

Astronomer



Journal of the Tamworth Regional Astronomy Club Inc

October/November 2016
Vol 1 No 2

Dr Stephen Kane: finding a new Earth

36" 'Jos Roberts Telescope' reassembled!

TRAC visit to itelescope.net

Book reviews

Raffle winners!

Spring skies – Venus shines in the West

Cover Photo:

Dr Stephen Kane talks with media
during his visit to Tamworth



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Photo by Warwick Schofield

Dr Stephen Kane answers questions at his presentation in Tamworth: "Finding a new Earth: Exoplanets & Habitability".

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Exciting times for TRAC!

The past few months have certainly been a very exciting time for the Tamworth Regional Astronomy Club.

The highlight of course has been the visit to Tamworth in July by Dr Stephen Kane, Professor of Astrophysics, San Francisco State University, and the fascinating presentations he delivered at Tamworth High School "Finding a New Earth: Exoplanets & Habitability". It was fantastic to see the large crowd in attendance at the evening session and the high level of interest in the science of astronomy in our region, particularly amongst younger members of the community. Photos and an overview of Stephen's visit and presentation are included in this edition of *Astronomer*.

On behalf of TRAC, I would like to once again thank Stephen for his wonderful assistance in helping to promote our Club in the first year of its operation and we are delighted to welcome him as an Honorary Member! We certainly look forward to hearing more about his work and hope to have the opportunity to conduct similar events in the future. Sincere thanks also to Tamworth High School for providing the facilities for Stephen's presentation and to the Club members who worked tirelessly on this important event.

A number of weeks ago, several Club members braved freezing weather conditions to visit the very impressive itelescope.net facility at Siding Spring Observatory. This visit will be of major benefit for TRAC's proposed Astronomy & Science Education Centre (A&SEC). A report on the visit by Warwick Schofield appears on page 9.

Warwick has also been busy reading several books by astronomer Dr Fred Watson and has written some wonderful reviews in this edition. Thanks again Warwick!

Another major highlight in recent weeks has been the generous donation by Raymond McLaren of Andromeda Engineering at Moonbi of space at his Advanced Engineering Workshop for the 'Jos Roberts Telescope'. This fantastic location has enabled Club members to reassemble the telescope and will provide an ideal location for the testing of the 36". A sincere thank you to Raymond for providing this facility for the next six months and we look forward to getting the

scope up and running in the very near future! There are also plans for Jos to visit Tamworth (see Diary – page 21) and his assistance will be invaluable in helping us to get the best out of this huge instrument.

After many months of promotion and selling tickets, TRAC's raffle was drawn by Stephen Kane and the Club extends its congratulations to prize winners Mick Davies, Chris Thompson and Mick Ross.

Earlier this year, Warwick, Margie and Phil had the opportunity to meet with Angélica Anglés, PhD candidate in Astrobiology, Department of Earth Sciences, The University of Hong Kong during her visit to Australia. Angélica is studying for evidence of Life on Mars and has provided her biography which appears on Page 11. Thank you to Angélica for sharing a snapshot of your amazing research and studies in astronomy and music and we hope to have the opportunity to hear more about your work in the future!

In some very exciting late breaking news, Warwick, Margie, Barry Gilbert and several others have recently purchased the historic 34" Hewitt Camera from Lindsay Lowe with a view to TRAC taking ownership of this powerful photographic instrument! An overview of the history of the Hewitt Camera, which became operational in England in 1962 to track artificial satellites and was subsequently relocated in 1982 to Siding Spring Observatory, is available online at: <https://ehive.com/collections/3501/object/s/150162/34-hewitt-camera>

A full update and article on the Hewitt Camera will be provided in the next edition of *Astronomer*.

Finally, TRAC has also recently taken possession of the 16" telescope optics and hardware donated by Lindsay and Margie has also assisted TRAC to secure a beautiful 4", F15 Unitron refractor. The 16" will eventually be housed at TRAC's A&SEC facility and the 4" will be a wonderful addition to our Club's community education and outreach activities. More details coming soon!

Best wishes and clear skies to all! ☆



Leigh Tschirpig
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Astronomer Journal of the Tamworth Regional Astronomy Club Inc

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If you wish to submit material for publication, please send your text and photographs in jpg format to the above e-mail address.

Regular Meetings of TRAC are generally conducted on the evening of the first Monday of each month at the Botanic Gardens Meeting Room, Victoria Park, Piper Street, Tamworth, followed by an observing session or an indoor program in the case of poor weather. Technical meetings are usually held on the second Saturday following each Regular Meeting. Dates and times are subject to change - please check our website for the latest details. For further information contact the Secretary at the above e-mail address.

Dr Stephen Kane - Exoplanet discoverer

BY LEIGH TSCHIRPIG



Part of the large crowd at Dr Stephen Kane's presentation at Tamworth High School.

Photo by Warwick Schofield

IT WAS a great privilege and honour earlier this year for the Tamworth Regional Astronomy Club to host professional astronomer, leading exoplanet discoverer and former Tamworth resident, Dr Stephen Kane, Professor of Astrophysics, San Francisco State University.

A number of TRAC members had the opportunity to enjoy a meal or two with Stephen during his time in Australia and it was wonderful to meet with him and learn more about the exciting field of study in which he has been so actively involved over many years.

The focal point of Stephen's visit were the presentations he made at Tamworth High School where, as a former student, he completed his secondary education. His

presentations included a daytime talk to school students from the local region and an evening address which attracted a large crowd at the School's auditorium.

Stephen's talk provided a wonderful overview of how far our knowledge has increased in recent years about the existence of planets orbiting other stars and the tantalising possibility that some of these planets may be candidates for the existence of life. The world-leading research in which Stephen and his colleagues have been involved underscores how important the science of astronomy continues to be in our modern age and highlights the amazing discoveries which still await us as we seek to learn more about the incredible universe of which we are such a very small part.

Using ground-breaking observational techniques, Stephen has been forging ahead in discovering an amazing array of alien worlds, objects that would otherwise be invisible if not for the subtle tell-tale signs uncovered through extremely precise measurements in the motions of the stars they orbit and changes in the brightness of those stars whose planets transit in front of them from our vantage point on Earth.

It was fascinating to hear about the incredible orbits, sizes and distances of many of these exoplanets and particularly those planets which have been discerned to be of similar size to our own, located at just the right distance from their own "suns" and placing them as candidates where life could potentially exist.



Stephen Kane has been researching planets around other stars for more than 20 years and has discovered and characterised hundreds of exoplanets, including Kepler-186f which is the smallest planet yet to have been found in the Habitable Zone of a star.

Photo supplied by Tamworth Regional Council.

We were delighted to welcome Stephen as an Honorary Member of TRAC at the conclusion of his talk and are indeed excited by his offer to be an active member of our Club to assist in our endeavours to establish an Astronomy & Science Education Centre and to promote the science of astronomy in the Tamworth Region.

We were also pleased to present Stephen with a Club jacket (although he does have a pretty cool NASA one already!) and his association with TRAC will be invaluable in helping to promote and encourage community involvement in our Club's activities in the Tamworth region.

Many thanks also to Stephen for drawing TRAC's telescope raffle and congratulations to the three prize-winners! Details of the raffle winners are included on page 20 of this edition of *Astronomer*.

Once again, a sincere thank you Stephen - we certainly wish you all the very best for the future and particularly continued success in the incredibly important work you are undertaking!

Additional information about Stephen and his research activities is available on his website at: www.physics.sfsu.edu/~skane/



As more and more of these planets are uncovered, who knows what amazing information will be obtained from the evidence hidden in the signatures of these objects located at such incredibly vast distances from our home here on Earth.

We certainly take our hats off to Stephen and other astronomers who constantly search for new and innovative ways to grasp the technology available to us to make these discoveries and learn more about the cosmos.

There is no doubt the work being undertaken by Stephen and his colleagues has vastly added to our knowledge of the universe.

It wasn't too many years ago that the possibility of detecting planets around other stars seemed a bit far-fetched and that the obstacles of distance, the very low light levels from the planets themselves hidden in the glare of the stars they orbit seemed insurmountable. Yet, here we are today, with solid proof that not only do these worlds exist but they are very much commonplace.

Given the vast number of stars in the universe and their accompanying planets, the chances of finding more and more earth-like worlds seems inevitable. These are indeed very exciting times in this fascinating field of astronomical research and discovery!

It was also wonderful to hear about how, as a local school student, Stephen first became interested in astronomy



If you missed Stephen's Tamworth presentation, a video will be available to members and further details will be provided shortly. Thanks to Warwick Schofield for organising Folmac Video Productions of Tamworth to record this event. ☆

36" 'Jos Roberts Telescope' reassembled!

ON SATURDAY, 6 August, several TRAC members met at Phil Betts' home at Kootingal where the 36" 'Jos Roberts Telescope' has been stored since being donated to the Club last year by Warwick and Margie Schofield. Thanks to the generous donation of space at the Advanced Engineering Workshop of Andromeda Engineering, Moonbi by owner and TRAC member, Raymond McLaren, arrangements were made to relocate the telescope to this excellent facility where TRAC members will now be able to work on the

instrument over the coming months. Following are some photographs of the relocation of the telescope and the subsequent inspection of the telescope at TRAC's Technical Meeting held on 13 August. Thank you again to Raymond for allowing TRAC to utilise this excellent facility free of charge over the next six months! Looks like some exciting times ahead! ☆



Ready to roll. The base and mirror cell of the 'Jos Roberts Telescope' is loaded on a trailer ready for the short, but very careful trip from Kootingal to Moonbi. Photo supplied by Leigh Tschirpig.



The 36" arrives at Andromeda Engineering.
Photo by Leigh Tschirpig



Steady as she goes...carefully winching the base and mirror cell off the trailer.
Photo by Leigh Tschirpig



Back in one piece! The 36" reassembled with the folded optical top end.
Photo supplied by Leigh Tschirpig.



Installing the Newtonian top end on the 36" at TRAC's Technical Meeting, 13 August, 2016.
Photo by Leigh Tschirpig.



Happy days (and nights!) TRAC members admire the 'Jos Roberts Telescope' reassembled in its Newtonian configuration plus the classic 4" F15 Unitron refractor acquired for the Club by Margie Schofield. Now, just add the secondary mirror to the 36", some starlight and a VERY tall ladder!
Photo by Warwick Schofield.

itelescope.net visit

BY WARWICK SCHOFIELD



Photo by Stuart Goff

Club Building Committee visit to itelescope.net (formerly "global rent-a-scope") at Siding Spring.

CLUB MEMBERS have agreed to commence planning for an amazing public contribution to the Tamworth Community...an astronomical observatory and science education centre! WOW!

With some amazing concept drawings from Garry Copper and many hours of committee, Club and private meetings, a draft design was approved at a Club general meeting. The design included a roll-off-roof building principally to house the Club's 36" 'Jos Roberts Telescope'.

Garry organised with Peter Poulos from Coonabarabran (the manager of the site) for our building committee and engineers to make a visit to the itelescope.net facility. The story of our amazing experience follows:

As we drove very slowly along the narrow bitumen road to the Australian Astronomical Observatory site at Siding Spring, we noted that the temperature had fallen to 3 degrees Celsius and visibility in the thick fog was less than fifty metres. In the carpark at the visitor centre we donned thick coats and beanies and ran through the drizzle and fog to the entrance. The visitor centre is a very well set up astronomical display, souvenir shop and café for light meals. It sits in the shadow of the

massive dome of the Anglo-Australian 3.9 metre optical telescope. Today, the dome was not visible through the fog, but a quick run with heads down into the drizzle, fog and very strong headwind, we made it for a quick look at this amazing, now wholly owned Australian facility.

Garry had arranged to meet Peter at the itelescope.net building nearby, but the fog, wind, and cold air (or did I already tell you about that) meant that we made several left and right turns as our little vehicle convoy, with windscreen

wipers going flat out now, was stopped by a fancy Porsche sports car in the middle of the fog. "Follow me!" called Garry, "we are nearly there". We parked our cars and ran to a rather unimpressive building with a curved roof and one small door in the end. The sign above the door said: "itelescope.net".

As I entered, I thought I was in telescope heaven...millions of dollars worth of

very serious scientific hardware laid out before us!!

About twenty optical telescopes, all types of scopes and all alternative mounts AND all connected to multiple cameras and each one wired to a computer server. (I did notice that none were as large as our Club's 36"...but I had a lot to learn).



Photo by Stuart Goff

Roll-off roof frame and rails at itelescope.net facility, Siding Spring Observatory

Here's how I think it works...(their website, itelescope.net tells a lot of the story better than I can). The telescopes are individually owned by universities, research institutions, individuals and private investors from around the world. Mostly in the Northern Hemisphere! Each telescope is connected to a CCD (charged coupled device) camera and is set up for online internet access. A CCD can obtain a much more detailed image from an optical telescope than the human eye and with further computer enhancement gives us today's modern quality images, the ones we are used to seeing.

itelescope.net provides the facility in the cool mountains of the Warrumbungle National Park in a now protected site from light pollution. The telescopes all operate in a fully automatic mode on line. At dusk, providing it is not misty or raining, the roll back roof automatically opens and the telescopes are ready for action. They are accessed by astronomers who are allocated time or who "buy" time. Membership of itelescope.net is required to have access to telescope time. Astronomers from around the world, open their laptops, sign on and start work by remote control. We were amazed when one of the telescopes woke up, looked around and went back to sleep again!

Scopes are used for many different projects, some have multiple filter options and other functions. I was so amazed

and so busy ogling and taking photos that I did not listen to much of the excellent interpretation Peter was explaining!

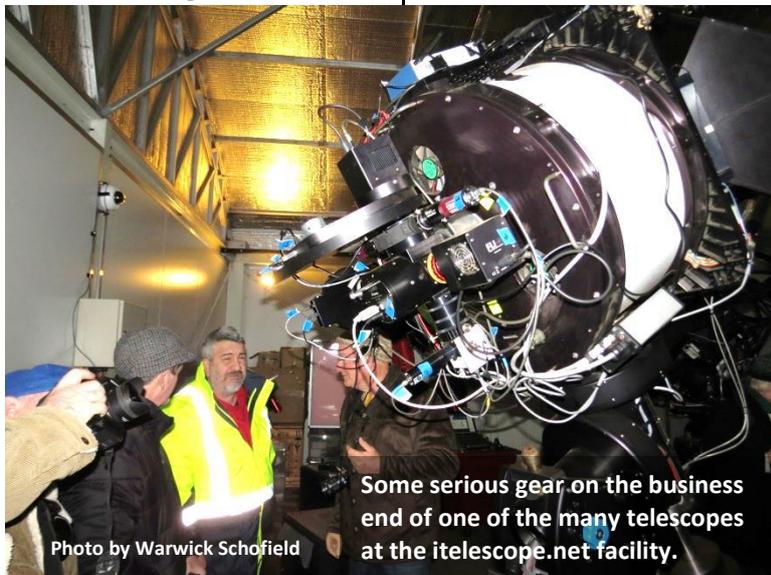
Meanwhile, our engineers were high up on a ladder checking out the mechanics of how the roll off roof worked and other aspects of this otherwise quite simple building. The itelescope.net web site explains how access costs vary from around \$20 to \$100 an hour depending on physical conditions at the time, moon, cloud and so on.

I can now see how our telescope and observatory and science education centre will give an excellent opportunity for people to bridge the gap between being a person on the street to conducting serious astrophysical observations and research. You will note on the itelescope.net website where

two year 11 schoolgirls from NSW won a small scholarship and, with the help of their science teacher, were able to win a science award by conducting studies on a double star in their own time, after school. The website is over 30 pages long and I was exhausted reading it and just trying to take it all in by about page 16!

What an experience! Thanks Garry and also Peter. Maybe some-time, our Club should arrange a visit to Coonabarabran to visit the Siding Spring public display, Anglo-Australian Telescope and enjoy the souvenir shop and café! (Note: The itelescope.net is not open for public access: it is a not-for-profit private enterprise business owned by its members.)☆

Photo by Warwick Schofield



Some serious gear on the business end of one of the many telescopes at the itelescope.net facility.



Photo supplied by Warwick Schofield

Plenty of smiles at the amazing itelescope.net !



Photo by Warwick Schofield.

Angélica's story

Prof Dr Brian Timms (University of New South Wales), Phil Betts, Angélica Anglés, PhD candidate (The University of Hong Kong), and Margie Schofield at "Montana", Moonbi. Angélica is studying for evidence of life on Mars.

Introduction: by Warwick Schofield.

LIFE ON Mars...really? For a few years now, Prof Dr Brian Timms has been studying invertebrate animal life in a group of "ponds", (gnammas/"native wells") on an isolated granite mountain top near members' Warwick and Margie Schofield's place near Moonbi.

The studies have not only confirmed the ability of animals to reappear (by the hatching of dried out eggs) but also the ability to revitalise after total desiccation for some months at a time (cryptobiosis). His studies have also led to the discovery of at least two new species at the site (a clam shrimp and an ostracod). So...maybe that is why we were privileged recently to have not only Dr Timms visit our property again but with him was PhD candidate Angélica AND Club Publicity Officer Phil Betts!

Angélica is from The University of Hong Kong, Department of Earth Sciences. Angélica's studies involve looking at the possibilities of life on the planet Mars.

The reasons for her visit soon became apparent and she was fascinated by the life forms found on bare, exposed, hot/cold granite pavements in our district. Prof Brian Timms is an internationally respected scientist (look him up: <https://www.ecosystem.unsw.edu.au/people/brian-timms>) so thank you, Brian, for this unusual, opportunity to see biology/geomorphology link with astronomy!

Angélica Anglés writes: WHEN I was a child I used to look at the stars for hours and hours with my grandfather. He told me that whatever I could imagine I could make it true. I really wanted to travel to space, and since a very young age I started reading books about the Universe. A way for me to expand my imagination and create stories was to play piano and imagine myself traveling in space.

I started the piano degree when I was three years old and since then I never stopped playing. However, when I was 18 and I had to choose a career, I could not decide which one I wanted most, continue with music or study the universe. So I decided to relate both at the same time.

I started studying Space Engineering in Sweden and later on I did three master degrees in between Germany and London; Geodesy, Astrophysics and Planetary Science. Currently I am doing my PhD in Life on Mars at The University of Hong Kong.

In the last years I attended NASA conferences and Astrobiology workshops around the world. I was recently awarded a prize to be part of an expedition in the Australian desert to study life on Mars.

Parallel to my studies, I have performed piano in some of the most famed auditoriums, such as the Royal College of Music in London or the Hong Kong Academy of Performing Arts, where I performed "space and martian music" arranged by myself. My belief is that music is propagated as electromagnetic waves and have a wave nature. That means that the music waves are analogous to a ripple on a pond created when we drop a pebble into a pond. In the same way, the music waves travel through space, and are propagated in space unless they find or interact with a material, which can be another planet, another star, asteroid...

If there are other extra-terrestrial worlds, other habitable planets hosting civilizations in other parts of the galaxy, a way to make us known and communicate with them is through music.

My final goal is to be able to play music in space, as a way to explore the universe. In that way I can do the two things I love the most, play piano and explore the cosmos. ☆

Three books by Prof Dr Fred Watson

BY WARWICK SCHOFIELD

STARGAZER the life and times of the TELESCOPE, 2004

THE WRITINGS of Fred Watson are many, but it has been my pleasure to review three of his books for TRAC members.

This 342 paged book (*STARGAZER*) is almost a tome (with over 50 pages of references, glossary, notes and index) of very carefully researched details and explanations of the history of man's observation of the universe and his progress with the development of the telescope. From Aristotle 350 BC, Da Vinci, Kepler and Newton, who in 1670 built the first reflector telescope with a 1 inch mirror made from metal!

Galileo, who in a desperate move to get away from his teaching career, turned to astronomy! How a spider's web on a lens led to the invention of cross-hairs for sighting.

Many astronomers are also accomplished musicians, including Herschel and "our Fred"!

Most Club members understand the workings of a refractor or a reflector telescope. But, Cassegrain, Schmidt, folded, alt-az, Dobsonian, nebula, charge-coupled-device, optic fibre...some Club members understand all these

things and have even designed and constructed significant telescopes (up to 32 inch) but there is always something to learn. Early telescope builders believed bigger was better and they went to extraordinary lengths to follow this idea.

STARGAZER in parts is very detailed and maybe a bit heavy going in places for some, but stick with it, the details are amazing and mostly necessary. The photos and optical diagrams are good, especially for those who like looking at the pictures in a book... (I had to keep referring to some of the diagrams!) In fact I have been inspired to consider constructing life sized historic telescopes as garden sculptures for the precinct of our proposed Astronomy and Science Education Centre (A&SEC). All we would need is various diameters of steel tubes and steel ladder type structures.

The book even leads us to radio telescopes. In the 1960s, the combination of radio and optical telescopes leading to the discovery of Quasars, the use of vast natural "gravitational lenses" and Einstein Rings. This book is a must read for all Club members. Unfortunately, *STARGAZER* has recently sold out with no plans for a re-print. However, I have secured a few copies for loan, reference and research purposes for TRAC members.

STAR-CRAVING MAD tales from a travelling astronomer, 2013

This 334 page book is based on the interests and experiences of participants in Fred's "STARGAZER TOURS". It takes us from the astronomers of ancient Peru to modern and interesting astronomical places around the world.

Information about dark matter and the expanding universe are all covered in a clear informative way. After all, Fred is an internationally renowned science educator and communicator (and an astronomer!)

Again, this book is very thorough in its research details, but is very easy to read and even has a nice section of coloured photographs!

He includes autobiographical pieces about Fred (his Uncle, Frederick "Fred" Garnett, an RAF pilot, was shot down during WW2).

Fred's EPILOGUES are amazing to read...I won't give anything away...and I can only suggest (no, I insist) that these books are made compulsory reading for Club members!

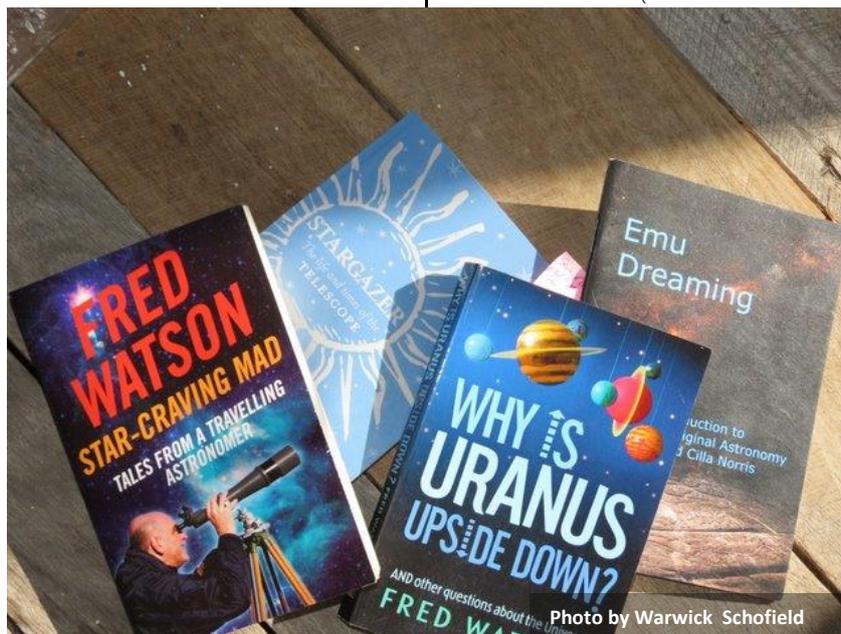


Photo by Warwick Schofield

WHY IS URANUS UPSIDE DOWN? And other questions about the universe, 2007

This is the easiest of Fred's books to read. Whilst the content is still quite technical, and you need to concentrate, the book is a series of short essays (some with diagrams) answering typical questions which Fred has answered on some of his radio question and answer programs.

The radio shows are always too brief, but here, Fred gets a chance to give a good, easy to follow answer to over one hundred astronomical questions.

You try explaining the phases of the moon. Where did the energy go from the big bang? Where did it come from?! What is dark matter? Why do we get two tides each day? Can you see geostationary satellites with binoculars? How can I get a job as an astronomer? What do astronomers do on cloudy nights? How do we know some meteorites come from Mars?

Easy to read, hopefully available at Club meetings from the Club's sales division shortly!★

Venus dominates in the West

BY LEIGH TSCHIRPIG

AS WE move into October, the evening winter constellations of Scorpius and Sagittarius are now located well towards the West following sunset and, for many casual observers, the sky may seem a little “bland” with the Southern Cross lying on its side in the South and the Northern and Eastern skies lacking some of the more well-known constellations. However, there is certainly much to see during October and November!

Blazing in the West at magnitude -3.9 at the start of October is the planet Venus, currently located in the constellation of Libra. Through a telescope at low to medium magnification, the planet’s brightness is quite startling. At the beginning of October, Venus has an apparent size of 12.1 arc seconds with the disc 85.4% illuminated, appearing similar in shape to the Moon a few days from full. By mid-November, Venus is only 73.7% illuminated but as the orbits of Earth and Venus bring the two planets closer, the apparent size of Venus increases to 15.2 arc seconds and shines with a brightness of magnitude 4.1. From a dark sky location, Venus is so bright that it can cast shadows!

Venus is similar in size and composition to the Earth with a diameter of 12,104 km but it’s here that the similarities end! With a dense carbon dioxide atmosphere and completely covered in clouds of sulphuric acid, Venus is one of the most inhospitable places in the Solar System. The atmospheric pressure at the surface of Venus is 92 times that of the Earth’s with a surface temperature of 470 degrees Celsius, hot enough to melt lead! In another bizarre twist, Venus turns on its axis in a slow, retrograde direction, against the direction of its orbital motion around the Sun, with one day on Venus taking 243 Earth days. Some amazing things to keep in mind as we gaze at this dazzlingly bright planet.

During October, Saturn continues to be a wonderful sight through a telescope and is located almost directly above Venus in the

constellation Ophiuchus (the Serpent Bearer) with the two coming to a close conjunction with the bright star

Antares on the evening of 29 October. Enjoy the last opportunities to view Saturn in the evening sky this year before the planet moves towards the sun in early November.

Turning to the North, three bright stars, Altair, Vega and Deneb form an asterism known in the Northern Hemisphere as the Summer Triangle.

Altair, or Alpha Aquilae, flanked by two fainter stars, shines at magnitude 0.76, and is the brightest star in the constellation Aquila, the Eagle. It is 16.8 light years distant and, being one of the closer stars to us, has a relatively high real apparent motion, moving by a degree in around 5,000 years. Altair is yellowish-white and is about 10.6 times as luminous as the Sun.

Well below and to the West of Altair we find the star Vega, or Alpha Lyrae, the brightest star in the constellation Lyra, the Lyre or Harp of Orpheus in Greek mythology. The fifth brightest star in the sky, Vega shines at magnitude 0.03 with a distance of 23.5 light years. Above Vega are four fainter stars of Lyra, forming a small parallelogram. Located between the top two stars of the parallelogram is M57, the Ring Nebula. Visible in small telescopes, the Ring Nebula appears as a small, ghostly ring of light. The Ring Nebula belongs to a category of objects known as planetary nebulae, a name coined by early observers due to their planet-like shape. Planetary nebulae are actually the ejected glowing ionised gases from a dying star located in the centre of the object. At a distance of 1,400 light years, the Ring Nebula glows at magnitude 8.8 and has an apparent size of 1.4×1.1 arc minutes.

To the East of Vega and closer to the horizon is the final star in the Summer Triangle, Deneb or Alpha Cygni, a blue-white star marking the brightest point in the constellation of Cygnus, the Swan. At a distance of some 1,400 light years, Deneb is one of the most luminous stars known,

shining with a brightness of 54,000 times that of the Sun! Luckily for us, its distance places Deneb as the 19th brightest star in our sky.

Rising in the North-East in early October, and progressing across the northern sky through the next couple of months, is the constellation Pegasus, the winged horse of Greek mythology. An aid to identifying Pegasus are four stars of similar brightness, known as the Great Square of Pegasus representing the body of the horse, although the lower right star in the square, Alpheratz, is actually the brightest star in the constellation of Andromeda. To the West of the Square is the brightest star in Pegasus, Enif, (Arabic for “the nose” of the winged horse). Scanning the area just to the West of Enif with a pair of binoculars under dark skies will reveal the globular cluster, M15 just below naked eye visibility at magnitude 6.19. Through binoculars or a small telescope, M15 appears as a small fuzzy object, with larger instruments showing a mass of stars radiating from a bright central core. It contains several hundred thousand stars measuring about 175 light years across and is about 33,600 light years away. It has an apparent size of 2 arc minutes through a telescope and, at 12.2 billion years of age, is one of the oldest globular clusters known.

Returning to Alpheratz in the Great Square, we find a trail of stars leading down towards the northern horizon. To the left of this trail of stars from a dark sky site, you may notice a small patch of faint light. This is the Andromeda Galaxy, M31, the most distant object visible to the naked eye, located approximately 2.54 million light years away. This spiral galaxy is very similar to our own Milky Way Galaxy and has been estimated to contain around one trillion stars. Through larger telescopes, the Andromeda Galaxy is a fascinating object at low to medium powers, showing many structural details and two satellite galaxies, M32 and M110. Finder charts for the Andromeda Galaxy and M15 are provided on page 18, together with an online link to free printable pdf charts for many more astronomical objects. Happy star-gazing! ☆

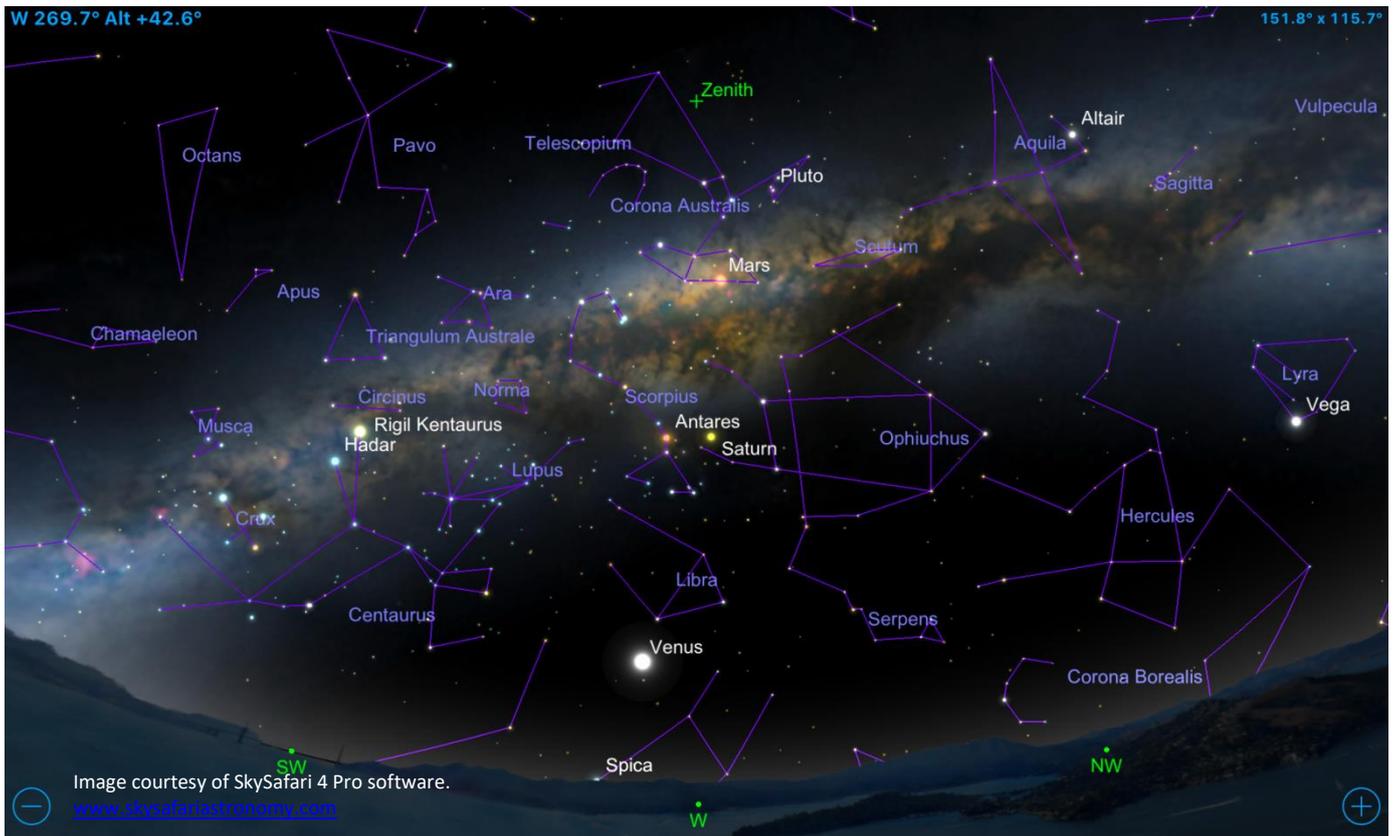


Phase of Venus on 15 November 2016. Image courtesy of SkySafari Pro software.
www.skysafarilastronomy.com

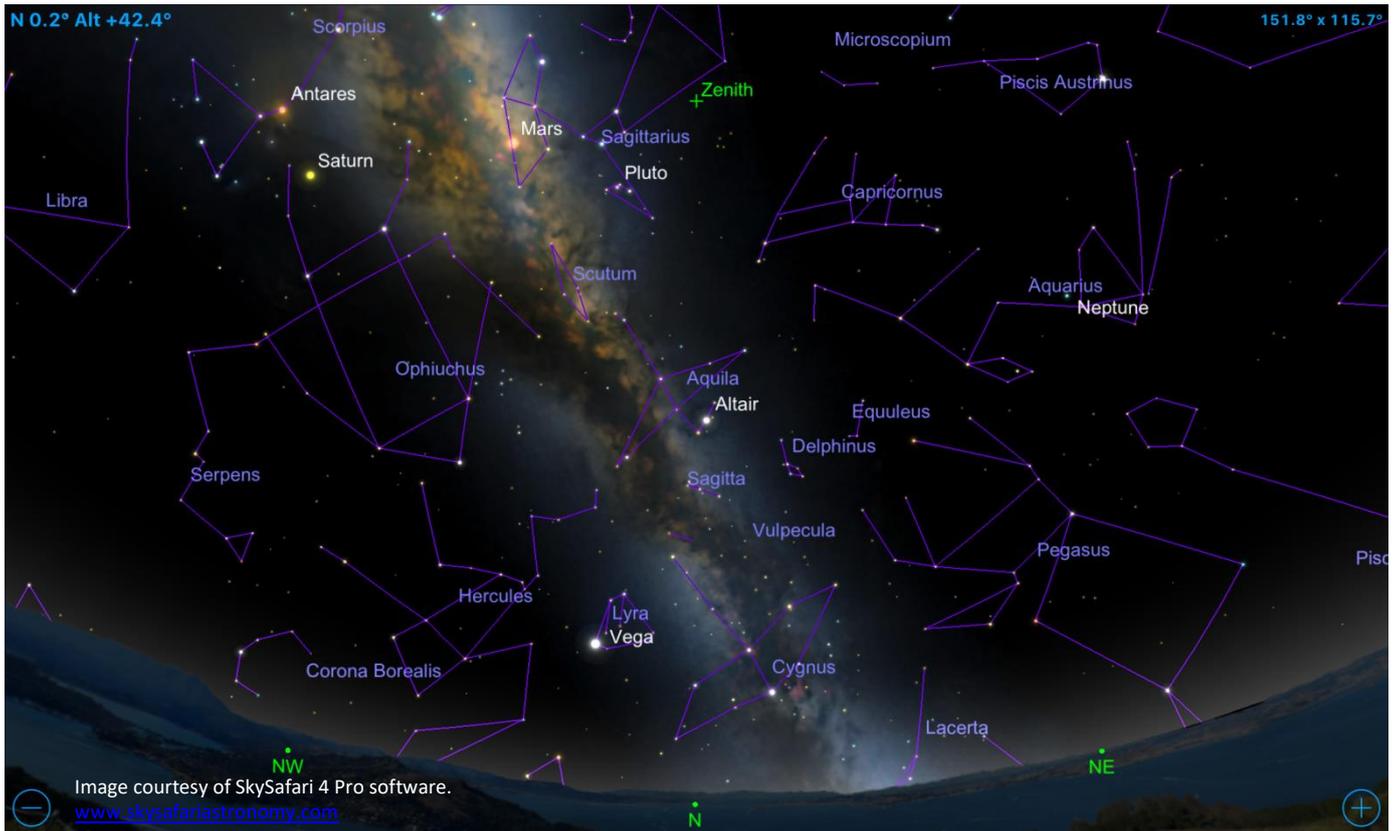
Evening Sky Maps

The following set of maps show the evening sky views to the West, North, East and South on 1 October and 1 November, 2016, approximately one hour after sunset from the Tamworth region. The images have been provided by SkySafari 4 Pro software - www.skysafariastronomy.com An all-sky map, together with a list of forthcoming astronomical events (free for personal printing), is available online at www.skymaps.com/downloads.html - scroll down to the latest Southern Edition and download the pdf file.

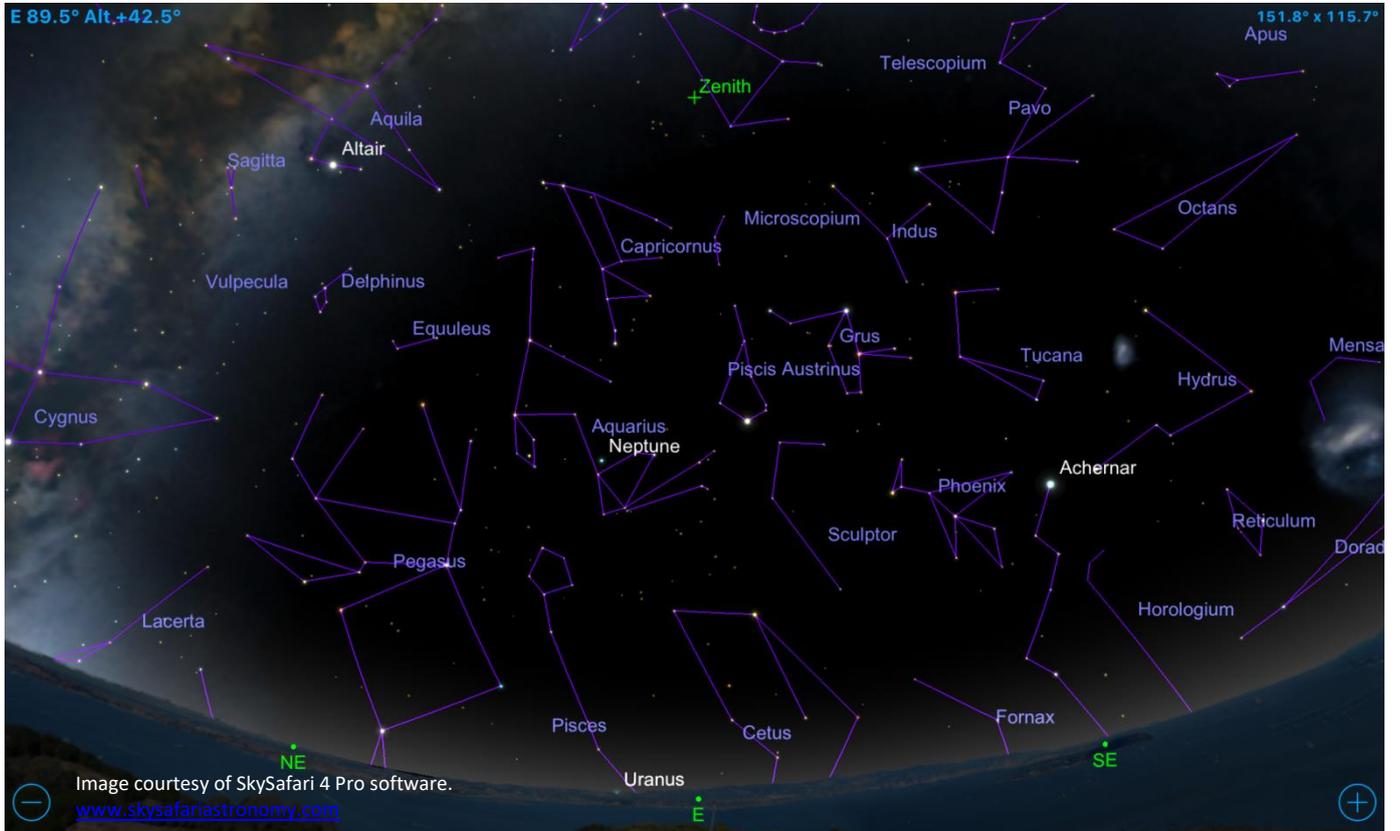
Looking West – 1 October, 2016



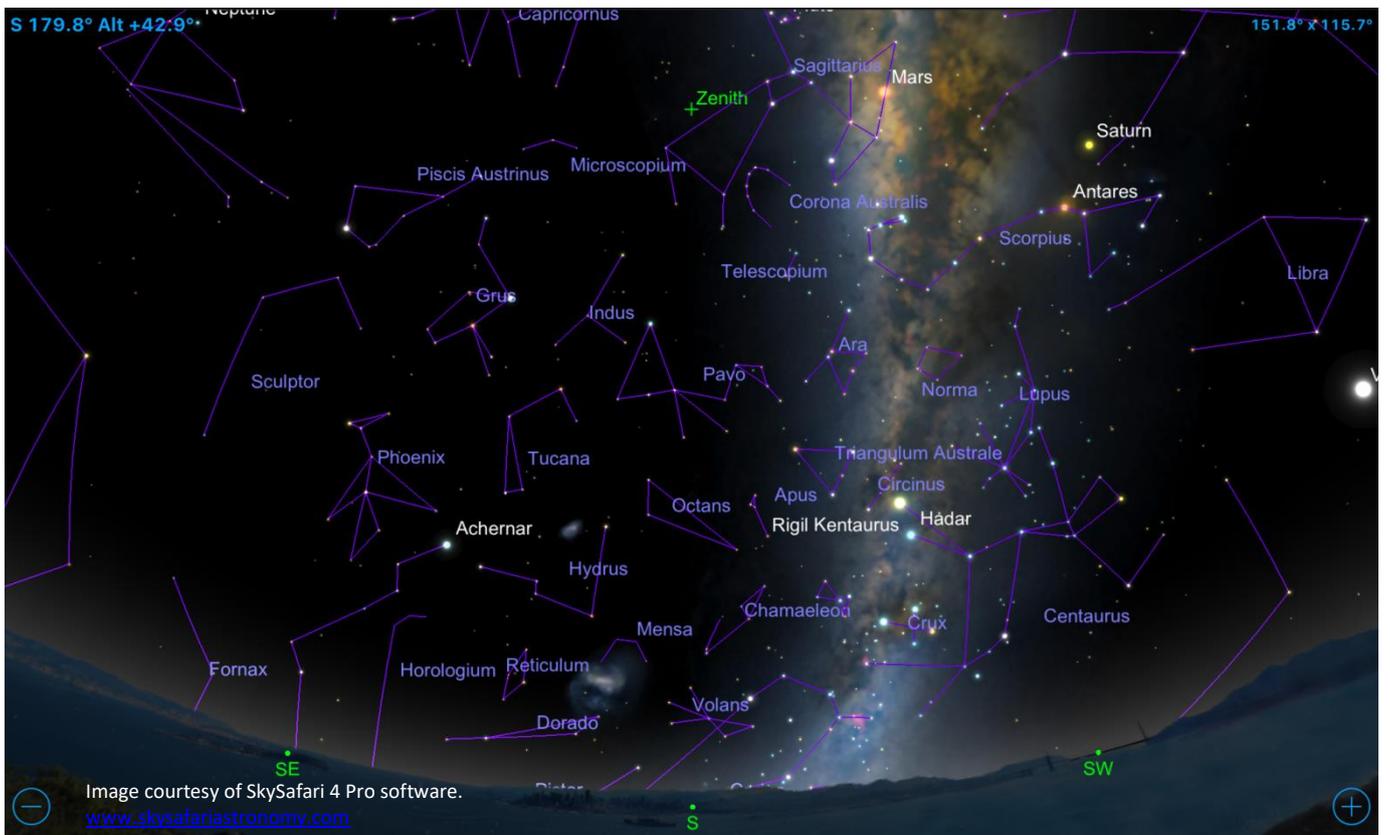
Looking North – 1 October, 2016



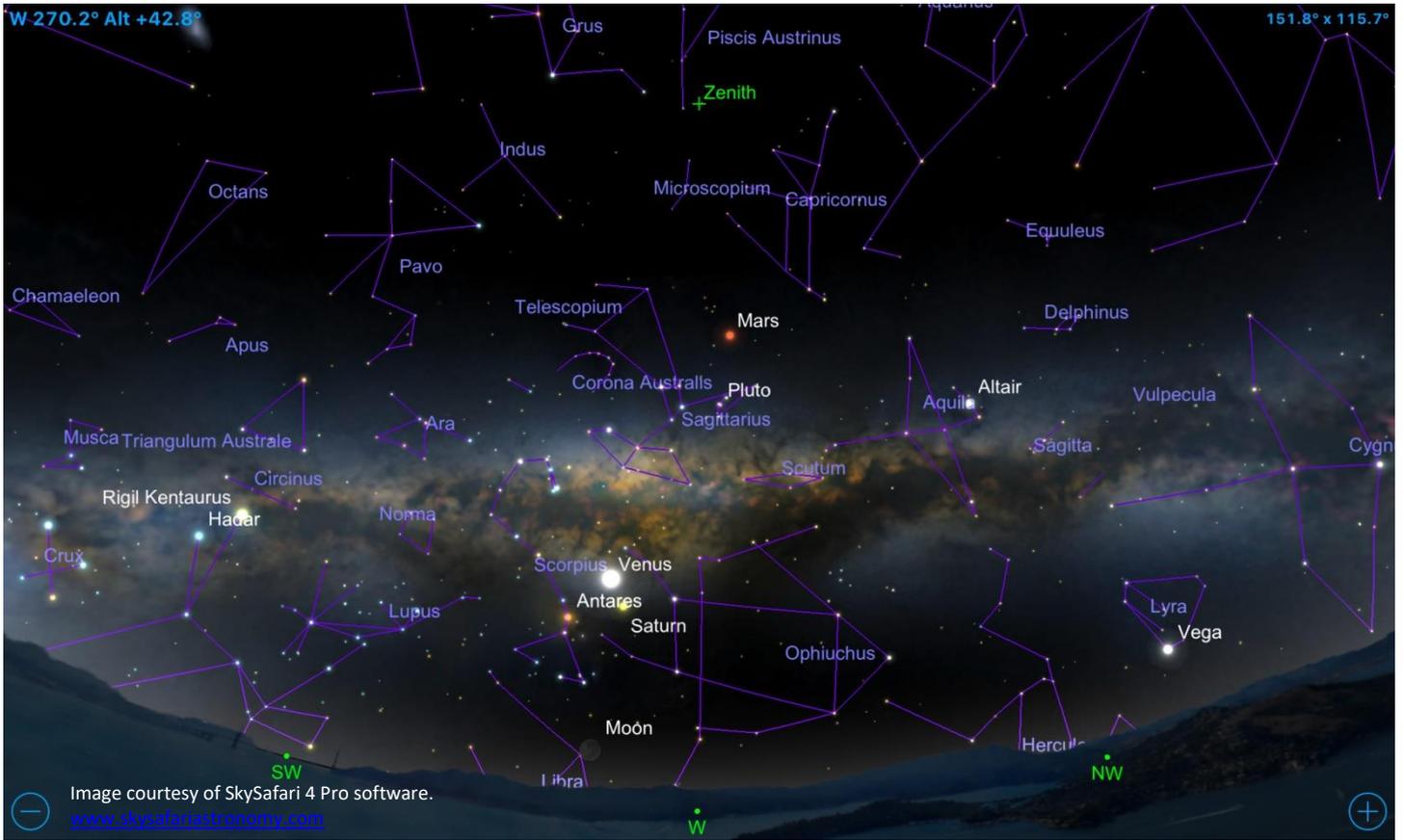
Looking East - 1 October, 2016



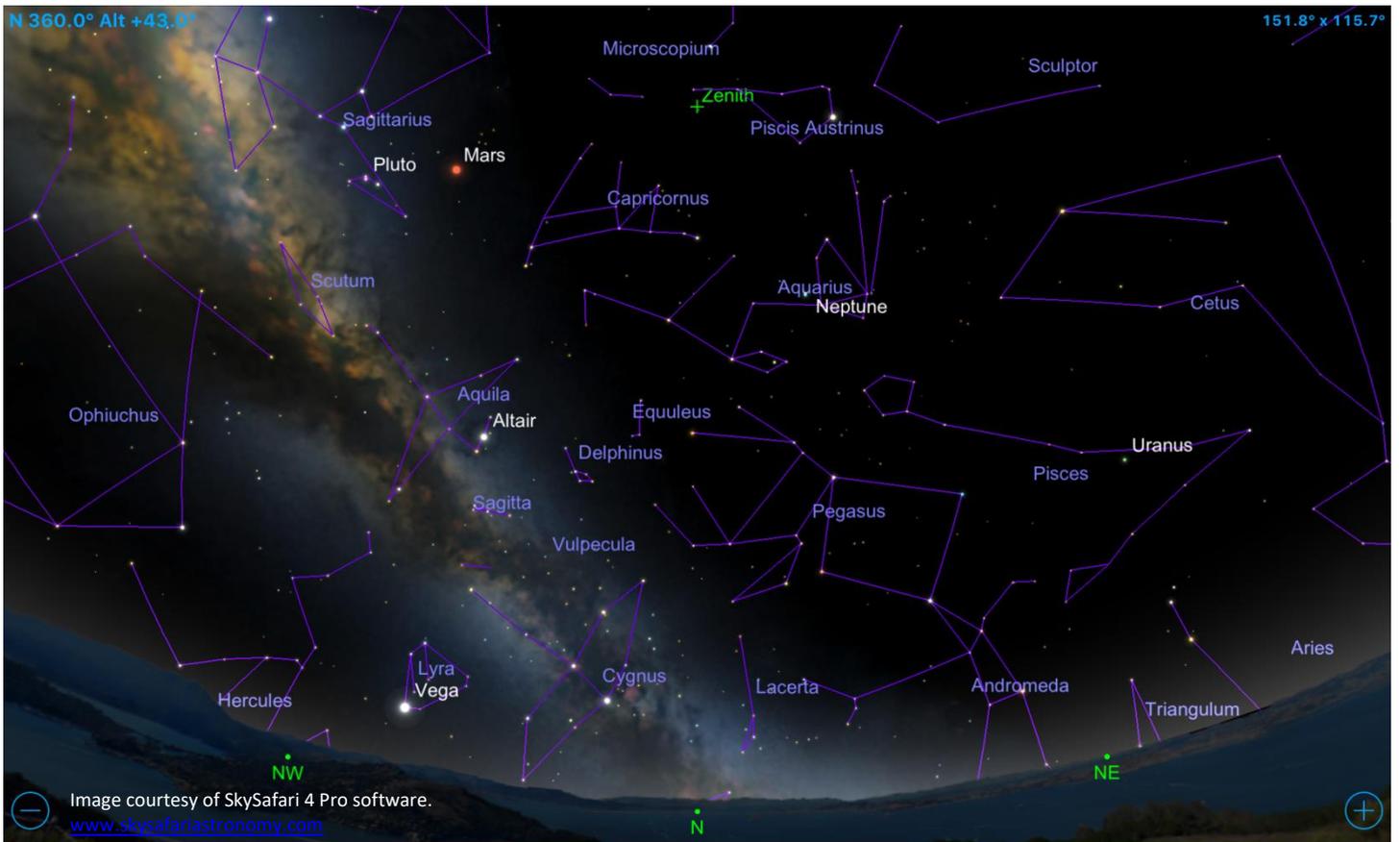
Looking South - 1 October, 2016



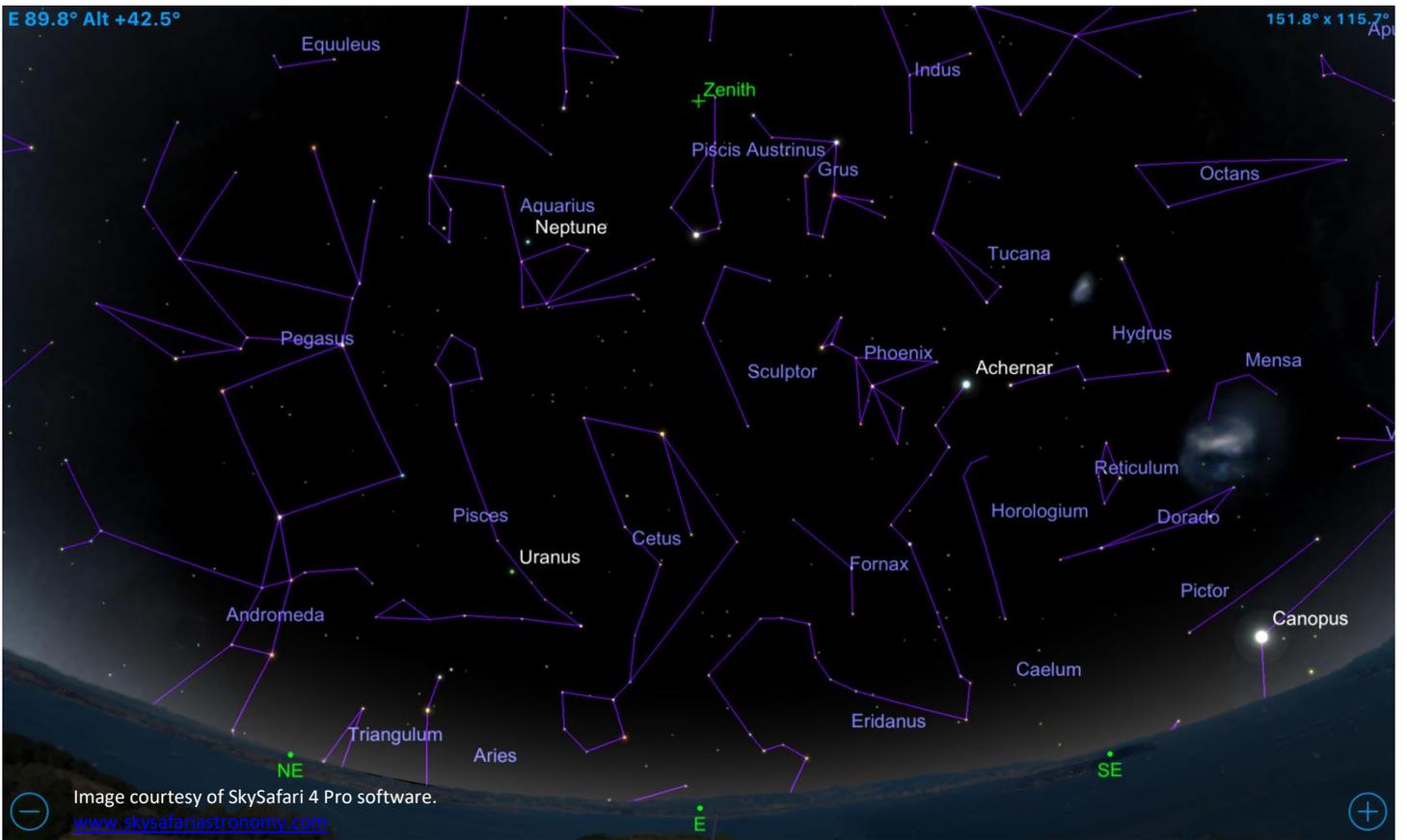
Looking West – 1 November, 2016



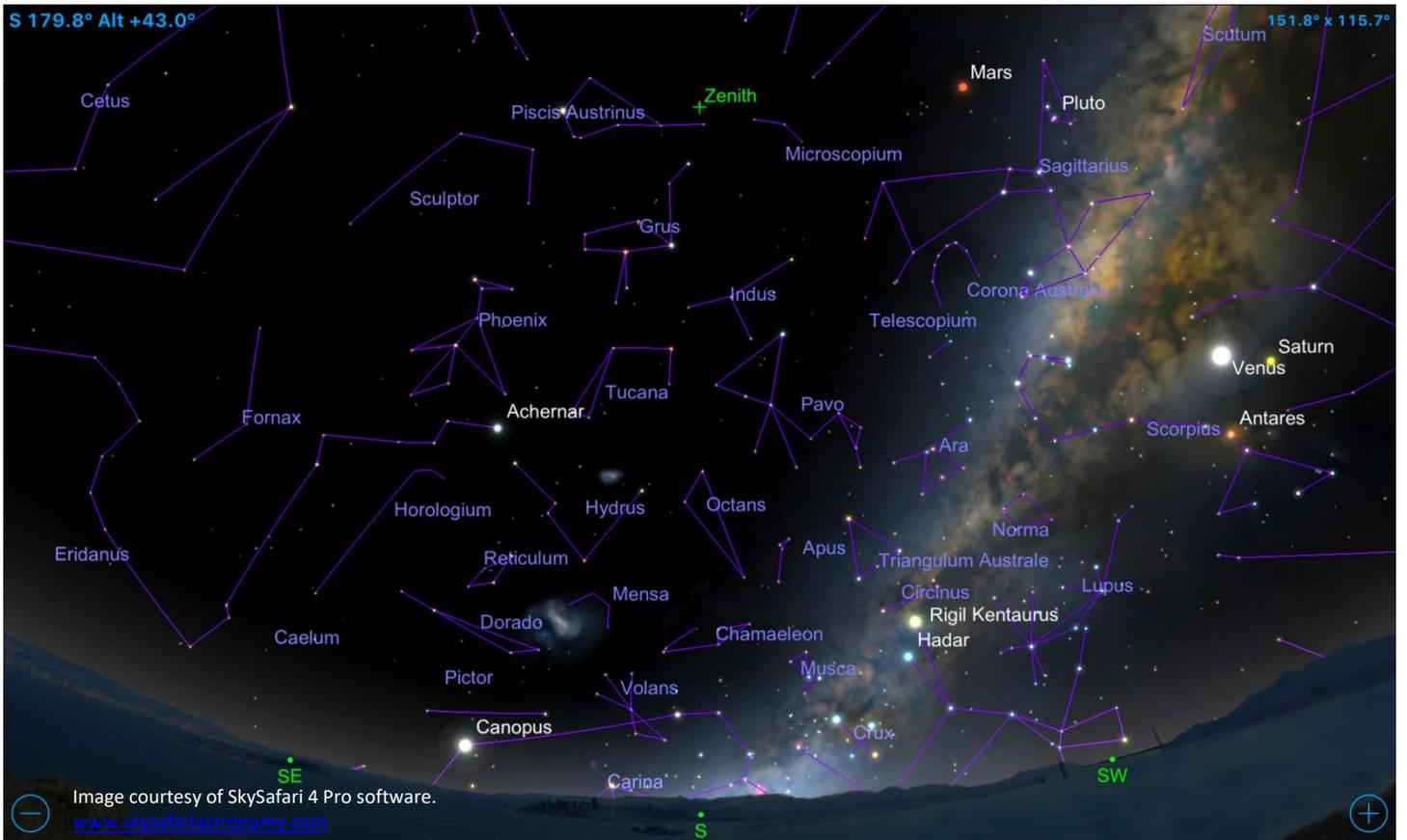
Looking North – 1 November, 2016



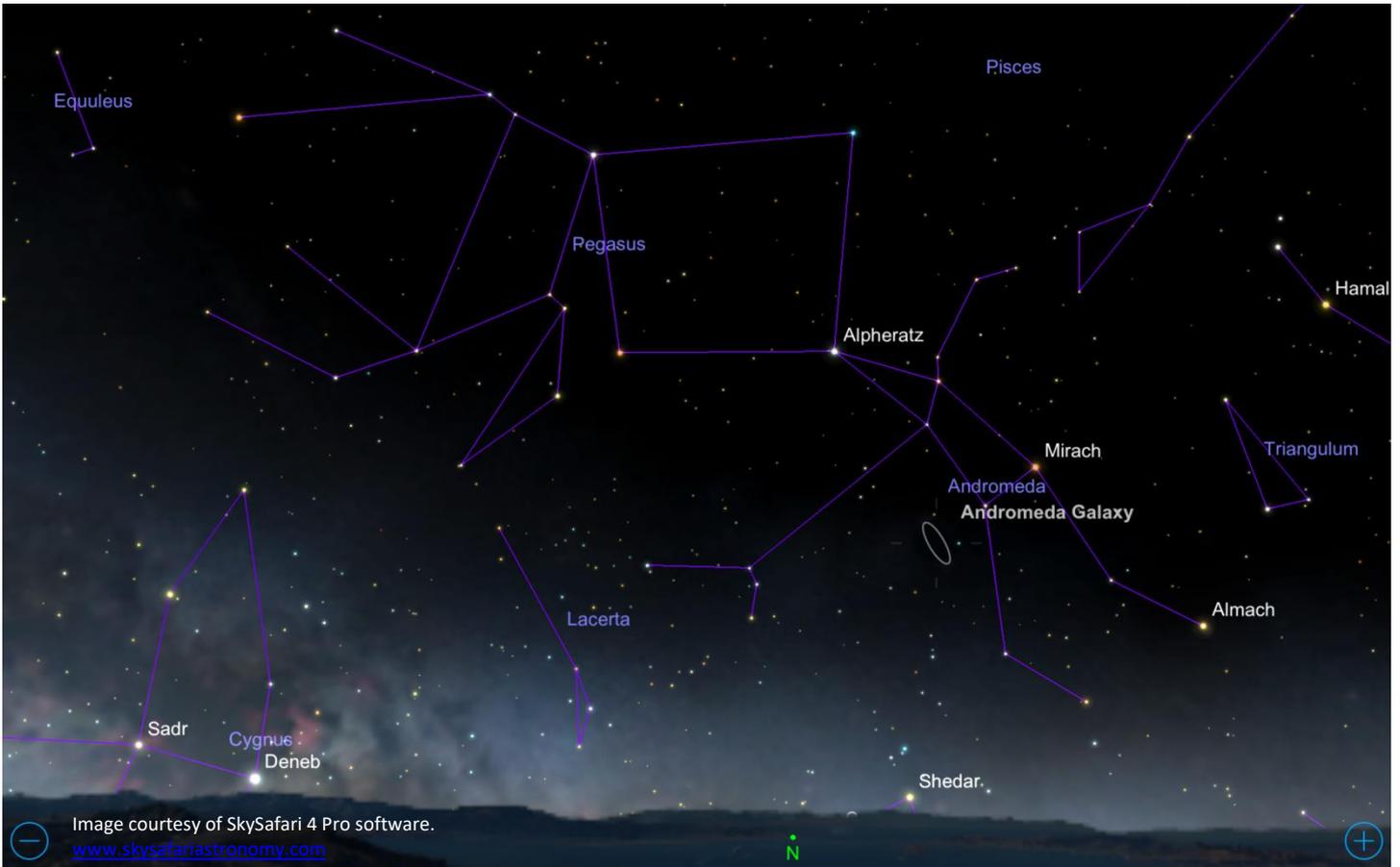
Looking East – 1 November, 2016



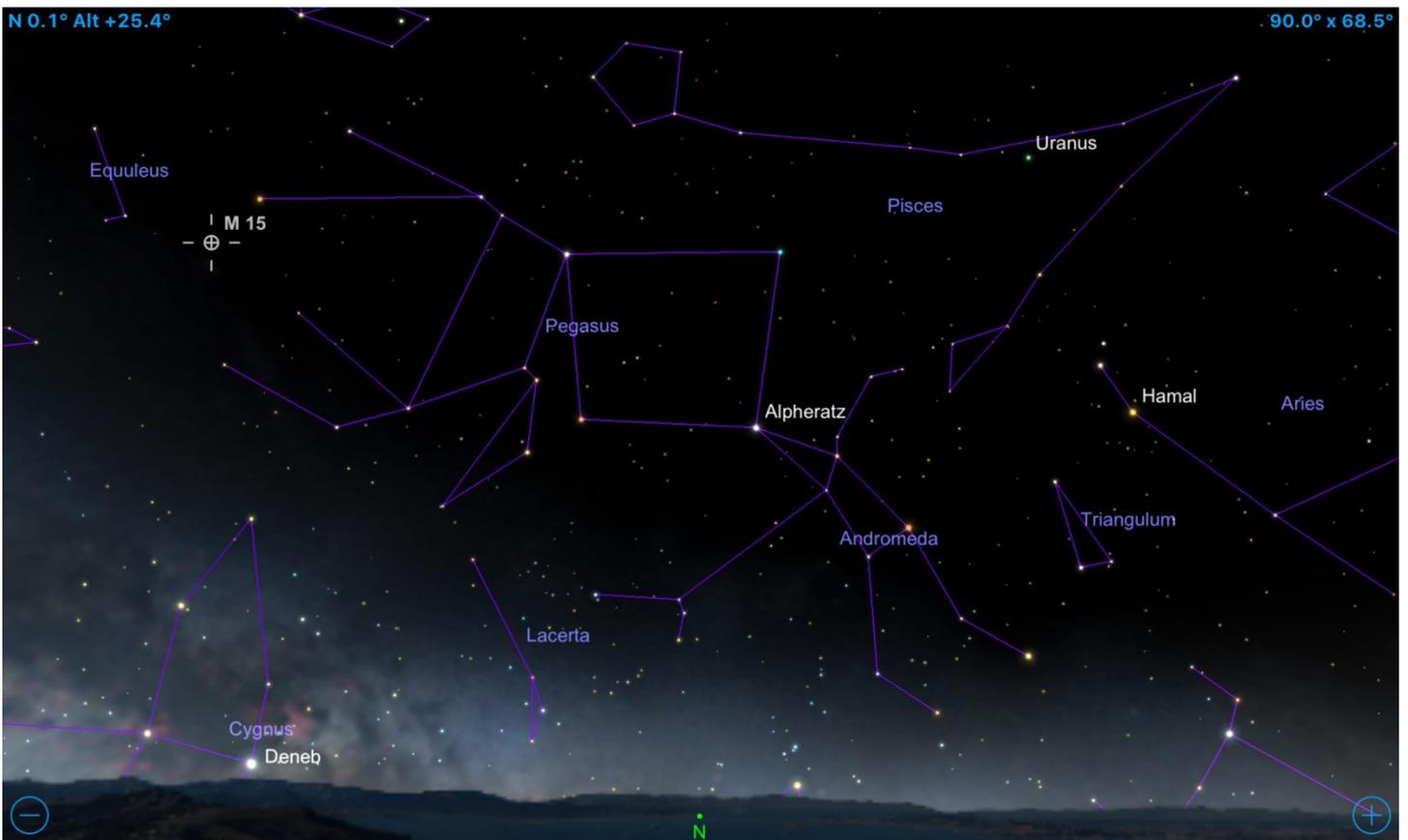
Looking South – 1 November 2016



Andromeda Galaxy finder chart – Looking North at 10.00pm on 1 November, 2016



M15 finder chart - Looking North at 10.00pm on 1 November, 2016

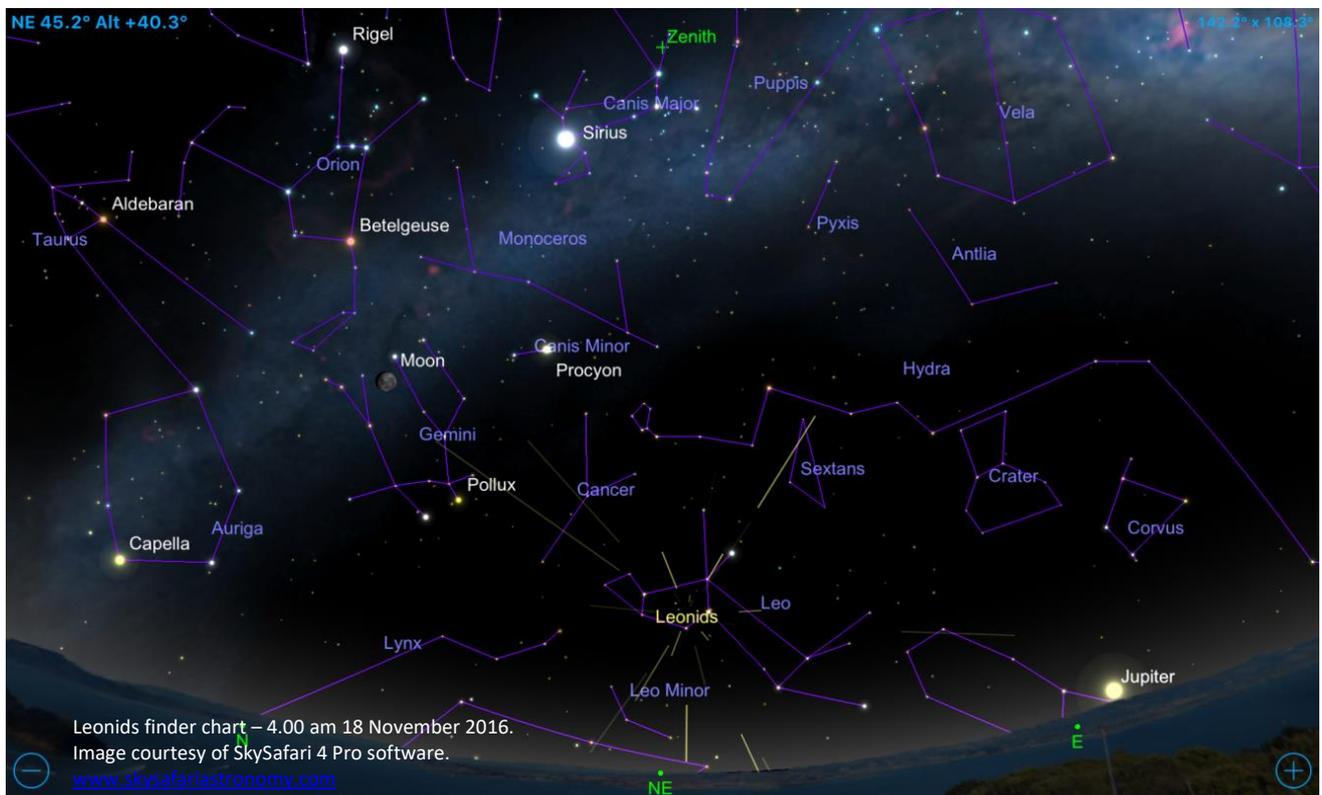
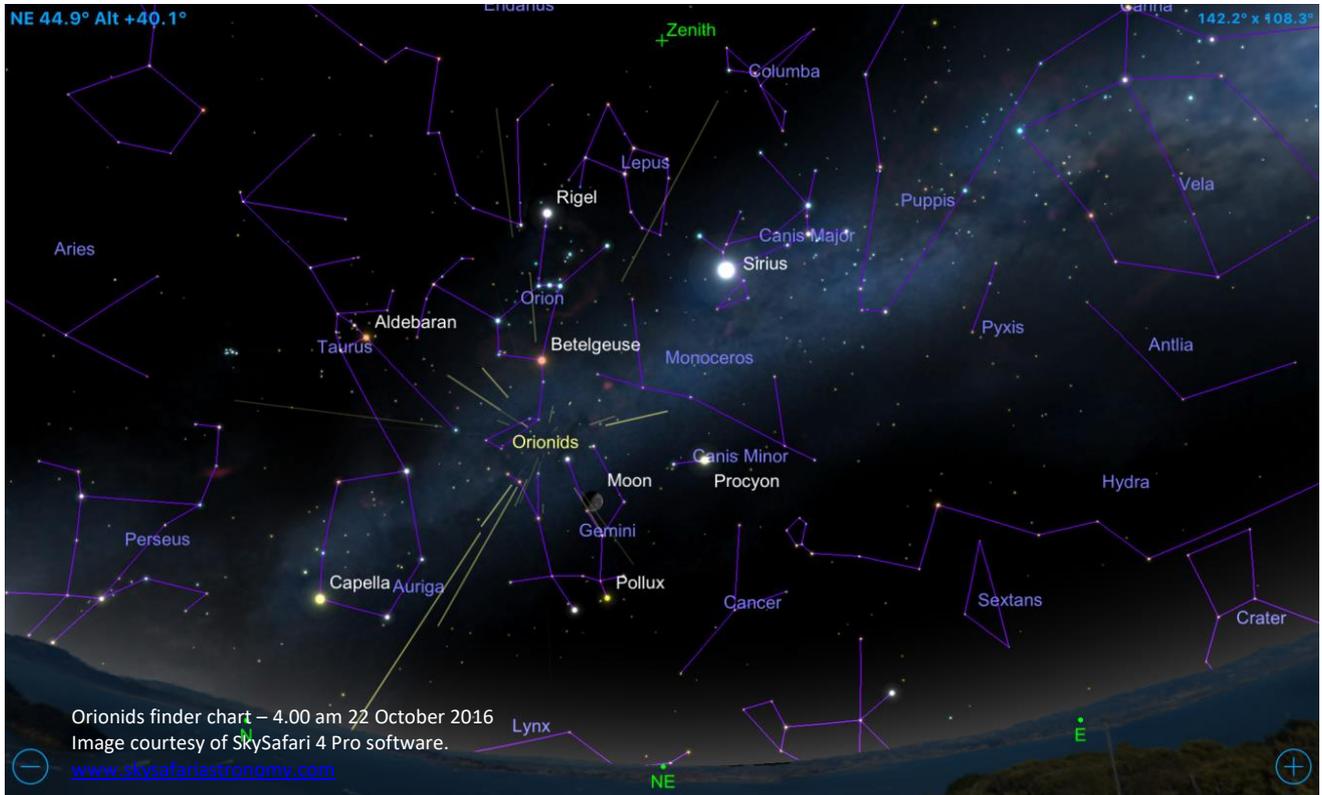


Free printable finder charts for many other astronomical objects are available online at <http://freestarcharts.com>. Remember to turn them upside down for our view in the Southern Hemisphere!

Meteor Showers

DURING OCTOBER and November, there are two notable meteor showers, the Orionids which peak on 21/22 October and the Leonids which peak on 17/18 November. While the light from the Moon will affect both showers this year, it may be worth venturing outside an hour or two before dawn on or around these dates to catch a glimpse of these meteors. The Orionids originate from particles left by Comet Halley and typically produce around 10-20 meteors per hour, radiating from a point near Betelgeuse in Orion.

The Leonids have been famous for producing meteor “storms” at approximately 33 year intervals with the last major events in the late 1990’s/early 2000’s. The Leonids originate from the debris of Comet 55P/Tempel-Tuttle and are expected to produce a similar number of meteors as the Orionids. As the name suggests, the Leonids appear to radiate from a point near the constellation of Leo. The number of meteors visible will be affected by the Moon which this year will be three days past full. ☆



TRAC Raffle Winners!



Winners are grinners! Treasurer Stuart Goff presents TRAC's raffle winner, Mick Davies, with his new 8" Sky Watcher telescope. Congratulations and well done Mick, we hope you have many enjoyable evenings under the stars with your new 'scope!
Photo by Warwick Schofield.

THE TAMWORTH Regional Astronomy Club's raffle was officially drawn by Dr Stephen Kane at the conclusion of his presentation held at the Tamworth High School auditorium on Wednesday, 27 July, 2016. The first prize of an 8" Sky Watcher Dobsonian telescope was won by Mick Davies (pictured above). Second and third prizes of a pair of binoculars were won by Chris Thompson and Mick Ross. Congratulations to our raffle winners and we hope you enjoy your prizes!

Thank you once again to everyone assisted with the selling of tickets which has greatly helped to raise much

needed funds for the Club during our first year of operation. TRAC would also like to once again extend a sincere thank you to [New England Instrument Company \(NEIC\)](#) for the fantastic deal they provided in supplying the prizes. We also again sincerely thank [AM Printing](#) for donating the cost of printing our raffle tickets. A reminder that NEIC has offered a 10% discount to TRAC members for items purchased at their store.

We hope to run another raffle in the coming months – watch this space for details!☆

Club shirts and jackets available

A REMINDER that TRAC members can order polo shirts, jackets and hoodies with our Club logo from [Monogram It/Hip Pocket](#) at 123 Bridge Street, Tamworth. If you would like to place an order, contact our Executive (see page 3 for contacts) to obtain an authorisation slip, then call into the store with the signed slip to check your size, place your order and confirm pricing. It usually takes around two weeks for items to be printed. The polo shirts are slightly different to

the sample pictured (the collar is blue), and all clothing items are available in male and female styles. Thank you once again to Sandy McIntosh at Monogram/Hip Pocket for assisting with the supply of these items.☆



Forthcoming meetings and events

Monday, 10 October, 2016

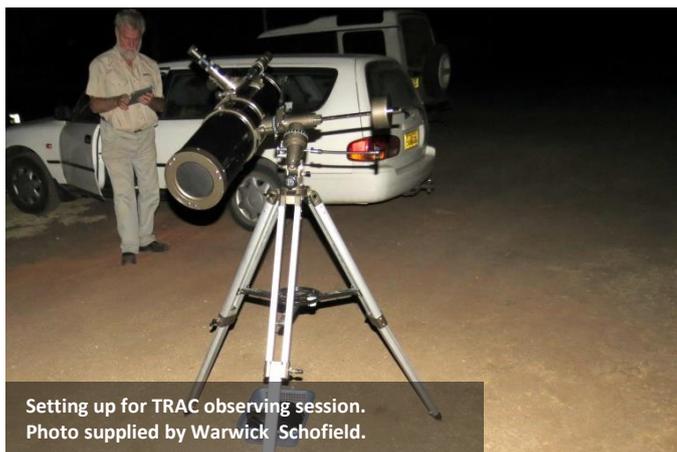
Monthly Meeting of the Tamworth Regional Astronomy Club Inc at Victoria Park, commencing with an Executive Committee meeting (all welcome) at 6.30 pm and followed by an observing session at 7.30 pm (weather permitting). An alternative indoor program will be held in the case of poor weather.



TRAC observing night at Victoria Park, Tamworth.
Photo by Warwick Schofield.



Discussing telescopes at a TRAC meeting.
Photo by Warwick Schofield.



Setting up for TRAC observing session.
Photo supplied by Warwick Schofield.

Saturday, 22 October, 2016

Technical Meeting of the Tamworth Regional Astronomy Club Inc, commencing at 6.00 pm with a BBQ. Location details and confirmation of the meeting will be e-mailed to TRAC members. In the case of poor weather, the meeting will be held at Victoria Park. For enquiries, please contact Secretary Garry Copper (see page 2 for contact details). Please check our website for any late changes.

Monday, 7 November, 2016

Monthly Meeting of the Tamworth Regional Astronomy Club Inc at Victoria Park, commencing with an Executive Committee meeting (all welcome) at 6.30 pm and followed by an observing session at 7.30 pm (weather permitting). An alternative indoor program will be held in the case of poor weather.

Saturday, 12 November, 2016

Technical Meeting of the Tamworth Regional Astronomy Club Inc, commencing at 6.00 pm with a BBQ. Special guest will be **Jos Roberts**, builder of TRAC's 36" telescope. Confirmation of the meeting will be e-mailed to TRAC members. In the case of poor weather, the meeting will be held at Victoria Park. For enquiries, please contact Secretary Garry Copper (see page 3 for contact details). Please check our website for any late changes.



Stuart Goff inspects the 'Jos Roberts Telescope',
TRAC Technical Meeting, 13 August, 2016.
Photo by Leigh Tschirpig.