Opportunities with the Subaru-Gemini Time Exchange Program

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Gemini Director
The Gemini Observatory
Operating two twin 8.1m telescopes on Mauna Kea and Cerro Pachon: providing access to the entire sky

Gemini is managed by AURA on behalf of

Markus Kissler-Patig - Subaru Users’ Meeting - January 2013
The Time Exchange agreement

Subaru and Gemini have extended their formal agreement to exchange time.

The amount of time exchanged is decided on a semester by semester basis: in 2013A the proposal was for 4 to 10 nights.

How? Through the regular SUBARU application process.
The Telescopes

Optical configuration:
Ritchey-Chrétien Cassegrain

Primary Mirror:
f/1.8, 8.1 m diameter, 20cm thick, 22 tons
ULE glass by Corning’s Canton and REOSC

Secondary Mirror:
1.0 diameter, Zerodur by Schott and Zeiss
Tip-tilt corrections up to 200Hz

At Cassegrain:
f/16, 1.610mm/arcsec

Coating:
Four-layer protected Silver
## Current Instrumentation

<table>
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<tr>
<th>SITE</th>
<th>Instrument</th>
<th>Wavelength range</th>
<th>FoV, Mode, Resolution</th>
<th>AO Support</th>
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<tr>
<td>Gemini-N</td>
<td>GMOS-N</td>
<td>360-940 nm 1-5 µm</td>
<td>5.5‘x5.5’ LS, MOS, IFS (5”x7”) R:600-4,000</td>
<td>ALTAIR</td>
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<td></td>
<td>NIRI</td>
<td>950-2400 nm 1-5 µm</td>
<td>20”x20” - 120”x120” LS R:500-1,000</td>
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<td>NIFS</td>
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<td>IFS (3”x3”) R:5000</td>
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<td></td>
<td>GNIRS</td>
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<td>LS R:1,800-18,000</td>
<td>ALTAIR</td>
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<tr>
<td></td>
<td></td>
<td>950-2400 nm</td>
<td></td>
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<tr>
<td>Gemini-S</td>
<td>GMOS-S</td>
<td>360-940 nm 1-3 µm</td>
<td>5.5‘x5.5’ MOS, IFS (5”x7”) R:600-4,000</td>
<td>NICI AO</td>
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<tr>
<td></td>
<td>NICI</td>
<td>950-2400 nm 900-2400 nm</td>
<td>18”x18” imaging, coronagraph</td>
<td>GeMS</td>
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<tr>
<td></td>
<td>GSAOI</td>
<td>360-1000 nm</td>
<td>85”x85” imaging with MCAO</td>
<td>GeMS (GeMS)</td>
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<tr>
<td></td>
<td>(FLAMINGOS-2)</td>
<td></td>
<td>6.1’ Ø LS, MOS (2’x6’) R: 1,200-3,000</td>
<td>(XAO)</td>
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<td></td>
<td>(GPI)</td>
<td></td>
<td>IFU 2.8”x2.8” contrast: 10³ at 0.4”</td>
<td>(None)</td>
</tr>
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<td></td>
<td>(GHOS)</td>
<td></td>
<td>2 IFUs in 7’ Ø R: 50,000 + 75,000</td>
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</tbody>
</table>
80-90% **Queue mode:**

- **Opening the time domain:**
  Targets can be spread in RA

- **Flexible observing:**
  The weather condition can be specified

- **Rapid response:**
  Triggers result in observations within 24h

Data available in the **Gemini Science Archive** by Gemini Operations
Observing modes

- Queue mode (80-90%)
- Classical mode (10-20%)

Queue support - being deployed:
- Eavesdropping

Classical support - coming soon:
- Base Facility operations ⇒
- Remote observing
Of interest to the Subaru users
Flexibility in the time domain
Observing the Southern Sky
Using Gemini’s unique instruments
Flexibility in the time domain
Flexibility in the time domain

Allows you:

- to request (multiple) time-critical observations (transiting exo-planets; multiple epochs of variables; ...)
- to request targets of opportunities and trigger observations to be performed within 24h (GRBs; supernovae; follow-up of space-based observations; ...)
- to spread targets in RA over the semester
Observing the Southern Sky
Southern Sky

Subaru latitude $+19^\circ$

ALMA latitude $-23^\circ$

Gemini-South latitude $-30^\circ$

Gemini South is better suited for:

- ALMA follow-up programs
- but also ASTE, VLT, Magellan, DES, LSST, ...
Gemini’s Unique Instruments
Multi-conjugated Adaptive Optics

GeMS feeds **GSAOI**: 0.9-2.4 μm, 87”x87” FoV, 20 mas pixels

Field of view 87”x 87”
H band
FWHM = 0.080”
FWHM rms = 0.002”
Multi-conjugated Adaptive Optics

GSAOI status:
available in 2013A, currently doing system verification

H-band
60 mas FWHM
Orion bullet region

GeMS+GSAOI

seeing 0.8”-1.1”

From 1.0” to 0.1”

PSF FWHM:
Blue: [FeII] 93 mas
Green: Ks 103 mas
Red: H2 84 mas
Gemini Planet Imager

**Status:** passed readiness review in December; acceptance in May; shipping in June; commissioning in July; offered end of 2013

![GPI simulation](image1)

![GPI lab measurement](image2)

Contrast ratio in lab: ca. $10^{-7}$ at 0.4"

http://gpi-camera.viewnetcam.com
Science with GPI:

**Exoplanets:** detect planets in the outer regions (>5 AU) of planetary system around main-sequence stars

**Circumstellar disks:** study of polarized light from debris disks

**Solar system:** surface of Gas giant moons; shape and composition of asteroids; atmospheric activity of Uranus and Neptune
Texes returns to Gemini-North

High spectral and spatial resolution, MIR grating spectrograph

On IRTF since 2000; On Gemini in 2006 and 2007; Offered for collaborative projects to the Gemini Community in 2013

Operates between 4.5 and 25 µm
0.5% spectral coverage
R = 80,000 (4 km/s) with 2”- 5” long slit
R=10,000-15,000 with 20” long slit

Team helps with proposals and interpretation, makes observations, and reduces data

John Lacy (PI), UT Austin
Matt Richter (Galactic and extragalactic), UC Davis
Tommy Greathouse (Solar System), SWRI
Dan Jaffe, UT Austin
Summary
The Subaru - Gemini time exchange offers a unique opportunity to join the forces of the two observatories.

Of special interest to the Japanese community:

- Flexibility in the time domain
- Observing the Southern Sky
- Using Gemini’s unique instruments
どうもありがとう