TMT−Japan Report

Masanori Iye (NAOJ)

（1） Science objectives

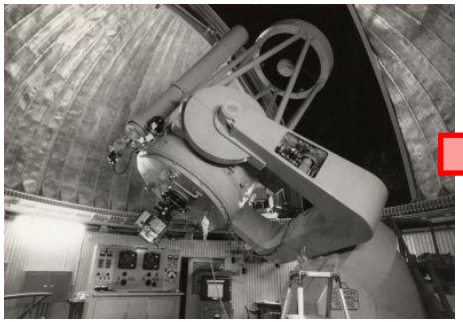
（2） Outline of TMT project

（3） Japan’s role and plan

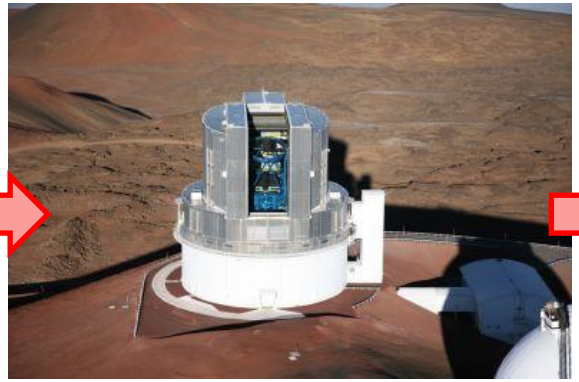
Japan's Astronomical Facilities

Nobeyama→Subaru → ALMA → TMT

Opt/IR



Okayama 188cm,1960年



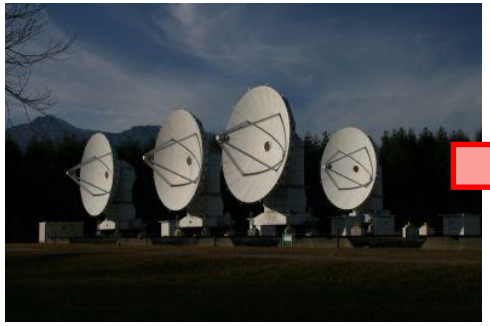
Subaru,2000年

TMT,2020年

1960 1970 1980 1990 2000 2010 2020

Radio

Nobeyama,1982年



ALMA 2011年

(1) Science objectives of TMT

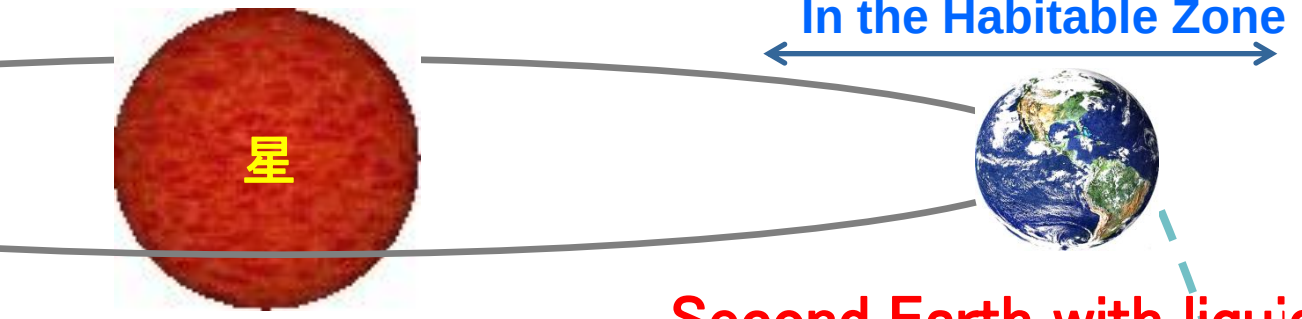
- **30m Opt/IR Telescope**

  Will be the main Opt/IR facility in the world during 2020 – 2040

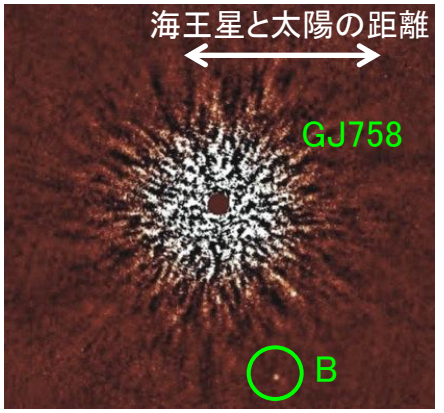
- **New Objectives**
- **Search for the second Earth and probe for the existence of life in the Universe.**
- **Measure the properties of Dark Energy**
- **Witness the first stars in the Universe**

①Search for the second Earth and Probe for life in the Universe

Direct Imaging

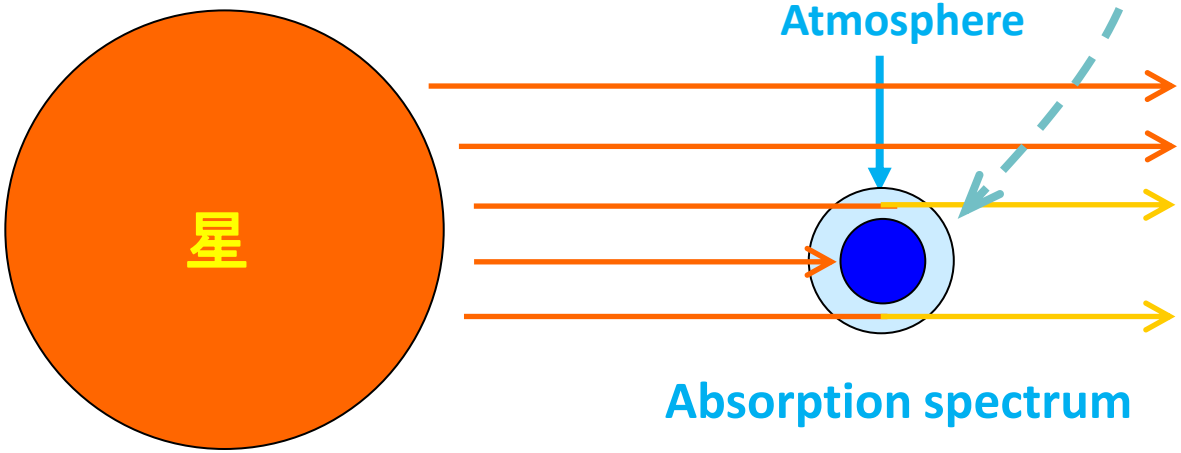


Second Earth with liquid water on its surface



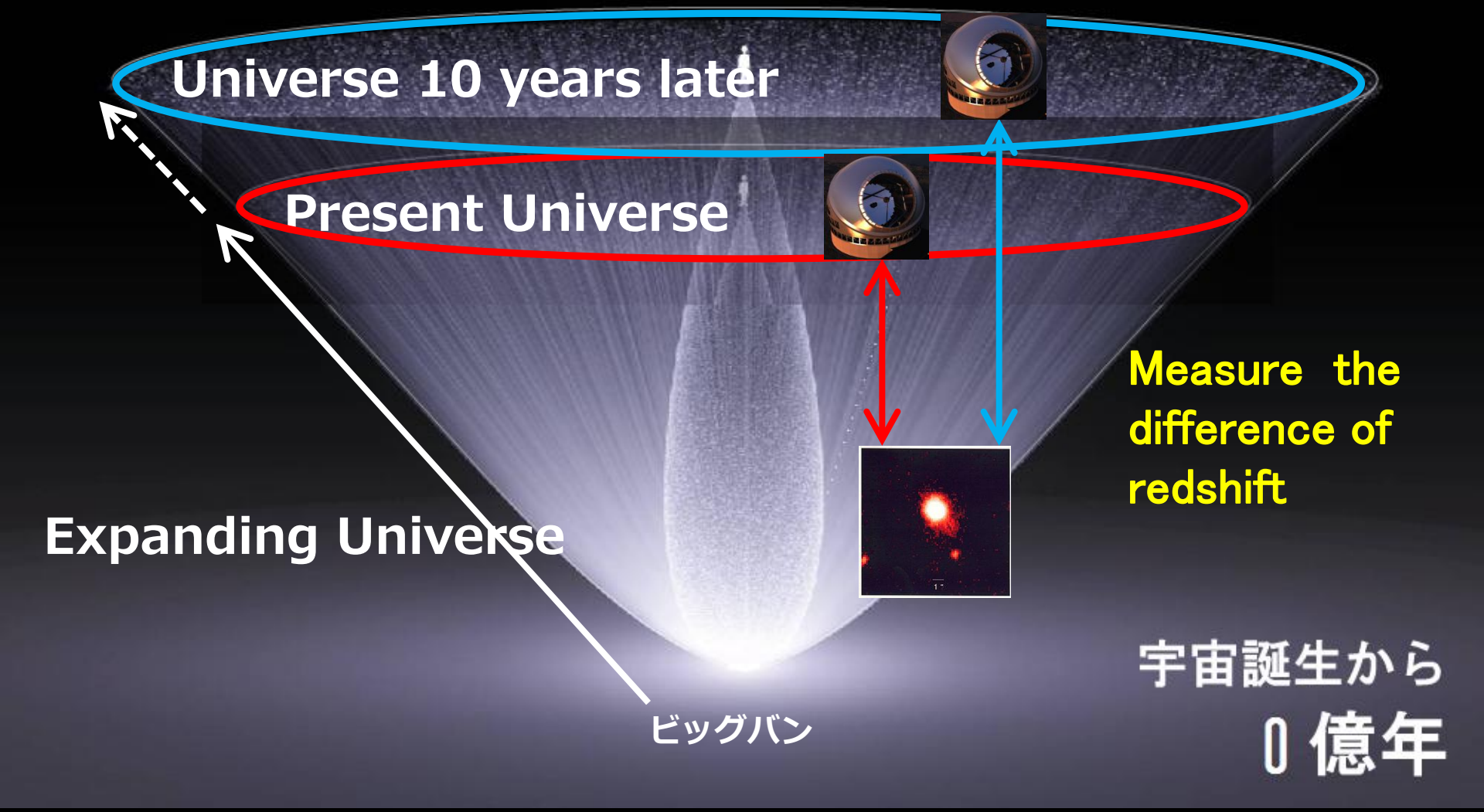
Exoplanet imaged by Subaru

Transit



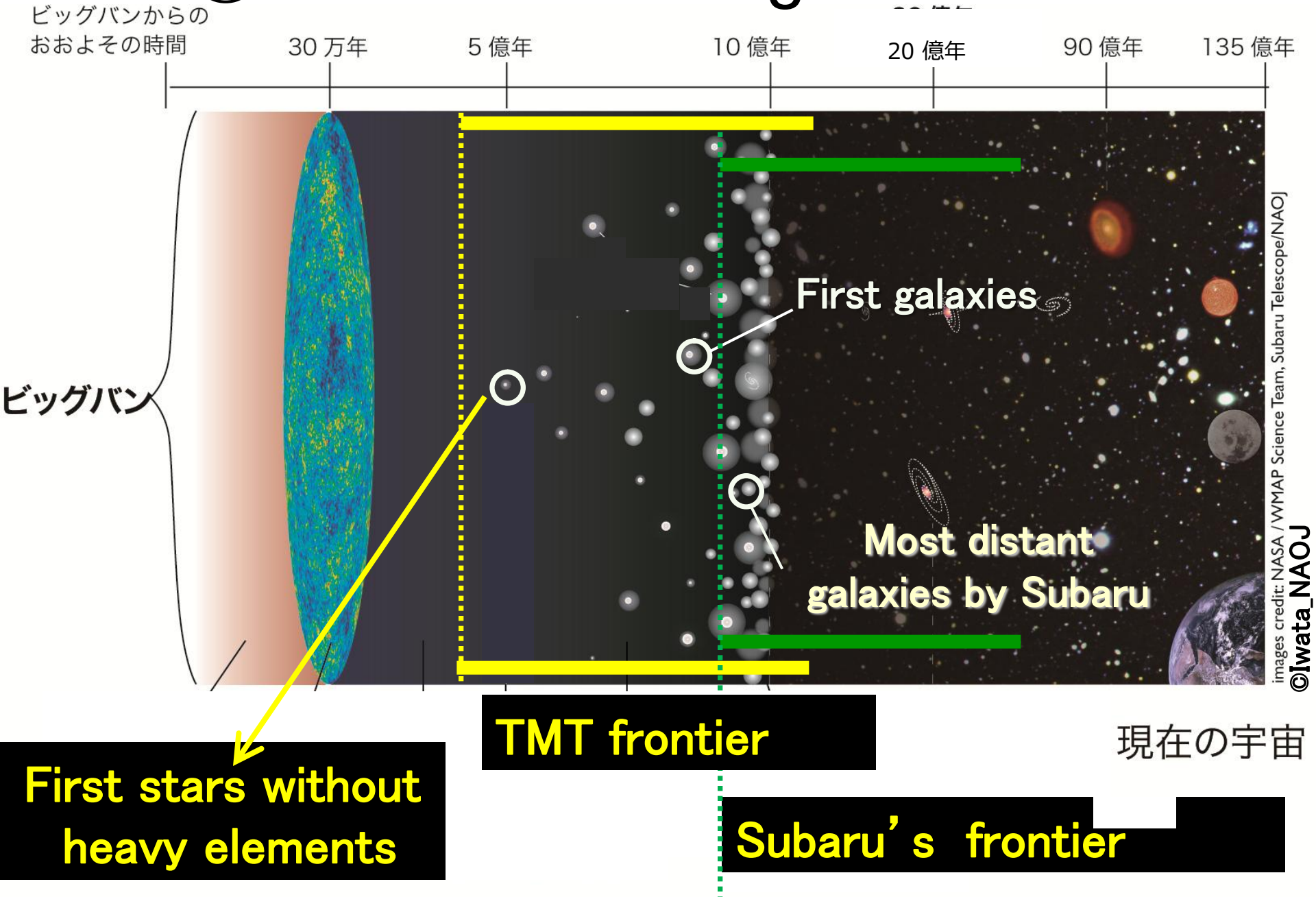
Look for O2 or CH4 as bio markers

② Direct Measurement of the Cosmic Expansion



Measure the time evolution of redshift of quasars in 10 years to elucidate cosmic expansion history

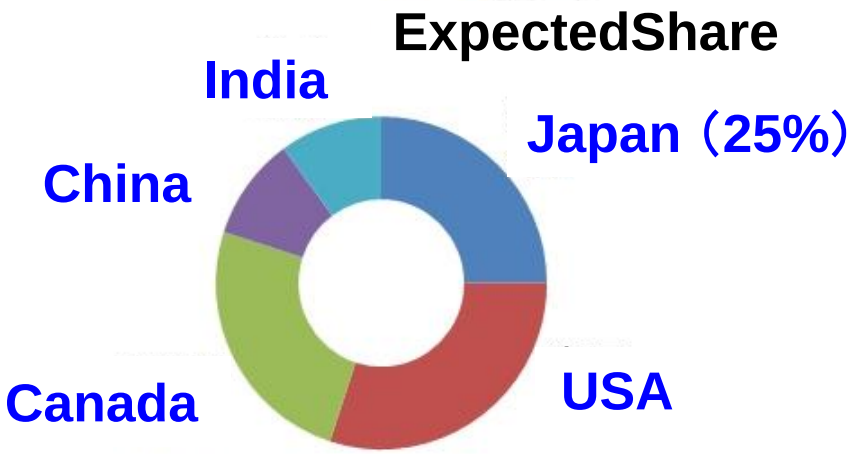
③ First stars and galaxies

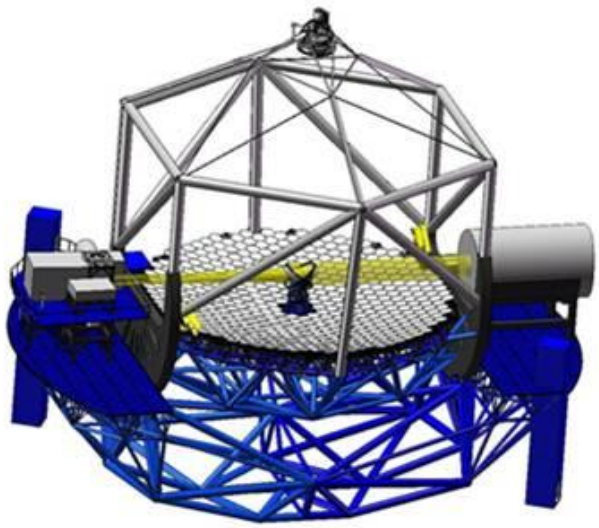


(3) Outline of the TMT Project

TMT

- International Science Project
  - Cost： 1500M$
  - Construction： 2014—2021





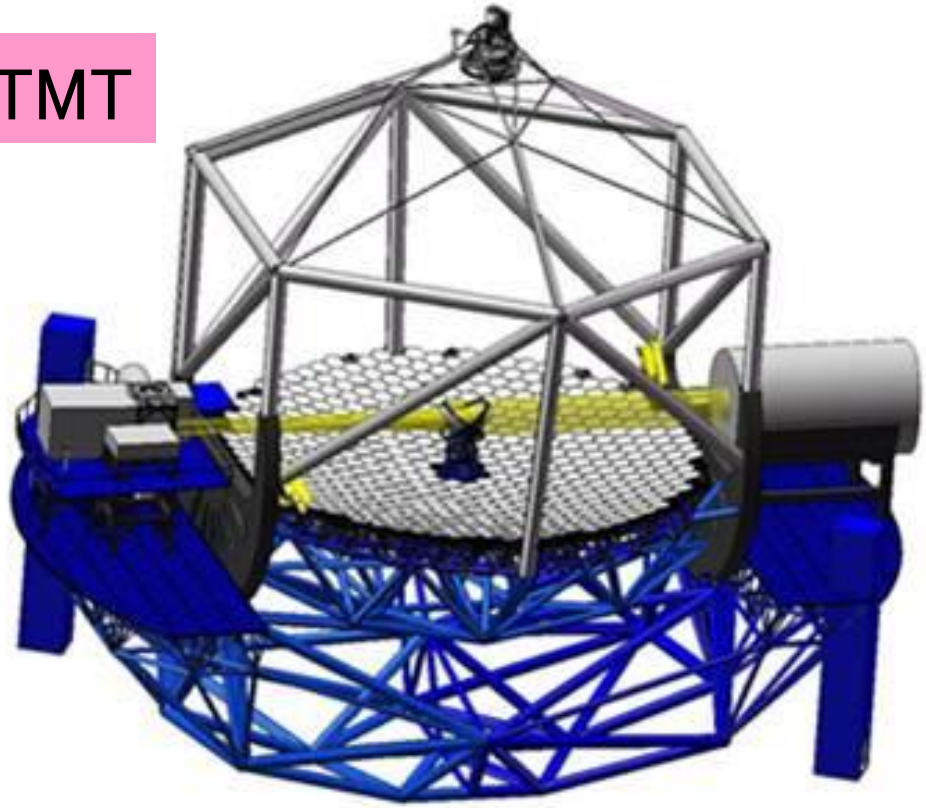
- 13N Mauna Kea, Hawaii
- Cover northern sky, with survey capability provided by Subaru
- Aims for the 1st running ELT

TMT vs Subaru

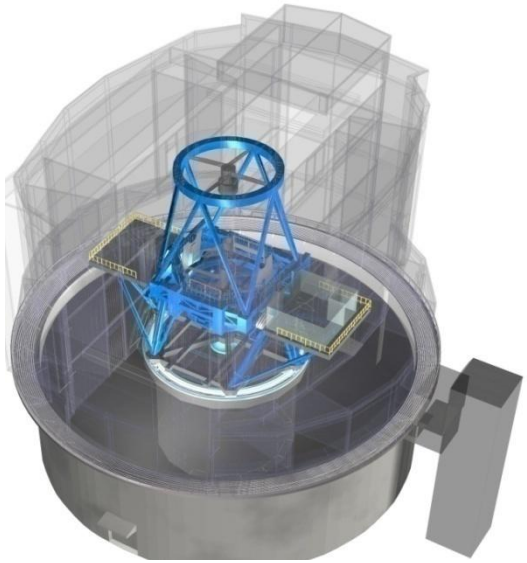
M1 diameter x3.8
Enclosure height x1.3

	TMT	Subaru
M1	segmented	monlithic
Diameter	30m	8m
Weight(ton)	1400	555
Enclosure	56m	43m

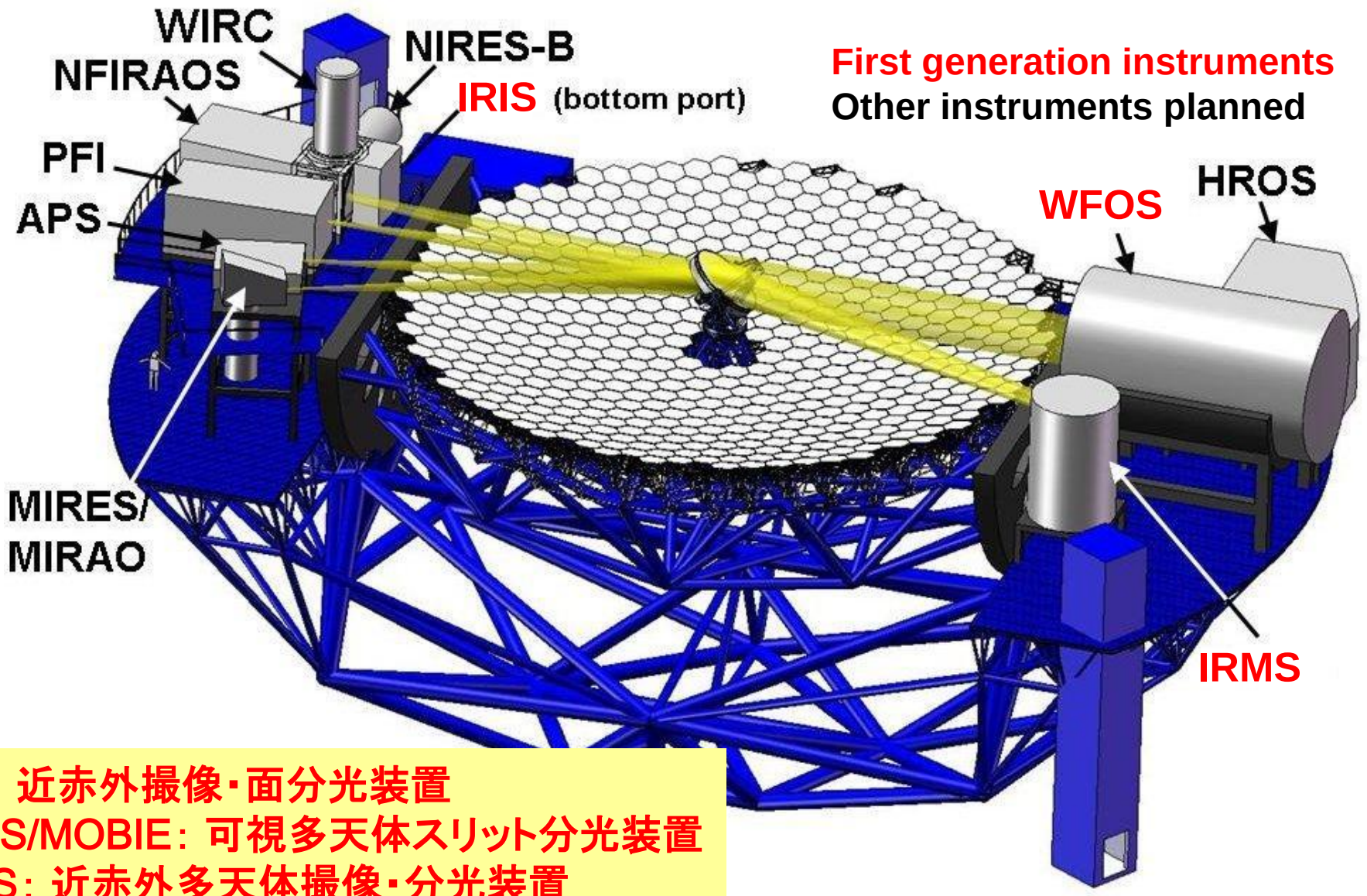
TMT



Subaru



TMT Instruments



IRIS: 近赤外撮像・面分光装置
WFOS/MOBIE: 可視多天体スリット分光装置
IRMS: 近赤外多天体撮像・分光装置

Construction permit at 13N (2011.2)

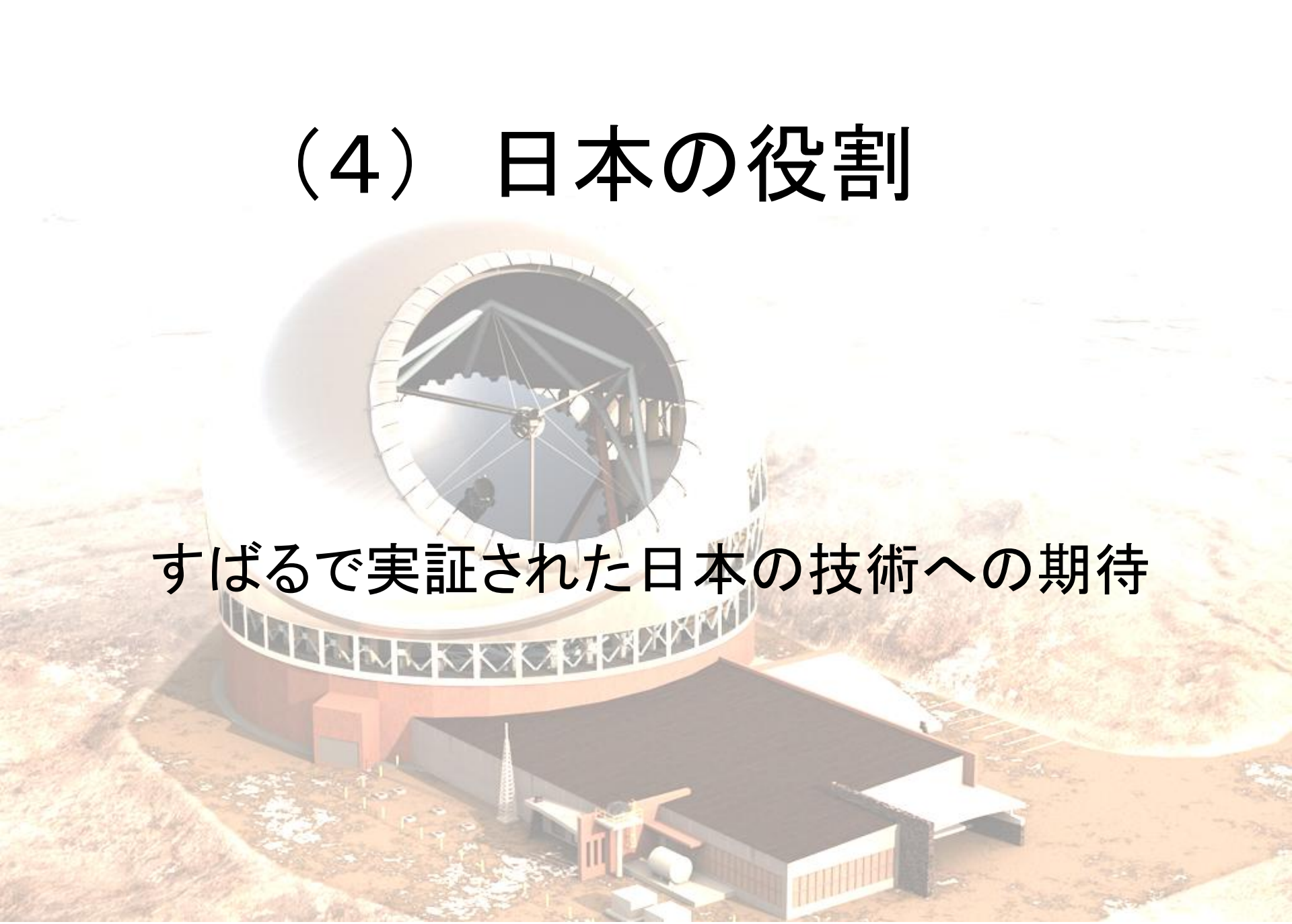
TMT Collaborative Board

UC, Caltech, ACURA, NAOJ, and NAOC signed to Letter of Intent in October 2011
TMT entered into new stage for making coherent budget requests to funding agencies of each partner.
India is expected to join shortly
NSF solicitation will be announced in Dec 2011 for down selecting GMT/TMT by July 2012

TMT board meets every three month
TMT proposal development team consisting of representatives from each partner has telecon every 2 weeks.

Aims to agree on partners share of roles toward the January TMT board meeting.

（4） 日本の役割



すばるで実証された日本の技術への期待

Community Assessments

2006/11： Opt/IR Astronomy Community => NAOJ

2008/3： Opt/IR Committee of NAOJ => NAOJ

2008/6： International Review Panel => NAOJ

2010/3： Astrophysics Panel, Council for Science

「Long term plan and prospects for astrophysics」

Recommendation of TMT for early realization

2010/10 ：MEXT panel for large scale science

Evaluation of TMT as a top-rank project to start

2011/1： Physics Panel, Council for Science

Physics symposium on Large Scale Science Facilities

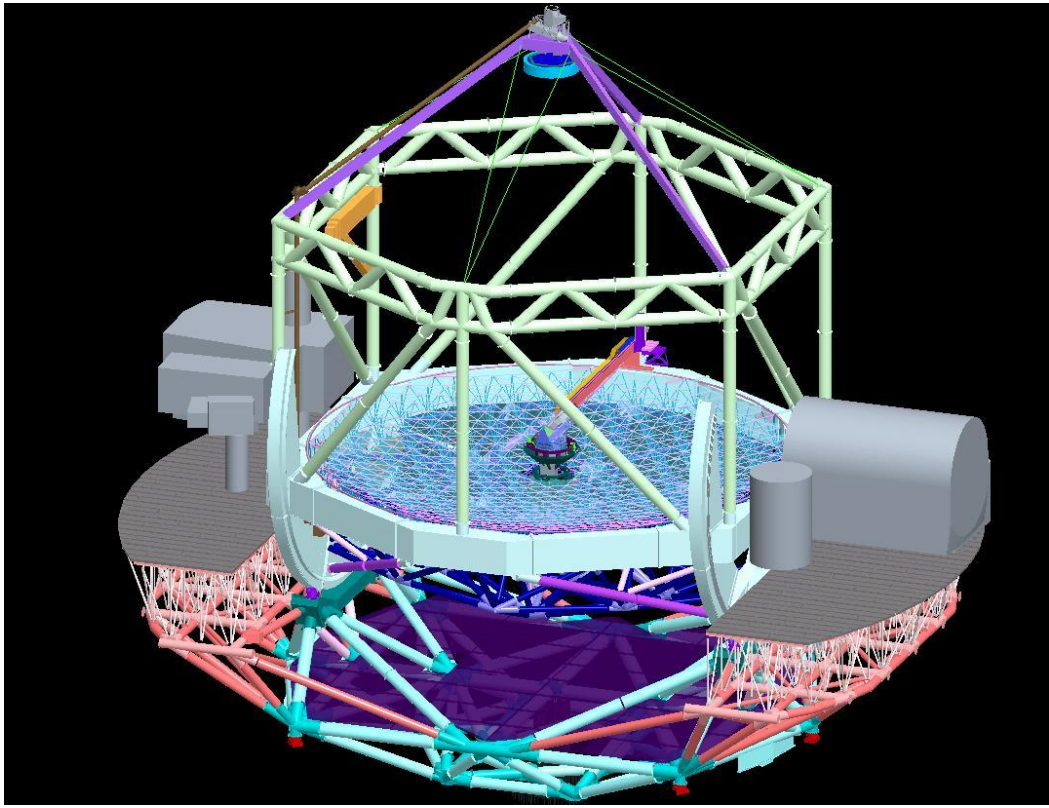
Reported the status of TMT asking for support

	Japan	USA	Canada	China	India
Summit Facility					
Base Facility					
Enclosure					
Telescope Str					
M1 blanks					
M1 polishing					
M1 support					
M2					
M3					
Coating/Cleaning					
M1CS					
TCS					
AO					
Instruments					
Peersonnel					

TMT telescope structure

- **Design studies of the TMT telescope structure based on the supplementary experiences gained at Subaru Telesocpe**

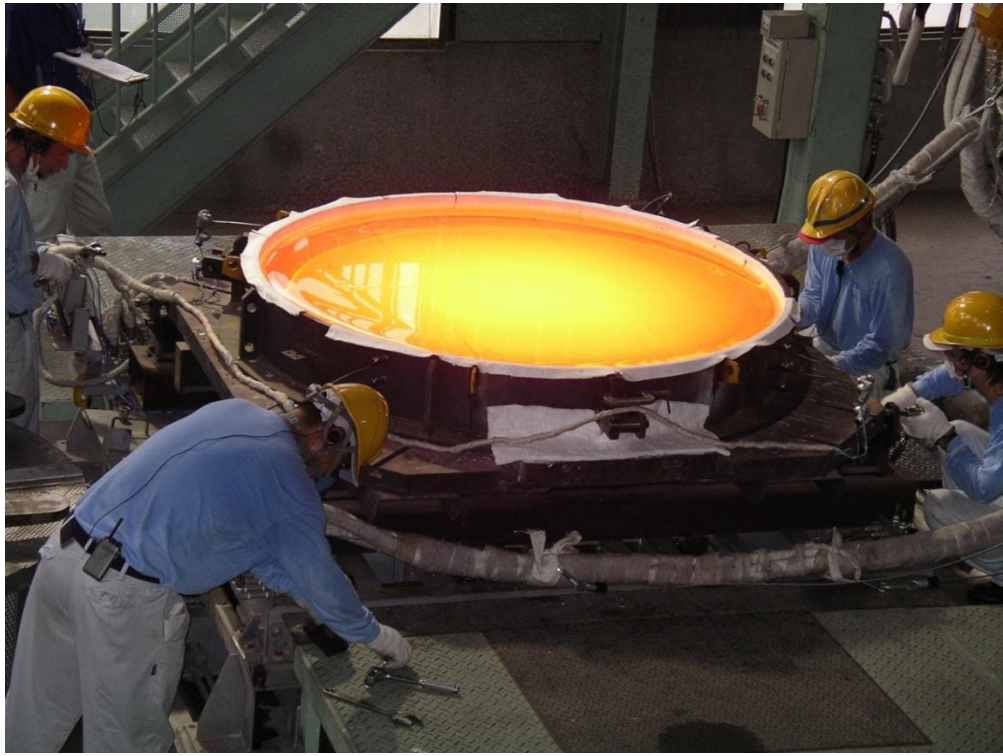
- Light weight sturdy truss
- High tracking precision
- Seismic safety device



All but M2, M3 are the scope of works

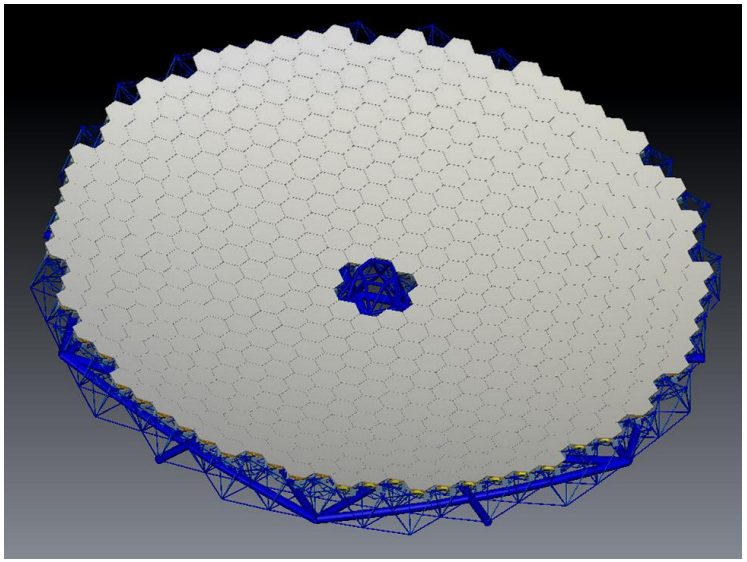
TMT M1 blanks

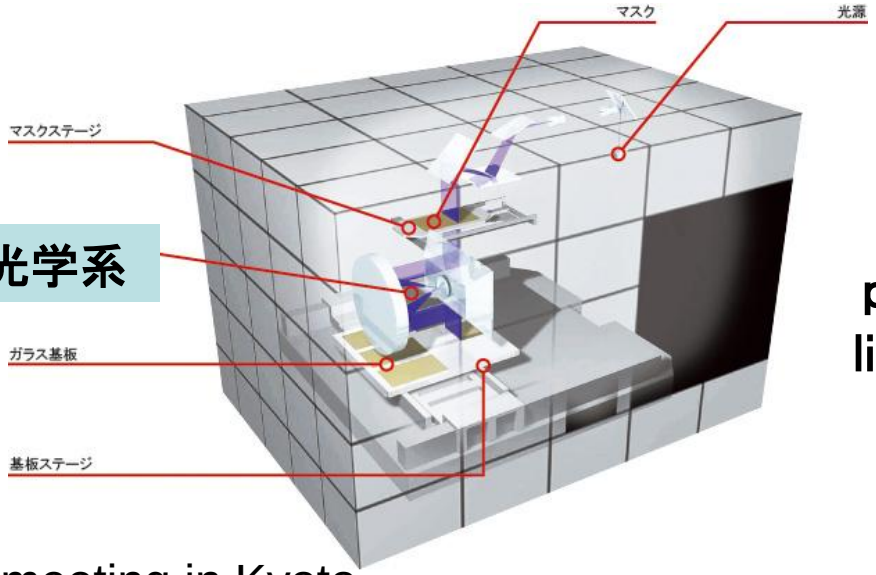
- **Clear Cerun**
  - **Diameter1.55m、Thickness58mm**
  - **574 segments. Fabricate Line in position**



Polishing M1 mirrors

- **High precision generation of the aspheric surface**
  - **82 different types**
  - **Production line is almost there**





大型鏡投影光学系

Facility for mass production of large liquid crystal panels

TMT-J Schedule: hoping to start R&D in 2012