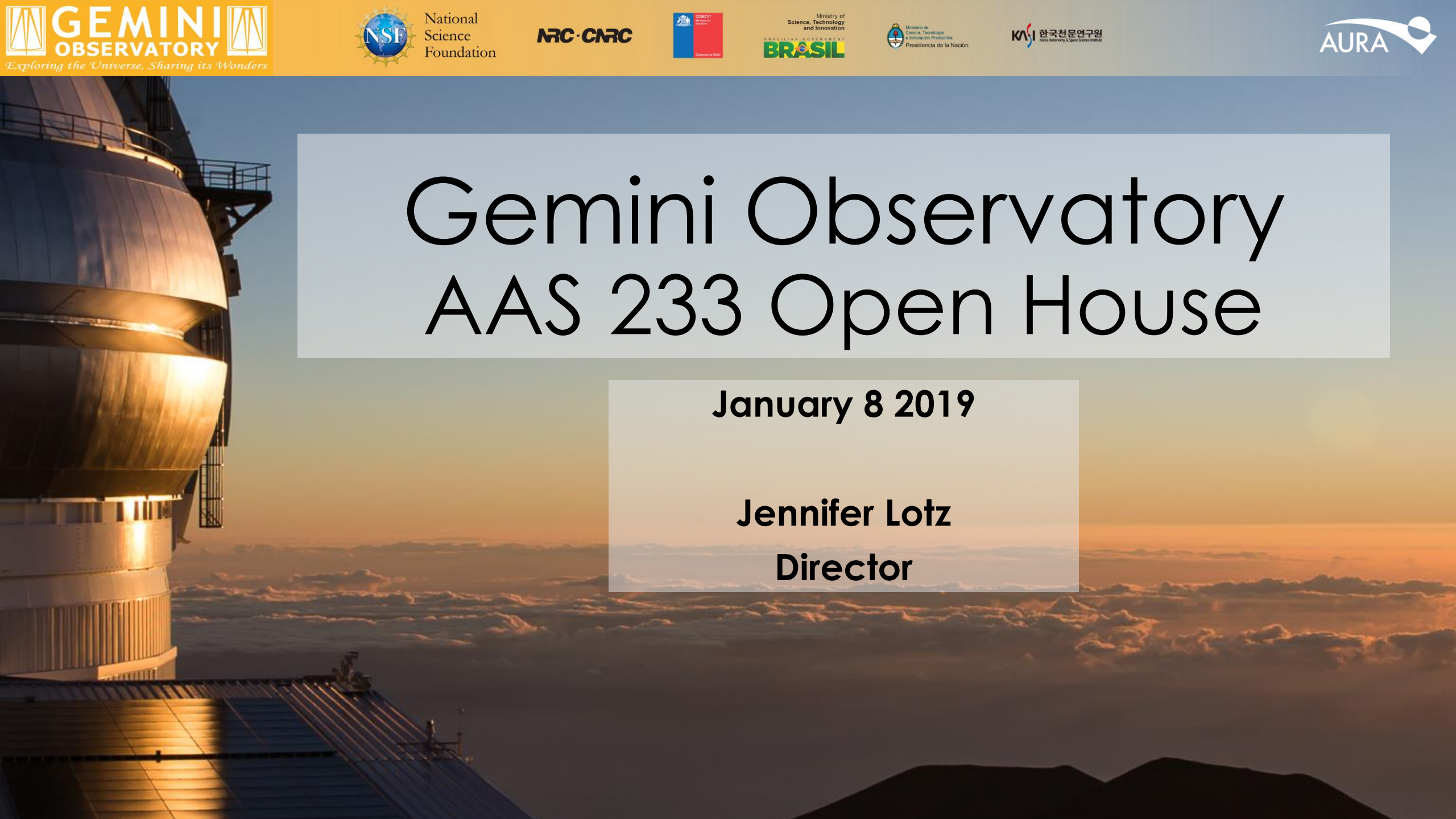


Gemini Observatory
AAS 233 Open House

January 8 2019

Jennifer Lotz
Director

Gemini Observatory Overview & Strategic Vision

Jennifer Lotz, Gemini Observatory (this talk)

Gemini Planet Imager Science and Future

Quinn Konopacky, UC San Diego

Gemini in the Era of Multi-Messenger Astronomy (GEMMA)

John Blakeslee, Gemini Observatory

- the future of adaptive optics at Gemini-N
- software infrastructure for Time Domain astronomy

Questions & Discussion

Gemini Observatory Overview & Strategic Vision

- Gemini international partnership update
- Current observing capabilities and opportunities
- Gemini in the 2020's
  - high-resolution spectroscopy, imaging for exoplanets, stellar chemistry, stellar populations, extragalactic astronomy & more
  - premier facility for time-domain & multi-messenger follow-up
  - future instrumentation: GHOST, SCORPIO, visiting instruments
  - revitalized adaptive optics, bi-hemisphere MCAO systems

Gemini International Partnership

Welcome Korea!

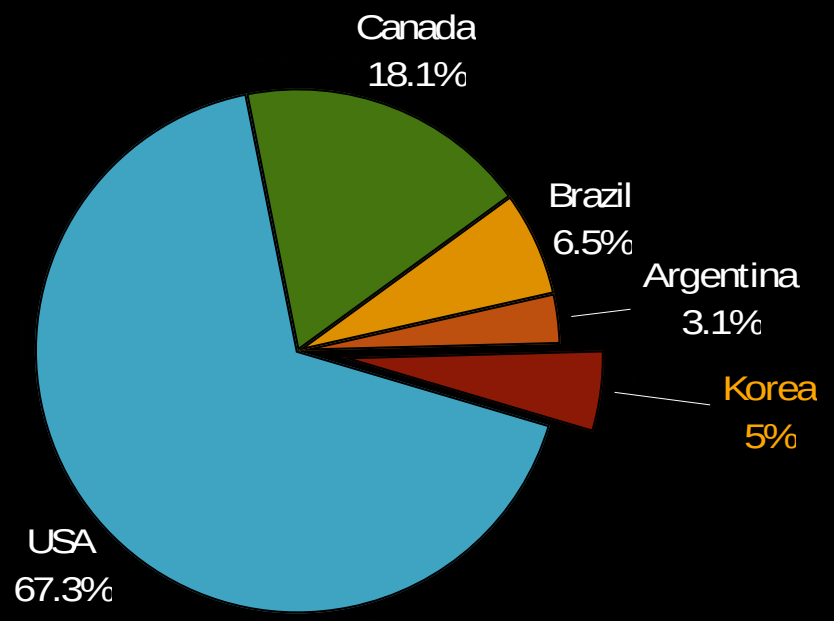
5% participant as of January 1st 2019

current international agreement ends 2021;

All current participants have stated intention to remain in partnership and participate in negotiations for new agreement in 2021

(+ Chile, Hawai'i 5% time in South, North respectively)

2019 Partner Shares



O&M Budget: $ 29.3M

IDF Contributions: $ 2.9M

Limited Term Collaborators:

- Weizmann Institute ($100K/year)
- Ben Gurion University ($100K/year)

Gemini Observatory Overview

- Twin 8.2m OIR telescopes on Maunakea and Cerro Pachón
- Large public US time allocation:
  ~185 nights on each telescope in 2019
  ~2.5x oversubscription for Band 1 & 2
- Queue, classical, and ToO observing;
  Subaru Telescope exchange program
- Flexible visiting instrument program with path for public access (e.g. IGRINS, 'Alopeke, MAROON-X)

Gemini Current Instrumentation

North

facility

GMOS (optical imaging/long-slit/IFU)

NIRI (NIR imager)

NIFS (NIR IFU)

GNIRS (NIR long-slit)

Altair (NGS/LGS AO)

visiting

'Alopeke (optical speckle imager)

GRACES (high-res optical spectrograph)

TEXES (mid-IR spectrograph)

POLISH2 (optical polarimeter)

South

facility

GMOS (optical imaging/long-slit/IFU)

GPI (ExAO coronagraph)

FLAMINGOS-2 (NIR imager/long-slit)

GeMS/ GSAOI (MCAO NIR imager)

visiting

DSSI (optical speckle imager)

Phoenix (high-res NIR spectrograph)

Gemini Observing Opportunities

Spring & Fall Semester: BI-ANNUAL, queue, classical, ToO, priority visitor, eavesdropping; Subaru Telescope exchange

Large & Long Programs: ANNUAL, queue, ToO, and priority visitor; *February: letter of intent due, March: proposal deadline*

Fast-Turnaround: MONTHLY; queue, ToO

Director's Discretionary: open call, queue, ToO

Poor Weather Programs: open call, queue (UNDERSUBCRIBED)

Gemini in the 2020's

- high-resolution spectroscopy & imaging for exoplanets, stellar chemistry, stellar populations, extra-galactic, & more
- premier facility for time-domain & multi-messenger follow-up (e.g. LIGO now, LSST science operations ~2022)
- future instrumentation: GHOST, SCORPIO, visiting instruments
- revitalized adaptive optics, bi-hemisphere MCAO systems

Exoplanet Science with Gemini

Gemini Planet Imager (**GPI**) science – Q. Konopacky's talk (GPIES)

LLP 2016: *Probing the Fundamental Stages of Planet Formation*, PI J. Monnier

LLP 2015: *Characterizing Dusty Debris in Exoplanet Systems*, PI C. Chen

see ***The Future of Ground-Based High Contrast Imaging;*** **Wed 10am, room 304**

Speckle imaging of exoplanet host systems with **'Alopeke, DSSI, Zorro**

LLP 2018: *Validating TESS Exoplanet Candidates*, PI I. Crossfield

High-resolution, high-stability spectrograph for radial velocity studies

MAROON-X – visiting instrument, PI J. Bean/U. Chicago
commissioning GN 2019B; target radial velocity ~ 1 m/s

Exoplanet Transit spectroscopy with **GMOS**; LLP 2015: *Detection and Characterization of Clouds in Exoplanet Atmospheres, PI. C. Huitson*

High-Resolution Spectroscopy with Gemini

see also ***Resurgence of High Resolution Spectroscopy at Gemini***; (today)

GRACES- Gemini Remote Access to ESPaDOnS (CFHT) Spectrograph

R(max) = 67,000, λ = 0.4-1.0 micron

LLP 2018: *Chemistry of new metal-poor stars*, PI K. Venn

IGRINS, PHOENIX – past visiting instruments

LLP 2016: *Young & Proto-planetary Disk Formation*, PI G. Mace

future: **GHOST**: GS in 2020

R = >50,000, >75,000

λ = 0.36-0.95 microns

built by NRC-H/AAO/ANU

IGRINS2: GS in ~ 2023

R= ~45,000

λ = 1.4-2.5 microns

built by KASI

Time Domain Astronomy with Gemini

Queue observations, rapid instrument switching, N/S & E/W access

→ ideal facility for rapid, agile follow-up for LSST, LIGO, & IceCube

SCORPIO – 8-channel imaging spectrometer for GS in ~2022;

with simultaneous $\lambda = 0.38\text{-}2.35\ \mu\mathrm{m}$ coverage, R=4000 long-slit, 3' FOV

PI M. Robberto, STScI. (SwRI, GWU)

see ***Science with SCORPIO on Gemini*, Wed. 2pm, room 310**

GEMMA - J. Blakeslee's talk;

software infrastructure to enable TDA at Gemini

→ dynamic queue scheduling, AEON, and new data pipelines

Future of Adaptive Optics at Gemini Observatory

GeMS/GSAOI - multi-conjugate adaptive optic imaging at GS
1.4' FOV, 0.085" resolution in K-band (with 3 NGS)

update natural guide star sensor → ~triple GeMS sky coverage

GEMMA – J. Blakeslee's talk
- build improved MCAO for Gemini-N. (**GNAO**),
  with 1st light imager(GNAOI) ~2024; multi-object IFU (**GIRMOS**?) ~2025
- new Real-Time Computing systems for GeMS and GNAO

Adaptive Secondary Mirror for Gemini-N in mid-2020s
enable wider field corrections/GLAO for full G-N instrument suite

The next 5 years will be exciting times for Gemini users!

Strong international partnership, strong development of new instruments

Many ways to propose & observe; open call for visiting instruments

Strong science opportunities for time-domain astronomy, exoplanet science, high-res spectroscopy, high-res imaging with new & improved adaptive optics

We want your big ideas (and ASTRO2020 white papers)!

www.gemini.edu/gemma/#big-ideas