Gemini Strategic Science Plan

Virtual Town Hall

Elena Sabbi

Gemini 2.0

A major revitalization of Gemini Observatory capabilities and instrumentation

GN mirror recoating

GNIRS LR IFU

IGRINS-2

GNIRS HR IFU

GN M2

GPI 2.0

GNAO+GIRMOS

MAROON-X Fac.

22B	23A	23B	24A	24B	25A	25B	26A	•••	28A

F2 MOS

GHOST

GHOST PRV

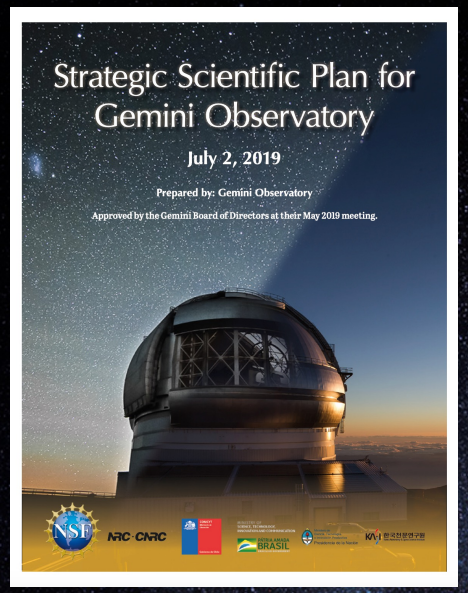
SCORPIO

F2+GeMS

GS mirror recoating

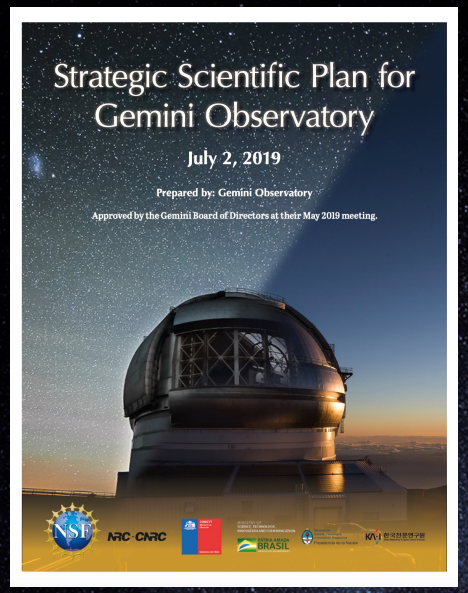
Rubin Sci Ops

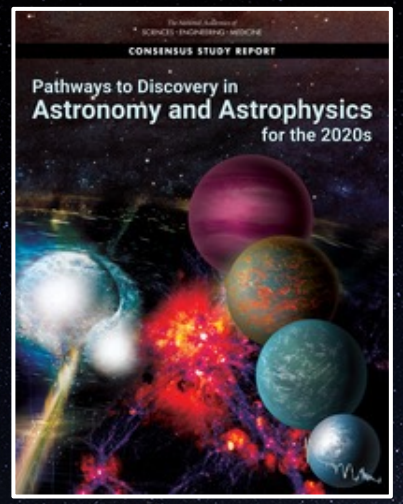
Strategic Scientific Plan for Gemini Observatory 2019

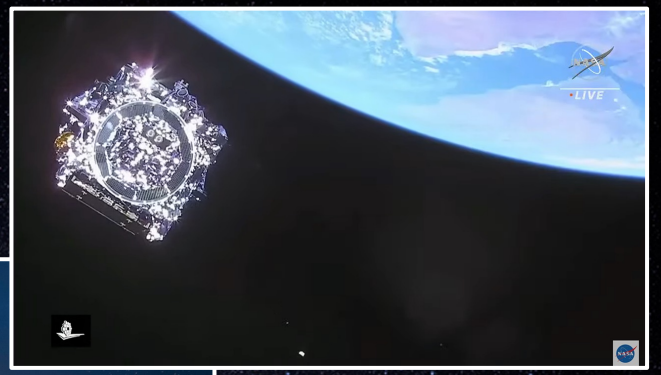


Written in response to the rapidly changing astronomical landscape

Strategic Scientific Plan for Gemini Observatory 2019







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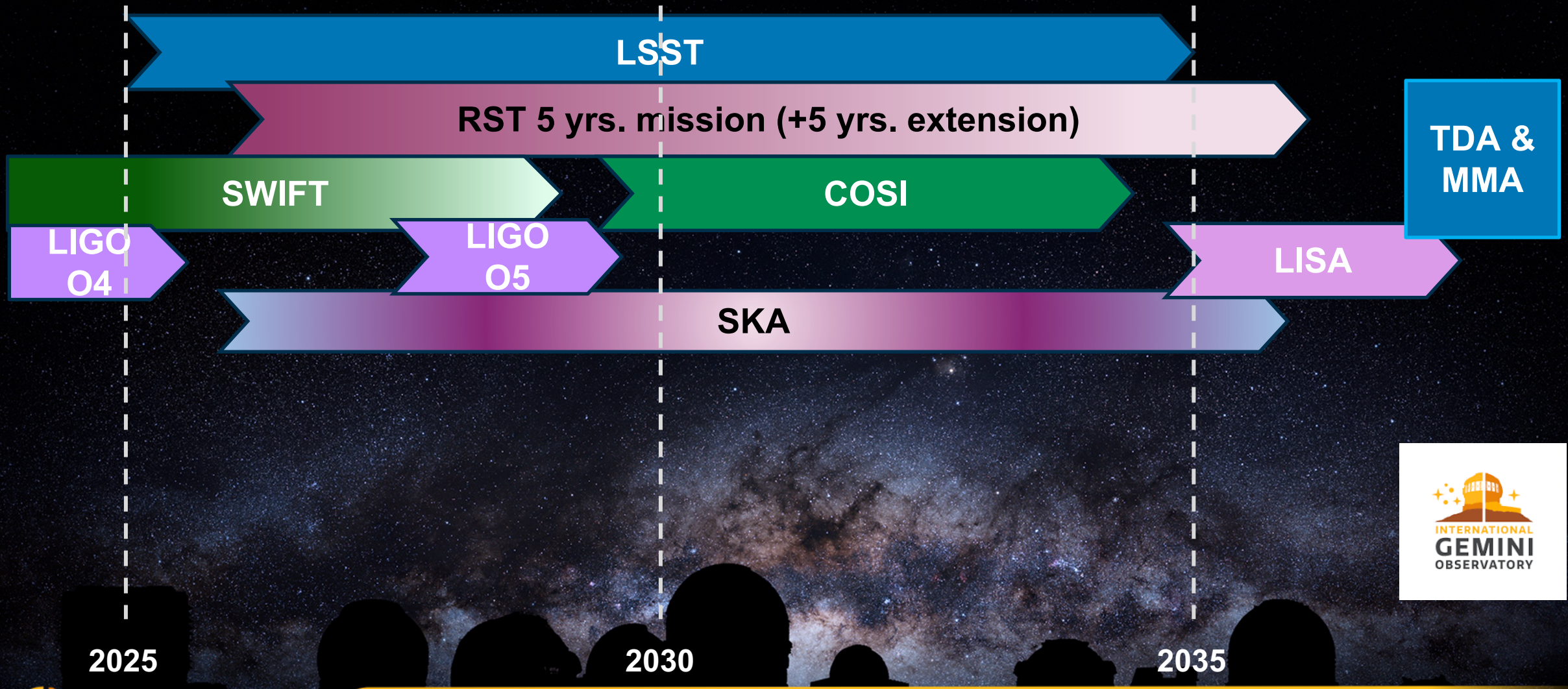
2024-2040 A new Era for TDA/MMA



A Transient Universe

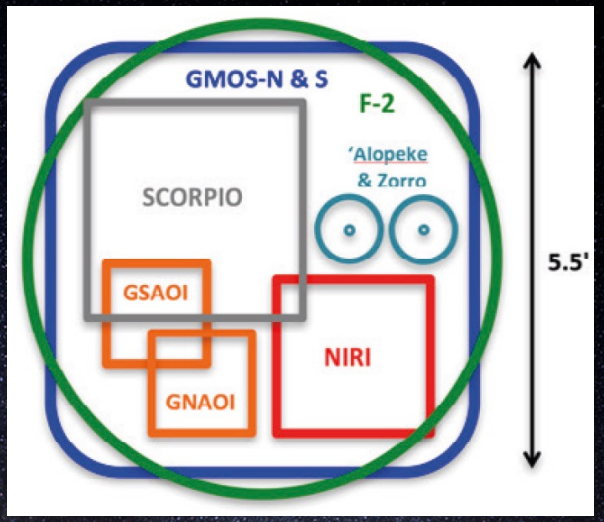
- Study dark matter & dark energy
- Mapp NEA & Kuiper belt objects
- Detect transient astronomical events (SNae, GRBs, gravitational lensing)
- Optical counterparts of GWs from the LIGO-VIRGO-KAGRA collaboration (and LISA)

Gemini in TDA/MMA

Incorporate Gemini in the Astronomical Event Observatory Network

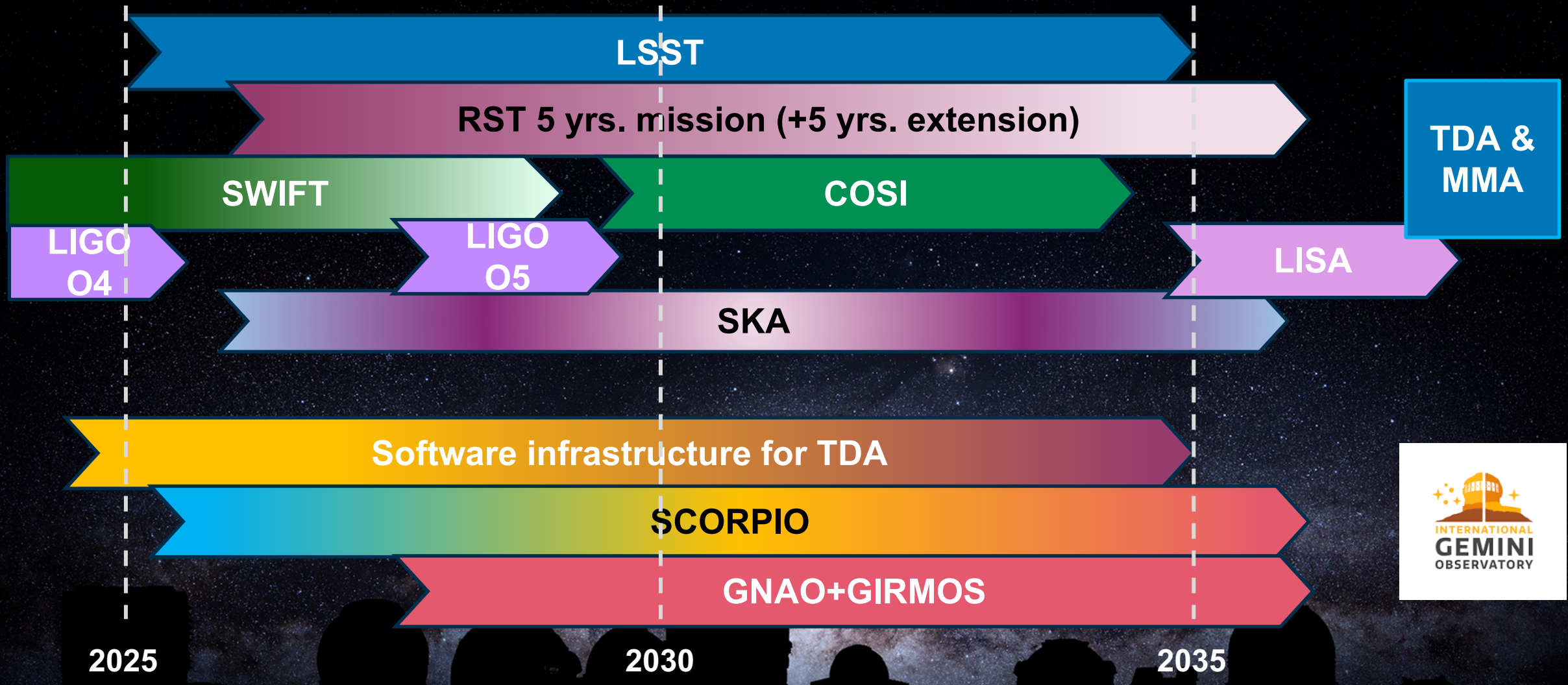
DRAGONS: a new end-to-end pipeline

Rapid response & Outreach



Instruments upgrades

2024-2040 A new Era for TDA/MMA



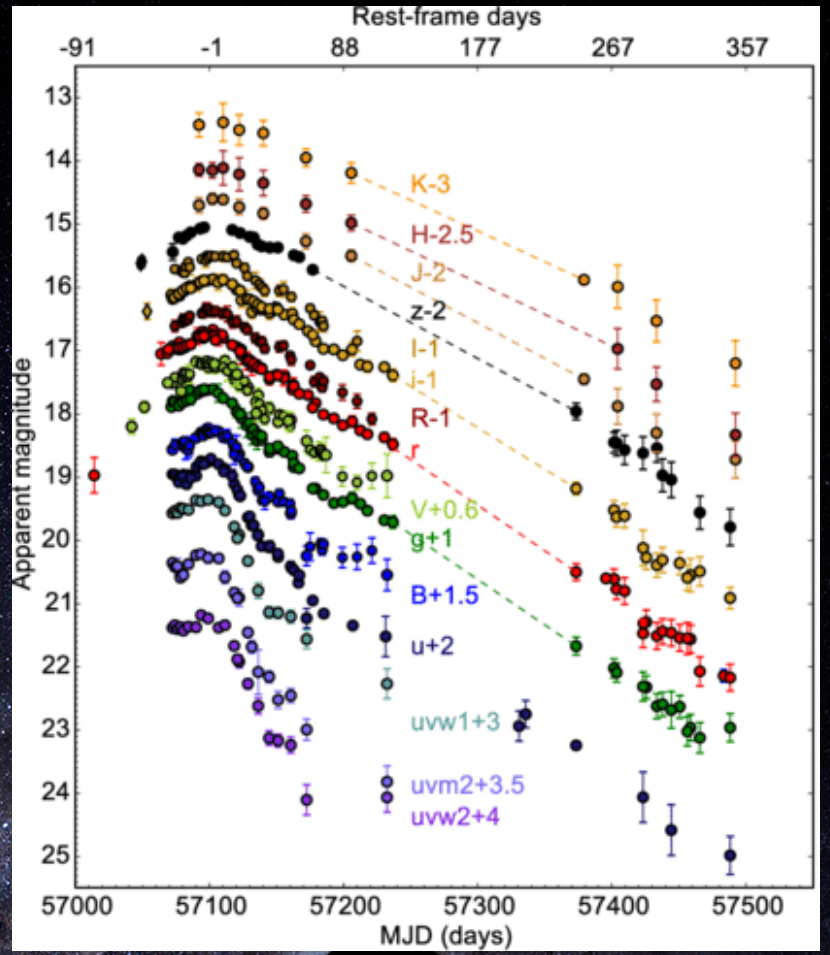
SCORPIO

8-channel imager + spectrograph:

- Simultaneous observations in g, r, i, z, Y, J, H, and K_s (FoV 3'x3')

Science Goals:

- Study the temporal evolution of the SED of transient events
- Multiband monitoring of variable and binary stars
- Characterize the electromagnetic spectrum of gravitational waves counterparts – binary neutron star mergers light up the entire electromagnetic spectrum!!



GIRMOS

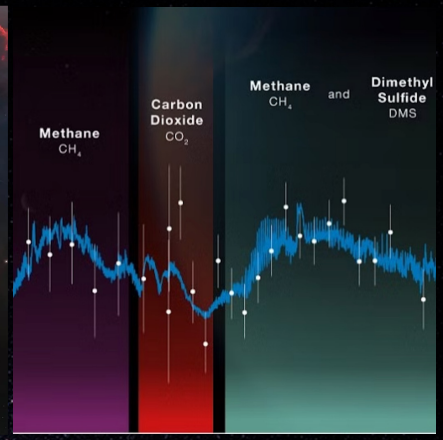
MOAO-fed Multi-Object IFU FoR 2'x2' + imager (85"x85")

- 4 targets, spatial resolution 0.025, 0.05 & 0.1 "/spaxel.
- R 3000 & 8000
- IFUs field: 1"x1", 2"x2", 4"x4"
- Wavelength: 0.95-2.5 microns

Science goals:

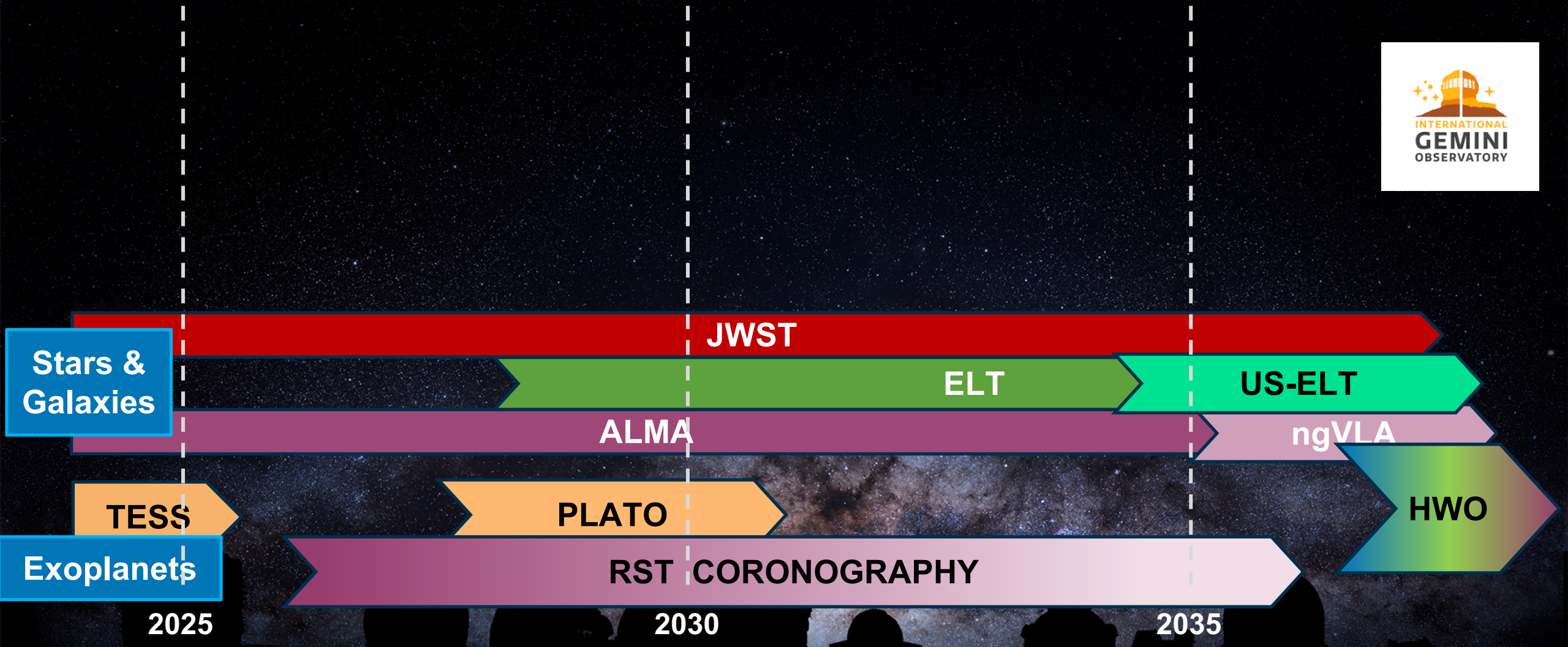
- Study the evolution of the universe from z~10 to the present days
- Investigate high-z galaxy mergers in dense clusters
- Dense star-forming regions in the MW and the LG (resolve embedded Class I and II YSO clusters)

A New Era for Astronomy & Cosmology



- Planets and stars formation
- Discovered planets that might sustain life
- Galaxy evolution
- First stars & galaxies

2024-2040 Landscape



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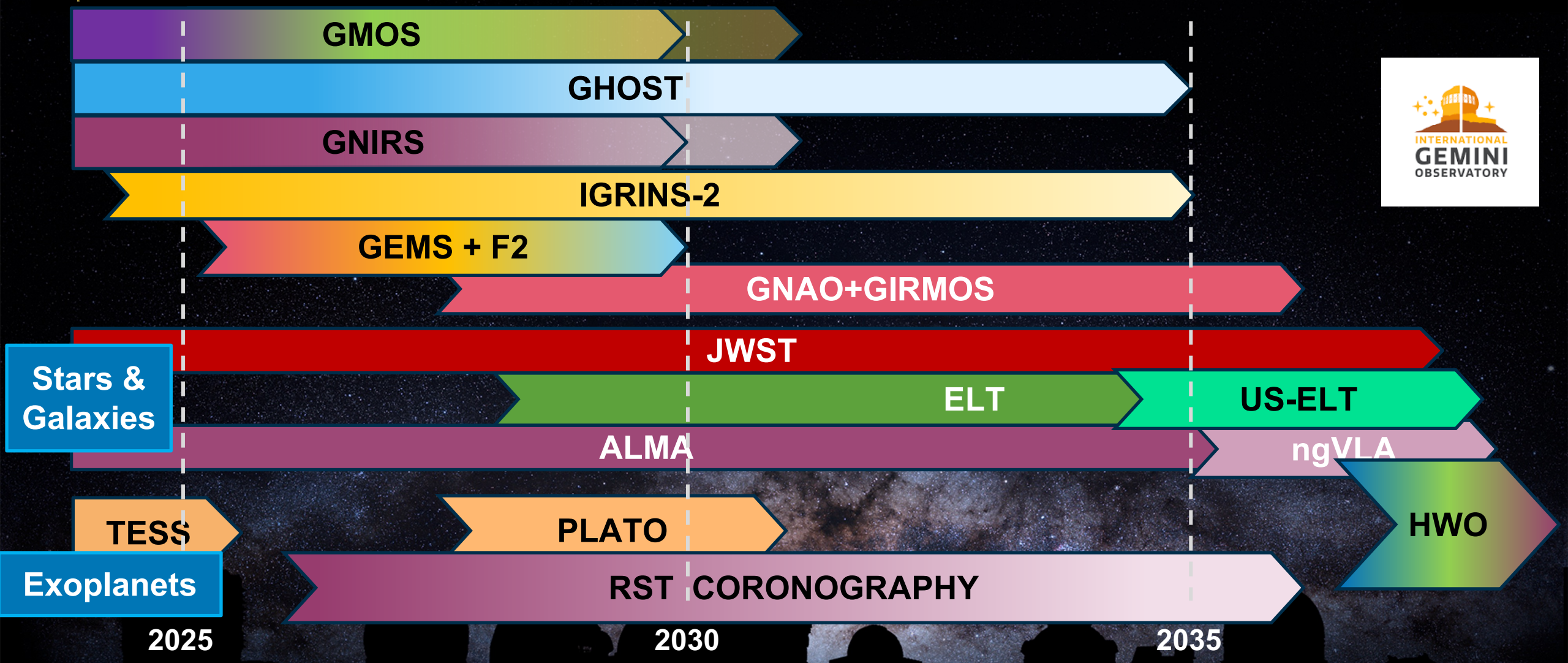
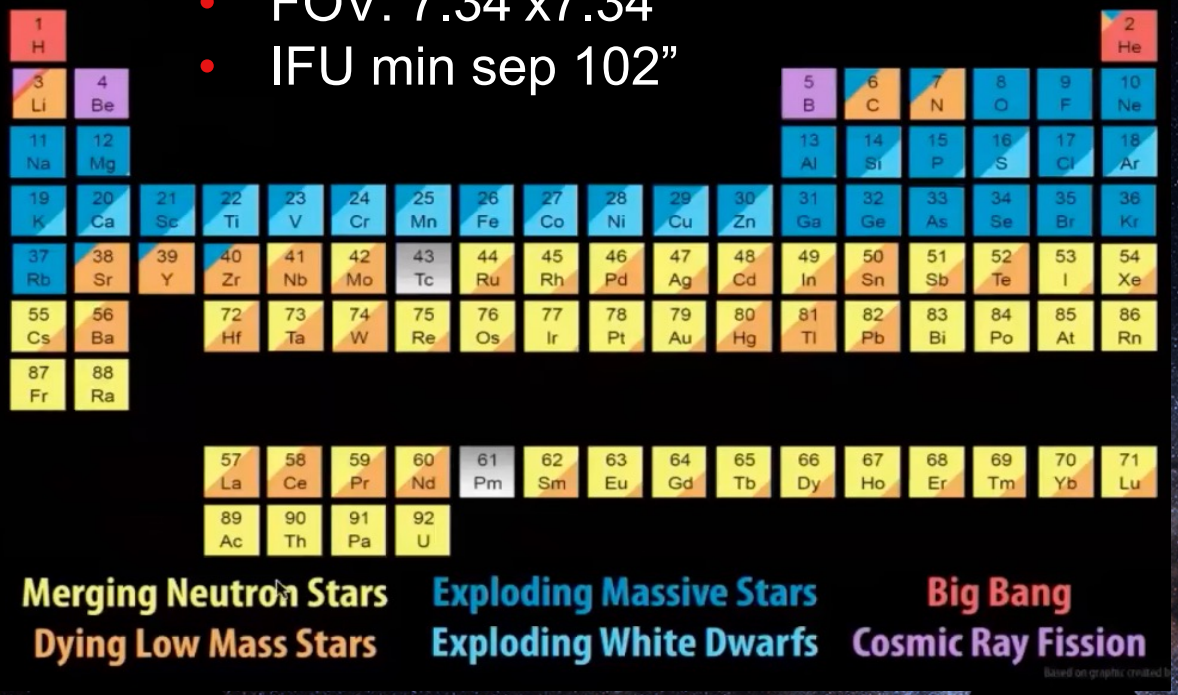


GHOST

- 383 – 1000 nanometers
- R: 56,000 (2 IFU) & 76,000 (1 IFU)
- FOV: 7.34'x7.34'
- IFU min sep 102"



Science cases:

- Chemodynamic analysis of stellar populations;
- Exoplanets masses and interior structures;
- IGM temperature and enrichment at the end of the reionization epoch ($z<6.5$);
- High-ionization lines in core-collapse SNae (disappear within 1-2 days) – determine the progenitor;
- Origin of heavy elements.

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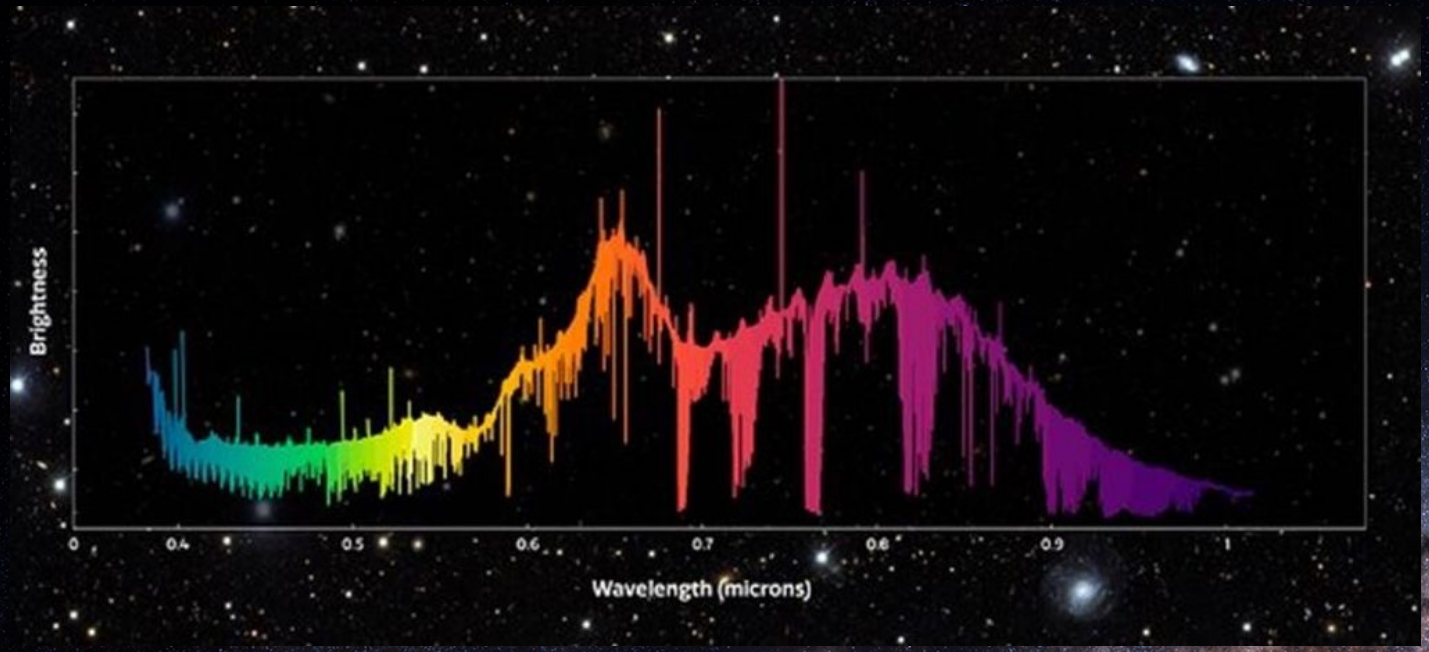

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IGRINS-2 & GPI-2

IGRINS-2

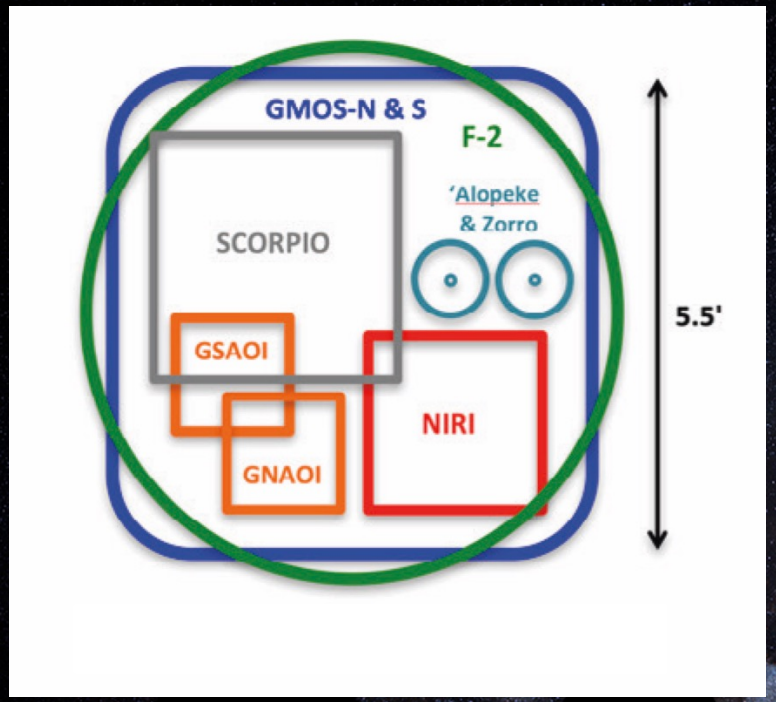
High-res spectroscopy (R~45,000 145-250 nm)
C/O in the planet's atmosphere tells us where the planet formed
Covers H_2O, CO, CH_4, and OH (the building blocks of the amino acids needed for life)
Asymmetric signatures give information about day and night/weather variations, wind speed, etc

GPI 2.0

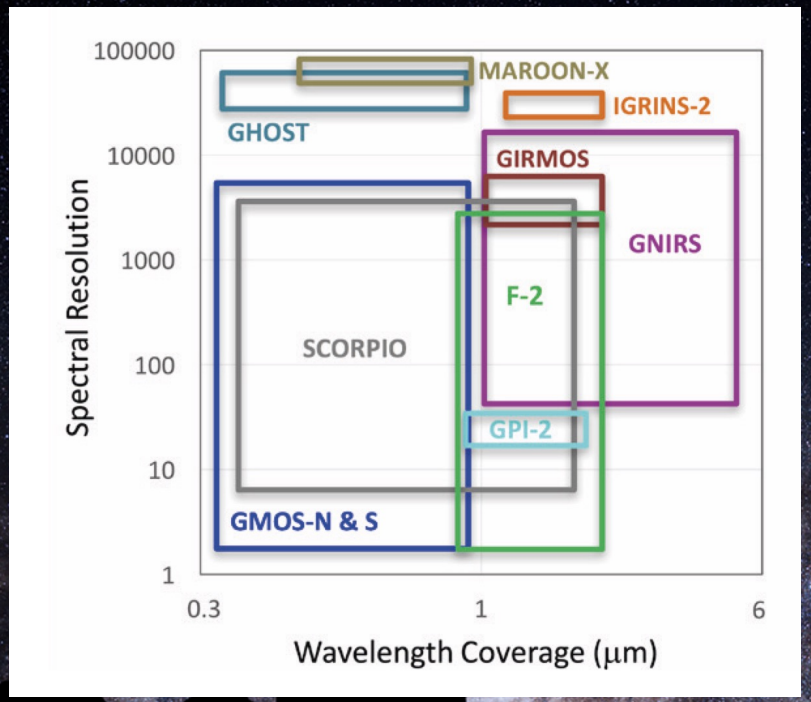
Extreme AO coronograph (97-240 nm) IFU spectroscopy
Trace distribution and relative abundance of silicates and complex molecules across circumstellar and protoplanetary disks
Study disk chemical evolution as a function of the parent star and the surrounding environment

Gemini's capabilities in 2028

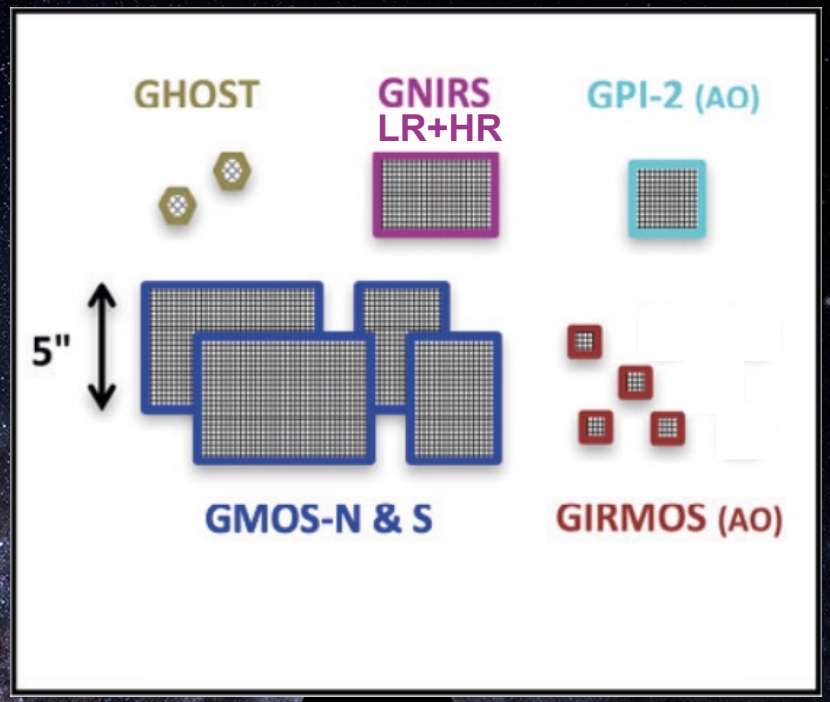
Imaging



Spectroscopy



IFU



Community Brief Reports

June 1st September 14st

What critical instrumentation capabilities should Gemini Observatory develop or maintain in the next 10 to 15 years? Should Gemini develop new workhorse instruments for its two sites, or are multiple specialized instruments preferable?

What synergies with other major space and/or ground-based missions and surveys Gemini Observatory should pursue? How can this be optimized?

How can Gemini pave the path for US-ELT and HWO?

What data and/or archive improvements would increase Gemini's scientific return in the 2030s?

What other instruments would benefit from the new MOAO / GLAO system?

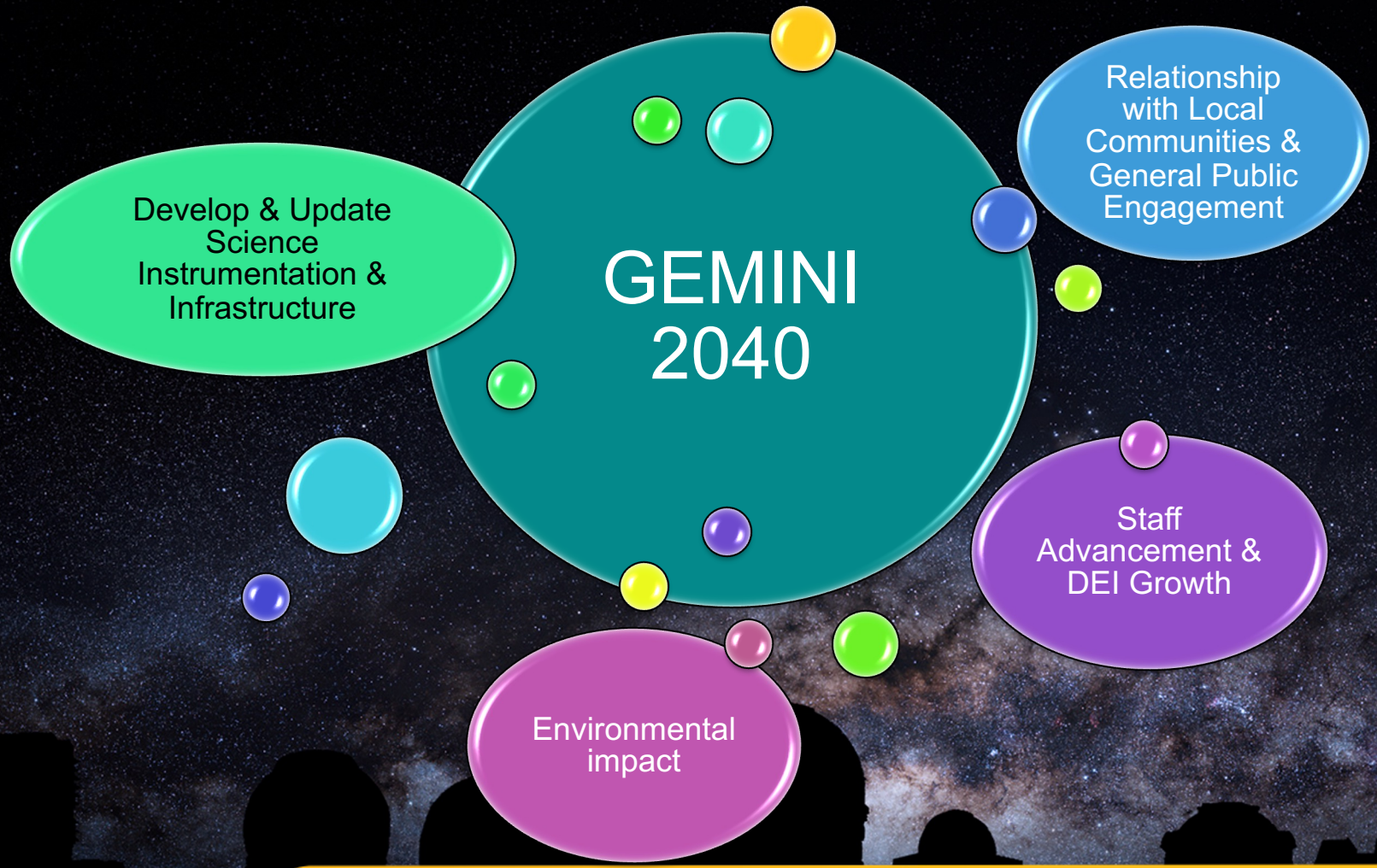
Community Brief Reports

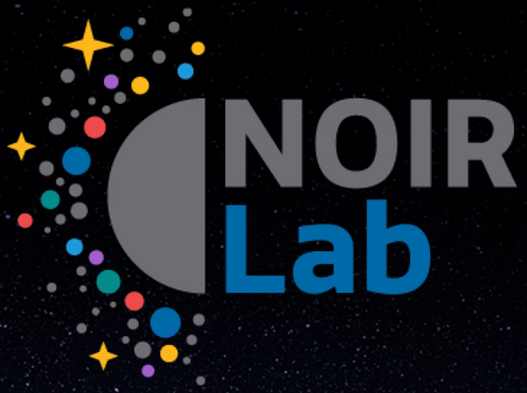
June 1st September 13th

Submit a 2 page (excluding References) in pdf format to
gemini-community-papers@noirlab.edu

The Briefings should include:
1 page for scientific background and goals
1 page for the technical recommendations to reach the goals.

Gemini Scientific Leadership 2030s





AURA

NRC·CNRC

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Exploring the Universe, Sharing its Wonders!