SOUTHERN AFRICAN LARGE TELESCOPE

STRATEGIC OBJECTIVES

AFRICA'S GIANT EYE ON THE SKY

INSPIRING SOCIETY BY EXPLORING THE UNIVERSE

MISSION

Lead the advancement and development of optical astronomy on the African continent and

inspire **AND EDUCATE**

new generations of scientists and engineers worldwide.

Provide a

world-class **LARGE TELESCOPE RESEARCH FACILITY**

cost-effectively to astronomers in an international community.

SALT description

The Southern African Large Telescope, SALT, is the largest single optical telescope in the southern hemisphere, and amongst the largest in the world. It has a hexagonal primary mirror array 11 metres across. It is the non-identical twin of the Hobby-Eberly Telescope (HET) which is located at McDonald Observatory in West Texas, USA. The light gathered by the huge mirror is fed into a suite of instruments (an imager and two spectrographs in SALT's case) from which astronomers infer the properties of planets, stars and galaxies, as well as the structure of the Universe itself.

SALT represents a new paradigm in the design of optical telescopes. Rather than a conventional "equatorial" mount which makes it easy to follow a star across the sky, SALT only rotates around a vertical axis (in azimuth), while its elevation is kept fixed. This is mechanically simpler than the equatorial mount for large telescopes, but it requires precise, complex movement of the prime focus tracker assembly. In the age of computer control, this design has become an attractive alternative to more conventional designs.

THIS FLAGSHIP PROJECT DEMONSTRATES THAT THE FRONTIERS OF SCIENCE ARE NOT EXCLUSIVELY RESERVED FOR THE DEVELOPED WORLD.

SALT provides a first-class and cost-effective facility for fundamental research in Africa in a field where South Africa has a long history of excellence. Strong ties have been established with researchers around the world which benefit local young scientists and engineers in a stimulating, high-tech environment.

SALT is located alongside the telescopes of the South African Astronomical Observatory (SAAO) in the Karoo desert, 20 km from the small town of Sutherland and about 370 km north-east of Cape Town.

SALT'S STRATEGIC OBJECTIVES

SCIENCE:

Enable world-leading astrophysical research

To provide high-quality data that result in highly-cited papers published in front-rank journals. This is achieved by maximising SALT's scientific productivity, i.e., minimising technical downtime and optimising operational efficiency. Which is contingent on having the financial resources to support operational needs and to nurture and retain a cohort of skilled and creative staff, and enabling them to identify and pursue key scientific and technical initiatives.

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SCIENCE AND INDUSTRY:

Pursue instrumentation development

To establish the local skills and capacity required to design and build internationally competitive astronomical instrumentation. This calls for leveraging expertise available within the SALT partnership and other international instrumentation groups, to build active collaborations that drive technological innovation and skills transfer, and ultimately enhance SALT's capabilities. This, too, relies on securing the necessary financial support, for both equipment and people (staff, students, interns and apprentices spanning a broad range of levels).

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SCIENCE AND SOCIETY:

Drive human capital development and science engagement

To employ this iconic facility and the ubiquitous appeal of astronomy to encourage widespread interest in science and technology, through outreach to undergraduates, schools and the general public; to train graduate-students; to have a special focus on developing and leading professional astronomy and high-tech astronomical instrumentation on the African continent; to promote SALT as a global flagship optical telescope, increasing its visibility and growing its reputation in the international scientific community, as well as national and international media.

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SALT AND **SCIENCE**

SALT'S

STRATEGIC OBJECTIVE REGARDING SCIENCE

enable **WORLD-LEADING ASTROPHYSICAL RESEARCH**,

provide **HIGH-QUALITY DATA** that result in **HIGHLY-CITED PAPERS** published in front-rank journals,

MAXIMISE SALT'S SCIENTIFIC PRODUCTIVITY by:

- » minimising technical downtime,
- » optimising operational efficiency.

To achieave this objective, sufficient financial resources are required

- to support operational needs,
- to nurture and retain a cohort of skilled and creative staff,
- to enable the staff to identify and pursue key scientific and technical initiatives.

SCIENCE *productivity*

The productivity of an observatory is usually measured by the science publications that are peer-reviewed and are based on data obtained at that observatory. The typical delay between the observations and the final publication is roughly 1-3 years, which is the time it takes the principal investigator or their collaborators to reduce and then analyse the data, sometimes to collect other data, and finally to write the paper. This explains a low rate of publication for a 'young' observatory (where age is the time since science operations began); the rate increases with age, but levels off again when an equilibrium is reached, with a rate increase mainly due to publications that took much longer than the typical time and publications based on archival data which have become public in the meantime.

SALT NOMINALLY BEGAN FULL SCIENCE OPERATIONS IN

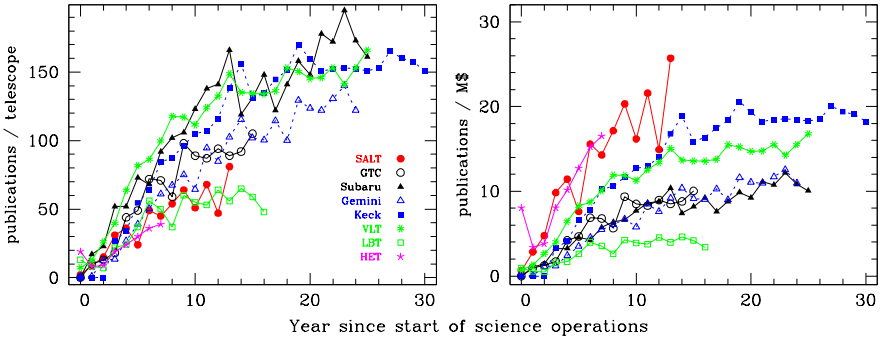
2011

AND IT HAS PRODUCED OVER

55 PUBLICATIONS PER YEAR SINCE 2016

SALT IS AN AFFORDABLE DATA MACHINE, MAKING IT POSSIBLE FOR A DEVELOPING COUNTRY TO PARTICIPATE IN HIGH-QUALITY SCIENTIFIC RESEARCH.

SALT nominally began full science operations in 2011 and it has produced over 55 publications per year since 2016. The figure on page 10 shows SALT's publication rate in comparison with other telescopes in the 8 – 10 metre range (left panel). If we divide the publication rate by yearly operations costs (right panel), SALT shows its strength: its operations costs are low (3.2 million USD based on 2019 prices), partly because it is operated in service mode only. SALT is only equalled by its twin telescope HET (the Hobby-Eberly Telescope in the USA) and stays highly competitive even compared with the two Keck telescopes and ESO's four VLT telescopes, where the operations costs per telescope are lower since they are respectively at the same site and can easily share resources. SALT was also affordable to build with only 24 million USD based on 2010 prices, compared to, for example, the Subaru telescope, which at 440 million USD construction costs is the most expensive telescope of this size to date. SALT's low costs are partly due to its unconventional design with a fixed elevation angle.



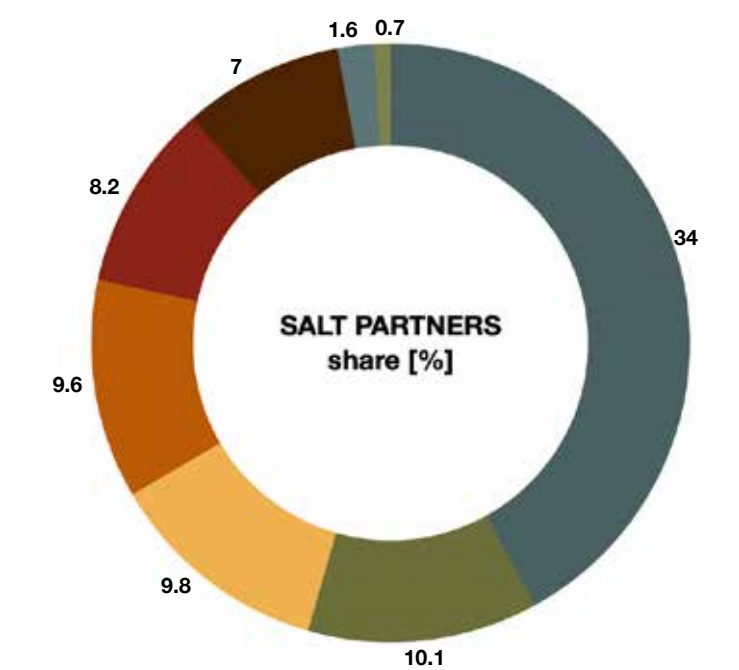
Publication rates of various telescopes since the start of their operations. The telescopes are: SALT (9.8x11.1m), Gran Telescopio Canarias (10.4m), Subaru (8.2m), Gemini North and South (each 8.1m), Keck I and II (each 10.0m), VLT telescopes UT1 – UT4 (each 8.2m). Left panel: The publication rates are divided by the number of telescopes to make them more readily comparable. Right panel: Publication rate divided by annual operations costs in million US Dollars and inflation corrected to the year 2019.

To measure the merits of scientific research it is also important to note what type of journal a paper has been published in. The quality of a journal is measured by its so-called impact factor, which is a measure of how often, on average, a contribution is cited per year. Of the 616 refereed SALT publications between 2005 (first light) and the end of 2024, six were published in the highest impact journal, Nature, closely followed by two papers in Science. The table below lists the other journals used in Astrophysics.

Journal	Impact factor	SALT publications
Nature	48.5	6
Science	45.8	2
Nature Astronomy	14.3	8
Astrophysical Journal Letters	11.7	29
Publ. of the Astron. Society of the Pacific	7.7	4
Astrophysical Journal Supplement Series	6.5	7
Astronomy & Astrophysics	5.8	107
Astrophysical Journal	5.4	112
Astronomical Journal	5.1	31
Monthly Notices of the Royal Astr. Society	4.8	259
Publ. of the Astron. Society of Australia	4.6	6

INTERNATIONAL collaborations

SALT is a partnership of several astronomical communities across the world (see table); partners, apart from South Africa, come from the USA, Europe and India. Such a partnership invites international collaborations between South African and other partner scientists. Since South Africa has the largest share in observing time, astronomers both from other partner institutions, as well as many from institutions not formally affiliated with SALT, tend to collaborate with South Africans to gain access to the telescope.



- Republic of South Africa
- Rutgers University, USA
- Poland
- Dartmouth College, USA
- University of Wisconsin–Madison, USA
- Inter–University Centre for Astronomy & Astrophysics, India
- American Museum of Natural History, USA
- UK SALT Consortium, UK

* Status Nov 2025; currently 19% of the time is used and paid for by South Africa.

Such collaborations are also seen in the authorship of scientific publications (see table below): while 16% of the 616 refereed data publications since first light in 2005 have a South African as first author and 35% have a first author from one of the other partners, a total of 58% have at least one South African author.

Authorship on 616 SALTs refereed publications between 2005 and end of 2024

	RSA	other SALT partner	non-partner
1st author from:	97	216	297
Co-author(s) from RSA (excluding 1st author)	80	70	211

Astronomers collaborating in SALT science often come from world ranking institutions. For example, 14% of SALT publications involve astronomers from the world-leading Harvard University. Other renowned institutions are the Max Planck Society in Germany (on 16% of SALT publications) and the Spanish National Research Council (CSIC) (also on 16% of the SALT publications).

EFFICIENCY

Operational efficiency can be displayed in various ways. For optical telescopes the length of a night matters, so it is important to distinguish between summer and winter semesters. Weather obviously plays a significant role and, as based on recent years, bad weather results in approximately 45% downtime in winter and 35% downtime in summer for SALT. Maintenance and other planned engineering and upgrade work as well as unscheduled technical fault fixing take up some 3–6% each, and sometimes more if a several-week-long shutdown is required (e.g., to install a new instrument). That leaves 40 – 50% of available night time for science operations. Interestingly, the total hours observed are similar over the two semesters, balancing out the longer winter nights against the larger weather downtime fraction in winter.

Observing efficiency refers to how much of the science operations time is actually used for obtaining data. The so-called overhead is the time spent on moving the telescope to the next target, correcting the pointing, acquiring the guide star, focussing, changing instruments and filters, reading out the detector, etc. Any waiting time between visibilities of high priority targets count against observing efficiency, which is why one of SALT's strengths is to utilise programmes with lower priority targets needing short (10 – 15 minute) exposure times that easily and flexibly slot in between longer exposures when needed.

Observing efficiency is constantly being improved by automating and refining procedures, often through improved software on both the telescope and instruments and the tools to manage the observing queue of targets. For example, the SALT Array Management System (SAMS) was designed to maintain the overall shape of the SALT mirror array after an initial set-up procedure. Before its installation, the mirror had to be aligned several times per night, while now one alignment lasts for a week or longer, drastically reducing the engineering downtime. In addition, the recently initiated SALT Efficiency project succeeded in saving about 17% observing overhead time, which is now available for science.

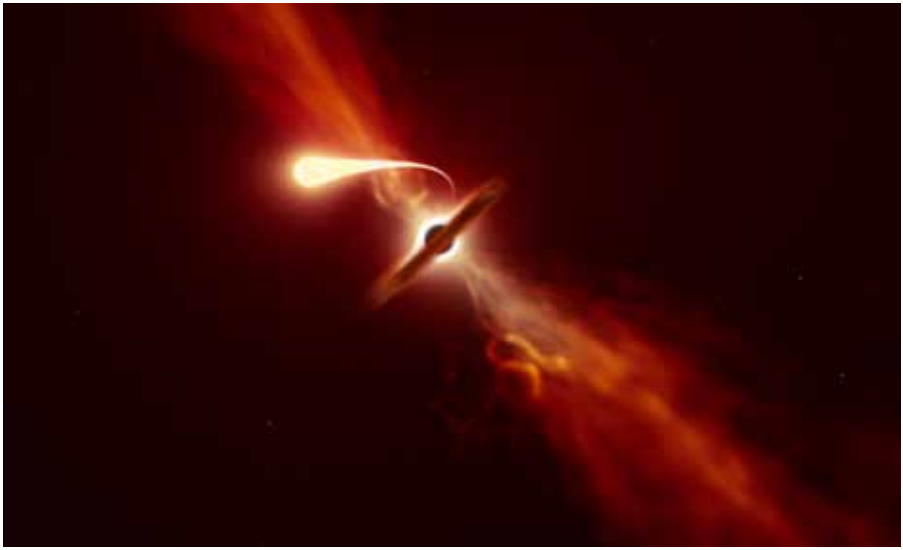
SUPPORTING THE **SCIENCE OBJECTIVES**

SALT CONTINUES TO MAKE IMPROVEMENTS AND TO BUILD NEW INSTRUMENTS FOR THE USER COMMUNITY TO DO MORE AND BETTER SCIENCE.

Much of this work is done through the South African Astronomical Observatory (SAAO) that hosts SALT and which possesses fully equipped workshops and a wealth of instrumentation expertise. Using these facilities is more affordable than out-sourcing orders for custom-built equipment and it is also more efficient as it is possible to experiment and to fine-tune designs.

As an example of how SALT strives to offer competitive instrumentation to enable new research, a local team has been working on upgrades to the prime focus spectrograph (the RSS) and collaborating with laser physicists from Scotland to build a bespoke Laser Frequency Comb for the High-Resolution Spectrograph. These developments are in support of SALT's strategic plan and will address the growing need for transient identification spectroscopy in the era of large survey facilities (such as the Vera C. Rubin Observatory, operating at optical wavelengths, in Chile and MeerKAT, operating at radio wavelengths, in the South African Karoo), as well as exoplanet space missions such as PLATO. Those new facilities will find vast numbers of such events, amongst which there will be rare and unknown objects. It will be critical to obtain spectroscopic observations of these targets in order to classify them and investigate the underlying physics involved. SALT is ideal for such follow-up work (and has proven this many times in the past, not least of which in obtaining one of the first spectra of the multi-messenger event GrW170817).

Artist's impression of a star (to the top) being torn apart as it is sucked in by a supermassive black hole (dark disc in the centre). Astronomers call this a 'tidal disruption event'. In a recently published study using SALT data (among others), a team of astronomers found that when a black hole devours a star, it can launch a powerful blast of material outwards. – Credit: ESO/M.Kommesser.



SALT AND **INDUSTRY**

SALT'S

STRATEGIC OBJECTIVE REGARDING INDUSTRY

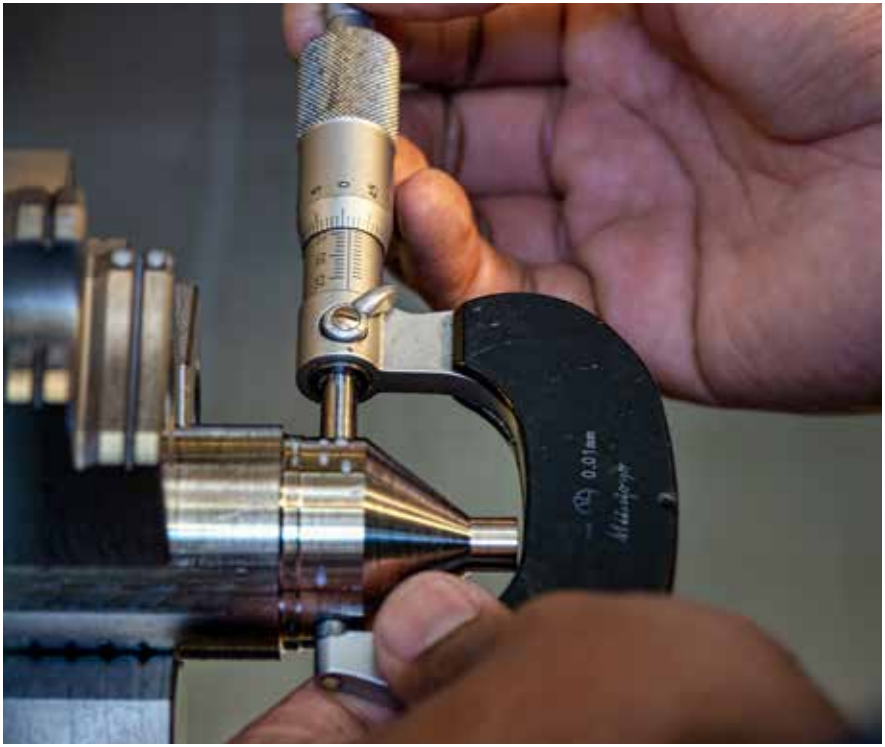
pursue **INSTRUMENTATION DEVELOPMENT**,

establish the **LOCAL SKILLS AND CAPACITY** required to design and build internationally competitive astronomical instrumentation,

broaden SALT's **SCIENTIFIC AND TECHNICAL COLLABORATION.**

This requires us to:

- leverage expertise available within the SALT partnership and other international instrumentation groups,
- build active collaborations that drive technological innovation and skills transfer, and ultimately enhance SALT's capabilities.
- to secure the necessary financial support, for both equipment and people (staff, students, interns and apprentices spanning a broad range of levels).



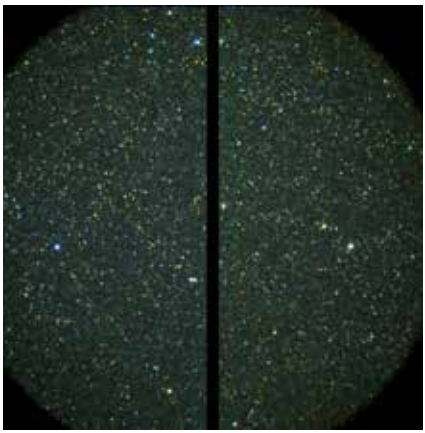
expertise within the SALT PROJECT

SALT is operated and maintained by the South African Astronomical Observatory (SAAO), which includes mechanical and electronics workshops within the Instrumentation group, as well as a contingent of software developers and an IT team. As with many other observatories, these departments not only provide support, but also develop new instruments, or parts thereof, and pursue more efficient ways to run the telescope and instruments.

As an example of shared expertise, SALT's Laser Frequency Comb project is the culmination of years of partnership between two groups of scientists — astronomers from SALT and laser physicists from Heriot-Watt University (HWU). The two have been working together since 2015, affording SALT staff and students privileged access to this highly specialised technological domain, and giving HWU staff the opportunity to test their lab devices on one of the world's largest optical telescopes. This initiative demonstrates the power of multi-disciplinary collaboration: the LFC will extend the scientific reach of SALT's High-Resolution Spectrograph, but by incubating this novel instrumentation, SALT is also helping to advance one of the critical enabling technologies for the demanding field of extreme precision radial velocity research.

SALT'S SOUTH AFRICAN DESIGN

There has been a mutually-beneficial knowledge exchange between SALT and its older sibling, the Hobby Eberly Telescope (HET) at the McDonald Observatory in West Texas, USA. SALT's design was largely based on the design of the HET, but with many improvements, which were mostly developed in South Africa. Further work has gone into optimising the reliability and performance of SALT and its instrumentation.



OPERATIONAL DOWN-TIME IS NOW APPROACHING 5%, WHICH IS VERY LOW FOR SUCH A COMPLEX SYSTEM.

HET's upgrade to accommodate the Dark Energy Experiment (HETDEX) incorporated many of the design ideas that SALT had implemented, some of which they have improved on further.

- The Spherical Aberration Corrector that was designed by Dr Darragh O'Donoghue of SAAO has since been improved on again by the HET.
- SALT's Tracker is a more stable construction than the original for the HET. SALT added a secondary actuator on the Y-drive, called the anti-gravity drive, which relieves the load on the primary drive that now does the fine-tuned movements.
- SALT uses an improved design for cooling to keep the dome and payload as close to the actual night-time temperature as possible while observing. For example, all pieces of electronics are placed in so-called igloos at the base of the telescope structure.
- SALT's dome construction is a half-sphere and thus allows easy access to the top of the telescope structure and the tracker via an interior catwalk at the base of the dome.

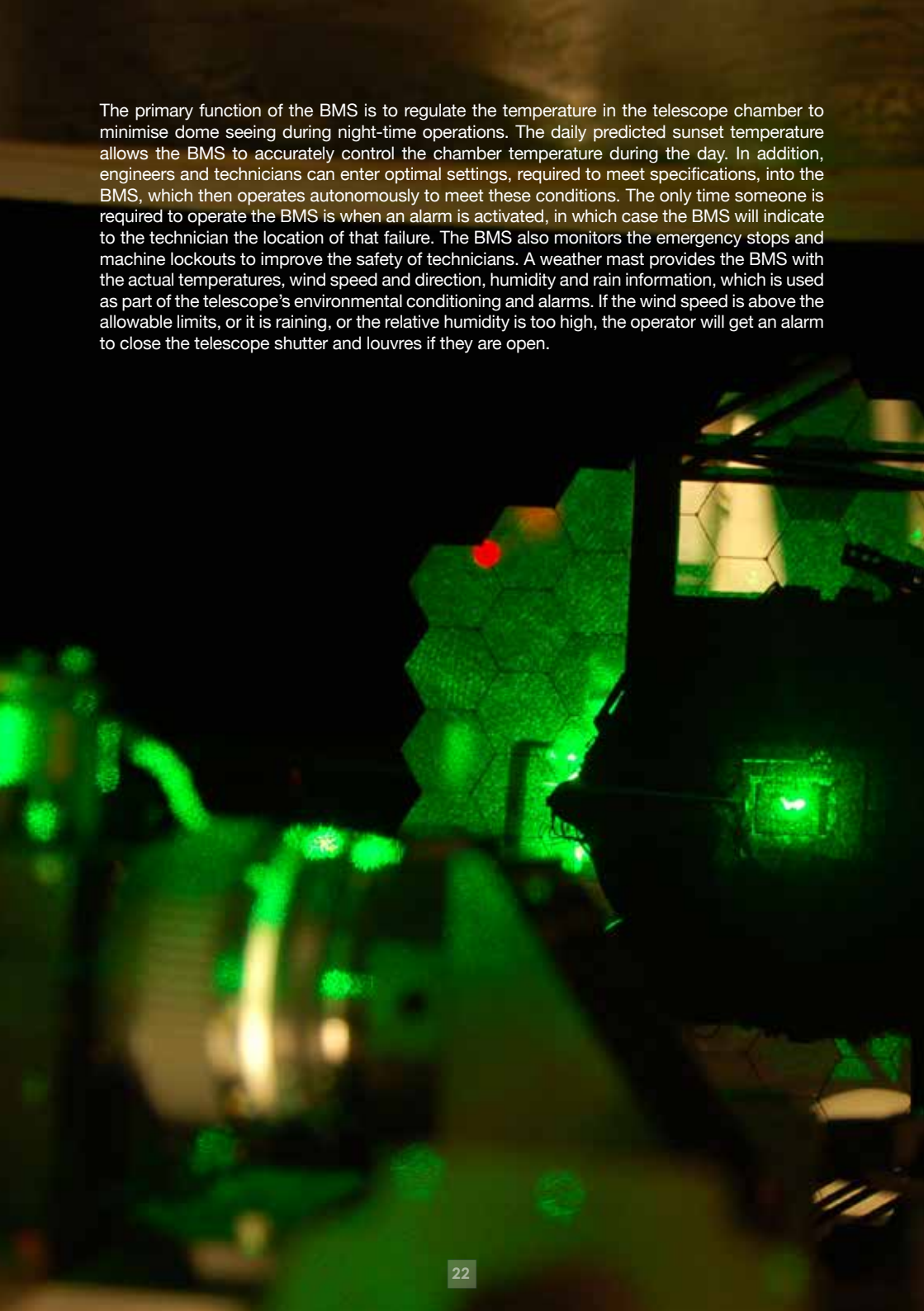
SOFTWARE

AN IMPORTANT ADDITION TO MECHANICS AND ELECTRONICS

Modern telescopes rely more and more on software for efficient and smooth operation, as well as to relieve the operators and observers of tedious routine procedures, such as focus optimisation and accurate primary mirror alignment. Such software is best developed in-house, since local expertise regarding specialised instruments has been honed over many years and successful software design relies on efficient communication between operators, observers, instrument developers and the team developing the software. In addition, initial data reduction is done in automated pipelines, searchable archives are provided, and observations can be more easily planned using simulators that determine the required exposure times for individual objects.

AS AN EXAMPLE, THE BUILDING MANAGEMENT SYSTEM (BMS) SOFTWARE CONTROLS ALL THE COOLING AND ELECTRICAL SUPPLY SYSTEMS AND IT INTERFACES TO OVER 400 ACTUATORS AND SENSORS TO MONITOR AND CONTROL THE TELESCOPE ENVIRONMENT.

The primary function of the BMS is to regulate the temperature in the telescope chamber to minimise dome seeing during night-time operations. The daily predicted sunset temperature allows the BMS to accurately control the chamber temperature during the day. In addition, engineers and technicians can enter optimal settings, required to meet specifications, into the BMS, which then operates autonomously to meet these conditions. The only time someone is required to operate the BMS is when an alarm is activated, in which case the BMS will indicate to the technician the location of that failure. The BMS also monitors the emergency stops and machine lockouts to improve the safety of technicians. A weather mast provides the BMS with the actual temperatures, wind speed and direction, humidity and rain information, which is used as part of the telescope's environmental conditioning and alarms. If the wind speed is above the allowable limits, or it is raining, or the relative humidity is too high, the operator will get an alarm to close the telescope shutter and louvres if they are open.



SKILLS TRANSFER AND TECHNOLOGICAL *innovation*

All engineering and support work for SALT endeavours to build up transferable skills for the South African high-tech environment by hiring interns and offering student projects. These people then develop expertise that they will take with them when moving to new employment, which will usually be within local industry or in small companies.

Skills can also be transferred via equipment: designs developed for SALT have been transferred and taken over by the HET, SALT's twin in the United States. The SAAO and SALT mechanical workshops are also renowned for their high-precision work, often involving unusual materials. Local industry and small companies, who do not have the capacity for in-house research and development, commission the manufacturing of high-precision products or small numbers of products to our workshops and thus profit from SALT's expertise. As a consequence, these companies become more competitive and can offer highly specialised services.

SAAO workshops also out-source some production work, and by doing so drive the research and skills development in the respective companies. For example, a lot of of the high-precision work on the primary mirror alignment system (SAMS) was done in Sutherland by unskilled labour, which, in gaining these skills, became more employable.

A CASE STUDY:
Adelaide Malan

Adelaide Malan, with only a matric certificate and no tertiary qualifications, started working at the observatory in Sutherland in 2004, helping out in reception and the bookings department. In January 2005, one of the mechanical engineers at SALT asked Adelaide to help with some work on the Primary Mirror sensors. She had to carefully clean all 480 sensors by sanding them, before attaching each of them to the mirror segments. She also made sure that the coating room and equipment was kept clean and ready for use. This experience helped Adelaide to develop patience and to do her job with great care, since working with high-precision instruments leaves no room for mistakes.

In 2008, Adelaide moved to the procurement department where she helped with purchases and other administrative duties. Without any tertiary qualifications (in procurement or otherwise), this was a wonderful opportunity for her to obtain experience in the supply chain part of the operation. In 2017, Adelaide was thus able to take over the whole procurement department when that position became available and, at the same time, she became a member of the project team who implemented the SALT supply stores. Her past experience came in handy at this point, and she was able to take control of the stores and organise the stock worth millions of Rands. Today, Adelaide is working on her diploma in procurement.

"My 9 years of experience in Procurement have taught me that nobody is too old to learn new skills and to pick up knowledge through mentoring from managers and senior colleagues. As a shy and 'not-so-sure-about-myself' person, I have learned that you have to work hard to achieve your goals, and with the right support system on your side, you are able to achieve it. Over the years, I've learnt to negotiate better prices on purchases, which in my eyes was "begging", but instead it's all about negotiating and discounts. Being in charge of the daily running of the stores and the annual stock taking helped me to take control and to be more assertive. The necessity of keeping updated also became useful to my personal life when it comes to discipline and organisation."

"Procurement means more than the purchasing of goods and making sure you get the goods and services on time. It is also about treating suppliers and your internal clients with respect and making sure that the relationship you build with them is long-term and that both parties can benefit from it. Anyone interested in studying Procurement can achieve so much in this field because it is very broad and opens up many possibilities when applying for work."

FINANCIAL SUPPORT

Though SALT is a low-cost project, there is sufficient financial support, through the usual NRF channels for all facilities, for internships and students. South Africa's share in SALT of over 30% ensures that some of the money is being spent on development of new instrumentation and software.

Additional funding was provided by the NRF in 2018 to fast-track the development of capability to support two key strategic interests, namely transient/time-domain and exoplanet science. This is part of the NRF/SALT Strategic Instrumentation Initiative, and is a combined project with SARAO that built the world-class MeerKAT radio telescope array in the Karoo. People are shared between the two observatories, making this a fantastic opportunity to make use of expertise across the NRFs astronomy facilities.

SALT AND **SOCIETY**

SALT'S

STRATEGIC OBJECTIVE REGARDING SOCIETY

DRIVE HUMAN CAPITAL DEVELOPMENT and science engagement,

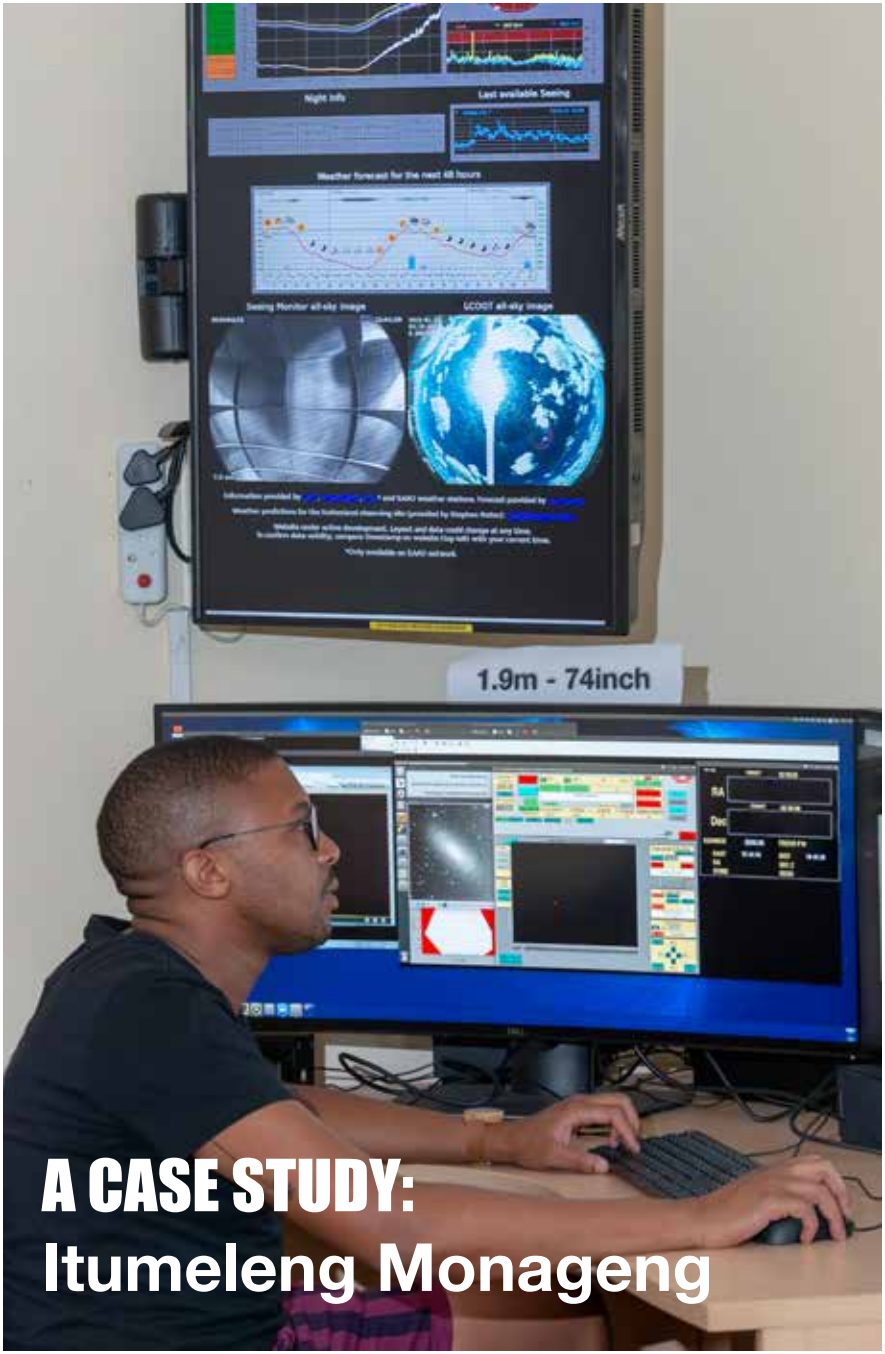
employ this iconic facility and the ubiquitous appeal of astronomy to **ENCOURAGE WIDESPREAD INTEREST IN SCIENCE AND TECHNOLOGY**.

This is achieved through

- outreach to undergraduates, schools and the general public,
- training of graduate students,
- having a special focus on developing and leading professional astronomy and high-tech astronomical instrumentation on the African continent,
- promoting SALT as a global flagship optical telescope,
- increasing SALT's visibility,
- growing SALT's reputation in the international scientific community, as well as national and international media.

TRAINING OF *graduate students*

The large South African share and smallish size of the South African science community ensures not only that plenty of student projects can be conducted with SALT, but students are also actively encouraged to apply for observing time themselves, which means they obtain cutting-edge modern observational astronomy experience early in their careers. Since science operations started in the second semester of 2011, about 550 successful SALT proposals from all partner institutions have included at least one student project.



A CASE STUDY:
Itumeleng Monageng

Itumeleng Monageng obtained his PhD from the University of Cape Town (UCT) in 2018, with the thesis titled ``Optical and gamma-ray study of gamma-ray binaries". One of Itu's goals was to use radial velocity measurements from SALT/HRS to obtain orbital parameters which helped to constrain the nature of the compact object of one of the known systems, 1FGL J1018.6–5856. He was thus able to derive the mass of the compact object, which he found to be a neutron star.

In 2018, Itu put in an application to attend the prestigious Lindau Nobel Laureate Meeting that was held in Germany in July 2019. These meetings take place every year in Lindau, Germany, where 30-40 Nobel Laureates meet outstanding young scientists aged up to 35: undergraduates, PhD students, and postdoctoral researchers. The scientific programme is based on the principle of dialogue: lectures, discussions, Master classes, and panel discussions are specially designed to facilitate the exchange of knowledge, ideas, and experience between the Nobel Laureates and the young scientists.

A multi-step application and demanding selection process ensures that only the best young scientists are selected. Itu was selected as one of the top 20 young scientists from South Africa and one of 580 young scientists from 88 countries who attended the 2019 meeting.

CAREER PLANNING

An excellent tool to draw young people into a career in science and technology is the Job Shadow programme. Every year between 20 and 30 learners are invited to visit SAAO and SALT for two days to find out what a career in astronomy entails. A few years ago, the programme was extended to include related careers, and the learners now have the opportunity to make informed career choices by being exposed to the multiple careers offered by an observatory, ranging from research in astronomy and instrumentation, through mechanical engineering and electronics, information technology and software engineering, to finance and library work. The learners are also informed about the various institutions of higher learning that offer relevant courses, about available bursaries, and they are given HR-related information on the possible salaries in the respective careers.

Set in motion in July 2014, the enlarged job shadow programme immediately became a great success: requests to come to SAAO multiplied. In July 2017, a new section to the programme was introduced, covering a `view from a student's perspective', where learners get the opportunity to speak to PhD students working at SAAO. They are closer in age to the learners and best suited to answer the real questions pertaining to what university life is all about, the pros and cons of this path, and what it takes to be successful.

Careers with SALT in particular comprise, next to the scientists, mechanical and electronics engineers and technicians, software engineers (dealing with controlling the hardware as well as with data reduction and user support related issues), telescope operators, procurement, finance and other administrative careers.


EXIT

outreach AND EDUCATION

During the construction of SALT, the SALT Collateral Benefits Programme (SCBP) was established, with the objective that society should benefit from the construction of this large telescope. Its focus points are education in mathematics, science, engineering and technology, science communication and awareness, socio-economic development, and public engagement. Today, the SCBP activities are fully run by the SAAO science engagement personnel.

THE PROGRAMME IS HIGHLY SUCCESSFUL AND HAS REACHED ABOUT 500,000 PEOPLE BETWEEN 2011 AND 2024, DIVIDED INTO 52% LEARNERS, 2% TEACHERS AND 46% PUBLIC.

Activities for learners comprise school visits, quizzes and competitions, visits to SAAO and its workshops and job shadowing. An inflatable planetarium helps school kids in disadvantaged areas to experience the night sky and understand the motion of Earth and the planets. Teachers participate in workshops where they are provided with relevant curriculum content and exposed to creative pedagogical approaches to teaching the astronomy-based theme. This includes encouragement and support for naked-eye observations, the use of astronomy software such as Stellarium and Celestia, hands-on activities, simulations and investigations. Activities for the public consist mainly of the Sutherland Observatory tours (including SALT) and participation in science festivals, as well as Open Nights at the SAAO site in Cape Town, star-gazing sessions and the establishment of science clubs.

The small town of Sutherland in the Northern Cape province, near which the SAAO telescopes are located, profits in particular through local employment at the observatory. In addition, SALT and SAAO endeavour to support the local community by supplying modern equipment (e.g., a communications tower to supply internet access to a community centre and other locations), and offering support for local schools where possible. A special goal of the observatory, working together with the local community leaders, is to improve mathematics and science education and training in the community to help individuals to further their studies and make the youth more employable. Sutherland and the surrounding communities also profit from the Sutherland Community Development Centre which facilitates socio-economic well-being.

International SALT partners regularly participate in outreach activities whenever there is an opportunity, e.g., during Board meetings and SALT science conferences held in South Africa.

PROMOTING **SALT**

SALT obtains increasingly more exposure, both in the international science community as well as in the public domain.

SALT regularly exhibits at major science conferences such as the triannual IAU General Assembly, the annual European Week of Astronomy and Space Science (EWASS) organised by the European Astronomical Society, the annual American Astronomical Society (AAS) meetings and the biannual SPIE (Society of Photo-Optical Instrumentation Engineers) conference on Astronomical Telescopes + Instrumentation. These conferences attract several hundred to a couple of thousand scientists (and engineers in the case of SPIE) and many come away having established what SALT has to offer and how they can observe with it.

SALT, together with SAAO, is also regularly present at national public science exhibitions, science festivals, etc, where the public is informed about activities with SALT and encouraged to ask astronomical questions. One of the main interests is the difference between optical and radio astronomy, referring to the two large world-class telescopes in South Africa: SALT and MeerKAT.

All these activities are supported by a series of new leaflets and brochures, describing SALT, its science and its technical facts.

MEDIA COVERAGE

SALT regularly features in the news, presenting new and exciting astronomical discoveries. The most important recent media news came from SALT's participation in the world-wide coverage of the scientific event of the century: the first multi-messenger event, which involved a binary neutron star merger. This was initially detected by the LIGO and Virgo gravitational wave detectors in the USA and Europe, and shortly afterwards in all parts of the electromagnetic spectrum by various telescopes around the world.

SALT was one of the first telescopes to obtain a spectrum, showing a blue component that was only visible for a day as it rapidly faded. This was a compelling demonstration of SALT's strength in rapid follow-up observations of interesting and rare transient events.

AFRICAN *leadership*

SALT has taken a lead on the African continent by, for example, organising a series of workshops on SALT data reduction in various African countries and, where available, funding African astronomers to attend SALT conferences. Southern African astronomers are also eligible to directly apply for the South African share of SALT time, while other African astronomers are strongly encouraged to collaborate with South African astronomers and participate in SALT programmes that way. Plans also exist to extend these efforts, in particular on the technical side. This aligns well with the efforts of the radio astronomy community which is setting up an African VLBI (Very Long Baseline Interferometry) Network (AVN).

LIST OF ACRONYMS

BMS	Building Management System
CSIC	Spanish Research Council
ESO	European Southern Observatory
HET	Hobby-Eberly Telescope
HETDEX	HET Dark Energy Experiment
HWU	Heriot-Watt University
HR	human resources
KAT	Karoo Array Telescope
LIGO	Laser Interferometer Gravitational wave Observatory
NRF	National Research Foundation
PLATO	PLAnetary Transits and Oscillations of stars
RSS	Robert Stobie Spectrograph
SAAO	South African Astronomical Observatory
SAC	Spherical Aberration Corrector
SALT	Southern African Large Telescope
SAMS	SALT Array Management System
SARAO	South African Radio Astronomy Observatory
SCBP	SALT Collateral Benefits Programme
VLT	Very Large Telescope
U	University

SAAO CAPE TOWN

P.O. Box 9
Observatory, 7935
South Africa

Phone: +27 (0)21 447 0025
Fax: +27 (0)21 447 3639

Email: salt@salt.ac.za

www.salt.ac.za
SALTastro
@SALT_Astro