LCOGT: Where Are We? Where Are We Going?

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Eventful Universe, Tucson, AZ
LCOGT Purpose and Scope

LCOGT is a privately-funded observatory dedicated to optical and NIR time-domain astronomy.

We interpret “time-domain” fairly broadly, including extrasolar planets, supernovae, stellar oscillations, and more.

We employ about 50 FTEs, including 14 PhD astronomers.

We concentrate on follow-up work, not wide-field surveys. For targets, we depend on connections with (or membership in) surveys such as PTF, PS1, WASP, Kepler, and LSST.
When complete, our network will consist of the following sizes and numbers of telescopes and sites (more or less):

2 x 2m telescopes at Haleakala and Siding Spring (now)
   Visible-light imagers (now)
   Low- and Medium-resolution spectrographs (soon)
   Lucky imagers (soon)
   IR imagers (someday)

15 x 1m telescopes at 6-8 sites (starting this year)
   Visible-light imagers
   Medium-Res spectrographs
   Lucky imagers

24 x 0.4m telescopes at 6-8 sites (starting now)
   Visible-light imagers
   Lucky imagers
2.0m Telescopes

- Two telescopes designed by TTL
- Acquired by LCOGT in 2005
- Both telescopes operational
  - Significant educational component
- Continuous improvement program
  - Improve reliability
  - Improve science output
1m Components and Testing

Prototype being assembled now. Mounting has been under test for 4 months.
0.4m Telescopes
Instruments

2K x 2K imager = ‘Merope’ (now)

4K x 4K imager = ‘Spectral’ (now)

4K x 4K imager = ‘Sinistro’ (Sept 2010)

Low-Res SG = ‘FLOYDS’ (Jan 2011)

Med-Res SG ‘No Cute Name’ (Mar 2011)
Spectroscopy and RV with the Network

Each cluster of 3 x 1m telescopes will feed a single cross-dispersed echelle spectrograph. (6 spectrographs)
Each 2m telescope will support a 3-fiber multi-object feed to an identical spectrograph. (2 spectrographs)
Sites

- **Northern Network**
  - Maui: Haleakala
  - North America: SPM? Texas?
  - Canary Islands: IAC
  - Asia: ??
- **Southern Network**
  - Chile: CTIO
  - South Africa: SAAO
  - Australia: SSO
  - West Australia ??
1st 1m Site: CTIO

Preparing for 2nd concrete pour, 10 Feb 2010

Artist’s rendering
Requirements:

Network looks like one (distributed) telescope to users.

Users can specify observing programs that are useful for time-domain astronomy (often pretty complicated).

System can respond to ToOs in real time; users can update target lists in near real time.

Telescopes respond to central scheduling, but do something sensible if communications fail.

Observing schedule adapts to failed observations.

Observing schedule is efficient (finishes projects, does most important things first, does not allow idle telescopes).
The Control Loop

Astronomer:
I want a picture of Jupiter next Monday at 9.

Plan for Telescope B at Site A:
- Monday @ 8: Fornax
- Monday @ 9: Jupiter
- Monday @ 10: Taurus

Got it! Telescope B covering Jupiter @ 9!

Site Agent

Las Cumbres Observatory Global Telescope Network

Site A, Telescope

Observation Database

Planner:
Hmm, Jupiter will be visible from Site A next Monday at 9, I'll slot it in the plan.
Functional Block Diagram
Normal Planning vs ToO and Event Handling

Knows about rise & set times plus weather statistics.....

Plus what past obs have failed/succeeded.....

Plus current site conditions.

Seasonal Planner

Monthly Planner

Adaptive Scheduler

Site Agent

TAC

ToO Request

Normal Request

POND
Normal Planning vs ToO and Event Handling

Knows about rise & set times plus weather statistics.....

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ToO Request

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POND
Summary

LCOGT is dedicated to time-domain astronomy.

It is primarily concerned with follow-up of time-varying objects.

It is deploying a world-wide network of 2m, 1m, and 0.4m telescopes in small clusters at 6 to 8 sites.

2m telescopes are available now. 1m and 0.4m telescopes will start to come line in the next year. The network will be finished in 3-4 years.

Eventually, each site will be capable of photometry, high-speed photometry, and spectroscopy. NIR imaging/photometry will follow.

The network will appear to users as a single facility, geographically distributed, and capable of doing more than one thing at a time.

The control system will support quick response to Targets of Opportunity.
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LCOGT grad student fellowship competition now open! See ad in April AAS Job Register.