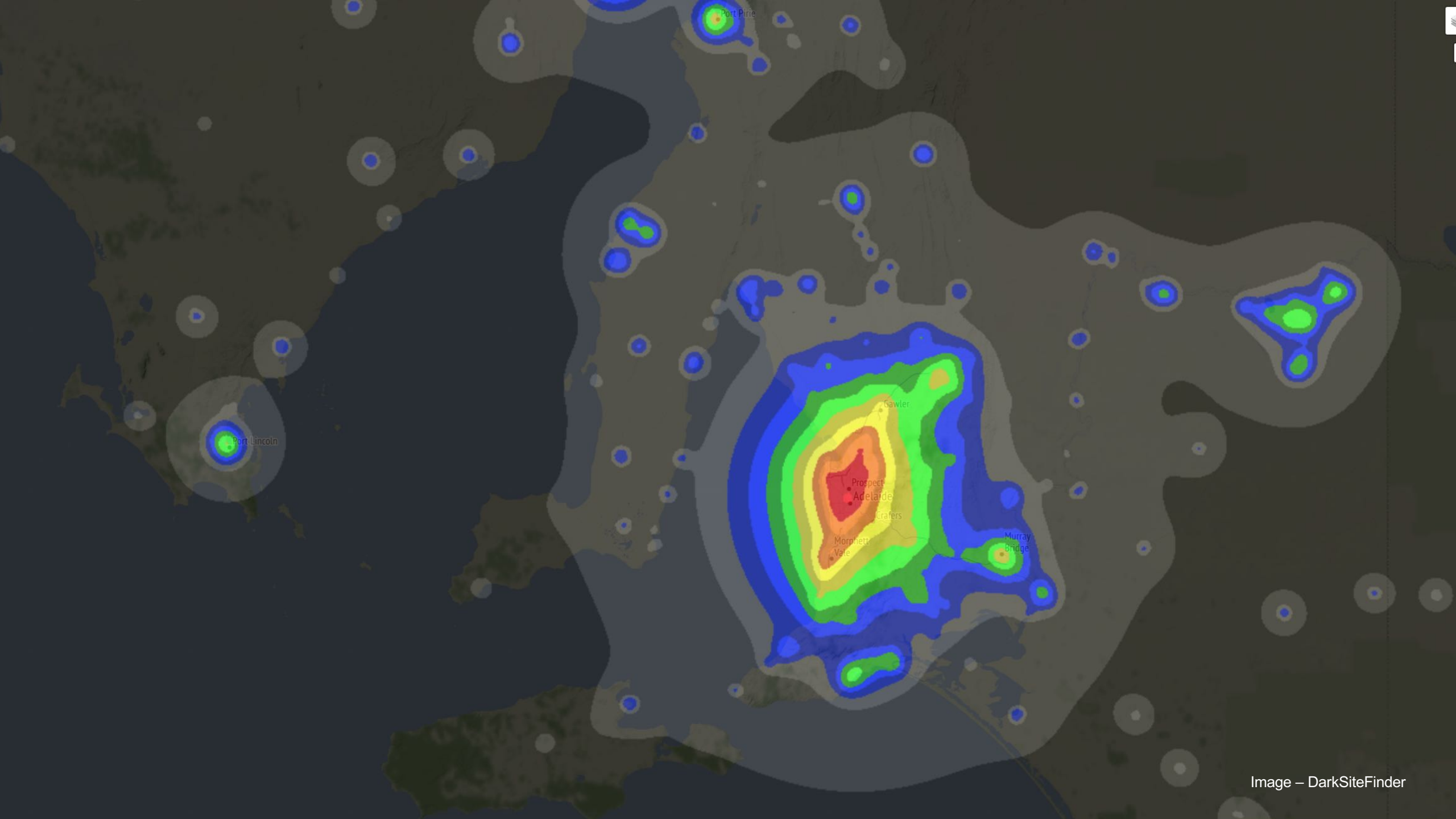


Image – DarkSiteFinder



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Electronically Assisted Astronomy



What is Electronically Assisted Astronomy (EAA)?

Basic Definition

- The near real-time observation of celestial objects enhanced using software automation and fast, sensitive sensors instead of an eyepiece. *Electronic Observing!*

Key Points:

- “near real-time” means now, with no AP post-processing.
- “enhanced” generally means much better than your eyes alone.
- AP image quality is often traded for timeliness.

But there's more to the EAA experience...



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What is Electronically Assisted Astronomy (EAA)?

Is it Observing or is it Astrophotography?

- *Answer: It's in between, and it's both.*



508mm (20-in) Dobsonian, Bortle 3 sky



8-inch f/2 RASA, Bortle 3 sky
7 hours of 2 min exposures

21:59 1.7
8.48



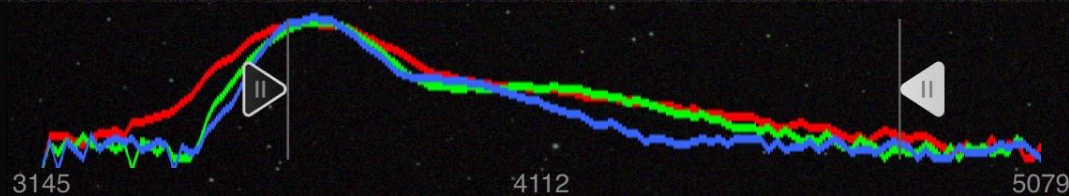

Histogram


Guide


Tools

Auto

Reset



Max 59547
Min 3
Avg 3685
Std 229



Live



49s

Clear

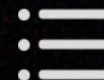
3008x3008 Gain: 250 Temp: -10.0°C Cooler: 45% Stacked: 2 Ignored: 0

Stacking

22:23 1.7
8.48



Live



127s

Clear

Histogram



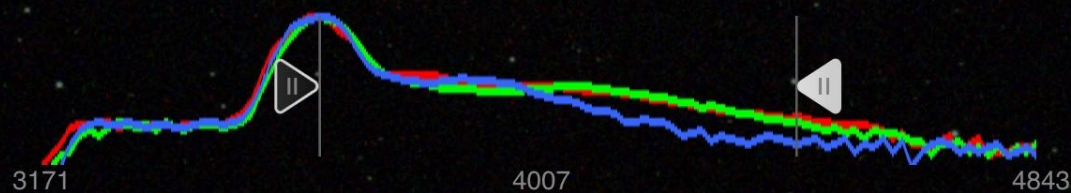
Guide



Tools

Auto

Reset



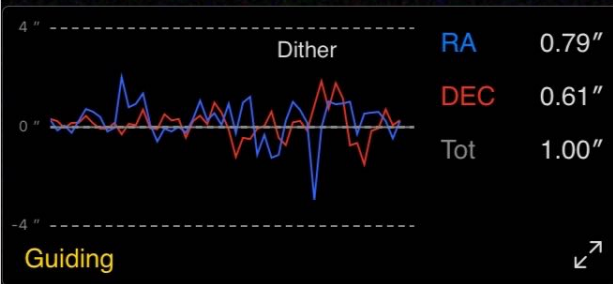
Max 55563
Min 0
Avg 3649
Std 239



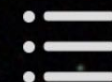
3008x3008 Gain: 250 Temp: -10.0°C Cooler: 43% Stacked: 10 Ignored: 0

Stacking

22:53 1.7
8.48



Live



162s

Clear



Histogram



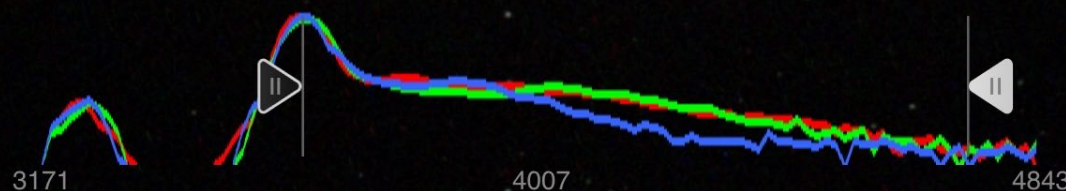
Guide



Tools

Auto

Reset



Max 54264
Min 0
Avg 3621
Std 254



3008x3008 Gain: 250 Temp: -10.0°C Cooler: 43% Stacked: 20 Ignored: 0

Stacking



Why do EAA?

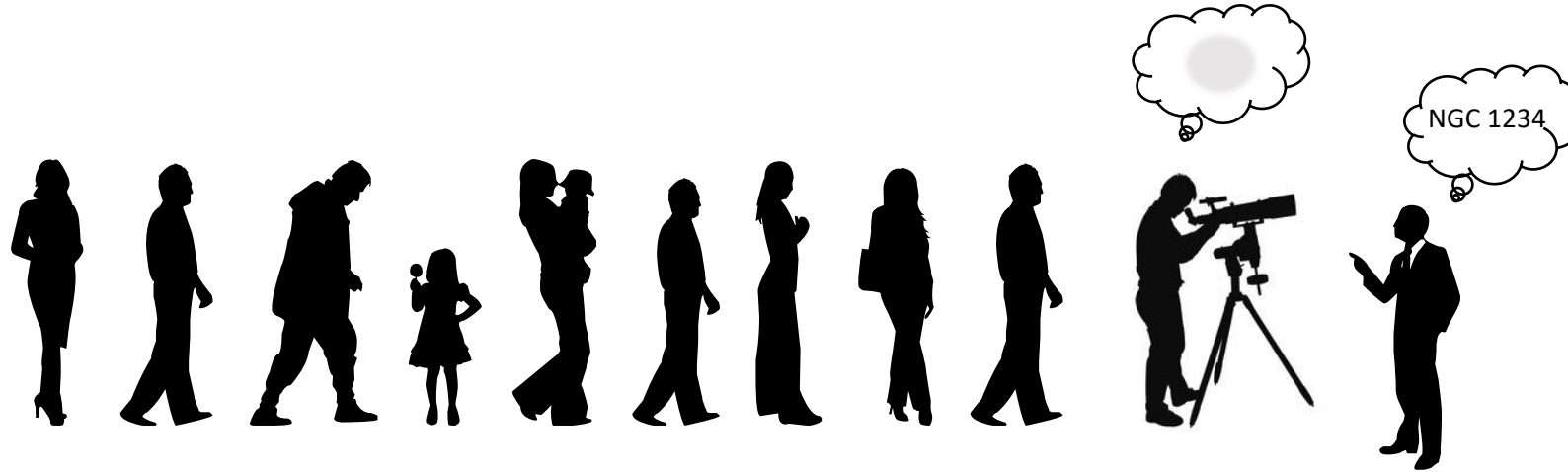
Key Advantages

- Vastly improved Astronomy experience vs eyepieces
 - **Deeper:** Small aperture telescopes can show very faint celestial objects in detail, and can easily exceed the visual performance of much larger telescopes. A Performance Multiplier! No more “faint fuzzies”.
 - **Colour:** View celestial objects in colour, not shades of grey.
 - **Light Pollution Buster:** Enables excellent views from urban settings.
 - **Access:** Empowers people with disabilities (eyesight, agility).
 - **Efficiency:** Enables viewing many objects in a night.
- EAA also enables new sharing experiences
 - Ideal for Internet live stream broadcasts (ASSA Online Star Party)
 - Greatly enhances Astronomy Outreach (ASSA Winter Star Party)



Conventional Astronomy Outreach

Used successfully for decades. But it can be an underwhelming experience for some*



I'm waiting in line to see a faint, fuzzy NGC thing. I think?

* Except for the Moon, visible bright planets, and a few deep-sky glossies



Conventional Astronomy Outreach

And a non-experience for others



I can't reach

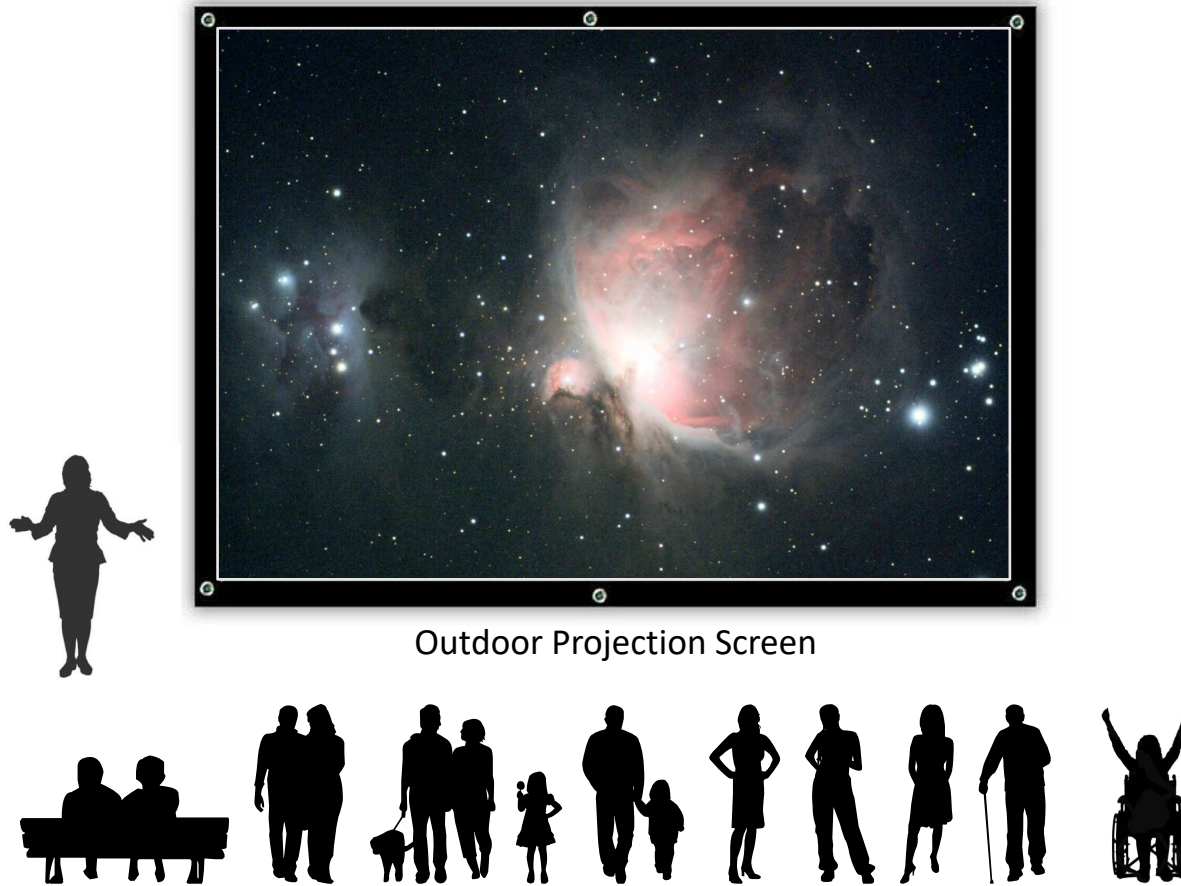


I just can't



Electronically Assisted Astronomy Outreach

Enables a vastly improved User Experience



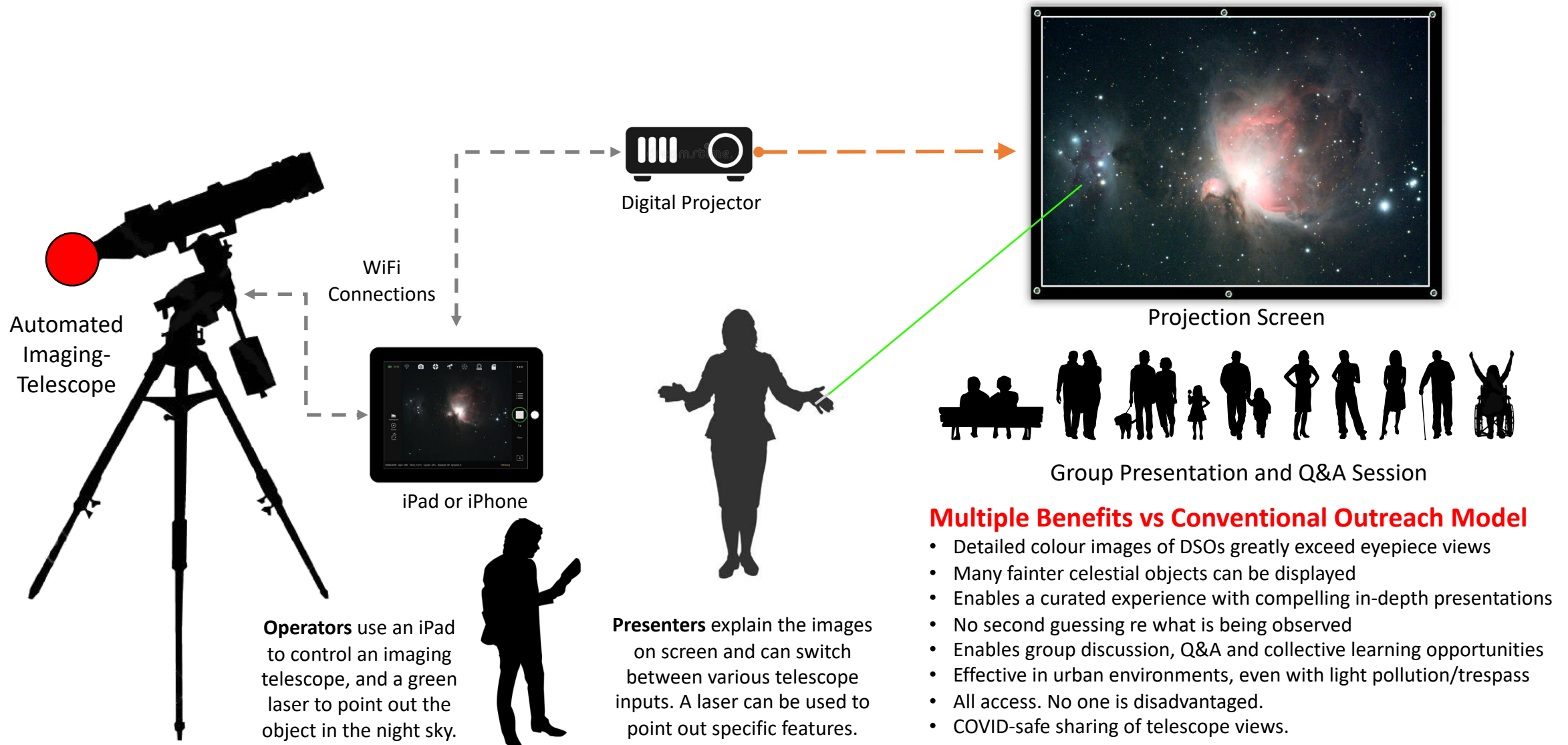
Outdoor Projection Screen

Group Presentation and Q&A Session



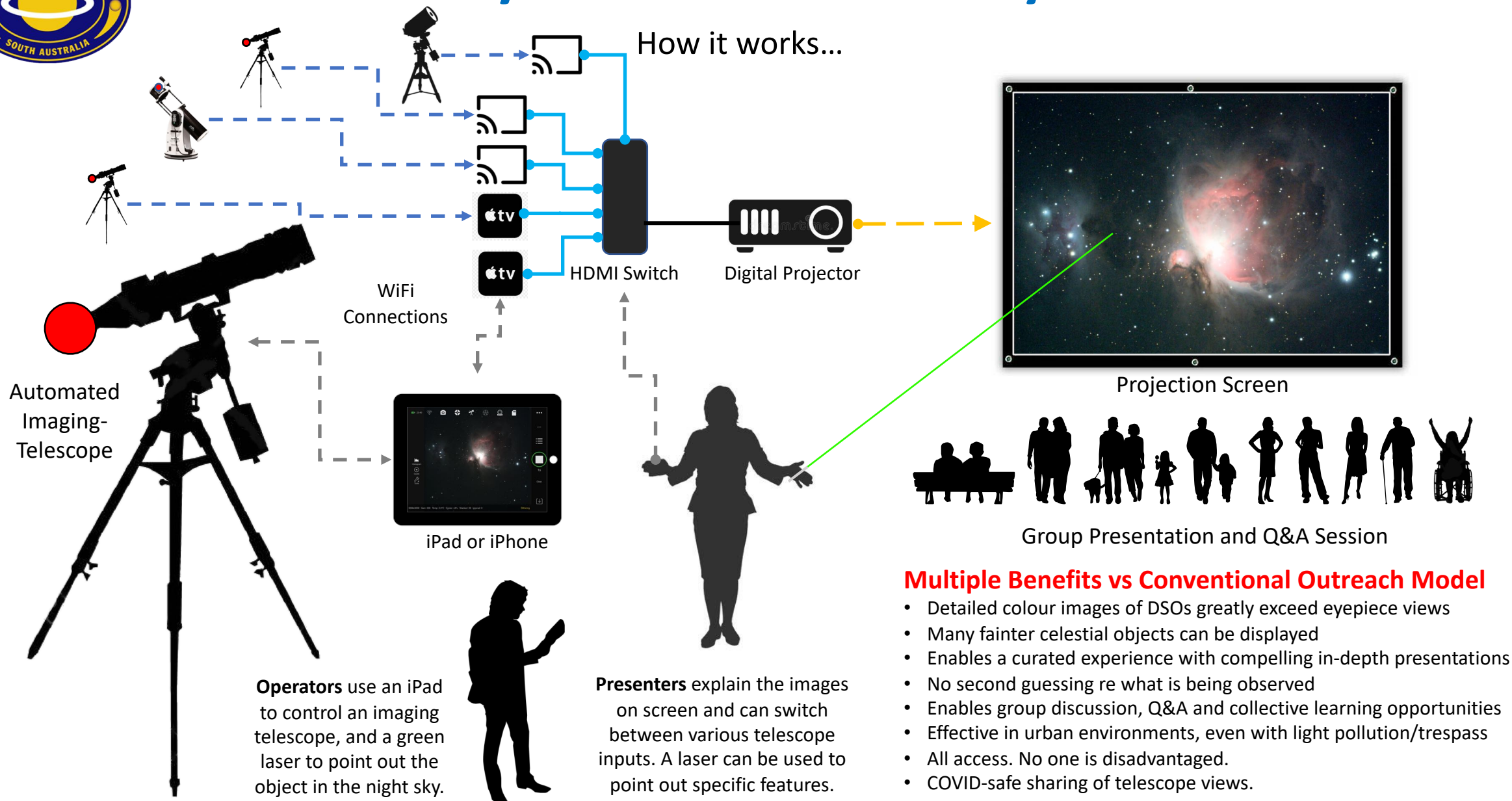
Electronically Assisted Astronomy Outreach

How it works...





Electronically Assisted Astronomy Outreach



STOCKPORT OBSERVATORY

Winter Star Party

SATURDAY 6 AUGUST 2022

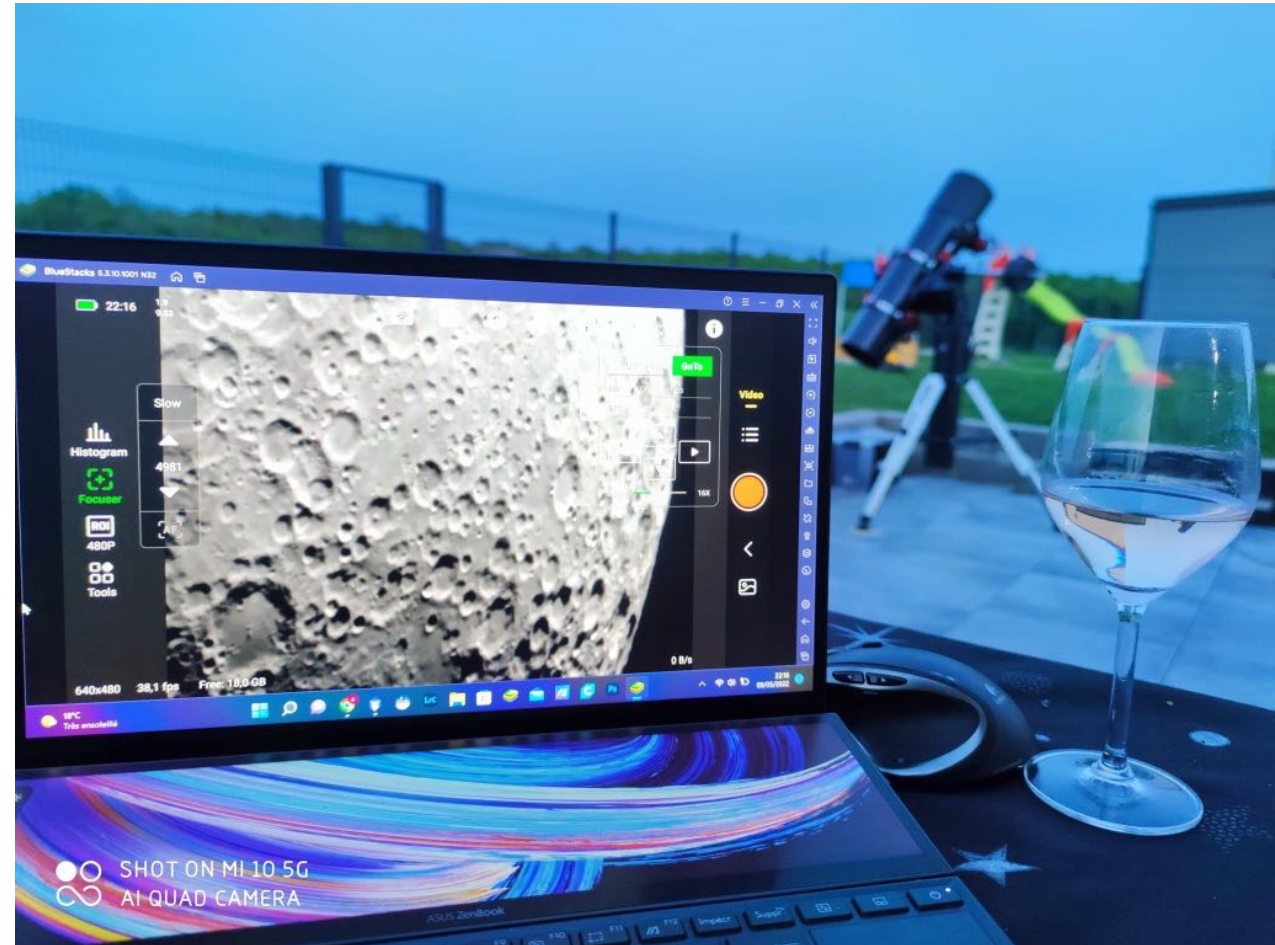


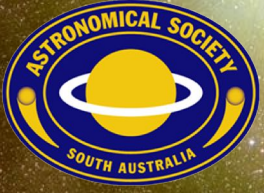
national science week



Electronically Assisted Astronomy Outreach

How we now do it...





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EAA Equipment



How to do EAA

Good News

- Everything is available commercially off-the-shelf. No DIY.

Bad News

- It can be expensive. Costs similar to astrophotography (AP).

Good News

- Much easier than AP due to automation & reduced work flows.

Bad News

- There's no escaping the need for perseverance.



How to do EAA

Multiple Configuration Options

- The automation software, sensors and other components are all available commercially off-the-shelf (COTS) to mix & match as you wish, as a partially or fully integrated automated system.



Laptop + SharpCap + QHY PoleMaster, cameras, etc...
Non-Integrated Mix & Match System



ASIAIR Pro + Electronic Focuser + Astro-Camera + Guider
Partially Integrated (Hybrid) System



Stellina Observation Station
Fully Integrated System

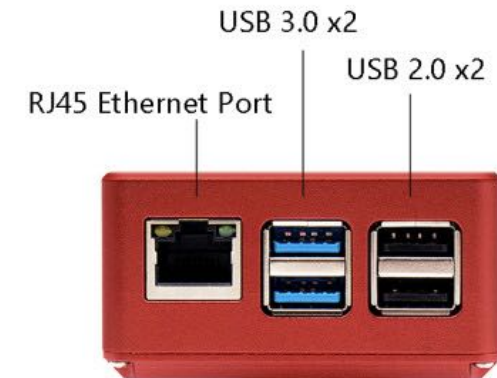
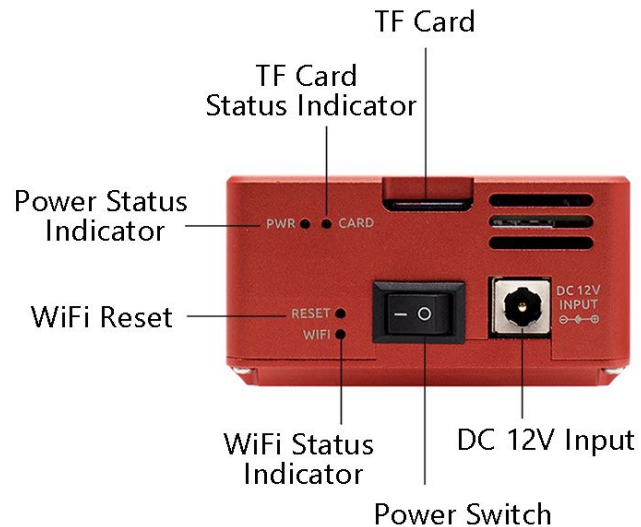


ZWO ASI AIR Pro (<https://astronomy-imaging-camera.com>)



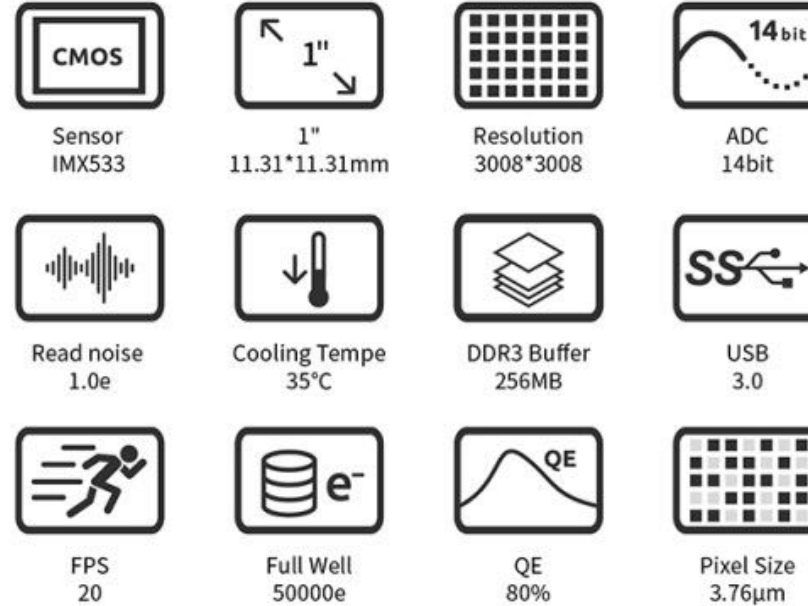
The ASI AIR Pro fully automates or aids:

- Polar Alignment (manual)
- Slewing & Plate Solving
- Accurate Focussing
- Multi-Star Guiding
- Image Calibration (flats, darks, bias)
- Live Stacking (image registration)
- Imaging of Multiple Objects (Plan)
- Remote Access (WiFi or ethernet)



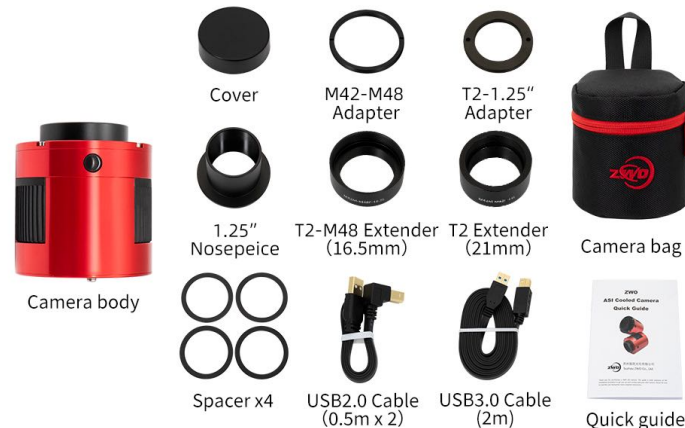


ZWO ASI533MC Pro (<https://astronomy-imaging-camera.com>)

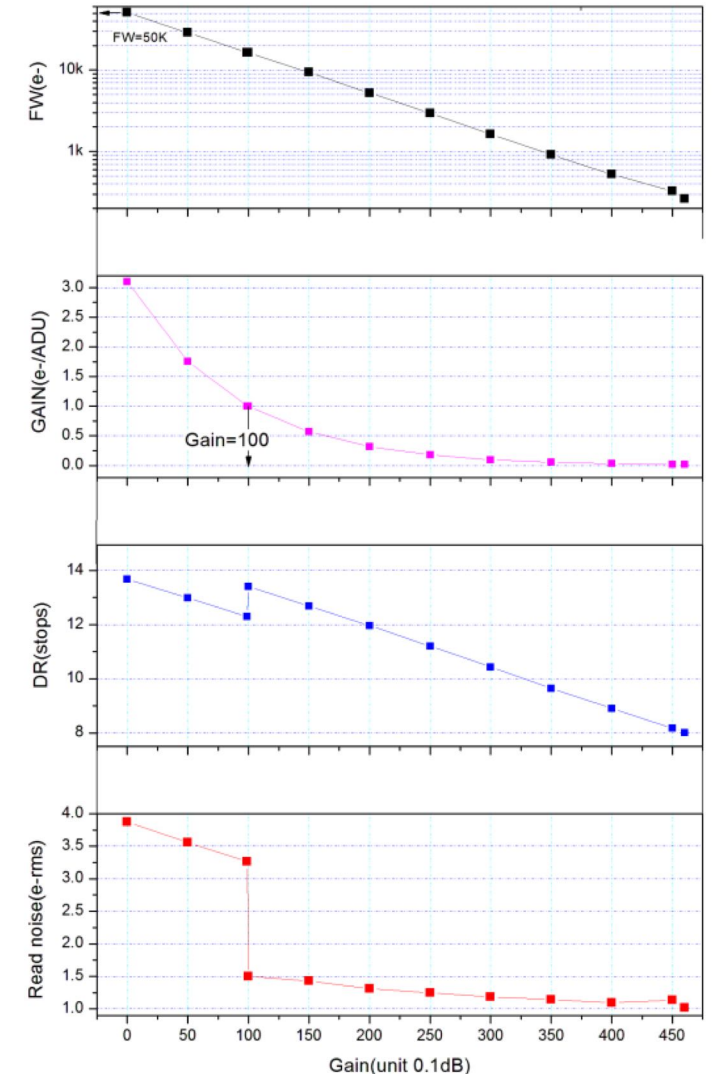


Camera Performance & Features

- Sony IMX533 backlit CMOS sensor
- One-Shot Colour (OSC) camera
- Peltier cooled (needs 12V DC 5A supply)
- Low read-out noise, high dynamic range
- Zero “amp glow” (common CMOS issue)
- Fast data transfer via USB 3.0
- Excellent astro-camera for beginners



Read noise, full well, gain and dynamic range for ASI533





My EAA / Astrophotography Rig



WO ZenithStar 80FD 80mm f/6.9



ASI533MC Pro



ASI290MM mini



60mm 280mm FL Guide Scope



0.8x Reducer/Flattener
(WO 80mm f/5.5)



ASIAIR Pro



SSD Storage



Filter Drawer



2-inch Filters
L-Pro, L-eXtreme, UV/IR



Sky-Watcher AZ-EQ6



ZWO Electronic Focuser



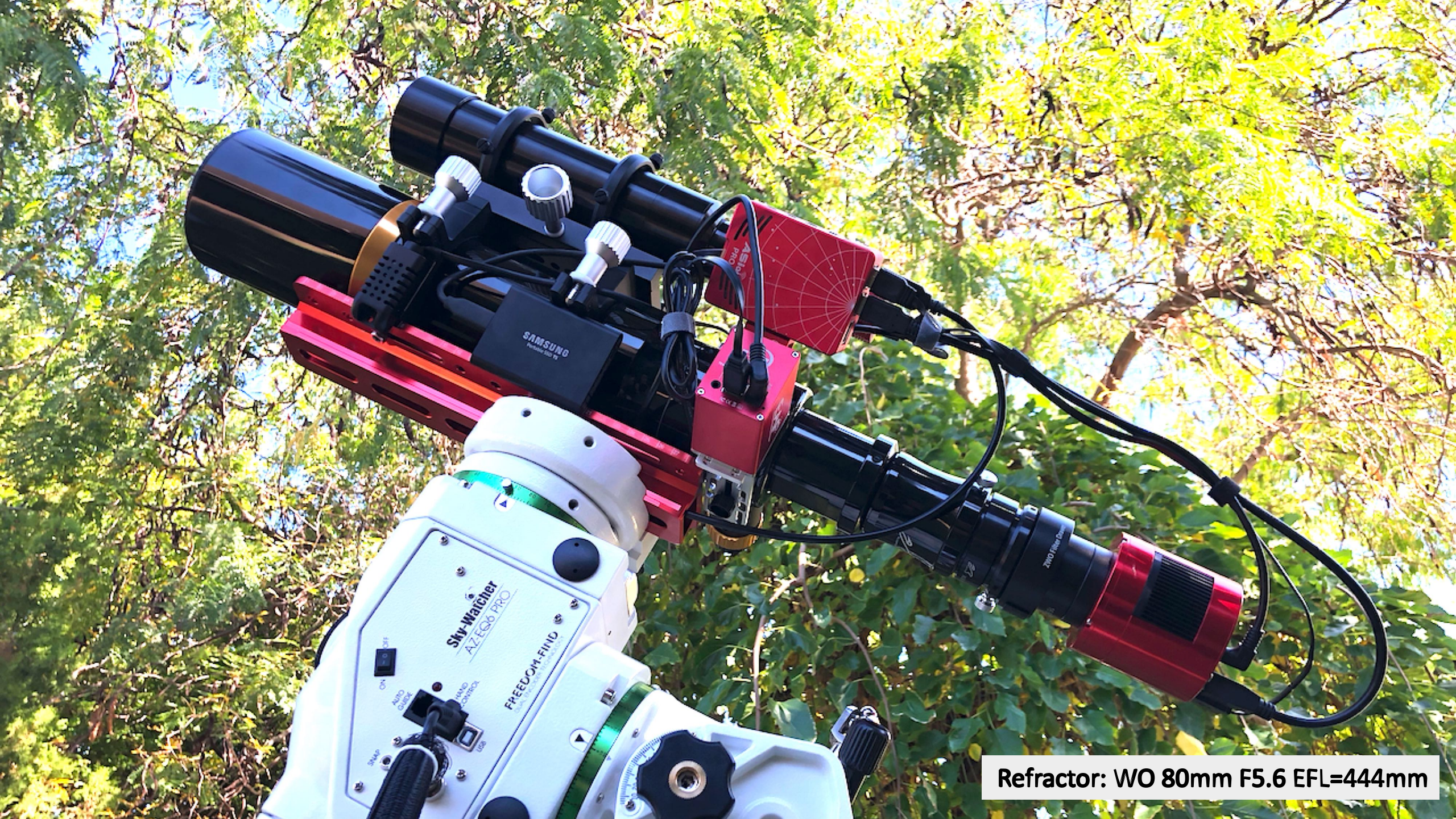
12V DC 10A
Power Supply



TP-Link AC750
WiFi Travel Router



Pegasus Astro
Pocket PowerBox Advance



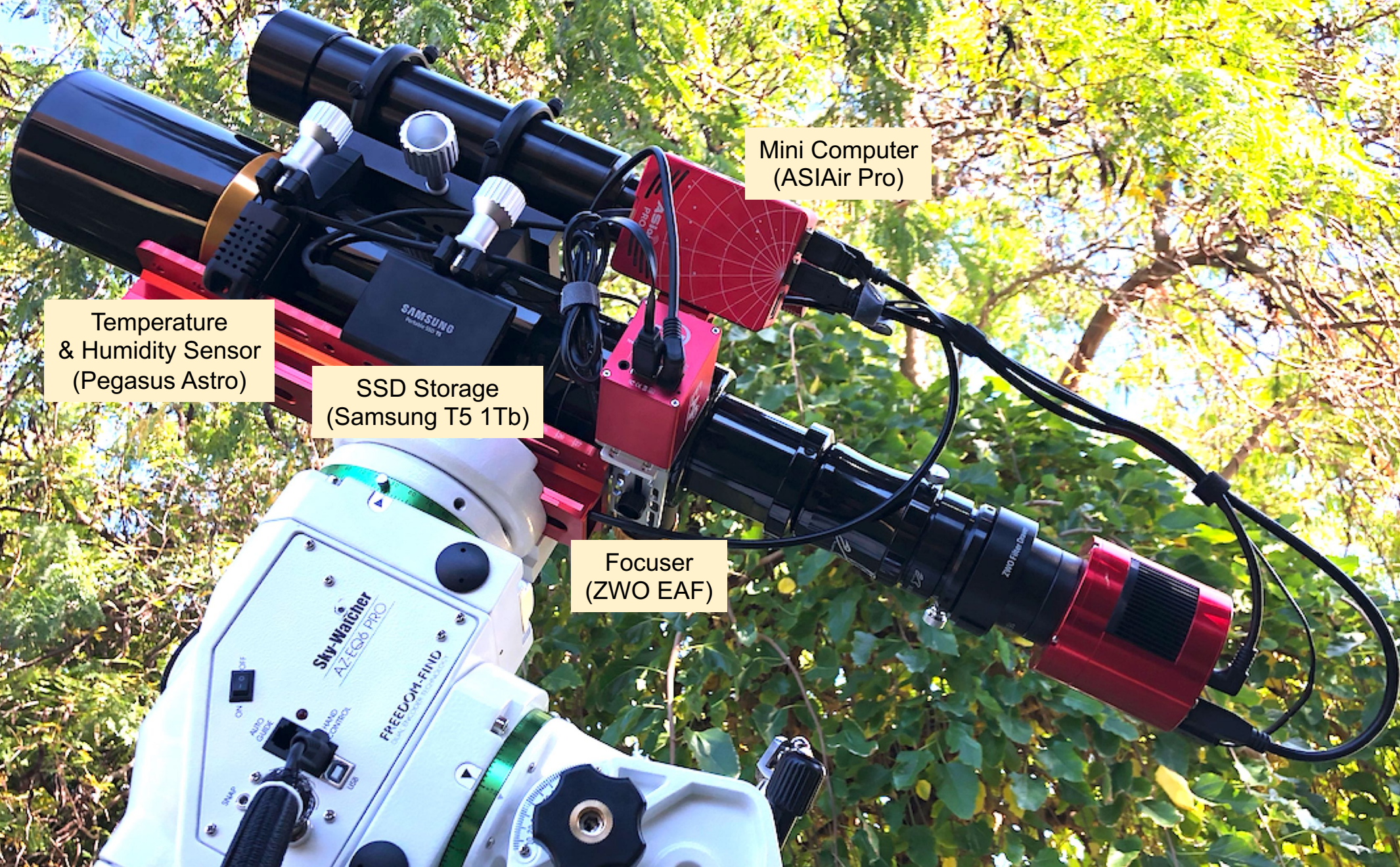
Refractor: WO 80mm F5.6 EFL=444mm

Temperature
& Humidity Sensor
(Pegasus Astro)

SSD Storage
(Samsung T5 1Tb)

Mini Computer
(ASIAir Pro)

Focuser
(ZWO EAF)



Guide Scope
(60mm)

William Optics ZenithStar FD
80mm Refractor
(555mm f/6.9 >> 444mm f/5.5)

Guide Camera
(ASI290MM mini)

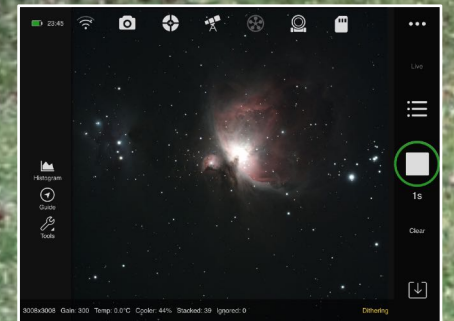
Power Management
(Pegasus Pocket Powerbox)

Imaging Filters
(L-Pro & L-eXtreme)

Focal Reducer
(0.8x)

OSC Camera
(ASI533MC Pro)

GoTo Mount
(Sky-Watcher AZ-EQ6)



ASIAir App
(iPad or iPhone)



Mak-Newt: SW 190mm F5.3 EFL=1000mm



SCT: 235mm F6.3 EFL=1480mm



SCT 150mm F3.3 EFL=495mm



Fully Integrated Electronic Telescopes – The Future!



eVscope



Stellina

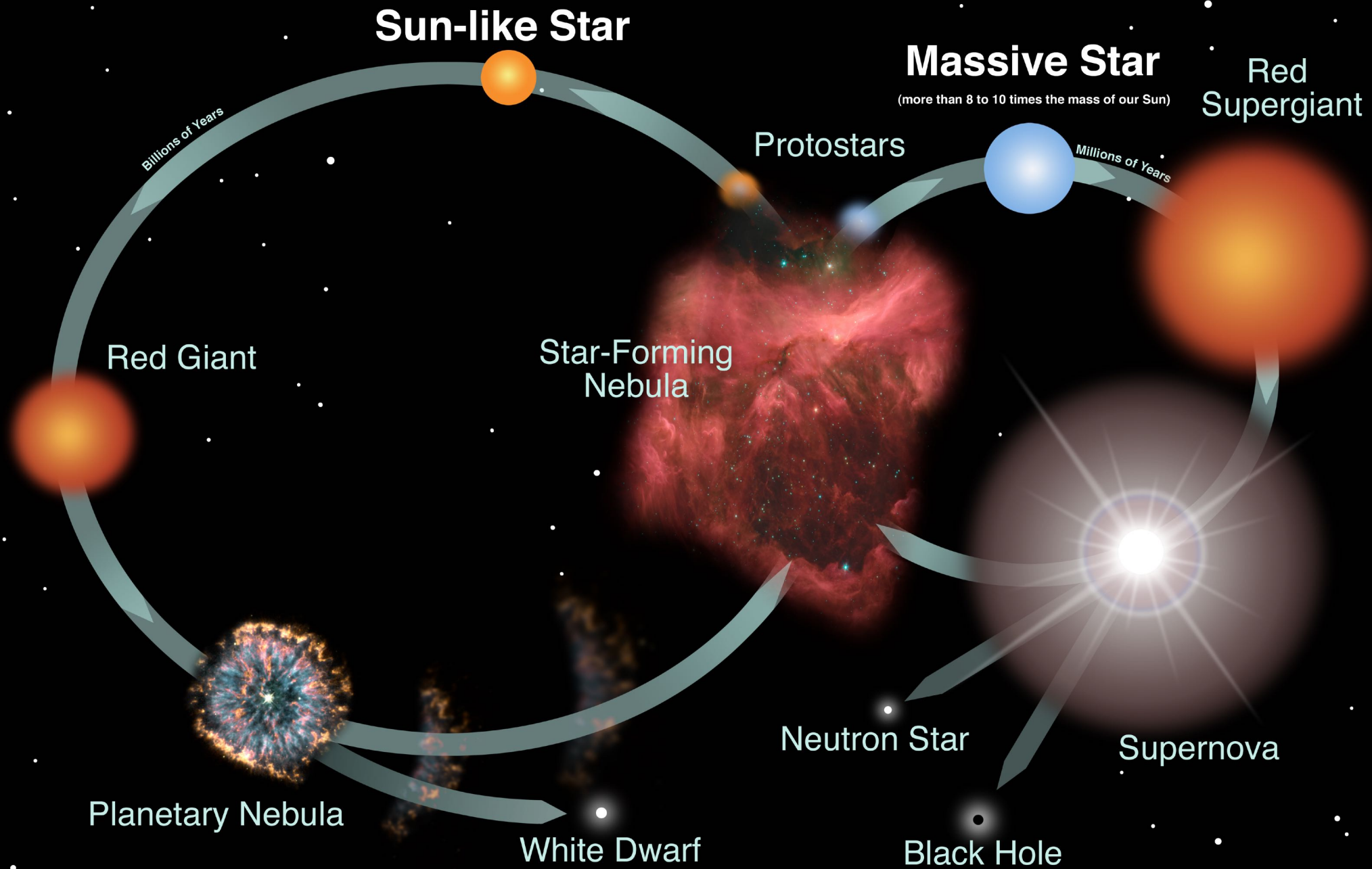


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EAA Images of Celestial Objects





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Sun
24 April 2022
80mm f/5.6 MN
ASI533MC Pro
Solar Filter



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Centaurus

Vela

Crux

Proxima Centauri
Circinus

Musca

Carina



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Proxima Centauri
80mm f/5.6 refractor
ASI533MC Pro
26 x 30s Gain 150 -10°C
Bortle 8, L-eXtreme filter



M42 (1.4 kly)
Orion Nebula
ASI533MC Pro 80mm f/5.6
Bortle 2, UV/IR Block



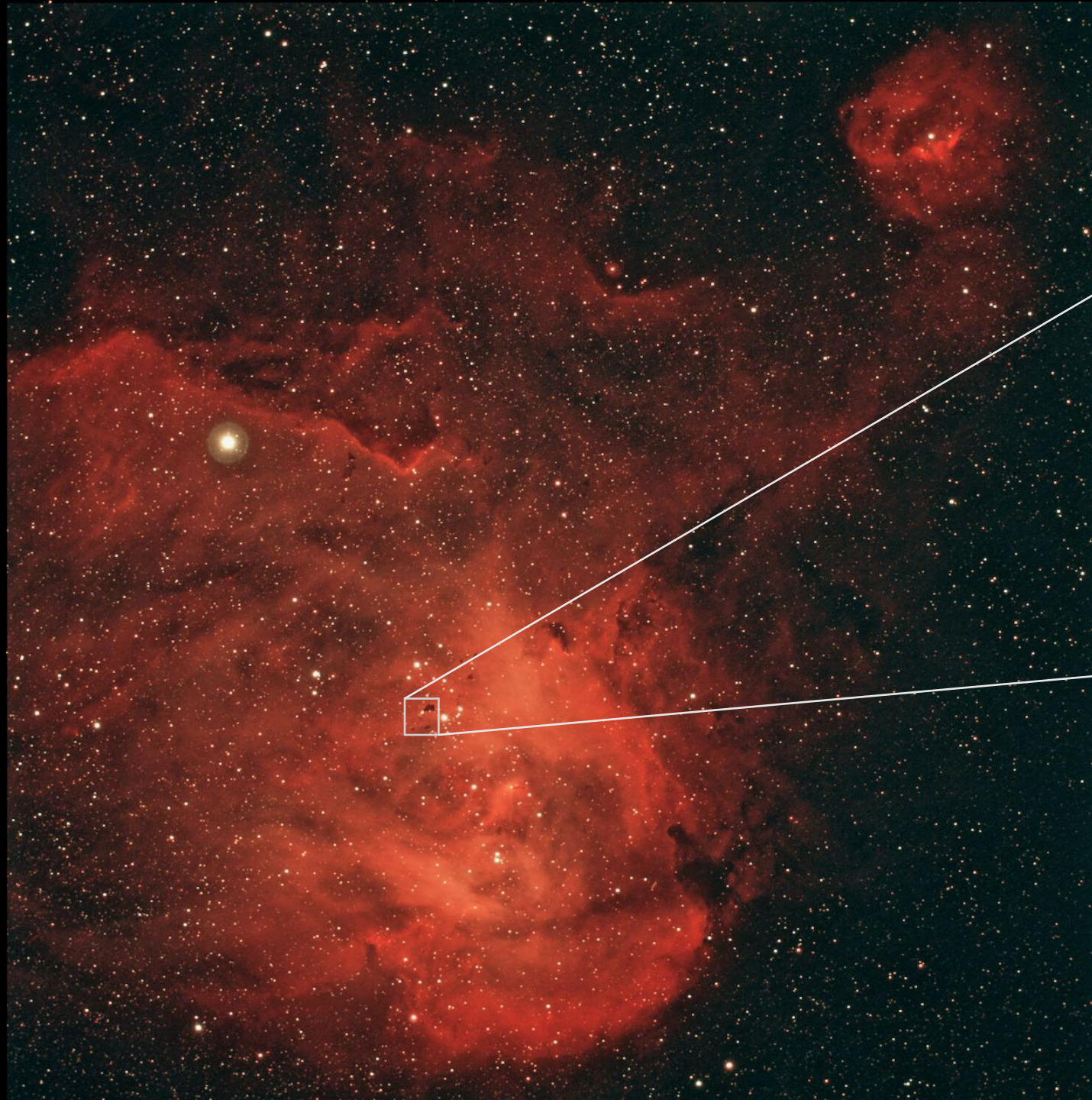
IC 2944 (5.9 kly)
3 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, UV/IR Block



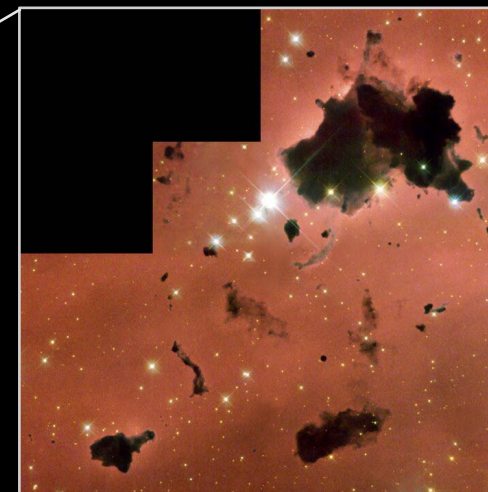
IC 2944 (5.9 kly)
10 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, L-eXtreme



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Thackeray's Globules
(Hubble Space Telescope)



IC 2944 + Lambda Centauri
Running Chicken Nebula
80mm f/5.6 refractor
ASI533MC Pro

Bortle 2, L-eXtreme filter



NGC 3324 (7.6 kly)
3 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, L-eXtreme



NGC 3372 (10 kly)
6 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, L-eXtreme



M20 (5.2 kly)
Trifid Nebula
ASI533MC Pro 80mm f/5.6
Bortle 2, UV/IR Block



M7 (890 ly)
Ptolemy's Cluster
ASI533MC Pro 80mm f/5.6
Bortle 2, UV/IR Block



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M46 + NGC 2438 (PN)
80mm f/5.6 refractor
ASI533MC Pro
5 x 60s Gain 110 0°C
Bortle 7, L-eXtreme filter



NGC 7293 (790 ly)
Helix Nebula
ASI533MC Pro 80mm f/5.6
Bortle 2, UV/IR Block



NGC 5189 (4 kly)
2 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, L-eXtreme



NGC 6164 (4.2 kly)
40 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, L-eXtreme



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Omega Centauri (16kly)
150mm f/6.3 SCT
ASI533MC Pro

Bortle 7, no filter



NGC 4945 (11 Mly)
7 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, UV/IR Block



NGC 5128 (13.1 Mly)
4 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, UV/IR Block



M83 (16 Mly)
10 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 7, UV/IR Block



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Markarian's Chain
80mm f/5.6 refractor
ASI533MC Pro
10 x 120s Gain 360 -10°C
Bortle 2, no filter



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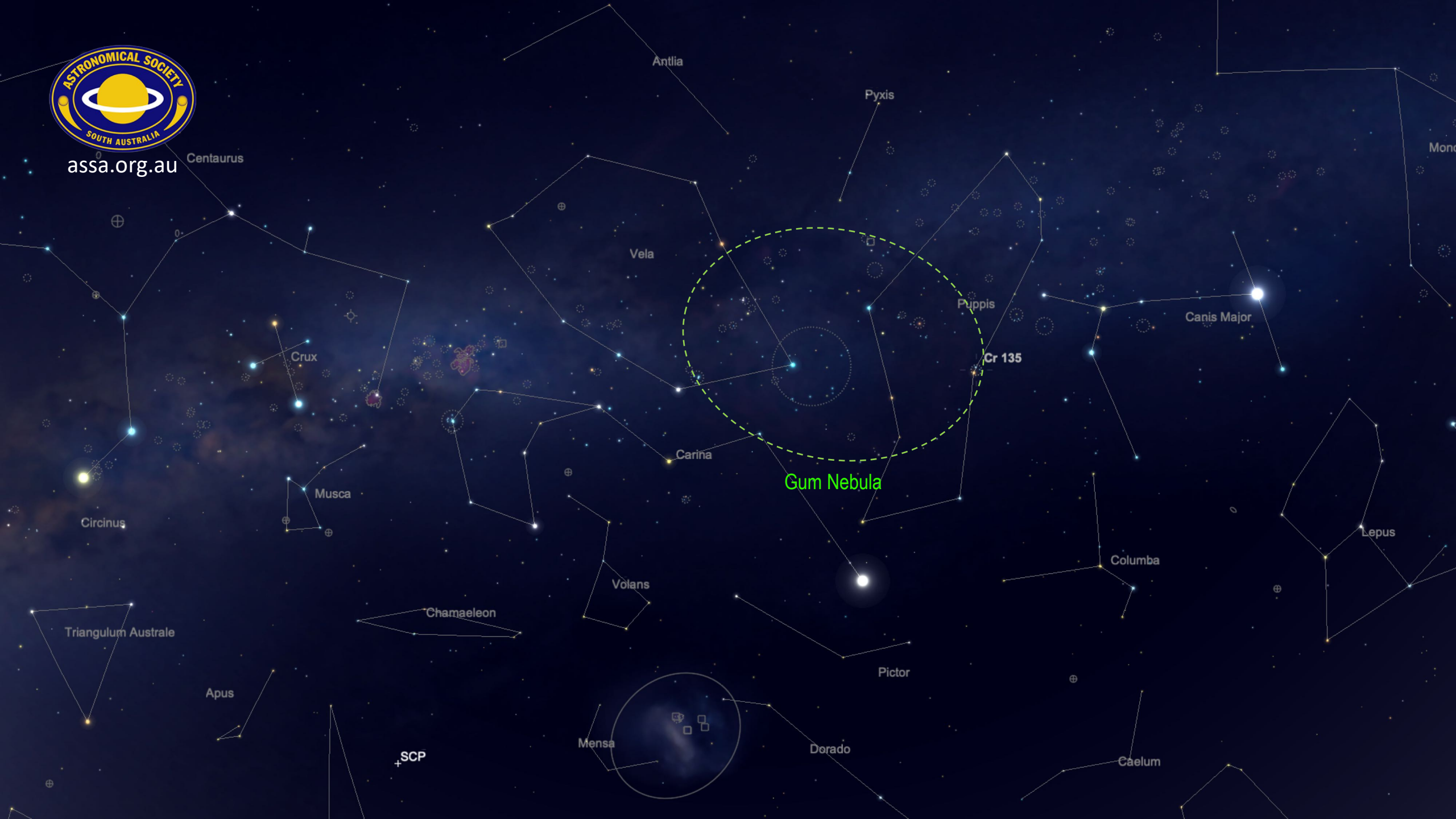
SN2022hrs
NGC 4647 + M60 (56 Mly)
1 May 2022
ASI533MC Pro 190mm f/5.3
Bortle 2, UV/IR Block



M1 (6.2 kly) SNR 1054
20 x 120s Gain 200, 0°C
ASI533MC Pro 190mm f/5.3
Bortle 2, L-eXtreme

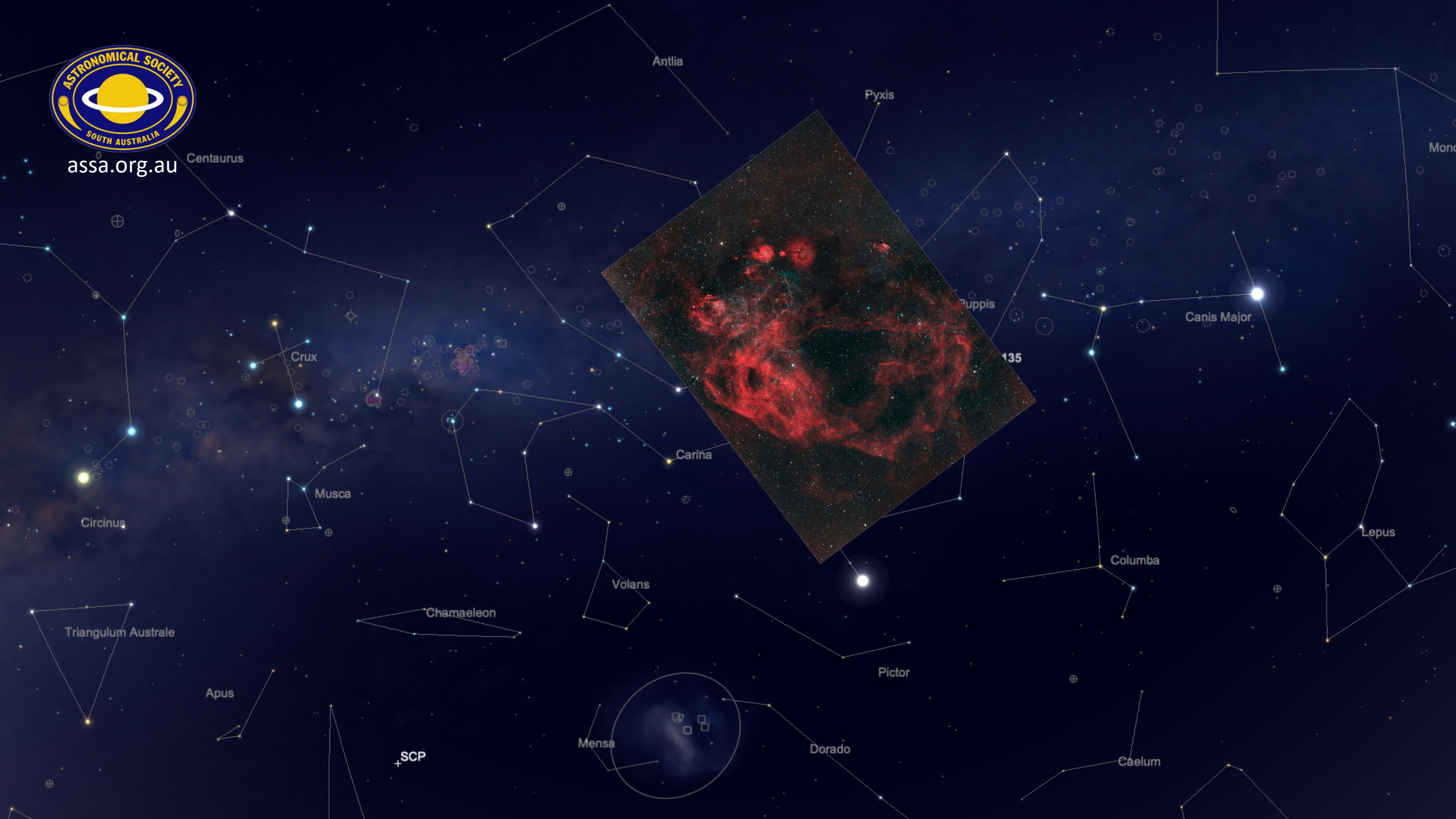


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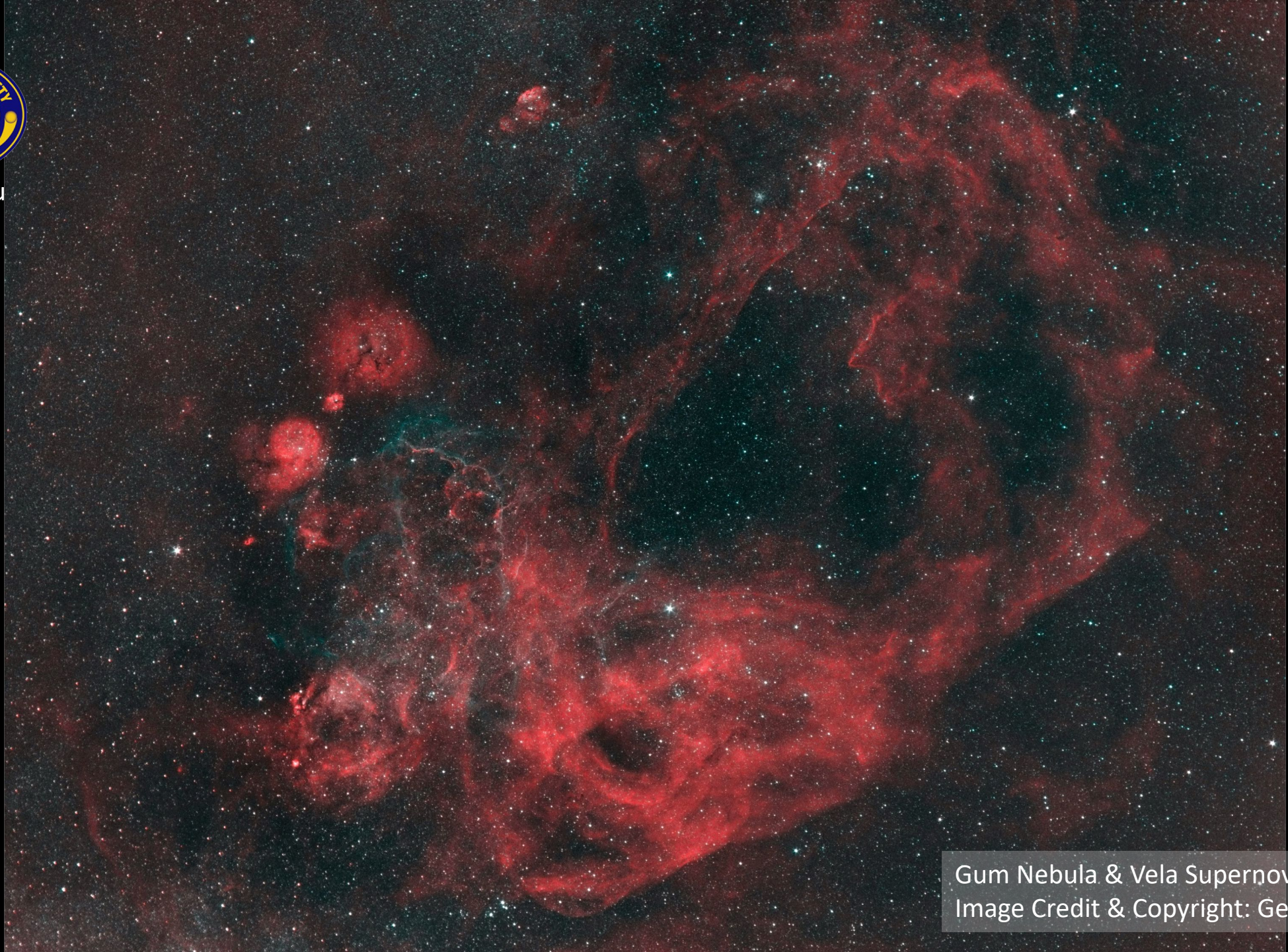


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Gum Nebula & Vela Supernova Remnant
Image Credit & Copyright: Gerhard Velaitis



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Colin Stanley Gum (1924 – 1960)



- South Australian
- 1924: Born 4 June 1924 (only child of Ivy & late Stanley Gum)
- 1937: Dux Gladstone High School (Flinders Ranges, SA)
- 1939: Prince Alfred College Scholarship
- 1949: Honours B.Sc. In Physics
- 1951: Master of Sci Degree from Adelaide Uni (Mt Stromlo)
- 1955: First PhD in Astronomy, Australian National University
 - Thesis: *A Study of Diffuse Southern Ha Nebulae*
- 1956: Research Fellow, CSIRO Division of Radiophysics
- 1959: Optical Astronomy, School of Physics, Sydney University
- Numerous scientific achievements in his short career
 - *Search & discovery of Ha regions in the Southern Milky Way*
- Honoured in the sky & on the Moon



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Colin Stanley Gum (1924 – 1960)



EXAMPLE

Increasing exposure time

NGC 6164

Planetary Nebula, Norma



1 x 30s

Sky-Watcher 190MN + ASI533MC (0°C, 200 Gain) + L-eXtreme

NGC 6164

Planetary Nebula, Norma



1 x 60s

Sky-Watcher 190MN + ASI533MC (0°C, 200 Gain) + L-eXtreme

NGC 6164

Planetary Nebula, Norma



1 x 120s

Sky-Watcher 190MN + ASI533MC (0°C, 200 Gain) + L-eXtreme

NGC 6164

Planetary Nebula, Norma



1 x 180s

Sky-Watcher 190MN + ASI533MC (0°C, 200 Gain) + L-eXtreme

EXAMPLE

Increasing stack number

NGC 6164

Planetary Nebula, Norma



1 x 120s

Sky-Watcher 190MN + ASI533MC (0°C, 200 Gain) + L-eXtreme

NGC 6164

Planetary Nebula, Norma



5 x 120s

Sky-Watcher 190MN + ASI533MC (0°C, 200 Gain) + L-eXtreme

NGC 6164

Planetary Nebula, Norma



10 x 120s

Sky-Watcher 190MN + ASI533MC (0°C, 200 Gain) + L-eXtreme

NGC 6164

Planetary Nebula, Norma



40 x 120s

Sky-Watcher 190MN + ASI533MC (0°C, 200 Gain) + L-eXtreme

NGC 6164

Planetary Nebula, Norma

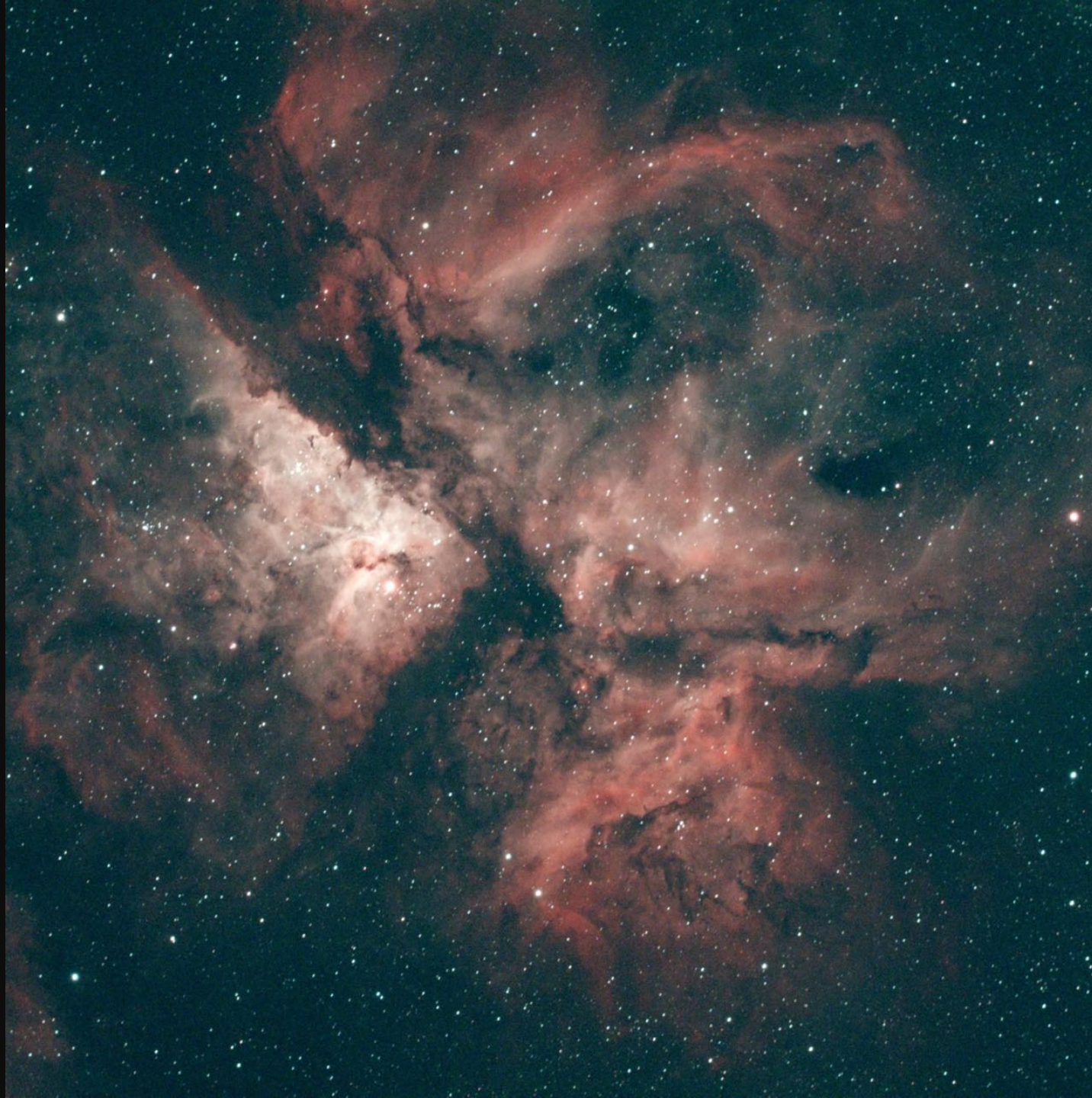


NASA Astronomy Picture of the Day (APOD) 7 May 2009

PROCESSED EXAMPLES



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Eta Carinae Nebula
1 x 180s Gain 360 -10°C
ASI533MC Pro 80mm f/5.5
Bortle 8, L-eXtreme filter



Eta Carinae Nebula
66 x 180s Gain 360 -10°C
ASI533MC Pro 80mm f/5.5
Bortle 8, L-eXtreme filter





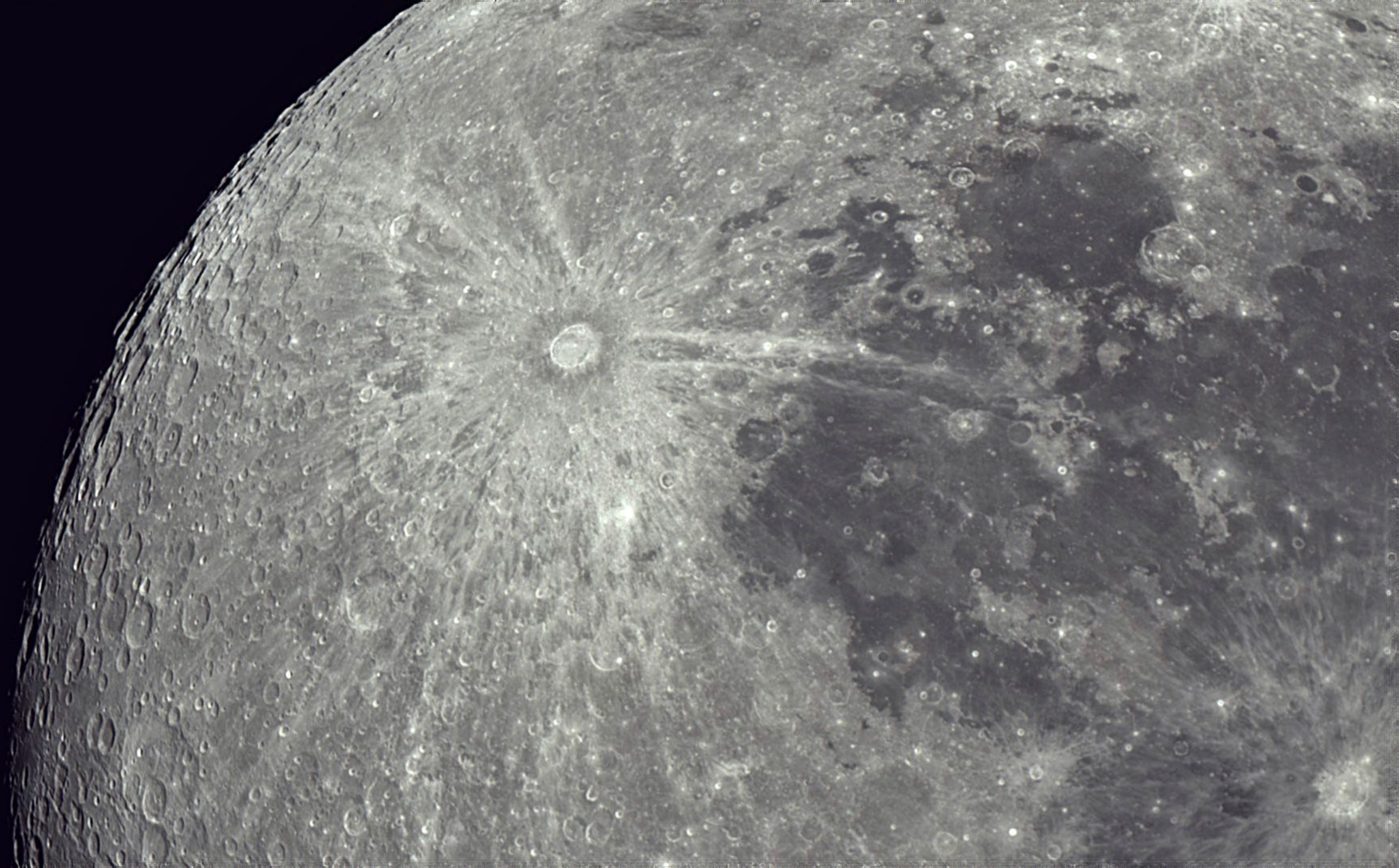


NGC 2035, 2020, 2014
60 x 120s Gain 200 -10°C
ASI533MC Pro 190mm f/5.3
Bortle 7, L-eXtreme



LIVE VIDEO STACK EXAMPLES







Saturn, 29 July 2020
Gerhard Velaitis
Best 40% of 18,800 frames
ASI290MC C11 2x Barlow f/20



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Questions





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PRESENTS

Telescopes in the PARK

Visual & Imaging Telescope Displays • Show & Tell Presentations • Telescope Demonstrations

3–7pm ACST Sunday 12 June 2022 • info & tickets: assa.org.au/park