EASY SCIENCE

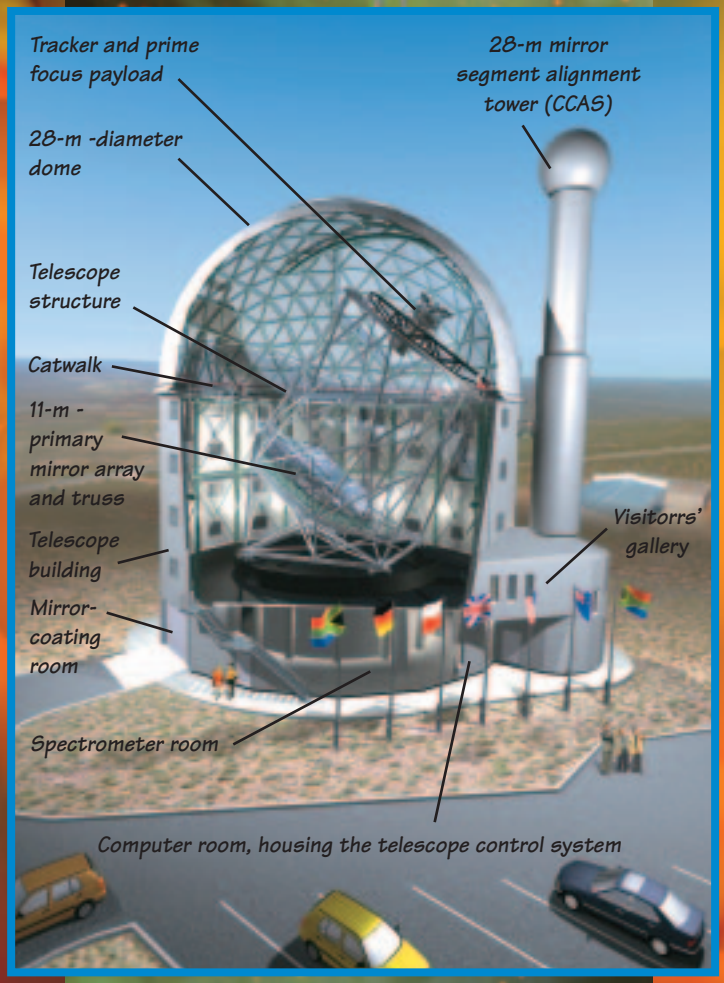
South Africa gets super new telescope

The Southern African Large Telescope (SALT) was officially launched on 10 November by President Thabo Mbeki. It is the largest single optical telescope in the southern hemisphere and is equal to the largest in the world. It is also one of the biggest science projects of South Africa's new democratic government. It took five years to build.

SALT, called "Africa's Giant Eye", is powerful enough to see distant stars, galaxies and quasars a billion times too faint to see with the eye. SALT is so powerful that it will, for example, be able to see the details on a R2 coin that is 5 kilometres away - not that any astronomer would want to do that! Astronomers will rather use SALT to study the birth of the earliest galaxies and stars (that happened billions of years ago), follow the life cycles and movement of stars in neighbouring galaxies and in our own Milky Way. They will be able to look at exploding stars, black holes, and search for planets around distant suns, and many more.

SALT will ensure that South Africa is among the nations at the cutting-edge of astronomical research. The country has been known for excellence in astronomy since 1820 when the first observatory was built in Cape Town.

SALT is at the South African Astronomical Observatory just outside Sutherland, a small town in the Northern Cape. It was built there to be far away from any city lights. Light pollution causes problems for astronomers when they observe the night sky. Sutherland, which is in the Karoo, has a dry climate, which means fewer clouds and good observing conditions. SALT is the only large telescope observing the southern hemisphere night sky.



First light image: The Lagoon Nebula

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EasyScience is produced by the South African Agency for Science and Technology Advancement (SAASTA), an operational unit of the National Research Foundation. SAASTA's mission is to promote the public understanding, appreciation and engagement with science and technology among all South Africans.
Visit the website: www.saasta.ac.za for more information.

SAASTA

President Thabo Mbeki (right) opening the Southern African Large Telescope on 10 November 2005. With him is Mr Mosibudi Mangena, Minister of Science and Technology

Opportunities for young South Africans

SALT is more than just a spectacular tool for scientists to explore the universe. SALT is capturing the imagination of young and old and is showing all South Africans that great science can happen in our country. Many opportunities have been created for a new generation of scientists, with bursaries and scholarships being offered by SALT Foundation partners.

Astronomers work to increase our understanding of how the Universe began, how it has evolved and will evolve. They use basic tools such as maths and physics to study how interstellar dust, gas clouds, planets, stars, galaxies and clusters of galaxies came to exist and how they work. If you want to study space science, the universities of Cape Town, the Free State, KwaZulu-Natal, Rhodes, North-West, Stellenbosch, Unisa, and the Witwatersrand all offer courses in astronomy. For more information, visit the websites: **www.space.gov.za/wsw/study** and **www.saao.ac.za/education**
The National Astronomy and Space Science Programme is run by a consortium of institutions at the University of Cape Town (**www.star.ac.za**).
For more information on SALT, visit **www.salt.ac.za**.

First Light image: NGC6744

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SALT collects the light from stars, galaxies and other objects in the night sky with a primary mirror. This mirror is actually made up of 91 hexagonal mirrors that work together like a single, giant mirror. The 91 mirrors together span 11 metres across. SALT has a sophisticated digital camera that records the images of objects it observes. It also has many other instruments that all work together to allow astronomers to see objects in the sky, some of which can not be observed by any other large telescope.

On 1 September this year, SALT astronomers released the first colour images from SALT to demonstrate its power. They call this occasion "first light". These images show old and young clusters of stars, regions where glowing gas clouds surround newly formed stars, and a spiral galaxy similar to ours, but located 30 million light years away.
(See images at: **www.salt.ac.za/science/first_light**)

South Africa has partners from Germany, New Zealand, Poland, Britain and the USA who contributed money and expertise to the building of the US$36 million SALT project. These partners will all get time on the telescope, but they won't have to travel to Sutherland. Their observing requests will come to Sutherland via the Internet. SALT staff will then make the observations and send the data back electronically.

Gold medal and a telescope for Southern Cross project

A young star gazer from President Brand Primary School in Bloemfontein won a gold medal as well as a special national prize for her innovative science project at the Eskom Expo for Young Scientists this year. Carissa Cronje (13) studied the night skies to see if the Southern Cross could be used to determine the date. For her efforts she is now the proud owner of a telescope, the prize for the most outstanding project in the Astronomy and Space Science category in 2005.

The Orin SkyQuestt XT6 reflector telescope was sponsored by the South African Agency for Science and Technology Advancement, a business unit of the National Research Foundation which focuses on promoting the public understanding, appreciation and engagement with science and technology among South Africans. This prize was up for grabs to all entrants in this category, including those in high school. Orion reflector telescopes serve up high-resolution images of the Moon and planets and are especially good for viewing deep-sky objects such as nebulas, star clusters, and galaxies.

The Question

For her project, Carissa's tackled the question if the position of the Southern Cross in the sky can be used to accurately determine the date. Using an astronomical

computer programme called SkyMap, she first made a study of the movement of the Southern Cross. She found that the Southern Cross moves in a predictable way, lying in exactly the same position each year, at the same time on a specific date.

"In Bloemfontein the long axis of the Southern Cross lies vertically at 21:00 on 21 May every year," says Carissa. The position of the Southern Cross, at the same time on consecutive days, changes by just less than a degree in a clockwise direction, and the path of the Southern Cross completes a full circle every year.

Measuring Angles

Carissa's father helped her build an apparatus which she could use to accurately measure the angle between the long axis of the Southern Cross and a perpendicular line. "The long axis of the Southern Cross is the line which joins the top and bottom stars," she explains. The apparatus consists of a 360° protractor mounted on a Perspex tile on which it can rotate freely. With each measurement, she positioned the protractor at right-angles to the southern celestial pole and parallel to the celestial equator. "One could say that I measured the slant of the Southern Cross," according to Carissa.

She measured the position of the Southern Cross 13 times over a period of eight months and found that it changes clockwise by just less than one degree per day. Carissa found that the number of days before or after 21 May coincided almost exactly with the number of degrees with which the long axis of the Southern Cross deviated from the vertical line on that particular day. She drew up a table to indicate how many days before or after 21 May any specific day of the year would be. "I considered this the expected angle, and compared it to the angle I measured," she explains. The average difference between her measurements and the expected angles was -1.8°, an insignificant value.

Conclusion

These results lead Carissa to the conclusion that the number of days before or after 21 May correlated closely with the angular position of the Southern Cross. The position of the Southern Cross, at a specific time each day, can therefore be used to accurately determine the date.

Carissa was so excited by what she had learnt of the movement of the Southern Cross that she wanted to share her new "calendar" with her friends. "I made an umbrella-shaped model to demonstrate the movement of the Southern Cross around the Southern Celestial Pole, and made a clock face to fit inside the circle made by the path of the Southern Cross," she says.

She showed that, over a 12 month period, the Southern Cross moves through a full circle of 360°. The hour arm of a clock moves through a full circle of 360° in 12 hours. The angle through which the Southern Cross moves every month is therefore identical to the angle through which the hour arm of a clock moves every hour Knowing that the Southern Cross lies at the 12 o'clock position at 21:00 on 21 May, she could show them that a month later, on 21 June, it will lie at the 1 o' clock position. On 21 July, it would be at the 2 o'clock position, and on 21 August at the 3 o'clock position, and so on.

"Because the month of May (5th month) is linked to the 12 o'clock position, I drew a five under the 12 o'clock position. Under the 1 o'clock position, I drew a six, under 2 o'clock a seven, under 3 o'clock an eight, etc.," she says.

Holding the clock-face up against the night sky with the 12 o'clock position at the top, at 21:00 on any evening, she showed her friends how one can determine the month of the year. Carissa explains that the top of the clock-face should be tilted forward by 30° (northwards) and one should align the edge of the clock-face against the bottom star of the Cross. The long axis of the Cross should point exactly through the centre of the clock-face. The adapted hour-position on the clock-face, against which the bottom

Carissa Cronje and the apparatus that helped her win a gold medal and national prize in this year's Eskom Expo for Young Scientists.

Carissa enjoying her new telescope.

Carissa's model of the movement of the Southern Cross

star of the Southern Cross is aligned, indicates the month, for example if it is in the 7 o'clock position, it would indicate the 12th month, or 21 December.

Family Hobby

Carissa has been star gazing as a Family Hobby with her family since the age of five. The hobby has certainly paid off, since two years ago Carissa and her elder brother, Christiaan, won a bronze medal at the finals of the Eskom Expo for a study of the position of the Moon. She is also full of praise for her science teacher, Jasper Herbst, who encourages his learners to make the most of the Expo and is always ready with advice. Carissa also loves the practical science experiments they do in science class at school.

When she does not have her head among the stars, Carissa plays hockey and netball, and sings in the school choir as well as the Bloemfontein Children's Choir. She is looking forward to the challenges of high school next year. She is not certain what career she will follow one day, but with hard work and determination only the stars can be the limit.

I SEE SCIENCE

EASY SCIENCE

A PHOTGRAPHIC COMPETITION TO CELEBRATE SOUTH AFRICAN SCIENCE

Show us how YOU experience SCIENCE & TECHNOLOGY. Capture its beauty and excitement on film. Show how it benefits our daily lives. The competition is open to all learners in grades 7 - 11 (in 2005).

ENTRY FORM

NAME & SURNAME .....

NAME OF YOUR SCHOOL .....

PROVINCE .....

IN WHAT GRADE ARE/WERE YOU IN 2005? .....

POSTAL ADDRESS .....

HOME TELEPHONE NUMBER .....

SCHOOL TELEPHONE NUMBER .....

SCHOOL FAX NUMBER .....

SIGNATURE .....

DEADLINE: 27 JANUARY 2006

HOW TO ENTER

1. Mail your entry to I SEE SCIENCE, SAASTA, P O Box 1758, Pretoria 0001 - OR
2. Hand deliver your entry to SAASTA, Didacta Building, 211 Skinner Street, Pretoria - OR
3. Enter digital images on CD or online, uploaded at: www.saasta.ac.za/sciencelens

PRIZES

The overall winner of the I See Science Category and his/her school will each receive a state-of-the-art digital camera to the value of R3 000. Four runners-up will each receive a digital camera to the value of R1 500.

RULES

- You can enter digital images, transparencies or prints. Digital images should be JPEG or TIFF files in the highest possible resolution.
- Each entry must be accompanied by a separate, signed entry form.
- Any photograph that has won a prize in another major competition is not eligible.
- The organisers will appoint independent judges and their decision will be final.
- All entries must reach SAASTA by 27 January 2006. Winners will be notified in February 2006.
- Winning, commended and other short-listed photographs may be published in selected media without permission of the entrants or payment for such use.

YOU MAY MAKE COPIES OF THIS ENTRY FORM.

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