# Remote & Robotic Astronomy at Mt Kent Observatory

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## OVERVIEW

Mt Kent Observatory is located on Queensland's Darling Downs and is operated by the University of Southern Queensland (USQ) for teaching, research and outreach. In addition to hands-on astronomical observing, facilities have been added for queue-scheduled robotic (i.e. automated) observing for USQ distance education students. The Observatory's capacity for live remote observing is also being developed, thanks to a NASA-funded collaboration between the University of Louisville and USQ.

The current robotic observing system at Mt Kent Observatory uses a standard web browser interface, linked to APTA's queue-scheduling and observatory control software and electronics that handles imaging requests, and dome control electronics and software developed by USQ. When conditions permit, observing requests are fulfilled using a standard but mirror-locked CCD-equipped 30cm Meade LX200 operating inside an octagonal "dome".

A live remote observing system now under development aims to use a 50cm Celestron with a focal-plane and other CCD cameras to deliver live night-time southern-sky observing to daytime classes at Gheens Science Hall & Rauch Planetarium in Kentucky. Remote observing sessions are scheduled to start October 2006 using open-source software and an X-windows interface.

*Mt Kent Observatory near Toowoomba on Queensland's Darling Downs. Left to right are the Louisville dome, the octagonal O'Mara "dome" and the Webb dome. The EDG utilities building and the microwave link tower are in the background.*

## ROBOTIC (AUTOMATED) OBSERVING

*Left: Mt Kent Observatory's robotic telescope is a fork-mounted 30cm Meade LX200 Schmidt-Cassegrain telescope equipped with a CCD imaging camera and housed in a custom octagonal "dome". The robotic observing system comprises an interconnected network that includes the telescope, camera, dome and auxiliary electronics. Custom software controls operation of the system, including dynamic scheduling of observations according to external factors, especially on-site weather conditions. Right: The telescope's octagonal "dome" enclosure.*

*Note: A Paramount ME robotic telescope mount combined with Celestron-14 35cm optics has been trialled at Mt Kent Observatory. The Paramount ME + C-14 combination will replace the existing 30cm Meade when an apparently intermittent pointing problem with the ME unit is diagnosed and fixed.*

## MT KENT OBSERVATORY

(longitude 151$^0$ 51' 19.5" E, latitude 27$^0$ S 47' 52.3", elevation 682 m)

| **Louisville Telescope** | **O'Mara Telescope** | **Webb Telescope** |
|---|---|---|
| (Robotic astronomy research) | (Robotic observing service) | (Visual use for teaching) |
| • 50cm f/6.8 astrograph Celestron C-20 (new product) Supplier: www.celestron.com | • 30cm f/10 Schmidt-Cassegrain Meade LX200 | • 40cm f/10 Schmidt-Cassegrain Meade LX200 Supplier: www.meade.com |
| • 3.5m Sirius fibreglass dome Supplier: siriusobservatories.com | • Custom octagonal "dome" | 4.5m Astrodome fibreglass dome Supplier: www.astrodomes.com |
| • SBIG STL-6303 CCD camera + LRGB filters (UBVRI planned) Supplier: www.sbig.com | • STL-1301 CCD camera + UBVRI filter set Supplier: www.sbig.com | |
| • Vantage Pro weather station Supplier: www.davisnet.com | • Optec TCF-S focuser Supplier: www.optecinc.com | |
| • Linux control software: http://www.astro.louisville.edu | •"Dick Smith" weather station Supplier: www.dse.com.au | |
| | • Boltwood cloud sensor Supplier: www.cyanogen.com | |

- The Educational Development Group (EDG) building is an on-site utilities building.
- The EDG has a control room, computer room, workshop, lecture theatre, accommodation & storage.
- A 34Mbit/s microwave link from ATI Australia www.atiaust.com.au links Mt Kent to the internet.
- The O'Mara Telescope uses APTA robotic observing hardware & software: www.apta.net.au
- O'Mara dome control hardware, software & computing support is provided by Dr Rhodes Hart et al.

## LIVE REMOTE-CONTROL OBSERVING

*Left: The new Celestron-20 50cm astrograph at Mt Kent Observatory. The optics have a novel corrected Dall-Kirkham Cassegrain design with a 2-element corrector lens near the focal plane. Attached to the telescope is an SBIG STL-6303 2048 × 3072 format 9μm pixel CCD camera which gives a 18.64' × 27.96' flat field with 0.546" square pixels. Ray-tracing results and star tests indicate image quality with the corrected Dall-Kirkham design is superior to a Schmidt-Cassegrain design, and a wider flat field of view results that is better suited to CCD imaging with large-format detectors. The telescope's German equatorial mount also permits tracking objects up to 30$^0$ past the meridian before meridian flip of the mount is required. Right: The telescope is housed in a Sirius Observatories 3.5m diameter fibreglass dome.*

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