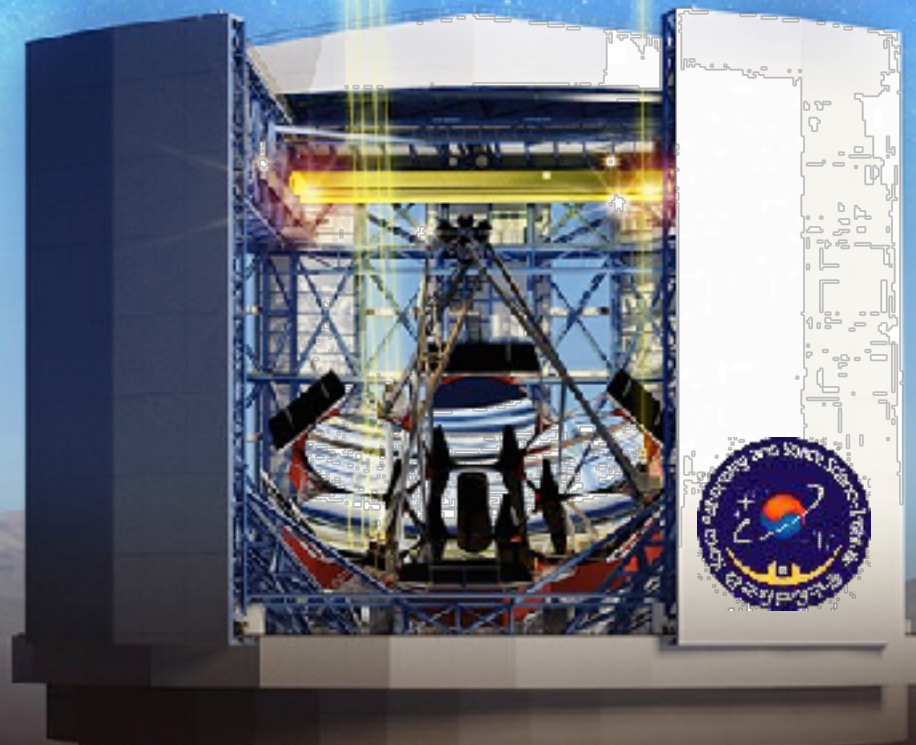


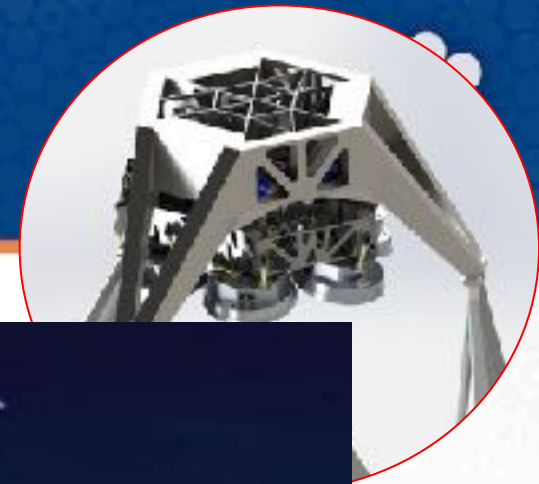
# Giant Magellan Telescope Project



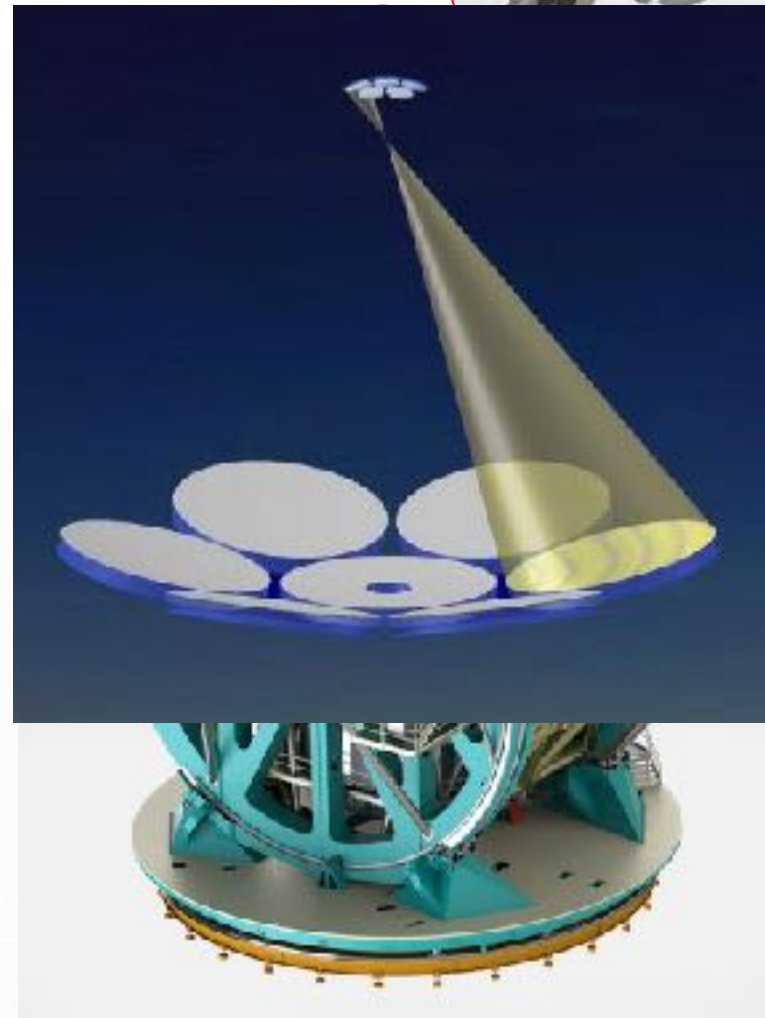
**Byeong-Gon Park**  
Korea Astronomy and Space Science Institute



# Telescope Design Overview



- Doubly segmented
  - M1 – 8.4m x 7 segments
  - M2 – 1.05m x 7 segments
    - FSM : Fast Steering Mirrors
    - ASM : Adaptive Secondary Mirrors
- LGS (6 lasers)
- Aplanatic Gregorian
  - M1/M2 segments are conjugate
  - f/0.7 primary
  - f/8 final focus – **1.0 mm/arcsec**
  - FOV = 20 arcminute
- Alt-Az Mount without Nasmyth Focus



# GMT Founder Institutions



Astronomy  
Australia  
Ltd.



Australian  
National  
University



Smithsonian  
Institution



HARVARD  
UNIVERSITY



Texas A&M

**Official Announcement on Nov. 29, 2017**

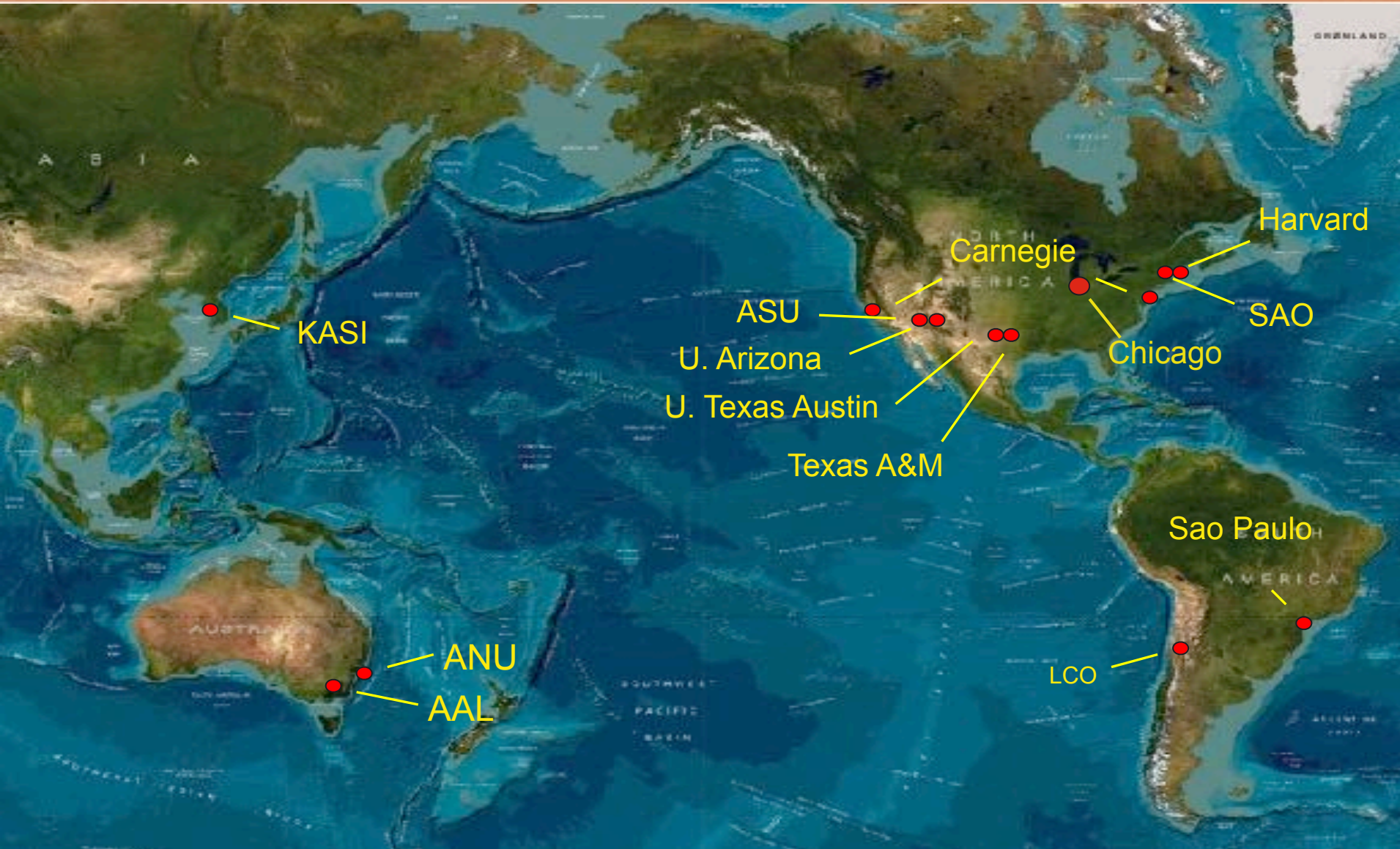


THE UNIVERSITY OF  
TEXAS  
AT AUSTIN



THE UNIVERSITY OF  
CHICAGO

# GMT Founder Institutions



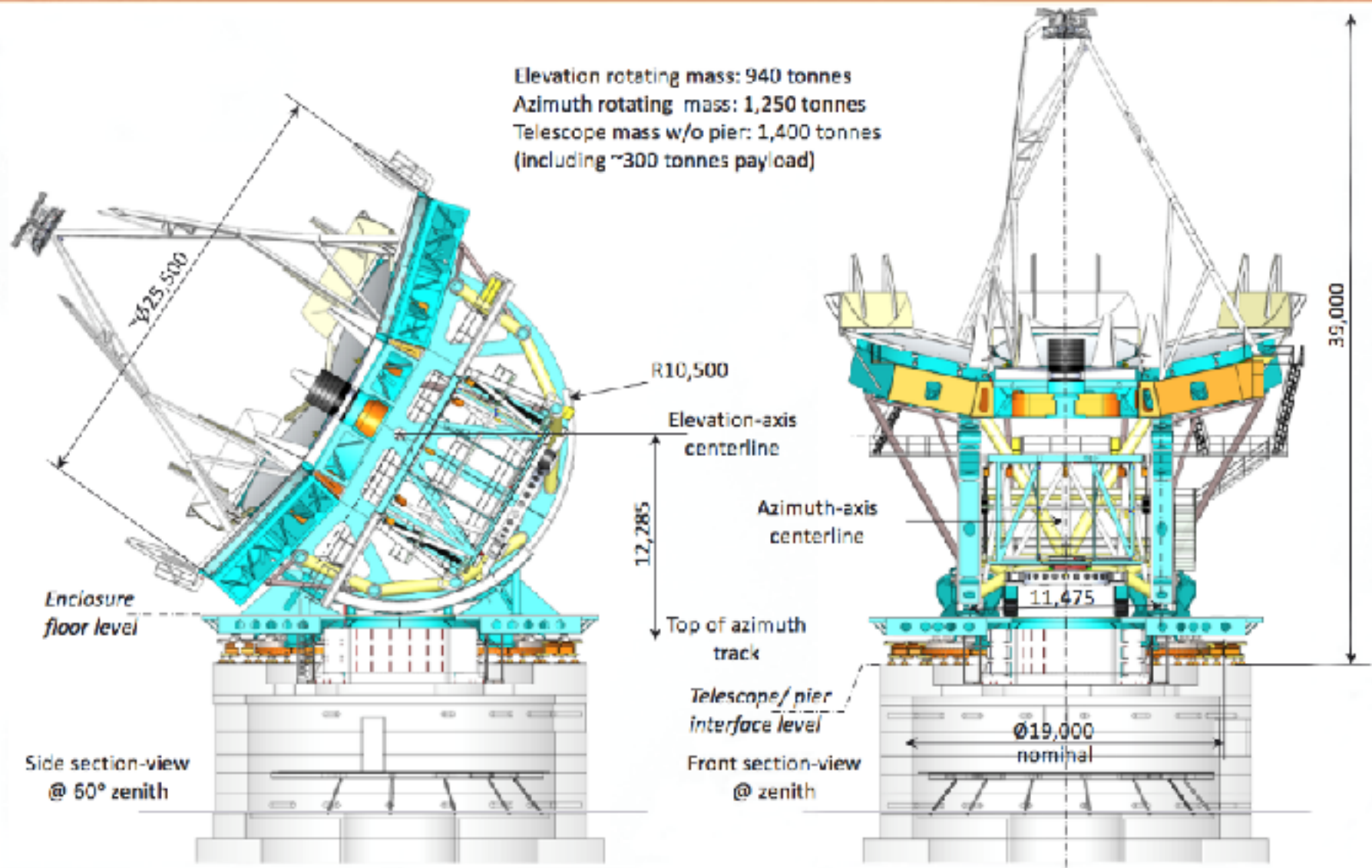
# Recent Progress



- Telescope Mount Procurement
- Primary Mirror Production
- Site Construction
- Instruments Development
- Science Book
- Science Workshops

# Telescope Mount Procurement

Elevation rotating mass: 940 tonnes  
 Azimuth rotating mass: 1,250 tonnes  
 Telescope mass w/o pier: 1,400 tonnes  
 (including ~300 tonnes payload)



# Telescope Mount Procurement

## Telescope Mount Procurement Status

Global competitive procurement based on *best value* to GMTO  
(Procurement from Sep. 2016 ~ )

Two stage process:

Stage 1: Six month design studies

Two vendor teams

Leads to a fixed-price proposal

Stage 2: Design-Build contract

Final design

Fabrication

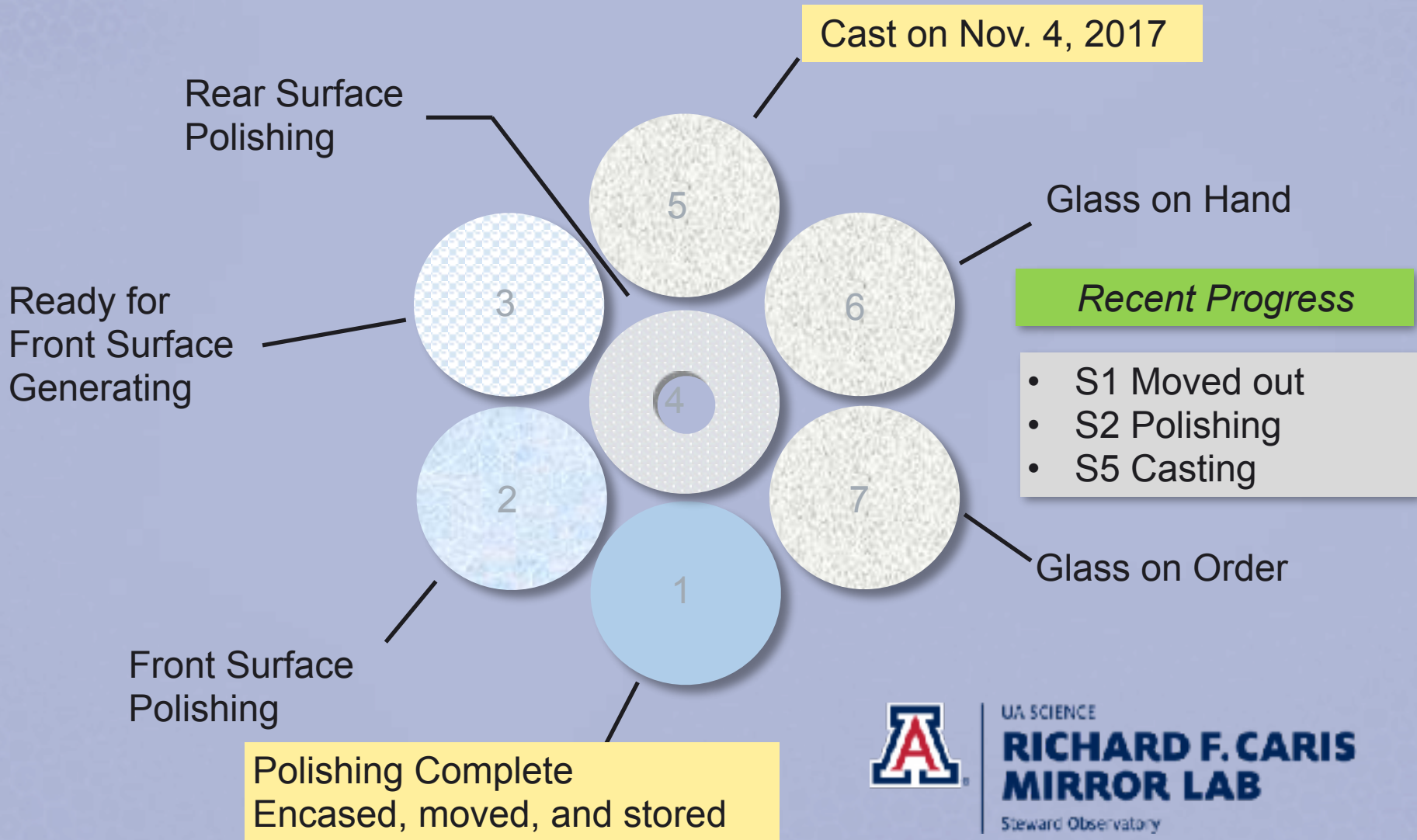
Installation on site



**Recent Progress**

***Two Vendor teams out of Five proposals are selected for Stage 1  
Announced on Dec. 7<sup>th</sup>: IDOM (Spain) and MT Mechatronics  
(Germany)***

# Primary Mirror Production



UA SCIENCE  
**RICHARD F. CARIS  
MIRROR LAB**  
Steward Observatory



# S5 Casting Event at Tucson



S1 Stored



# Las Campanas Observatory

GMT Site is 5km South of Magellan on Same Ridge



# GMT Site Master Plan

- Summit Site
  - Enclosure
  - Support buildings (coating facility)
  - Utility building
  - Offices
  
- Support Site #1
  - M1 & M2 operations
  - Workshops/storage
  - Backup generators
  
- Support Site #2
  - Residences
  - Dining & recreation



# Site Master Plan - Today



Summit

Warehouse / M1 Factory /  
M2 Metrology

Main Access Road

Support Site Loop Road

Residence

# Site Construction Infrastructure



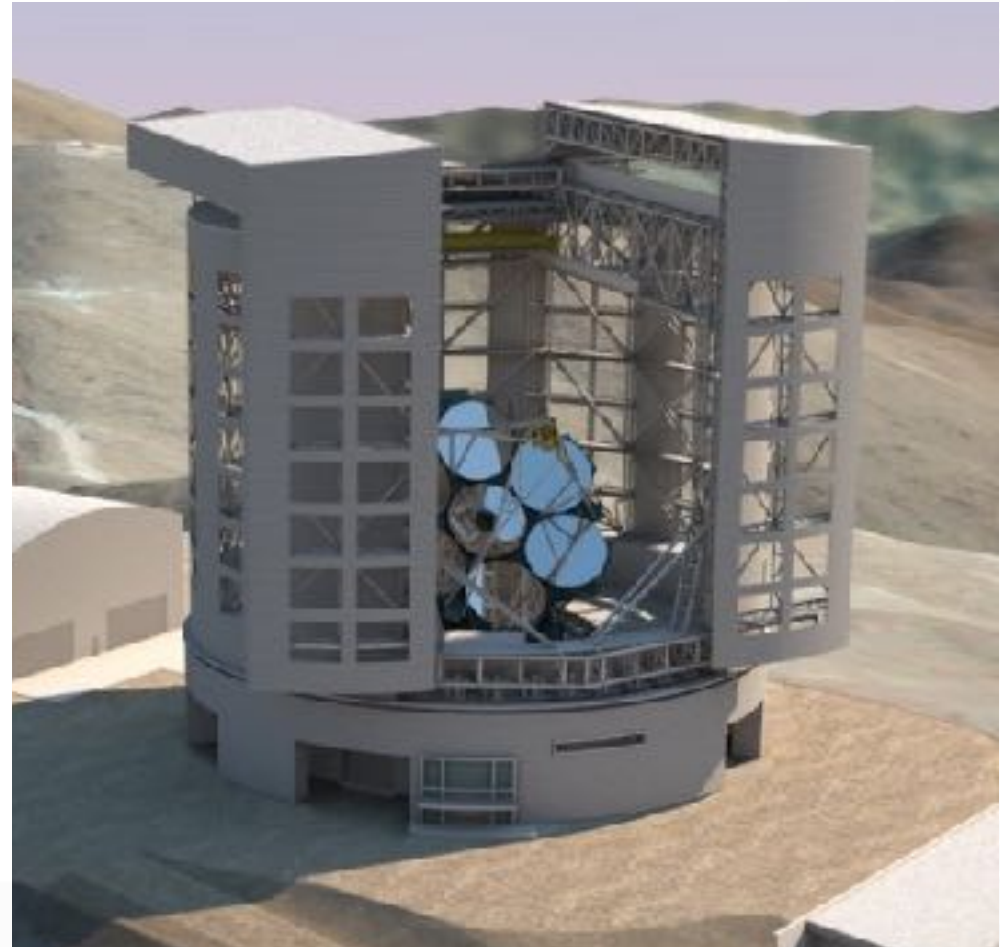
**Housing to support 250 construction workers on the site  
Summit excavation to start in early 2018**

# Summit Site Readiness



# Major Next Steps

- Jan 2018: begin construction of Enclosure & other site facilities (near critical path)
  - Hard rock excavation at five select areas
  - To be followed by concrete package in Q1 FY19





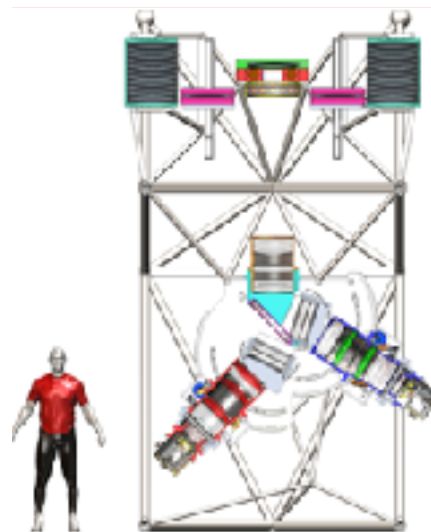
# Enclosure (Video ; ~ 34 sec)



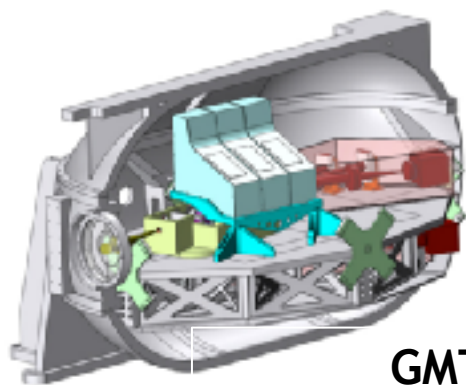
# 1st Gen. Science Instruments



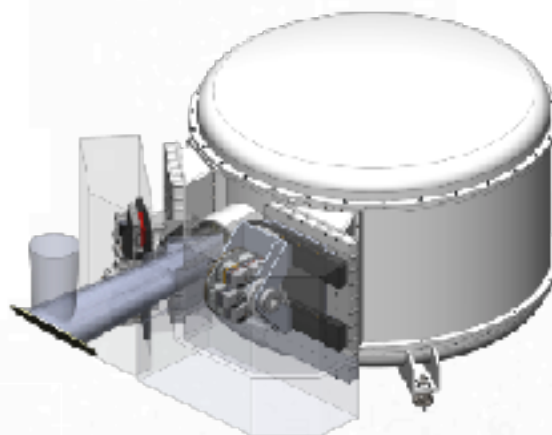
**G-CLEF**  
 $20,000 < R < 100,000$   
 Echelle



5.2  
 m **GMACS**  
 Visible Wide-Field MOS



**GMTNIRS**  
 AO-Fed 1-5 micron echelle



**GMTIFS**  
 AO-Fed IFU  
 Spectrograph and  
 Imager

# 1<sup>st</sup> Generation Instruments: Summary

| Instrument / Mode             | Capabilities                                 | $\lambda$ Range, $\mu\text{m}$ | Resolution                         | Field of View                | Status                    |
|-------------------------------|--|--------------------------------|------------------------------------|------------------------------|---------------------------|
| <b>G-CLEF</b> / NS, GLAO      | Optical High Resolution Spectrograph / PRV   | 0.35 – 0.95                    | 20 – 100K                          | 7 x 0.7, 1.2" fibers         | CDR 2018. 2.              |
| <b>GMTIFS</b> / LTAO, NGS AO  | NIR AO-fed IFS / Imager                      | 0.9 – 2.5                      | 5,000 & 10,000                     | 10 / 400 arcsec <sup>2</sup> |                           |
| <b>GMACS</b> / NS, GLAO       | Wide-Field Optical Multi-Object Spectrograph | 0.36 – 1.0                     | 1,500 – 4,000<br>(10K w/ MANIFEST) | 40-60 arcmin <sup>2</sup>    |                           |
| <b>GMTNIRS</b> / NGS AO, LTAO | JHKLM AO-fed High Resolution Spectrograph    | 1.2 – 5.0                      | 50K, 100K                          | 1.2" long-slit               | Large Grating Development |
| <b>MANIFEST*</b> / NS, GLAO   | Facility Robotic Fiber Feed                  | 0.36 – 1.0                     |                                    | 20' diameter                 |                           |

\*MANIFEST is a feed for G-CLEF and GMACS, not an instrument; it is in the instrumentation product tree

# Science Books Outline: 2012 vs. 2018

## [2012 Science Book]

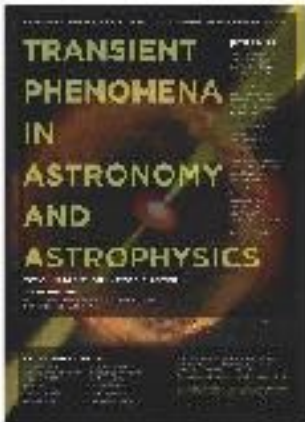
0. GMT technical summary
1. Formation of Stars and Planetary Systems
2. Properties of Exoplanetary Systems
3. Stellar Populations and Chemical Evolution
4. Assembly of Galaxies
5. Dark Matter, Dark Energy and Fundamental Physics
6. First Light and Reionization
7. Transient Phenomena
8. Synergy with Other Facilities

## [2018 Science Book]

0. GMT technical summary
1. The Solar System, Exoplanets, and Planet Formation
2. The Birth of Stars
3. Death of Stars
4. Building the Milky Way, Star by Stars
5. Individual Galaxies Over Time
6. Galaxy Assembly and the Cosmic Web
7. Cosmology & Fundamental Physics
8. First Light

# Annual Community Science Meetings

- |                                     |  |
|-------------------------------------|--|
| 2013: Galaxies and Cosmology        | Chicago, IL, University of Chicago's Gleacher Center |
| 2014: Explosive Transients          | Washington, DC, Museum of the Am. Indian             |
| 2015: Resolving Galaxies            | Monterey Bay, CA, Asilomar                           |
| 2016: Exoplanet Science             | Monterey Bay, CA, Asilomar                           |
| <b>2017: Chemical Evolution</b>     | <b>Tarrytown, NY</b>                                 |
| <b>2018: Star Birth, Star Death</b> | <b>Hawaii</b>  |



# 2017 Community Science Meeting

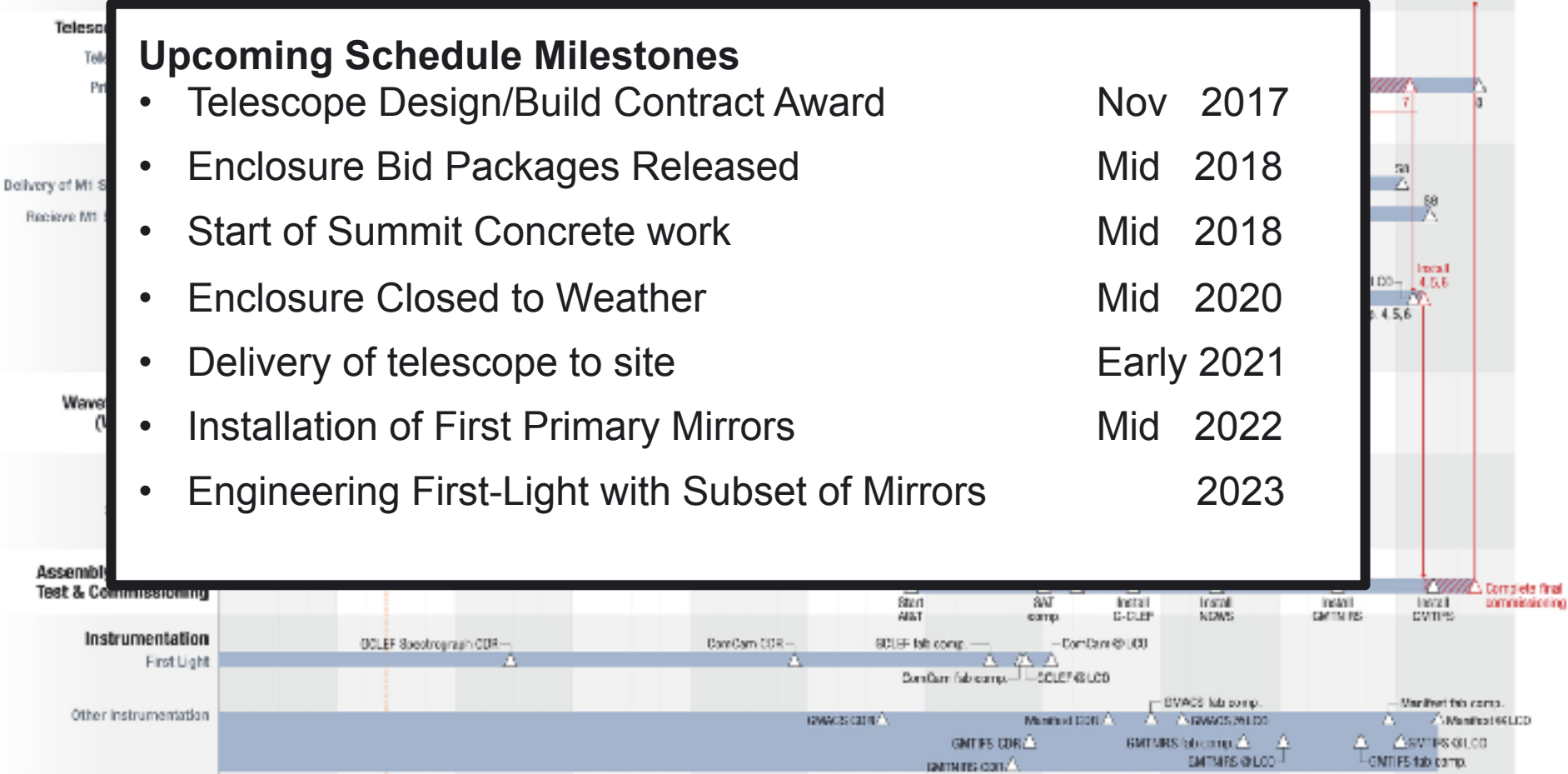


# Summary Schedule (no schedule margin included)



## Upcoming Schedule Milestones

- Telescope Design/Build Contract Award Nov 2017
- Enclosure Bid Packages Released Mid 2018
- Start of Summit Concrete work Mid 2018
- Enclosure Closed to Weather Mid 2020
- Delivery of telescope to site Early 2021
- Installation of First Primary Mirrors Mid 2022
- Engineering First-Light with Subset of Mirrors 2023



**Thank You**

