Gemini

As part of the US National OIR System

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Associate Director of Development

Operating two twin 8.1m telescopes on Mauna Kea and Cerro Pachón, providing access to the entire sky.

The Partnership

Gemini is managed by AURA on behalf of the NSF for an international partnership:

NSF · NRC-CNRC Canada · Ministério da Ciência, Tecnologia e Inovação BRASIL ~~Australian Government Australian Research Council~~ · Ministerio de Ciencia, Tecnología e Innovación Productiva Presidencia de la Nación · CONICYT Ministerio de Educación Gobierno de Chile

out in 2016+

Shares 2013-2015

US 65.50 %
CA 18.65 %
BR 6.53 %
AU 6.21 %
AR 3.11 %
(Hosts 10%)

Annual Contributions 2013-2015:

- $27M operations (~20% less than <2013)
- ~$4M instrumentation (best effort)

Current Instrumentation

- **4 instruments + 1 AO system at each site**
- **3 instruments and the AO system simultaneously mounted**

Site	Instrument		FoV, Mode, Resolution	AO Support
Gemini-N	GMOS-N NIRI NIFS GNIRS	360-940 nm 1-5 µm 950-2400 nm 1-5 µm	img 5.5 ‘x5.5’ LS, MOS, IFS (5” x7”) R:600-4,000 img 20” x20” - 120” x120” LS R:500-1,000 IFS (3” x3”) R:5000 LS R:1,800-18,000 (+img)	(ALTAIR) ALTAIR ALTAIR ALTAIR
Gemini-S TBC 2018	GMOS-S GSAOI FLAMINGOS-2 GPI *(GHOST)*	360-940 nm 950-2400 nm 950-2400 nm 900-2400 nm 360-1000 nm	img 5.5 ‘x5.5’ LS, MOS, IFS (5” x7”) R:600-4,000 img 85” x85” with MCAO img 6.1’ Ø LS, (MOS) (2’ x6’) R: 1,200-3,000 IFU 2.8” x2.8” contrast: 10^7 at 0.4” 2 IFUs in 7’ Ø R: 50,000 + 75,000	(GeMS) GeMS (GeMS) XAO (None)
Visiting	TEXES (GN) DSSI (GN) *(GRACES)*	5-25 µm 400-1000 nm ~600-1000 nm	LS R: 4,000 - 85,000 Dual EMCCD imaging, 20 mas resolution@650nm see CFHT/ESPaDOnS - high-res. spectrograph	none speckle none

Gemini's Future

Gemini is flexible and responsive to user needs

- **Obtaining telescope time**
  - Standard TAC
  - Large and Long
  - Fast Turnaround
- **Observing**
  - Queue
  - Classical
  - Priority Observing
  - Bring your students
- **Instrumentation**
  - 4 +1 per site
  - AO working with all instruments
  - Visiting instruments welcome
- **Development Opportunities**
  - In-kind contributions allowed
  - Yearly small ($100K) upgrade
  - Bi-annual large ($0.5M) upgrade

Gemini and the LSST

- The STAC's preference for our next facility class instrument (Gen4#3) is to support LSST follow-up work

- Gemini intends to dedicate a fraction (10-80%?) of Gemini-South to LSST follow-up. How much depends on the level of coordination between and within users, the US share, and the partnership.

Coordination Channels

- Gemini Management is not in a position to decide how to participate in any partner country's particular system

- We can help facilitate planning and implement desires

- US National Gemini Office and US National TAC can coordinate national efforts

- US members of Gemini Board and STAC can advocate for US positions within the partnership

Gemini and an OIR System

What role will Gemini play in a future US OIR *system*?

What role do you want Gemini to play in such a system?

- Our new approaches allow users to observe the way they want with the instruments they want (ours or theirs)
- Coordinated efforts could be done via the partnership or via the US share
- Future funding will not allow every 8-10m telescope to offer every wavelength/resolution/FOV option we do now. Coordination benefits all
- Gemini's strengths include its operational flexibility (multi-instrument queue, ToO, Long and Large, rapid turnaround, …)

Gemini, the *can do* observatory.

Gemini South Transformation

Old	New	When
T-ReCS	GeMS/GSAOI	2012
Phoenix	FLAMINGOS-2	2013
NICI	GPI	2014
GMOS-S (EEV)	GMOS-S (Hamamatsu)	2014

Gemini South Instruments

GeMS multi-conjugate AO system (can support GSAOI, GMOS-IFU, F2-MOS)	85x85"			allows science >850nm
GMOS multi-slit, long slit, and IFU spectrograph and imager	imaging 330"x330" MOS 30-60 slits/mask IFU 5"x7"	0.073"/px R=1000-5000	6144x4608 px, 3 chips Hamamatsu CCDs	0.36-0.93 microns
GSAOI high resolution imager for use with multi-conjugate AO system GeMS	85"x85"	0.02"/px	4 X Rockwell HAWAII-2RG HgCdTe detector	0.9-2.6 microns (27 narrow band filters in addition to the broad bands)
GPI AO imaging polarimeter/IF spectrometer	2.8"x2.8"	0.014"/px R=30-100	Rockwell HAWAII-2RG HgCdTe detector	0.9-2.4 microns
FLAMINGOS-2 multi-object spectrograph	6.1' diameter circle (imaging); 2x6' (spectroscopy)	0.18 "/px R=1200-3000	Teledyne Hawaii-II HgCdTe detector	0.9-2.4 microns

Gemini North Instruments

GMOS multi-object long slit and IFU spectrograph and imager	imaging 330"x330" MOS 30-60 slits/mask IFU 5"x7"	0.073"/px R=1000-5000	camera EEV, Hamamatsu	0.36-0.94 micron
NIRI imager	22"x22" to 120"x120"	0.022 to 0.117 "/px	1024x1024	1-5 micron
NIFS integral field spectrograph	3"x 3"	R=5000 0.04"x0.1" spaxels	Rockwell HAWAII-2RG HgCdTe 2048x2048	1-2.4 micron
GNIRS spectrograph	slit widths 0.1-1"; can use with ALTAIR for imaging at 1-2.5 micron	0.15"/px and 0.05"/px ; 0.12" FWHM imaging with AO	R=1700 0.9-2.5 micron; partial coverage at R=5000	1-5micron long slit and 0.9-2.5micron cross-dispersed

Visiting Instruments

DSSI/Speckle diffraction-limited optical imager (at Gemini North)	FOV 2.8-5.6" FWHM=20 mas at 650nm	diffraction limited	400-1000 nm
TEXES high resolution spectrograph (at Gemini North)	Long slit few to 20 arcsec	R=4000-100,000	5-25 micron
GRACES (at Gemini North)	Point source (fiber fed)	R=50,000 echelle	400-1000 nm

Gemini Staff

# of observatory FTE scientists	# of observatory FTE mountain personnel	# of observatory FTEs involved in engineering, software, and instrumentation
The observatory employs about 50 people with science background (Astronomers/Scientists, Science Operations Specialists, User Support, etc.) 7 people are on tenured or tenure track astronomer positions ~25 people have personal research as part of their duties; <8 FTE are spent on personal research	Gemini does not have anyone stationed on the mountain 24/7 Day crews of 10-20 people drive up to the telescopes Monday-Friday Night crews of typically 2 operate the telescopes at night	Gemini employs ~80 people in technical/engineering positions; and another ~30 in administration The total number of FTEs at Gemini (including the scientists and "mountain" personnel) will amount to ~165 FTEs in 2015, distributed about equally between Gemini North and South

Gemini Users

# of publications related to observatory data taken	# of proposals accepted at <u>each telescope</u>	# of different PIs using the observatory per annum	Total # of investigators using the observatory per annum
Publication counts can be found at http://www.gemini.edu/science/publications/ The last complete year (2013) shows 202 annual publications based on Gemini data	Each telescope accepts 150-200 proposals per year, of which 2/3 come from the US community This does not include the yearly Large and Long proposals; nor the soon to come Fast-turnaround proposals	~300 different PIs/year (all partner countries)	>1400 investigators per year (including Co-Is; all partner countries)

Instrumentation Timeline