

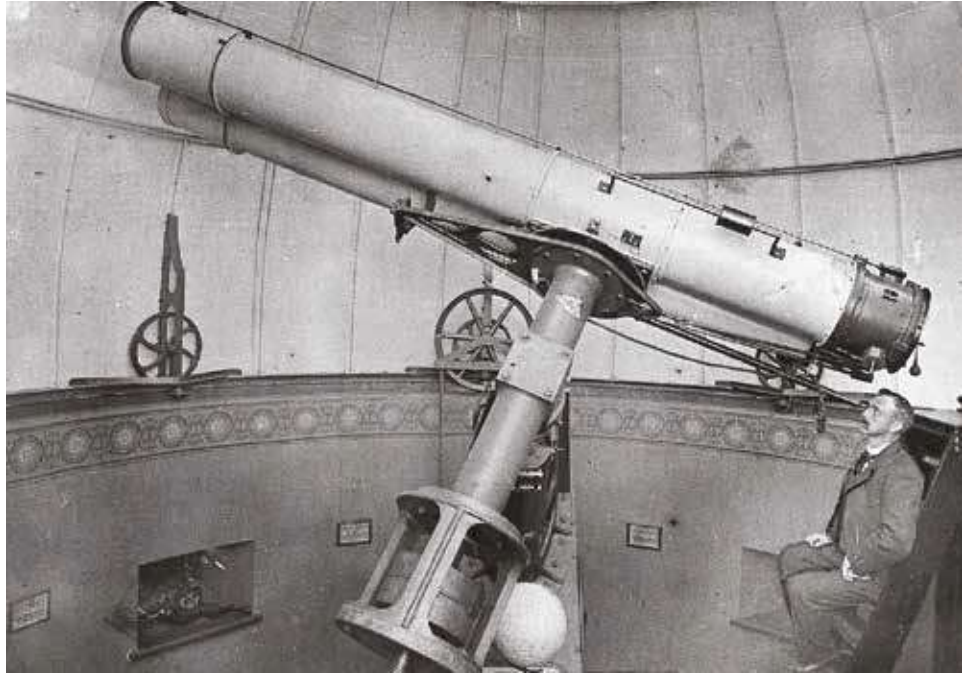




Gazing upwards, moving forwards

by Matthew Woods, Roger Groom,
Greg Lowe and Rhianna King

For more than 119 years, the Perth Observatory has provided a gateway to the galaxy for awed school students, a community of amateur star gazers, and local and visiting professional astronomers. It has also contributed valuable information to international collaborations and made some exciting discoveries. A new partnership agreement between Parks and Wildlife and an active and passionate group of volunteers marks a new chapter for this amazing facility and the future of astronomy in Western Australia.



The stars, planets and galaxies that light up our sky have enchanted and interested people for millennia. What we now term ‘astronomy’ – the study of celestial objects – was undertaken first by Aboriginal people who used stories to interpret tides, eclipses, and astronomical events such as comets and meteors. They also used the changing positions of stars and planets, and the rising and setting times of the sun and moon, to help interpret the seasons and guide what foods were available and when, and to determine when certain animals were more likely to be caught. Astronomy also played a profound role in Greek mythology and ancient philosophy. Philosopher Plato wrote “Astronomy compels the soul to look upwards and leads us from this world to another” and if what he said is true, then the Perth Observatory in Bickley is WA’s gateway to that other world.

LIGHT-YEARS OF HISTORY

The first proposal for an Observatory in Perth was made by Premier John Forrest in 1891. It took five years until the first foundation stone was laid at Mt Eliza, on the site that is now Dumas House opposite Kings Park, and another year and seven thousand pounds to complete. The Observatory operated on this site until 1963 when the new Perth Observatory was opened in 1966 at Bickley in the



Darling Range, 35km east of the city and 380m above sea level where light pollution that hindered star viewing was reduced. At this time the world was captivated by astronomy and this state-of-the-art facility enabled WA to contribute a number of significant discoveries and meaningful data to the international scientific arena.

TELESCOPES

The original Perth Observatory had two telescopes, the Astrographic Telescope (built in 1897 by renowned Irish instrument maker Howard Grubb and last used in 1999) and the Troughton & Simms six-inch Meridian Transit Circle Telescope (built in 1899 and decommissioned in 1957). While old in age, the Astrographic Telescope took more than 28,000 glass plates which helped to discover 29 asteroids between 1970 and 1999.

Previous page


Main Domes at the Observatory house powerful telescopes.
Photo – Roger Groom

Above left The Observatory can be visited during the day for tours as well as at night.
Photo – Matthew Woods

Above William Ernest Cooke, Western Australia’s first Government Astronomer.
Photo – Perth Observatory

The Meridian Transit Circle Telescope was used to accurately determine Perth’s longitude position, which meant the Observatory could provide the citizens and transport services of WA, as well as ships off the coast of Fremantle, with the exact time. The Meridian Transit Circle Telescope was also used to determine an accurate trig point for Perth which allowed for better surveying. It is now on display in the foyer of the Observatory’s main office in Bickley.

In 1910, the Perth Observatory took ownership of its third telescope. The 12-inch reflector Calver Telescope (fashioned by George Calver) was sent to WA for the 1910 passing of Halley’s Comet but unfortunately it missed the pass due to missing parts and malfunction. Although it missed the pass, the Calver Telescope was taken on the 1922 Wallal



“Today, while the science is more advanced, and the telescopes are more powerful, the wonderment and awe of those who visit remains the same.”

Above Night tours are popular from September to May.

Photo – Roger Groom

Left The roof of the domes open to reveal the sky.


Photo – Matthew Woods

better understand Halley’s Comet including discovering jets of Copernicium gas on the comet. In addition, the Astrographic Telescope was responsible for producing 10 per cent of all the ground-based observations. These were used to guide the ESA spacecraft Giotto which flew by the comet. Both telescopes enabled the Perth Observatory to play a significant role in the international study of this once-in-every-76-year-event.

In 2006 using gravitational lensing (where light from a distant star is bent and magnified by the gravity of a foreground star and planet causing an additional small increase in the intensity of magnified light), the Perth Observatory and the European Southern Observatory La Silla Observatory in Chile discovered a super-earth exoplanet, which was gifted the unceremonious name OGLE-2005-BLG-3901b.

OUT-REACHING TO THE STARS

The Perth Observatory’s long-running outreach program dates back to its roots at Mt Eliza when people visited the facility to view the stars and attend public lectures using a 12.5-inch Calver telescope which is still in use now. Today, while the science is more advanced and the telescopes are



Solar Eclipse Expedition where it was used at Eighty Mile Beach, between Port Hedland and Broome, to assist in the photography conducted by Lick Observatory personnel. With these plates, the expedition was able to perform calculations to further confirm Einstein’s theory of general relativity. The Calver was restored in 1996 and is still used today during night tours of the Observatory.

The year after the facility opened in Bickley, it took delivery of a Repsold 19cm Meridian Transit Circle telescope from the Hamburg Observatory as part of a four-year project. The telescope was the first automated multi-slit photoelectric micrometer of its kind in the world. Using this telescope, a German expedition of astronomers and Observatory staff produced the Perth 70 Meridan catalogue, which provided important data on star

positions in the southern hemisphere night sky. The telescope remained on loan after the German expedition left and was used to compile the Perth 75 and Perth 83 catalogues before being returned to Germany in the late 1980s.

In 1971, the Observatory’s arsenal of telescopes was bolstered with the addition of the Lowell 61cm reflector telescope, which was installed as part of NASA’s International Planetary Patrol Program to continually photograph atmospheric and surface features of the planets. The program involved seven telescopes around the world and focused on Jupiter and Mars as well as Saturn. It was this telescope that collected the images in 1977 that contributed to researchers concluding that Uranus is surrounded by rings.

In 1985–86 the Lowell Telescope also produced images that helped astronomers



Above The moon's surface is visible through the Observatory's telescopes.

Photo – Matthew Woods

Top right Volunteers engage with a range of people through the Observatory's outreach program.

Photo – Roger Groom

Above right A 'celestial walk' at the Observatory maps out the planets by relative distance.

Photo – Matthew Woods

more powerful, the wonderment and awe of those who visit remains the same.

On certain nights from late-September through to May, the Perth Observatory offers night tours. The phase of the moon and the amount of cloud cover in the sky determine what visitors can see. On nights when there is a Full Moon, the telescopes focus on the moon's surface, while on 'dark sky nights' – when there's no moon – fainter objects such as the Tarantula Nebula in the Large Magellanic Cloud are easier to see. 'Moonlit nights' are when the detail on the moon is most visible and

star clusters and bright nebulae can also be seen. On occasion, a satellite or a meteor might flash past too, delighting those who see them.

These night tour evenings are run by experienced and passionate volunteers who demonstrate the telescopes and share their immense knowledge about the history of the Observatory, astronomy and the telescopes themselves which they tailor to the group's knowledge level. To ensure visitors can maximise their time at the facility, each telescope is manned by a volunteer who receives immense satisfaction from the 'WOW's and ensuing 'ohhs' and 'ahhs' that come from people as they peer down the eyepieces and off into another galaxy.

The Observatory also runs day-guided tours of the facility, where visitors enjoy a celestial sky show in a lecture room and look at the sun through a telescope. These tours are popular for school excursions and other group outings. A day visit to the Observatory can also be done as part of a whole day spent in the hills, which could

also include a trip into the surrounding national parks, including Beelu National Park where the Perth Hills Centre is located, a walk on the Bibbulmun Track or a ride on the Munda Biddi Trail, with lunch at one of the area's wineries. There's also a chance to spot some of the neighbourhood kangaroos that visit the Observatory grounds to graze on the lawn.

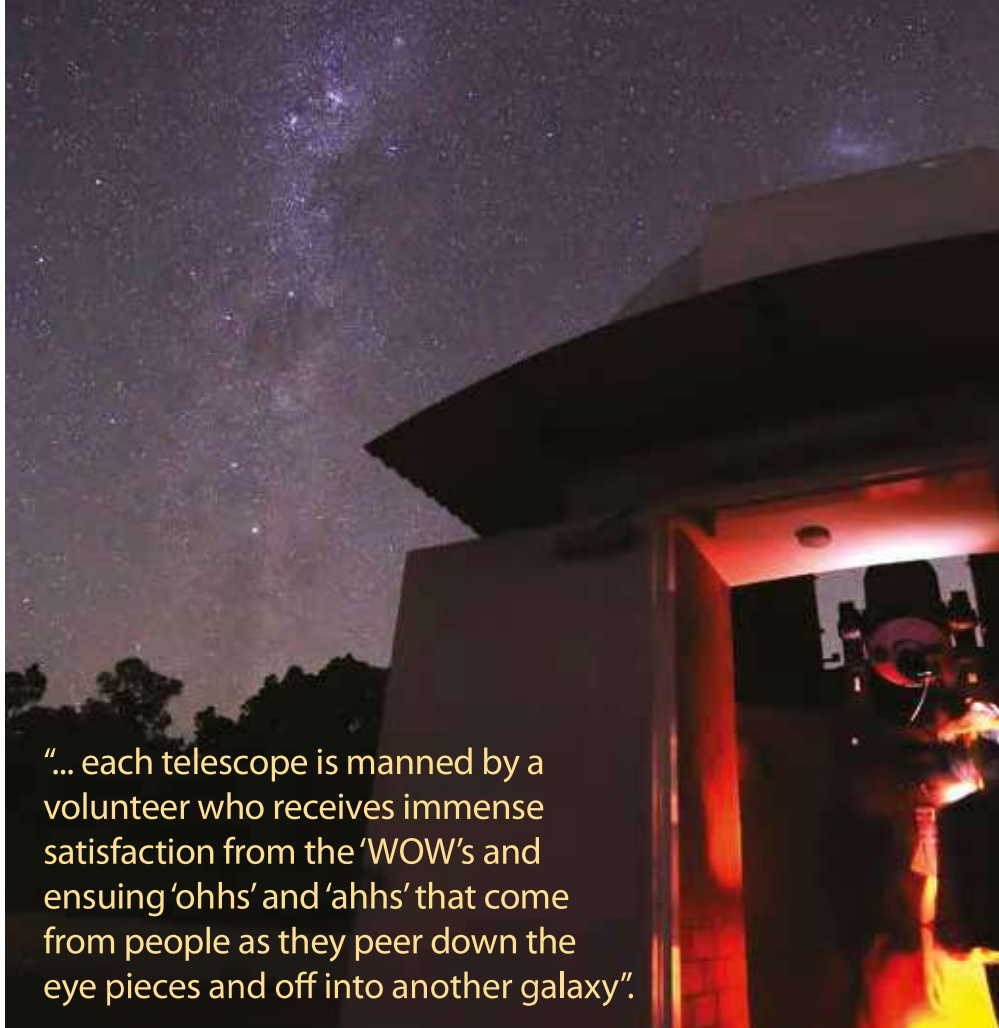
In an effort to diversify its potential as a world-class facility, the Observatory is also opening its doors to be hired for private functions such as weddings and conferences. It is also planning to expand its program to take the Observatory on the road and provide 'incursion'-type experiences to groups off-site.

For those who would like to 'own' their own piece of space, the Perth Observatory runs an adoption program where stars are sponsored. This is popular among people who would like to honour someone who has passed away or celebrate the arrival of a new baby. It also has been known to be taken up by romantics looking for a grand gesture.



Above Perth Observatory Volunteer Group Secretary Christine Coulstock and Chairperson Diana Rosman with Parks and Wildlife Director General Jim Sharp and Science and Conservation Director Margaret Byrne.
Photo – Karla Graham/Parks and Wildlife

Right Visitors to the Observatory can view features of the night sky.
Photo – Roger Groom



“... each telescope is manned by a volunteer who receives immense satisfaction from the ‘WOW’s and ensuing ‘ohhs’ and ‘ahhs’ that come from people as they peer down the eye pieces and off into another galaxy”.

Another way that people can engage with the Perth Observatory is through the Skynet telescope program through the University of North Carolina’s global network of telescopes called Skynet (<https://skynet.unc.edu>). Users around the world can operate the telescopes remotely, which is perfect for school students and researchers on the other side of the world who can look at our night sky during their day time hours. For another type of arm-chair astronomy, the Perth Observatory has developed an active and engaging online presence and uses its Facebook page and Twitter account to provide information about upcoming celestial events, promote the Observatory and engage with other astronomers and astronomical agencies and communities.

VOLUNTEERS SHINE

A management agreement between Parks and Wildlife and the Perth Observatory Volunteer Group was signed in June 2015 and sees the two groups partner to continue to expand the public

outreach program. The 80-strong force of volunteers who range in age from university students to retirees bring an extraordinary gamut of experience, skills and expertise to the Observatory. Their contributions range from answering email enquiries from home while juggling young children to working tirelessly to fix and maintain the telescopes, with a range of tasks in between.

Some of the volunteers have been with the Observatory for between 20 and 35 years while others have joined the group more recently, after answering a call for people to join the group in the last few years. Regardless of their length of service, the volunteers share an optimism that the public outreach program can be expanded and have hopes that the research aspects of the Observatory can get back up and running. Another thing the volunteers share is a genuine passion for astronomy, whether they developed it in their childhood while they watched the moon-landing or on camping trips while they gazed at the night sky. For some it’s something they developed later in life

when they were looking for an interest to occupy their post-work lives. And with enthusiasm like that, surely the sky’s the limit for this beloved institution.

Matthew Woods is a volunteer and marketing/media coordinator for the Perth Observatory Volunteer Group as well as a bonafide space nut.

Roger Groom is a software developer/consultant by day, astrophotographer and amateur astronomy researcher by night and landscape and nature photographer by the weekend.

Greg Lowe is a Perth Observatory volunteer and worked as an astronomical officer for more than 41 years.

Rhianna King is a *LANDSCOPE* editor. She can be contacted on (08) 9219 9903 or by email (rhianna.king@dpaw.wa.gov.au).

The authors would like to acknowledge material gleaned from ‘Perth Observatory History’, compiled by Heritage Council historian Wayne Moredoundt for the Perth Observatory heritage listing.

Tips for viewing the night sky

- Viewing the night sky can be as easy as stepping out your back door at home or taking a weekend drive to a country location for dark skies. The darker the sky of your location, the less light pollution, the more stars, galaxies, nebulas and other objects you are going to see.
- In typical suburban Perth with just your eyes you will see the bright stars and planets, and maybe a faint hint of the Milky Way snaking across the sky. If you're on the fringe of Perth city you will see a lot more, including the definite structure of the Milky Way as well as large and small magellanic clouds, both being companion galaxies of our own Milky Way.
- To view the night sky let your eyes adjust for at least 15 minutes, without bright lights such as phone screens and outdoor lights around you. The stars will seem to appear as your eyes adjust.
- Binoculars are great for stargazing. Ideally they would be a medium quality set of 30mm to 50mm aperture and low magnification (up to 10x magnification). The combination of large aperture and low magnification will make your viewing experience more rewarding.
- Over time you might try to perfect the art of 'averted vision'. By using the receptors at the sides of your eye you will be able to see faint detail in the night sky more clearly. Try glancing to the side of where you want to look, and looking at the object out of the corner of your eye. It takes some practice but can let you see much more.
- If you wish to graduate from binoculars to a telescope, do so after you have familiarised yourself with the night sky and are able to invest more than \$500 in the telescope, as cheaper telescopes are rarely better than a good pair of binoculars (which might be worth about \$200). You should invest some time in researching your options and consider portability, usability and stability of the instrument.



Right Southern Cross.
Photo – Roger Groom

Aboriginal Dreaming

Aboriginal people are regarded as the world's first astronomers. They used the changing position of the stars and planets and the rising and setting times of the sun and moon to help guide what foods were available and determine the behaviour of certain animals. They used stories to interpret tidal movements, eclipses and astronomical events. These stories vary between language groups and played an important role in their spiritual connection to country.

The story begins with the tale of two spirit people – a man and a woman. The spirit people were standing in the dimness listening to the other spirits singing and dancing. They towered over the landscape when they spotted shining eyes on the ground all around them.

"They became inquisitive, as they just had to find out what all these little shining eyes were.

So over they walked and the spirit woman bent down and picked up a pair, and when she realised that they belonged to this beautiful little spirit child, she became so emotional that she could not bring herself to put the child back on the ground so she put it in her hair. This huge spirit woman had beautiful long white hair that flowed right down her back. She saw another little child so she collected that one to put it into her hair, and then another, and another...

The spirit woman wandered right down through the south around up past where Perth is today, all the while she was collecting the spirit children. By this time there were many thousands of the children in her hair, which was by now tied up like a net...

... one of the children became loose and fell, the instant it hit the ground it turned into stone and the stone was strong enough to hold up the sky ... as she ran across the country with the children falling from her hair she left a trail of stones all along the way.

I know that we have all been outside on the dark night and seen a shooting star streak across the sky, I have heard some people say make a wish, when we see this we always say *by-ee coolunger nyina*, which means little spirit children returning to earth. When they reach earth they are nothing more than a little stone, some are a bit bigger than others, and some don't make it at all.

The spirit children return to earth all the time, with a known pattern of large showers about every 33 years, that is when we believe that our spiritual energy is at its strongest."

This is an abridged version of a story written by Noel Nannup called 'Carers of Everything', which was included in the Swan Region Strategy for Natural Resource Management.

Background and top
William Bay National Park.
Photo – Peter Nicholas/
Parks and Wildlife

Above Geminids meteor
shower.
Photo – Roger Groom



Perth
Observatory

Explore the night sky with LANDSCOPE

Night sky
Feature
lift-out

Orion Constellation

The Constellation of Orion is one of the most easily recognised constellations in this area of the night sky, whether you know it as Orion or give it the more typical Australian name 'The Saucepan', you are sure to recognise it when above the horizon. Summer is the time to look at Orion, and with many telescopes being given as Christmas presents, it is often the first area people see. Orion contains the easily distinguished red supergiant star Betelgeuse, the bright Great Orion Nebula (within Orion's Sword), the Flame Nebula (at one end of Orion's Belt) and many other features distinguishable through binoculars or a telescope.



Pleiades

Pleiades (also known as the Seven Sisters) is an open cluster of bright distinguishable stars, which from our southern hemisphere location appears high in the north. With photography the cluster shows brilliant blue nebulosity. The cluster is approximately 440LY distant and about 20LY large. To the unaided eye Pleiades appears as a small group of bright stars about two degrees wide (four times the apparent size of the Moon). With binoculars many more stars become visible. This open cluster is best viewed with binoculars or a small telescope due to its large apparent size. Many different cultures around the world have varying stories regarding Pleiades due to its prominence in the night sky.



Enjoy a night under the stars

Visit the Perth Observatory for a night tour and you can see these objects plus more through one of the public viewing telescopes, housed in the white observatory domes. Knowledgeable guides at each telescope will help you make the most of your time at the eyepiece, and the host will talk to you about the greater night sky above. Bookings can be made at www.perthobservatory.com.au.

Adopt a star

The Perth Observatory runs a Star Adoption program where you can have your name registered in a database against a star of your choice. You get a private viewing session for you and a small group of your family/friends, a certificate, and help continue the education and outreach activities of the Perth Observatory through the licence fee paid.

When is it best to look at the night sky or join a tour?

Months	Best opportunities
December–March	Well-known constellations such as Orion, Gemini, Taurus, Cancer and Aries along with the open cluster Pleiades (Seven Sisters) dominate the northern horizon, while bright regions of the Milky Way, such as Eta Carina, rise in the south. Towards the end of this period Jupiter becomes visible in the north-east. This is a great time for all-round viewing.
April–May	The Southern Cross is high in the sky along with the spectacular Eta Carina as the core of the Milky Way including Scorpius rises in the east. Saturn and Mars become prominent in the east while Jupiter remains high in the north. Virgo is up in the north with our nearest galaxy groups.
June–September	The Milky Way is dominant overhead with all its glory and endless possibilities for viewing nebulas and star clusters. Saturn and Mars are high in the sky with Saturn at its best. Cold clear nights mean great opportunities for quality time under the stars, but rug up.
September–November	The Milky Way remains visible, setting in the west earlier but still with plenty to see. This is a time for galaxies with Fornax, Grus, Andromeda and Sculptor high in the sky. The Magellanic Clouds become star attractions as they rise in the south-east.

* Note: This information is appropriate for 2015–16 and will vary beyond that timeframe.

The night sky changes throughout the year, so you can plan your visit to the Perth Observatory for a time that suits what you want to see.

Every 27.5 days the Moon moves through a complete cycle of New Moon to Full Moon. The New Moon phase is the best time to view deep space objects such as nebulas, galaxies and star clusters. You will also see the Milky Way and Magellanic Clouds best during this phase. Full Moon will show you all the craters and shapes on the Moon, you can pick out where the Apollo craft landed, and still enjoy bright deep space objects such as bright star clusters and planets.

Weather, of course, has a big impact on viewing and January, February and May are generally regarded as best times for clear skies, with May recognised as Perth's best month for clear and steady night skies. While the middle of summer increases the chance of a clear sky, there is an increased likelihood of smoke, heat and dust in the air, which can impact viewing.

Above Perth Observatory at night.

Photos – Roger Groom (1,2) Geoff Scott (3) Matt Woods (above)



1. Alpha Centauri



2. Night tour at Perth Observatory



3. A lunar eclipse

Did you know?

The volunteers at Perth Observatory operate a robotic internet-connected telescope known as 'R-COP' under the Skynet international network of telescopes. This telescope is used for outreach activities with groups such as secondary students.

You can get involved in the Perth Observatory by becoming a volunteer. For more information email volunteering@perthobservatory.com.au.

Once a year the Perth Observatory hosts a summer lecture (the next session is scheduled for 9 February 2016). Come and enjoy the observatory grounds set amongst beautiful bushland, have a sausage sizzle or bring a picnic and listen to an entertaining talk.

The Perth Observatory is available for functions. Guests will be treated to a unique experience whether in the day or at night.