

Astronomer



Journal of the Tamworth Regional Astronomy Club Inc

Vol 6
2021

Feature

TRAC's New Home

Astronomy and Science Centre completed!

A look back

TRAC's first five years

Our historic 'new' telescopes

Uppsala Southern Schmidt Telescope
Automated Patrol Telescope/Baker-Nunn



Cover photo: Tamworth Regional Astronomy and Science Centre
Photo: Peter Hons
Background Moon image: Warwick Schofield

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Special commemorative
edition to mark the opening of
the Tamworth Regional
Astronomy and Science
Centre!



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Vol 6 - 2021



Tamworth Regional Council Acting Mayor and TRAC Publicity Officer Cr Phil Betts, with Vice-President Garry Copper and the Hon Kevin Anderson MP, NSW Minister for Better Regulation and Innovation and State Member for Tamworth (far right) addressing the media at the 'soft opening' of the Tamworth Regional Astronomy and Science Centre on 22 December 2020. Photo: Leigh Tschirpig

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We've come a long way! But the journey is just beginning...

Welcome to this special commemorative edition of *Astronomer* to mark the Official Opening of the Tamworth Regional Astronomy Club's new permanent home – the Tamworth Regional Astronomy and Science Centre!

Just over five years ago, a group of keen local amateur astronomers met to discuss the possibility of forming a regional astronomy club in the Tamworth area and in early 2016, the newly formed Tamworth Regional Astronomy Club (TRAC) became an incorporated organisation.

With great community interest in TRAC, its aim to promote the science of astronomy, its growing collection of large, professional sized telescopes which needed a permanent home, a rapidly increasing membership and enormous potential for astronomy and science related educational, research and tourism opportunities, Tamworth Regional Council (TRC) generously offered a portion of land at Victoria Park in East Tamworth for the establishment of a TRAC 'clubhouse'. This proposed facility, to be owned by TRC and leased to TRAC, would enable the Club to provide public access to its telescopes at a convenient location to residents in the Tamworth region at a reasonably dark location. These plans soon evolved into a proposed 'Astronomy and Science Centre (A&SC), Roll-off Roof Observatory and Planetarium Theatre' complex and Council subsequently lodged an application for NSW Government funding for this exciting community project which was successful. With in-kind assistance and amazing donations by Club members, ongoing community support and additional funding allocated to the project by Council, utilising economic stimulus assistance received from the Federal Government under the Local Roads and Community Infrastructure program during the COVID-19

pandemic, Tamworth is now home to one of the most modern and best equipped astronomy complexes of its type in Australia!

The Tamworth Regional Astronomy and Science Centre houses the Club's 36 inch 'Jos Roberts Telescope', one of the largest privately owned telescopes in Australia, the 32-inch Hewitt Camera, a former satellite tracking camera and one of only two built in the early 1960's by the British Government at a cost of some GBP £5.5 million, converted by TRAC to a modern digital astronomical imaging system, as well as many other large and historic telescopes.

To mark and celebrate the opening of the new Centre, this special edition of *Astronomer* features several articles from previous editions regarding these and other telescopes and equipment donated to TRAC, now housed at the complex, as well as an updated article on the development of the Centre and new articles on two more recent major donations to the Club: the Uppsala Southern Schmidt Telescope and the Automated Patrol Telescope (a converted Baker-Nunn satellite tracking camera), both of which were most recently stationed at Siding Spring Observatory for many years.

These and the other articles in this edition of *Astronomer* provide a chronology of some of the major highlights of the Club's acquisitions and activities since TRAC's formation and our plans for future activities and opportunities at the new complex. A sincere and heartfelt thank you to everyone who has helped to make this amazing Centre a reality and we look forward to sharing Tamworth's forthcoming exploration of the universe and this exciting journey with you!

Best wishes and clear skies. ☆

Garry Copper
Vice-President

Astronomer Journal of the Tamworth Regional Astronomy Club Inc

Contact details:

Tamworth Regional Astronomy
Club Inc
C/- PO Box 1023
Tamworth NSW 2340

E-mail: tracthestars@gmail.com

Web:
www.tamworthastronomy.com.au

Facebook: Search for Tamworth
Regional Astronomy Club

Patron:
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Dr Stephen Kane
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Karlie Noon

**Cr Col Murray
Mayor
Tamworth Regional Council**

I am over the moon that the Tamworth Regional Astronomy Club are now able to move into the completed Tamworth Regional Astronomy and Science Centre. It has been a long journey for the club to have their own facility, but we are proud that all levels of government were able to work together to build this important community asset. The Centre has been one of Council's major construction projects over the past twelve months.



We look forward to seeing what benefits this facility will bring socially, economically and with tourism. We wish the club all the best in the future.

**The Hon Barnaby Joyce MP
Federal Member for New England
Chair - House of Representatives Standing
Committee on Industry, Innovation, Science and
Resources, currently conducting Inquiry into
Developing Australia's Space Industry**

Going to the edge of space takes us deeper into science, deeper into mathematics, physics, our imagination and our faith. The implausible immenseness that befuddles our conceptions of what we see in our office or even our drive around the country. What's 412 kilometres from Tamworth to Sydney when Voyager 1 is 23 billion



kilometres from Earth and would take another 70,000 years to reach the nearest star, Alpha Centauri? But at that distance within the Milky Way Galaxy, one of an infinite number of milky ways in a universe we can't comprehend, we are working in relationship to those stars and we are spinning in an ordered system together. To think about a spot in space where there is no oxygen, no sound, no light and no time.

This new Centre is a mechanism to contemplate the magnificence that is rolled out before us on a dark, starry night. It asks you many questions, but more importantly, it asks you to think and hopefully inspires your wonder. The universe is wonderful. Galileo Galilei wrote "Mathematics is the language with which God has written the universe. You cannot teach a man anything; you can only help him find it within himself."

Maybe for some people this Centre will be a good place to start their journey in Tamworth.

**The Hon Kevin Anderson MP
NSW Minister for Better Regulation and
Innovation
State Member for Tamworth**

The Tamworth Regional Astronomy Club deserve praise for the contribution they are making to our region. Tamworth's great open skies have long been the envy of stargazers across the country and that is why I am thrilled that the NSW Government was able to provide \$1.8 million in funding for a new astronomy centre. With the facility filling up with some of the largest amateur telescopes in Australia, it is clear that Tamworth will soon become a tourism hotspot for those who look to the skies. I congratulate and thank the Tamworth Regional Astronomy Club for bringing this project to my attention so that I could assist in securing the funding required.





Photo: Leigh Tschirpig

BY TRAC VICE PRESIDENT GARRY COPPER

TRAC's new home!

The Tamworth Regional Astronomy and Science Centre

It's been quite a journey from concept to completion of the Tamworth Regional Astronomy and Science Centre, Roll-off Roof Observatory, Planetarium Theatre, and Hewitt Camera Observatory development at Victoria Park, Tamworth as detailed in the following updated report by TRAC's Vice President and Complex Project Manager, Garry Copper.

Tamworth Regional Council (TRC) was successful in gaining NSW Government Regional Growth Grant



The Tamworth Regional Astronomy and Science Centre under construction, August 2020. Photo: Garry Copper

Funding for the Astronomy & Science Centre (A&SC) project at Victoria Park in East Tamworth initiated by TRAC in 2017.

TRC formed a Project Team in July 2018 for the A&SC, the amenities block near the Tamworth and District Model Engineers facilities and the carpark upgrade. TRAC had a

nominated representative on the Council Project Team and moved forward to further develop TRAC's original concept plans with the aid of Council's appointed Architect.

The design was modified to have gable roof designs and included:

1. The A&SC – a large open space building to develop astronomy related tourism displays, provide STEM activities for education, hold TRAC public events and training sessions and Club meetings.
2. The main observatory - a large Roll-off Roof Observatory facility to house the Club's many telescopes, including the 36 inch Jos Roberts Telescope.
3. The Hewitt Camera Observatory – a split Roll-off-Roof Observatory to house the historic 34inch, 8.5 tonne Hewitt Camera.



The Roll-off Roof Observatory frame being assembled with the Astronomy and Science Centre in the background nearing lockup stage, September 2020. Photo: Garry Copper



Tamworth Regional Council Deputy Mayor and TRAC Publicity Officer, Cr Phil Betts, speaking with media representatives at the Astronomy and Science Centre 'Soft Opening' event on 22 December 2020. Photo: Leigh Tschirpig

4. The Planetarium Theatre – a multipurpose domed theatre for educational/tourism video presentations, since modified to additionally become a fully functional observatory dome.

In early 2019, following due process, Council decided it would proceed with construction in-house using consultants and contractors and project manage the construction.

Ongoing Project Team meetings ensued through the latter half of 2019 to finalise the design and specification. There were a couple of modifications made to the design. After holding discussions with observatory dome manufacturers, it was decided to reconfigure the Planetarium from a fixed domed roof to a full "University Size" rotating observatory dome. This would allow for astronomy teaching sessions to be held with a reasonably large telescope able to be rolled out and registered in position in the Observatory.

By February 2020, the revised plans, specification and general site layout were completed, Council called for tenders on 3 March and on 5 May announced that Rice Constructions of Armidale had been awarded the base tender to build the Centre with an anticipated construction period of approximately six months. The base contract included the Roll-off Roof Observatory, the A&SC building, the viewing alcove and connection annex between the two main buildings and ancillary works such as pathways, railings, drainage, conduits for future buildings and external lighting. The Hewitt Camera Split Roll-off Roof Observatory and domed Planetarium Theatre/Observatory were not included in the revised tender as the complex design had grown substantially since TRC's initial grant submission (eg. Hewitt Roll-off Roof Observatory added, viewing alcove and connection added, storage annex added, main Roll-off Roof Observatory re-positioned, kitchen now included and additional conditions to meet DA requirements). It was at this time that TRC, along with all other councils across Australia, received funding from the Federal Government to undertake



The Hewitt Camera following its installation on 10 March 2021 at the purpose-built split Roll-off Roof Observatory, Tamworth Regional Astronomy and Science Centre. Photo: Warwick Schofield

stimulus construction activities under the Local Roads and Community Infrastructure (LRCI) program via which Council could allocate funding to local construction projects of its choice. TRC subsequently made the decision to allocate a portion of the LRCI funds towards the construction of the Hewitt Camera Roll-off Roof Observatory and the Planetarium Theatre/Domed Observatory, enabling the complex to be completed in a single build. Construction proceeded close to the anticipated timeline and on 22 December 2020, at a 'soft opening' event, TRAC officially received the keys to the A&SC and Roll-off Roof Observatory. The Hewitt Camera Observatory was completed in February 2021, with the Hewitt Camera installed on 10 March and the Jos Roberts Telescope relocated to the complex on 31 March. The final major building component, the 6.7 metre dome, was installed at the Planetarium Theatre/Domed Observatory on 20 March.

TRAC is absolutely delighted with the completion of the A&SC complex and having the opportunity to undertake the many educational, research, tourism, outreach and other activities that members are planning to promote the science of astronomy in the Tamworth region and beyond. This has been an amazing project from the concept stage through to completion, supported by Tamworth Regional Council, the NSW Government and the Federal Government, to whom TRAC extends its



'First light' at the Roll-off Roof Observatory. From left to right: TRAC Members Craig Watson, Barry Gilbert, Garry Copper and Margie Schofield with the 'Stuart Goff Telescope', 26 January 2021. Photo: Warwick Schofield

deepest thanks along with our sincere gratitude to our many members who have made some truly amazing donations of equipment, time and resources to the Club as well as the broader community for their ongoing enthusiastic support. We look forward to welcoming you to one of our many forthcoming meetings and events soon! ☆

Garry Copper
Vice-President and
TRAC A&SC Project Manager

Wow, what a telescope!

BY WARWICK SCHOFIELD



Warwick Schofield travelled to Mount White in 2016 with Garry Copper and Phil Betts to collect the 36 inch telescope he and Margie had arranged to purchase and donate to TRAC. Here is the story of how our Club came to own possibly the largest privately owned portable optical telescope in Australia - and the road trip to collect it! Photo: Phil Betts

ONE WEEK after Phil Betts, Garry Copper, Leigh Tschirpigg and I had discussed plans to form an astronomy group in Tamworth, Margie and I went off on our Lightning Ridge Opal Mining Adventure!

Margie and I had just returned to our camp for the day after working underground at our opal mine. It was about 18 August, 2015 and the missed phone call was from my niece, Leah Stephinson, in Sydney. "Uncle Warwick" she said, "I have just seen a good looking telescope passed in at auction and wondered if you would be interested in buying it?"

It turned out that the 36 inch 'Jos Roberts Telescope' was possibly the largest, privately owned optical telescope in Australia! I felt obliged to get involved ... The telescope had to be moved by Monday, 30 August! The story of obtaining, transporting and storing the 'Jos Roberts Telescope' follows:

With two four wheel drive vehicles, two trailers (one hired) Phil, Garry and I left Tamworth early on Friday, 28 August to travel to Mount White (near Woy Woy) to purchase and collect the telescope.

After a few stops for coffee and snacks we turned into the roadhouse on the M1 near Gosford to check our gear and to phone Jos Roberts to say we were arriving soon. Jos met us at "Mount White House" (a spectacular restored homestead, overlooking the Hawkesbury River) and was very generous with his time and energy to explain the workings of the giant telescope. We were immediately impressed with the quality of workmanship and the enthusiasm Jos exhibited. The perfect balance of the fully assembled telescope amazed us as it could be easily oriented by one finger (the Dobsonian mounting system is certainly simple compared to my experiences with equatorial mounts!) Jos then showed us how to dismantle it and helped load the various components into the station wagons and onto the trailers.

The primary mirror (36 inches in diameter and 2 inches thick) was manufactured by Intermountain Optics in the USA and with its mountings and electronics, weighs over half a tonne! A few quick measurements confirmed that it MIGHT just fit on the larger trailer – we were also allowing for an overhang! The next task was to manage the lift of this heaviest component onto the trailer. With blocks, wedges, planks, pushing, crowbars and Garry's winch, we edged the mirror onto the trailer. Jos then cut timbers to install around the base of the load to prevent it from moving. We had only 2 cm on each side of the trailer as free space!

The main body tubes and pipes were fitted to the other trailer with some overhang, but they were not heavy. The balance of the telescope filled the vehicles - the secondary mirror (a very expensive and crucial component) folded Dobsonian body, a ten inch reflecting "finderscope" (larger than many amateur main scopes!) a five inch reflecting finderscope, a Telrad finderscope, light shields and other boxes of electronics and electrical "stuff".

With tie down straps, mesh and covers in place we were now ready to move. We had been on the run for over ten hours and were starting to tire!

We then retreated to the "Mount White House" where discussions and further arrangements were finalised. Jos talked about collimating the scope and some of the history of it. He offered to come to Tamworth one day when we are organised and teach us a bit more about the scope and will write some of its history for us (perhaps a further article for this journal...)

Having negotiated sections of the paddock where someone had become bogged (please, no...) we departed, with the proposed "Tamworth Astronomy Group" being the new legal owners. YEE HA!

Now to get home...somewhere around the West turn onto the new Hunter Expressway, the huge telescope, the four-wheel drive vehicle and trailer went the wrong way! It was next seen crossing median strips, through traffic lights...OK it was me!

At Singleton, after several checks along the way, we again stopped for a coffee, snack and recheck. It was around 11 pm by then and we pushed on. At Muswellbrook, the large telescope trailer and vehicle had to pull over to shake off a persistent, following police car - all good!

We then realised that we did not know where we were taking the telescope to! Fearing that the hire trailer would not make it back within the 24 hours, we were able to pay online for a further 24 hours hire. By the time we got near Tamworth, we arranged for Garry to go straight home (it was after midnight, after all) with a trailer and vehicle load of gear and Phil and I proceeded onto Phil's place at Kootingal with the other trailer and gear. Too exhausted to do much more, we left my vehicle, trailer and main body of the telescope in Phil's driveway and Phil drove me home in his car and then he finally arrived home at around 2 am! Quite an exhausting and very satisfying day - I'm sure we learned quite a bit about each other...and telescopes...that day and, surprisingly, we still get on very well together (don't we?)

The next morning, Phil drove up to Moonbi, collected me from home and we drove back to his place. There we met up with Garry and were soon joined by Leigh to unload the trailer and my four-wheel drive. "Wow, well done!" Leigh said as we

admired our new toy!

Phil had been busy emptying his shed of lawnmowers, bikes, and other gear, only to discover that we could not fit the telescope on the unloading planks under the roller door without digging trenches for the trailer wheels to sit down in! After some digging and the trailer lowered, we carefully winched the telescope into its temporary home.

Phew, job done and MISSION ACCOMPLISHED!! (To be continued...)☆



Warwick Schofield with the 36-inch Jos Roberts Telescope. Photo: Phil Betts



A video with an excellent segment on Jos Roberts and the 36 inch scope is online at <https://bit.ly/3cQWQLM> (starts at 5m 14s)

All set for the long (and very careful!) trip back home. From left to right – Garry Copper, master telescope maker Jos Roberts, Warwick Schofield and Phil Betts. Photo supplied by Phil Betts

Amazing gift to TRAC - the Robert Barnett Rigel Telescope!

Article originally published in *Astronomer* Vol 2, No 1 - October/November 2016

BY WARWICK SCHOFIELD



Photos on this page by Leigh Tschirpig

WELL, HERE we go again! With an amazing set of alignments of astronomical quality, TRAC recently acquired a magnificent 12½ inch reflecting telescope with a very solid equatorial mount on wheels with locking feet, Unitron sighting scope and probably Grubb Parsons optics!

The alignments...well, a friend of astronomer, PhD candidate, Donna Burton, BSc., MSc., (see separate article) told her of a large, heavy, optical telescope in Sydney looking for a home. Donna had remembered TRAC member Matt Dodds, a science teacher at Farrer Memorial Agricultural High School, Tamworth telling her of a newly formed astronomy club in Tamworth and that they may be interested!

Club members Warwick and Margie Schofield and Leigh Tschirpig, whilst attending the Siding Spring Observatory open day in October, 2016, first heard of this from Donna Burton who was operating a demonstration solar scope on the day (see story on page 9).

Well, within a few days, much to the delight of the Barnett family and a strong element of sadness (you see, Robert Barnett had died too early in life, at the age of only 58 - until now, his telescope project had lived on with them, as if a member of the family), the telescope was being dismantled and loaded onto a trailer and into a station wagon by Warwick to make the now familiar Sydney to Tamworth

'telescope run' to its new home. The journey was a smooth and uneventful drive up the M1, the new Hunter Expressway and New England Highway to Club member Raymond McLaren's Andromeda Industries Pty Ltd, Advanced Engineering Division, Aerospace manufacturing Workshop at Moonbi, near Tamworth. Here, Club members Garry Copper, Elise Copper and Phil Betts were anxiously awaiting to help with the unloading, unpacking...and to have a first look! ☆



People

Donna Burton

DONNA BURTON, PhD candidate, USQ, was the first Australian woman to discover a comet. In fact she discovered two comets (C/2006 R1 Siding Spring and C/2007 Q3 Siding



Spring) using the SSO Schmidt facility near Coonabarabran. Donna also worked with the Hewitt Camera project until that project came to an end in 1990. Donna is the National Coordinator for the international group, Astronomers Without Borders. It was Donna's idea that we might acquire the Robert Barnett Rigel telescope. ☆

The story of Robert Leigh Barnett (1931-1989) and his amazing telescope

Article originally published in *Astronomer* Vol 2, No 1 - October/November 2016

BY ANNA BARNETT

ROBERT BARNETT'S daughter, Anna writes:

Robert Barnett was born on 15 June, 1931 in Jamaica, the fourth child of Walter Leigh Barnett (Island chemist in Jamaica) and Elma Gwendolyn McDermott. He moved to England in about 1949 as there were limited job opportunities in Jamaica. He joined the RAF in the UK where he learned his trade in electronics. He met my Mum, Joyce Tilbury, at work, in the Royal Aircraft Establishment (RAE) in Sandhurst, Berkshire, England. They wed in 1957 and moved into their first house which they called "RIGEL" located in Medstead, Alton, Hampshire. Dad had a plan to build an observatory there and made a start but the dream was not realized.

They soon had two daughters Linda and myself, Anna, ... and a telescope mirror for a telescope which he was planning to build in about 1962-3, much to Mum's disgust as the money was meant to go towards a pram! Let's be practical, "a pram only lasts a short time, you can have a telescope for a lifetime!"

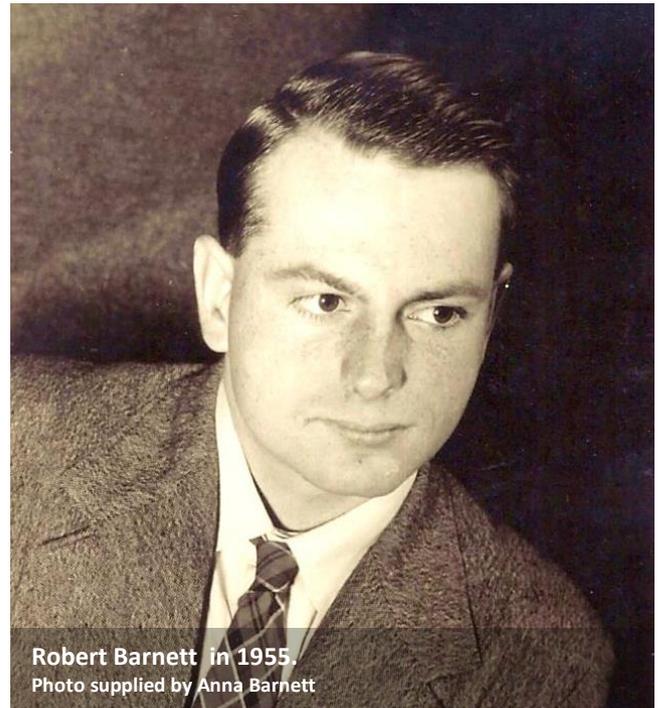
"If you did a job, always use all of your skills and abilities to make the best it could be and ensure you did the job well the first time"...

In 1968 our family moved to Australia (Dad was working for RACAL at the time) and chose to live in Sydney near his brother (they had always been close). We sailed for Sydney in July 1968, arriving

in August 1968 on the "Fairsky". The precious mirror travelled in a specially made box which I have given to the Club...you can see he never did anything by half! *"If you did a job, always use all of your skills and abilities to make the best it could be and ensure you did the job well the first time"...* (Note by Warwick: The quality of manufacturing of the telescope and mounts bears testimony to his principles...the family believes that the mirror was purchased from Grubb Parsons, of Newcastle, England - only the best will do!)

In the home garage at Carlingford, he would work most evenings, tinkering away, plotting and planning. He bought a lathe in the late 1970's and was assisted by his brother Eric in the construction of the telescope. Dad worked for RACAL then EMI then AWA. During that time he took out a patent for a "radio receiver protection arrangement". Most of his professional work was associated with the military and wireless and communications equipment. He retrained and graduated in Electronics Engineering at UTS in 1978. Some of his lecturers at UTS were the same people he had worked with in the UK!

I recall many evenings during my childhood of Dad pulling out the



Robert Barnett in 1955.
Photo supplied by Anna Barnett

telescope onto the driveway for an evening of viewing. When "special events" were due to occur, this often meant getting us out of bed, which we never appreciated of course!

In the last few years of his short life, whilst he often didn't have the physical energy to do the work, he continued drawing and designing improvements. His plan was to make the telescope track and take photos. Whilst he didn't quite get to achieve this, your group may have the skills and technical expertise to see his dream realized. Of course the

technology in 1989 when he died was prehistoric, compared to what can be achieved today...he would have loved it. Anna Barnett, October, 2016

Footnote:

We are not certain whether Robert Barnett ever had a clear look at the seventh brightest star, Rigel, but we assume so. Rigel is a quadruple star, a blue/white supergiant, about one hundred times larger than our sun. Its largest companion star is five hundred times fainter but still about four times larger than our sun and a double star itself. It takes a telescope of at least 6 inches diameter mirror to see the two largest elements. Anna assumes, as a conscientious engineer, that her father doubled that 6 inch specification to make sure his project worked! We also cannot locate a receipt for the purchase of the 12½ inch mirror, but we can safely assume it is a Grubb Parsons as it was expensive and was purchased from a company in Northern England! ☆



The precision engineered 12.5 inch 'Robert Barnett Rigel Telescope'
Photo: Leigh Tschirpig

TRAC acquires the Hewitt Camera – a piece of space history

BY WARWICK SCHOFIELD

Article originally published in *Astronomer* Vol 2, No 2 – October/November 2017

TRAC RECENTLY acquired the historic 'Hewitt Camera'!

Like many of TRAC'S amazing telescopes and heritage/historic collectibles, the 'Hewitt Camera' is no exception!

Put simply, the 'Hewitt Camera' is a 34 inch reflecting telescope..PLUS...only two of these telescopes were ever made. These were built in England in 1962.

Whilst the basic design was by Joseph Hewitt (1912-1975), the optics and construction was by Grubb Parsons of Newcastle in England under contract to the British Royal Radar Establishment.

The format is of Schmidt optic design with a 25 inch correcting lens installed above the primary mirror. The 34 inch primary mirror is cut in a spherical shape, hence the need for the corrector. The optics are cut such that the focal length of the mirror is only 27 inches. The correcting lens is 42 inches above the mirror, giving a focal ratio of approximately $f/1!$ Hence, the Hewitt has the ability to collect a large volume of light and a very large field of view.

At the focus, a slide in module exists to hold a photographic plate.

Because of the spherical nature of the mirror and its interaction with the correcting lens, the final image at the photographic plate is curved. To counteract this, a flattening lens is fitted immediately above the photographic plate. Three large, gold plated focussing vernier collimators are fitted to the photo plate module and the mirror is surrounded by finely balanced, spring loaded counterweights.

Above this is a shutter and aperture control which makes the whole unit into a 'space camera'. The shutter can be activated as still shots or multiple openings per photographic plate.

The purpose for this design was to photograph 'blue streak rockets' but it was eventually built for the purpose of photographing the trajectories of artificial earth satellites and therefore assist in calculating the gravity and the shape of the Earth (geodesy). The sensitivity allowed the original print plate photos to record stars with magnitude less than 10. The research work was finally completed in 1990 and the camera/telescopes were decommissioned.

Some years later, the 'Hewitt Camera' was acquired by Lindsay Lowe with assistance from Stuart Goff and Leigh Tschirpig, with a view to the Vol 6 - 2021 *Astronomer*

instrument being restored as a side project of the Lowe Observatory. The 'Hewitt Camera' lay in storage for a number of years until it was acquired in late 2016 by TRAC.

The field of view is very wide for a telescope at about 10 degrees (roughly 20 times the apparent width of the full Moon) and the directional controls are manually adjusted by steering wheels along the azimuth and altitude with pointers, locking latches and engraved setting circles.

A TRAC telescope sub-committee, under the guidance of member Raymond McLaren, have recently completed a restoration and reassembly of the 'Hewitt Camera'/Schmidt telescope. This was a massive task and was completed with the generous support of Andromeda Industries P/L Advanced Engineering Division's Aerospace Workshop. The Hewitt stands 3.5 metres tall on its pallet and weighs 8.5 tonnes!★



TRAC members Warwick Schofield and Barry Gilbert inspect the restored Hewitt Camera.
Photo: Margie Schofield

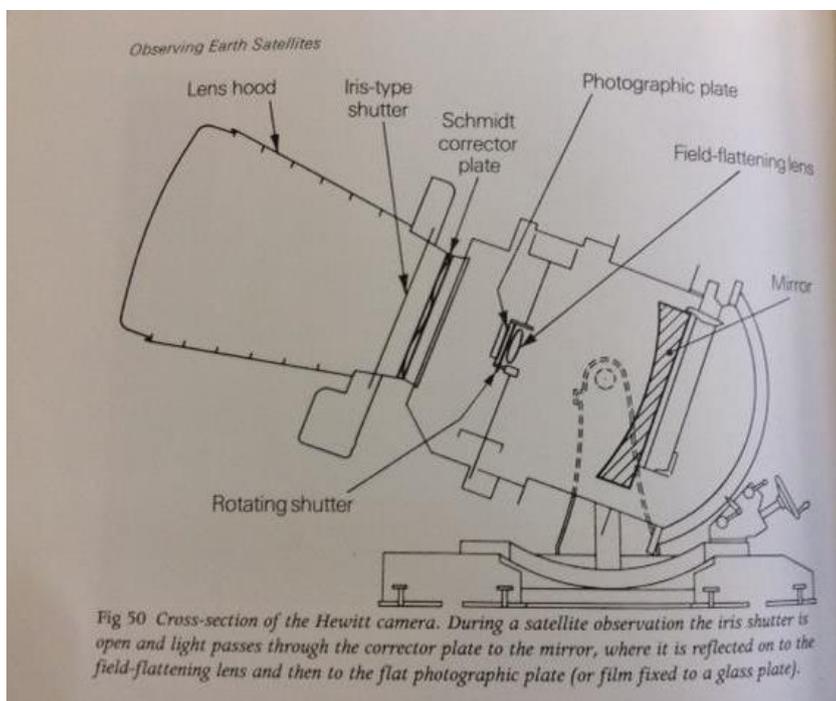


Fig 50 Cross-section of the Hewitt camera. During a satellite observation the iris shutter is open and light passes through the corrector plate to the mirror, where it is reflected on to the field-flattening lens and then to the flat photographic plate (or film fixed to a glass plate).

Diagram credit: King-Hele. D, *Observing Earth Satellites*, Macmillan, London, 1983.

Hewitt Camera Restoration First Digital Light!



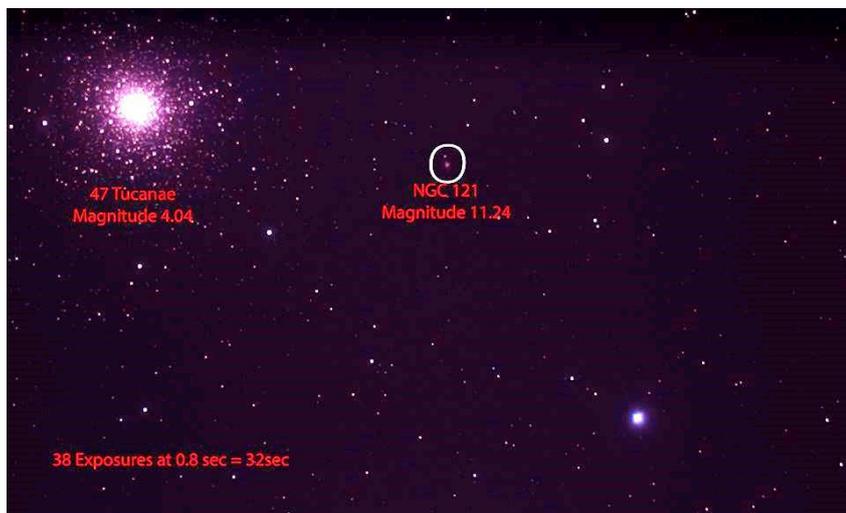
Scott Jackson makes the final focus adjustments of the Hewitt Camera's new cooled CCD, producing the instrument's first digital images, watched by delighted TRAC members.

Photo: Warwick Schofield

Originally printed in *Astronomer* Vol 2, No 2 - October/November 2017

THE TAMWORTH Regional Astronomy Club's Hewitt Camera Restoration Group, led by Raymond McLaren, recently achieved spectacular success with the first successful digital images obtained through this historic instrument.

Raymond and his team have been carefully and steadily working over recent months installing a modern CCD sensor in place of the camera's traditional film holder, dramatically modernising and increasing the capabilities of this massive research class instrument.

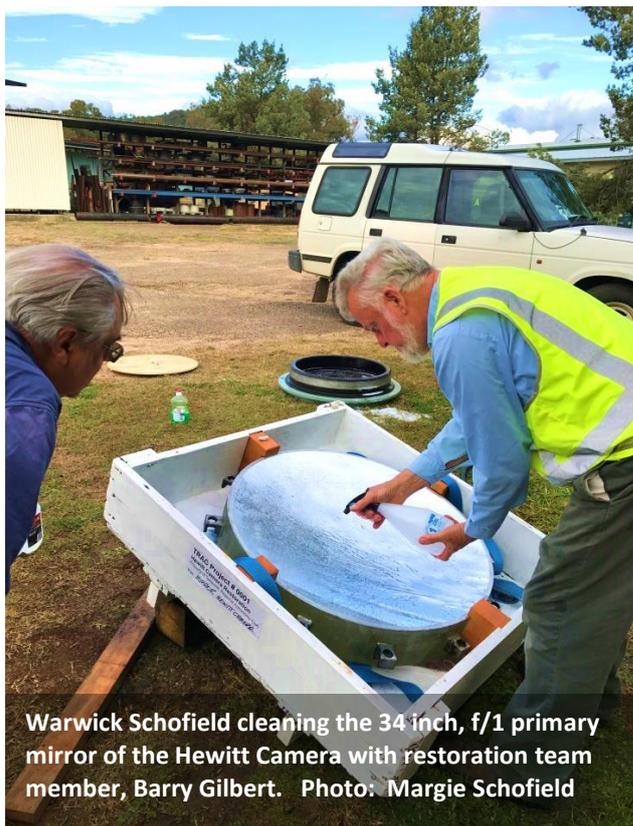


One of the first digital images from the Hewitt Camera shows the imaging potential of this remarkable instrument. TRAC image with notes by Stuart Goff.

The first colour images obtained with a newly installed ZWO 1600MC Cooled Camera show sharp star images with deep sky objects clearly displayed with integrations of only a few seconds. With a field of view of around 1 degree and the camera's fast f/1 focal ratio, the Hewitt Camera will allow wide-field research activities to be undertaken, such as searching for comets and near earth asteroids as well as being a highly capable deep sky imaging system. These capabilities will be further enhanced if tracking is added in the future.

This project has been no small task for an instrument weighing around 8.5 tonnes and is a real credit to Raymond and TRAC's Hewitt Camera Restoration Group. The potential benefits of the Hewitt Camera for TRAC and its future research and teaching activities are enormous and this amazing instrument is set to be an iconic feature of the Club for many years to come.

More details and updates about the Hewitt Camera will be provided in future editions of *Astronomer*. Stay tuned!☆



Warwick Schofield cleaning the 34 inch, f/1 primary mirror of the Hewitt Camera with restoration team member, Barry Gilbert. Photo: Margie Schofield

Mirror polishing machine finds new home at TRAC

BY CLEM CUMMING

Photo: Leigh Tschirpig

Article originally published in *Astronomer* Vol 3, No 1 – June 2018

MY Precision Optical Telescope Polishing Machine has now found a new home with Tamworth Regional Astronomy Club. From my point of view it could not have found a better home!

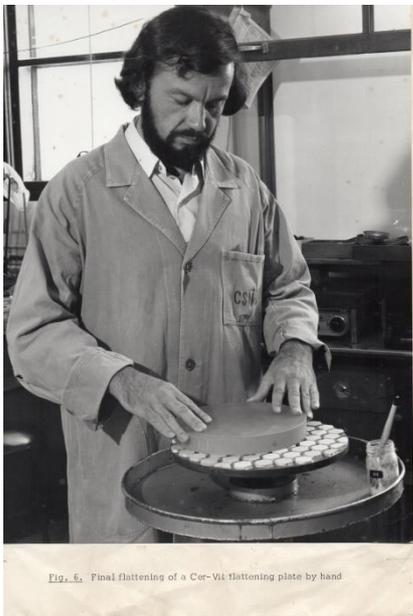


Fig. 6. Final flattening of a Cor-Vit flattening plate by hand

The history behind this machine began at RMIT University. The machine was designed by the Late William (Bill) James to my specifications required for student training. Bill was renowned for his skill in precision optics. I was Head teacher in Ophthalmic Optics which trained apprentices/trainees in spectacle lens design and manufacture, lens fitting and Retail ophthalmic dispensing etc.

To offer further skills, my students could select

an elective subject. These were Mathematics, Advanced Physics and Precision Optics. The most popular was Precision Optics. They all wanted to build a telescope. I offered Bill James the position to teach this elective subject, which he agreed to do. Bill ran the course for three years, until he was granted a Churchill Fellowship which took him off to England. I then took over the training in the Precision Optics Course.

The projects were kept to making an optical test flat, a diagonal mirror and a 6 inch primary mirror. When all these were completed the students were free to make their telescope mounts.

The wonderful experience to complete, align the mirror and see the Moon as close as you could touch it. One student entered his telescope in the Victorian Craftsmanship Display held at the Melbourne Town Hall and took the first prize.

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The course ran for eight years, until my Department was relocated which resulted in the Precision Grinding course being closed.

The Mirror Polishing Machine was at risk of being lost to spare parts or worse, so I offered to acquire it myself. RMIT agreed. I kept it at home hoping I could pass it on to a worthy owner, and with the keen eye of Warwick Schofield it has now found its rightful home.

The machine has two variable speed spindles, independent foot start switches, adjustable sweep heads which enable for mirror polishing up to twelve inch diameter. Each basin can be easily removed for cleaning by rotating the chrome collar ring around the spindle. It is vibration free and of strong construction.



Photo supplied by Clem Cumming
Credit: CSIRO

I have included some laps, the larger diameter are for flats and the smaller diameter laps are for a six inch F8 mirror.

My students and I found producing optical test flats or a telescope

mirror not only satisfying to achieve but is an art form. ☆

Footnote by Warwick Schofield:

As reported in the last edition of *Astronomer*, we hope to have Clem visit Tamworth to teach us some of the finer points of the machine. It will be an excellent tool for the intended astronomy courses to be run by TRAC. Thank you once again Clem for entrusting this precision and historic piece of equipment to TRAC! ☆

TRAC assists UK Defence Science and Technology Laboratory with satellite tracking project Argus 2

AS DETAILED in my 2019 President's Report (page 37 of *Astronomer* Vol 5), TRAC has been excited to be involved in recent months with the capturing of images of Low Earth Orbit (LEO) and Geostationary Orbit (GEO) satellites as part of project Argus 2 being undertaken by the Defence Science and Technology Laboratory (Dstl), UK Ministry of Defence, in conjunction with the Basingstoke Astronomical Society.

Reprinted below is a media release issued by Dstl on 30 January 2020 regarding Argus 2. At the time of writing, imaging of LEO satellites had just concluded with further images being obtained of GEO satellites, including those being gathered by TRAC's refurbished Hewitt Camera. Further updates will be provided in our monthly newsletter *Observer* and future editions of *Astronomer*.
Leigh Tschirpig

MEDIA RELEASE:

'Dstl, UK and Australian Astronomers Collaborate in Deep Space Situational Awareness

Orbiting satellites will be tracked in international experiment by scientists from the UK's Dstl and amateur astronomers from Australia and the UK.

Published 30 January 2020

From: Defence Science and Technology Laboratory:
www.gov.uk/government/organisations/defence-science-and-technology-laboratory

Operational and retired satellites orbiting more than 36,000 km above the Earth will be tracked in a collaborative international experiment by scientists from the UK's Defence Science and Technology Laboratory (Dstl) and amateur astronomers from Australia and the UK.

Argus 2 is the latest phase of a "citizen science" exercise which assesses the viability of tracking of objects in Space using commercially available cameras and lenses. The experiment is designed to explore affordable options for Space Situational Awareness, the process of tracking objects in orbit and predicting their future paths to help mitigate the risks to UK satellites posed by collisions with debris.

During Argus 1 in 2019 Dstl collaborated with the Basingstoke Astronomical Society (BAS) in the UK to track objects orbiting in the Low Earth orbit (LEO) belt 400km above the Earth. Dstl scientists developed automated image processing tools and in-house orbit estimation software to analyse the large amount of data captured and learned valuable lessons on the surveillance of Space. As part of Argus 2, members of the Tamworth Regional Astronomy Club (TRAC) in Australia will be observing the satellites from the Southern Hemisphere; this is to ensure that results are consistent with those captured by BAS



The Hewitt Camera/telescope will observe satellites in the GEO belt. Photo: Leigh Tschirpig

from the Northern Hemisphere and to examine the benefits and challenges of processing observations from two sites.

To track objects in the geostationary (GEO) belt, 36,000 km above the Earth, the Australians will be utilising one of the only two historic 34 inch Hewitt camera/telescopes designed by the Radar Research Establishment in Malvern, Worcestershire, and built by Grubb Parsons. The powerful, 8.5 tonne telescope with 24 inch aperture and f1 focal ratio was developed in the late 1950s to monitor the early generation of satellites.

As part of the project the astronomers will also be observing redundant satellites which have reached the end of their operational life. In accordance with international guidelines such satellites are moved 300 km beyond GEO to the Super-GEO satellite belt, a Space "graveyard". Once there they cannot directly collide with operational satellites in GEO, however the long term motion of these satellites is unknown. Argus 2 aims to better understand the evolution of the debris population to assess the risk posed to satellites critical to the UK that help underpin so much of modern life.

Mike O'Callaghan, Dstl's Space Programme Manager, said: "Space Situational Awareness is fundamental to protecting the operation and security of Space satellites. As Space becomes more crowded the likelihood of collisions increases. By observing current satellites we can help predict how they may behave in future and design measures to avoid collision. The data gathered with BAS was extremely useful and we look forward to adding a new dimension with the Australians."

Trevor Gainey from BAS added: "We enjoyed participating in the original Argus 1 project and testing our observational skills. We have more members interested in this follow-on project so are hoping for clear skies."

TRAC Publicity Officer and Tamworth Regional Council Deputy Mayor, Cr Phil Betts, said the Club was delighted to have the opportunity to assist with this international collaborative project and contribute to the important work being undertaken by Dstl and BAS to help address the risk of possible collisions between satellites.

Cr Betts said TRAC's involvement in Argus 2, which has the support of the Australian Department of Defence, will see Club members making a valuable contribution to this important field of Space research, utilising equipment ranging from DSLR cameras and amateur telescopes to the Club's recently restored and upgraded Hewitt Camera.

"The Argus 2 project provides TRAC members with a great opportunity to use their observational skills and equipment for this important research program and may pave the way for similar pro/am and citizen science collaborations in the future, particularly with the Astronomy and Science and Education Centre, Planetarium Theatre and Roll-off Roof Observatory project at Victoria Park in Tamworth set to commence construction this year which will become the Club's home base," Cr Betts said. ☆

A very special donation

By TRAC President
Leigh Tschirpig

Photo By Stuart Goff

Article originally published in *Astronomer* Vol 5 - 2020

IN FEBRUARY 2019, the members of the Tamworth Regional Astronomy Club were deeply saddened by the sudden passing of one of our Club's founding members, Stuart Goff. Stuart was a great friend over many years and a highly regarded local builder, amateur astronomer, telescope maker and astrophotographer whose photos of the night sky were truly stunning. At the time of his passing, Stuart was in the process of completing the construction of a high quality, short focus telescope which he was planning to

install on an equally high quality computer controlled telescope mount with the intention of taking high resolution digital images of deep sky celestial objects such as galaxies, nebulae, star clusters and other astronomical wonders.

In the weeks that followed, Stuart's family indicated to TRAC they would like to see his collection of astronomical instruments being used as they were intended, rather than gathering dust, and TRAC subsequently offered to purchase Stuart's telescope, together with another telescope he had also recently re-built for visual observing. These were acquired with a view to installing them at the Astronomy and Science Centre (A&SC) and Planetarium Theatre complex to be constructed at Victoria Park, Tamworth next year. The Club then began to look at raising some additional funds to make an offer to purchase Stuart's computer controlled mount.



Left to right: Sharon and Amber Goff, Tamworth Lions Club Immediate Past President Mick Evans and TRAC President Leigh Tschirpig.



The late Stuart Goff was passionate about astronomy, a keen astrophotographer and was actively involved in all aspects of TRAC's operations.

Photo: Garry Copper

It was around this time our Club received the fantastic news that the Lions Club of Tamworth had taken a decision to donate \$2,000 to TRAC to assist with our aim to promote the science of astronomy in the Tamworth Region. This generous donation allowed the Club to acquire Stuart's computerised mount and will now see his imaging telescope and mount assembled and put to very good use by TRAC.

On Thursday, 11 October, Stuart's wife Sharon and daughter Amber, along with the Immediate Past President of the Lions Club of Tamworth, Mick Evans, attended a special evening with members of TRAC at which our Club extended its sincere thanks to the Tamworth Lions Club members and the Goff family for the opportunity to acquire these high quality astronomical instruments which will be used for research, public outreach and educational purposes at the A&SC complex. The Club also expressed its thanks to TRAC member Steve Rogers, who is also a member of the Tamworth Lions Club, for arranging an astronomy evening and dinner with local Lions Club members last year and who has fostered the wonderful links between our organisations.

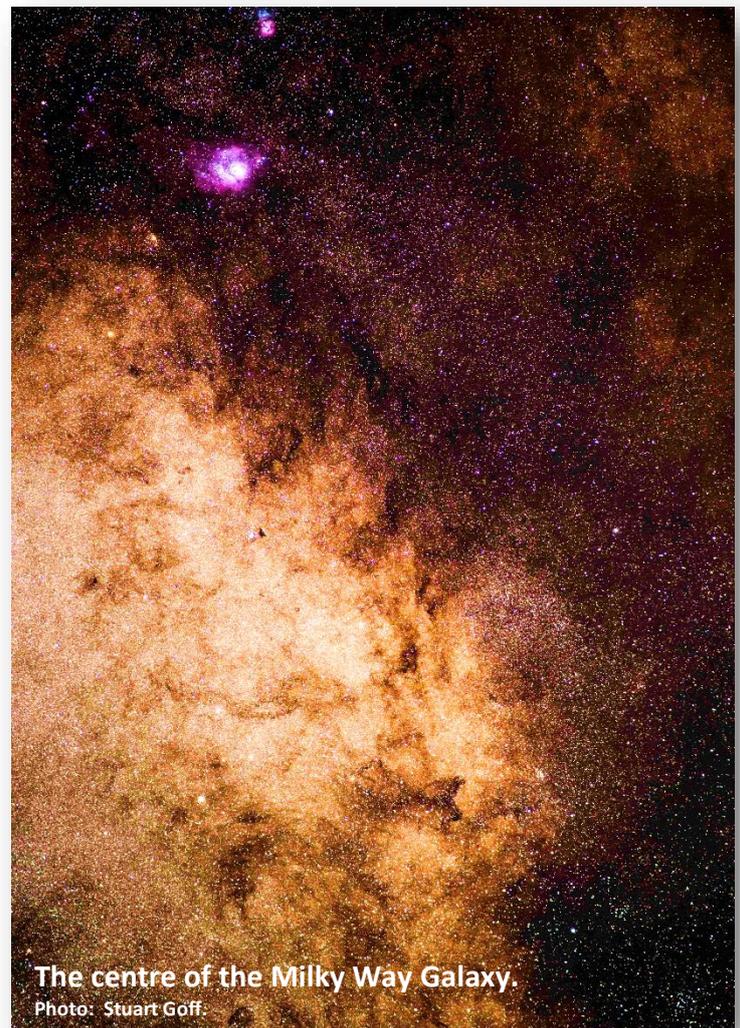
Our members will be forever grateful for Stuart's many contributions to the establishment of TRAC, having served as our inaugural Treasurer, coordinated and conducted the Club's first two astrophotography courses and provided an enormous amount of technical, construction,

observational work and advice on just about every facet of the Club's operations. Stuart always enthusiastically and freely shared his many years of experience in the field of astronomy and astrophotography for the benefit of anyone interested in learning more about our amazing universe.

The Club will always be grateful too for the generosity of the Lions Club of Tamworth and the Goff family for their wonderful assistance in enabling TRAC to acquire Stuart's telescopes and mount, which will carry his name in the A&SC facility, and will be a very important part of the array of telescopes to be installed at the

complex. Once again, a sincere thank you to all involved.

Finally, vale and thank you Stuart - mate, we miss you. ☆



The centre of the Milky Way Galaxy.

Photo: Stuart Goff

Uppsala Southern Schmidt Telescope donated to TRAC

By TRAC Vice President
Warwick Schofield

The Uppsala Southern Schmidt Telescope about to be removed from the dome at Siding Spring Observatory for transportation to its temporary home at Andromeda Industries, Moonbi following its donation to TRAC. Photo: Ashley Anderson

BUILT IN 1956 at the Uppsala University observatory workshop in Sweden, the telescope was first located at Mt Stromlo in Canberra (known as the Uppsala Southern Station) in 1957 where it 'took the first known images and mapped the orbit of the Russian Sputnik satellite.

It is a Schmidt/Newtonian optical telescope with a spherical 20/26 inch diameter primary mirror and a correcting plate giving a six degree field of view.

Seeking darker skies, it was moved from Canberra to Siding Spring near Coonabarabran in 1982 as a trial. The success of this move resulted in the formation of the Siding Spring Observatory (SSO) as we know it today where the largest optical telescope in Australia is housed, the 3.9 metre Anglo-Australian Telescope (AAT).

The Uppsala telescope has been used as a research and student telescope to study asteroids and comets and photographic studies of the Milky Way. It discovered the Great Daylight Comet of 2007, C/2006 P1, whilst being operated by internationally renowned astronomer Rob McNaught. McNaught discovered 75 comets and over 400 near earth asteroids greater than 100 metres in diameter. The

telescope was decommissioned in 2013 following bushfires.

The Uppsala Southern Schmidt Telescope was donated by deed of gift from the ANU Research School of Astronomy and Astrophysics (RSAA) to the Tamworth Regional Astronomy Club in October 2020. It weighs in at several tonnes - the main axis and drive alone weighs 1.2 tonnes.

Discussions and long-term planning with SSO Director, Professor Chris Lidman, Rob Brookfield and staff at SSO and members of the Tamworth Regional Astronomy Club have

made the dismantling and transport of this historic and valuable telescope to Tamworth possible. ☆

Ref:

astro.uu.se History of Astronomy in Uppsala
rsaa.anu.edu.au Siding Spring Observatory
wiki Uppsala Southern Schmidt Telescope



TRAC Life Member Margie Schofield inspects the declination axis of the Uppsala Telescope upon its arrival at Moonbi. Photo: Warwick Schofield



TRAC Life Member and Technical Adviser, Barry Gilbert with a section of the Uppsala Telescope at Andromeda Industries, Moonbi. Photo: Warwick Schofield

TRAC receives Automated Patrol Telescope

By TRAC Vice President
Warwick Schofield

The Automated Patrol Telescope being removed from its roll-off roof observatory at Siding Spring ahead of being transported to Andromeda Industries at Moonbi for restoration work by TRAC, led by Club Life Member Raymond McLaren. Photo: Warwick Schofield

THE APT was originally designed and built in 1955 as the Baker-Nunn satellite tracking camera. Twelve units were built in the USA for the Smithsonian Institution and were deployed around the world. Six additional cameras were built for the US military.

One unit was located in Australia at Woomera in 1957 where it took some of the first photographs of the Russian Sputnik 2 and the American Vanguard satellites. After 1973, it was moved to Orroral Valley in the ACT. It has a 0.78 metre primary mirror and a three element Schmidt lens with a focal ratio of f/1 and weighs approximately 4.5 tonnes.

In 1982 it was donated to the University of NSW where it underwent significant modernising and was upgraded to CCD/electronic capability and made into an astronomical telescope. It was relocated to Siding Spring Observatory near Coonabarabran, NSW. It saw first light in its modernised form in February 1989 and the Baker-Nunn commenced a new life as the Automated Patrol Telescope (APT).

From 1995, Colin Bembrick, Michael Ashley and others commenced an extensive series of research projects. In November 2020, Professor Susan Coppersmith, Head of the School of Physics, UNSW, signed the Deed of Gift to Tamworth Regional Astronomy Club, donating the APT for display to the public.

The preparation and transport of this historic and significant scientific instrument was made possible by Professor Michael Ashley, Colin Bembrick, Michael Phillips, Raymond McLaren of Andromeda Industries and their teams. ☆

Ref:

www.Honeysucklecreek.net/baker-nunn

Colin Bembrick, UNSW School, of Physics, May, 1995 (with Permission)

Historical information from newt.phys.unsw.edu.au (correspondence Michael Ashley)



From left: Raymond McLaren with Andromeda Industries team members Glen Young and Digby Brown securing the APT for transportation to Moonbi. Photo: Warwick Schofield



The APT on its purpose-built steel pallet constructed by Raymond McLaren at Andromeda Industries following cleaning work by TRAC Member Peter Hons. Photo: Warwick Schofield

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Tamworth Regional Astronomy Club (Inc.)

C/- PO Box 1023, Tamworth NSW 2340, Australia

Web site: www.tamworthastronomy.com.au

Facebook: www.facebook.com/groups/427835424074950/ (public page)

Return to: The Secretary

Email: tracthestars@gmail.com

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Membership Application Form



PLEASE PRINT CLEARLY

Full name of applicant _____

Home address _____

Postal address _____

E-mail address _____

Telephone (home) _____ (mobile) _____

Age (if under 18) _____ Occupation _____

Areas of expertise (optional): _____

Areas of astronomical interest: _____

Type of Membership: (See Category definitions below)

N.B. Fees below are effective from 1 December 2020.

Full Membership - with voting rights (includes pensioners, seniors, associates and students over 18) \$30 pa

Family Membership – one parent only will have voting rights, unlimited children under 18 \$50 pa

Spouse/partner's name: _____ Children's names: _____

Junior Membership with no voting rights \$10 pa

Life Membership - with voting rights (once only payment) \$1,000

(Members under the age of 18 must be accompanied by a parent or designated guardian, compliant with NSW W.W.C. Legislation, to all TRAC meetings and activities)

I, the above named person, hereby apply to become a member of the Tamworth Regional Astronomy Club Inc.

In the event of my admission, I agree to be bound by the constitution of the Club for the time being in force and agree to the waiver published on the Club's website under the 'Join' tab at www.tamworthastronomy.com.au

Donations to the Tamworth Regional Astronomy and Science Centre Fund can be made here: \$.....

Signature of Applicant _____ Date _____

Proposed by _____

Signature of Proposer _____ Date _____

Seconded by _____

Signature of Seconder _____ Date _____

N.B. Payment can be made by Direct Deposit as below. Cheques should be made payable to: Tamworth Regional Astronomy Club Inc.

If paying by Direct Deposit, please add your name for identification: Northern Inland Credit Union, BSB: 802298 A/C No: 100100515

Please note that all applications are subject to the Committee's approval, however this is done online and we are usually in touch within a day or two to confirm applications have been approved. Thank you for your interest in joining TRAC.

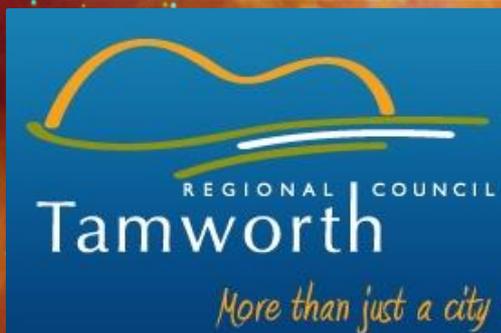
Membership Categories

- LIFE membership entitles the member to all the rights of full membership, including full voting rights. Life members will not be required to pay the annual subscription.
- FAMILY membership includes two parents and an unlimited number of the family's children under the age of 18. One nominated parent only will have voting rights.
- FULL membership is available to any Australian resident and entitles the member to voting rights and access to all functions and facilities (subject to accreditation procedures).
- JUNIOR membership is only available to persons who are under 18 years of age and entitles the member to all the rights of full membership except voting rights.
N.B. Members under the age of 18 **MUST** be accompanied by a parent or designated adult to all TRAC meetings and activities.

OFFICE USE ONLY. Approved by the Committee on ____/____/____ (Date) Signed: _____ (Club President)

Receipt no: _____ \$ _____ (paid) ____/____/____ (Date) Signed: _____ (Club Treasurer)

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