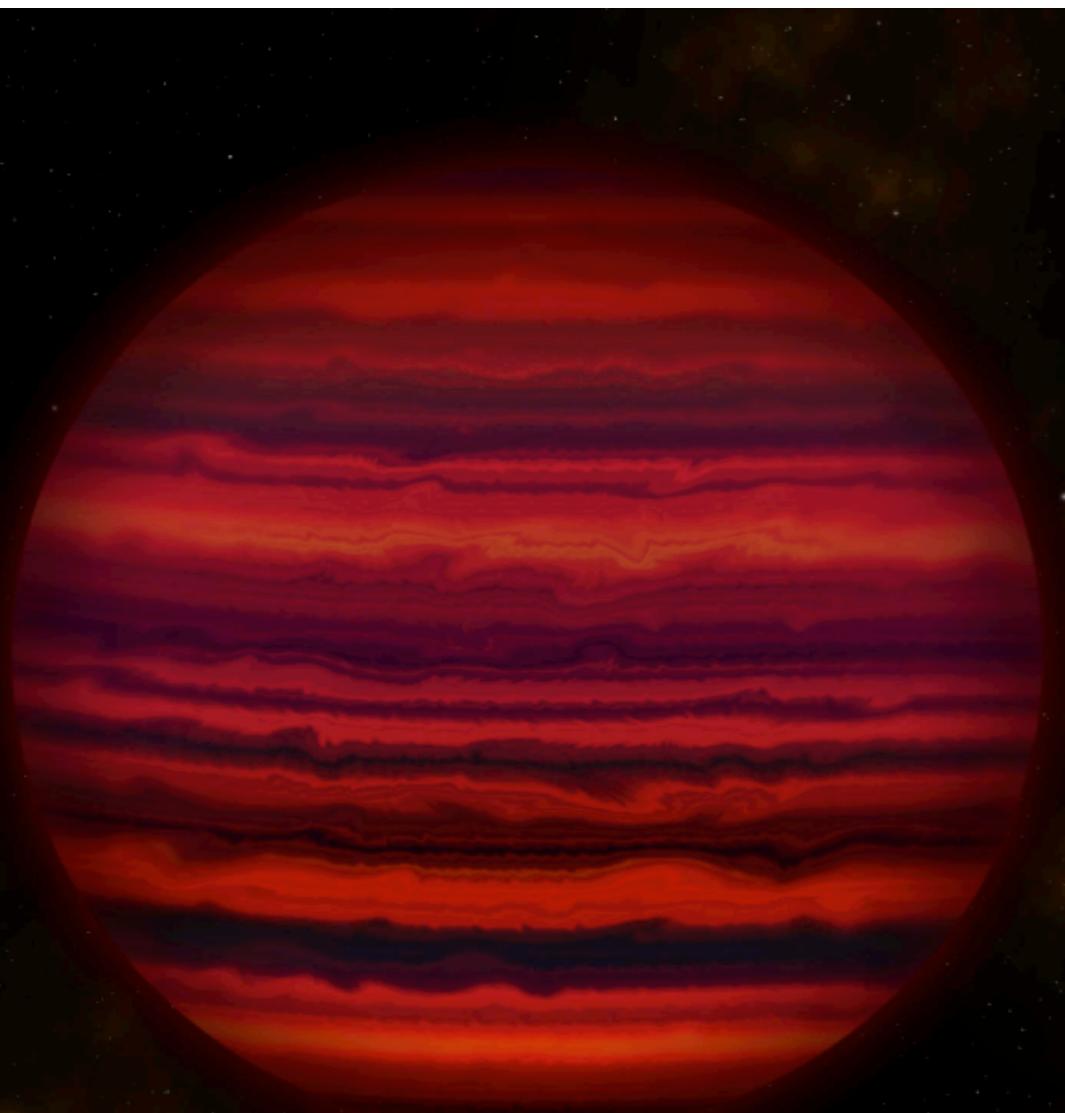


# Gemini Observatory Software Development Project

# Images from Gemini



Imágenes Históricas del Observatorio G

# Gemini Observatory



Gemini North in Hawaii and Gemini South in Chile

**Organization** Gemini Consortium ([NSF-US](#), [NRC-Canada](#), [CONICYT-Chile](#), [MCTI-Brazil](#), [MCTIP-Argentina](#)) and [AURA](#)

**Location** Mauna Kea Access Rd, [Hawaii](#), U.S.  
Cerro Pachón, Chile

**Coordinates**  19.82396°N 155.46984°W  
 30.24073°S 70.73659°W

**Altitude** 4,213 m (13,822 ft)  
2,722 m (8,930 ft)

**Established** 2000

**Website** [www.gemini.edu](http://www.gemini.edu) 



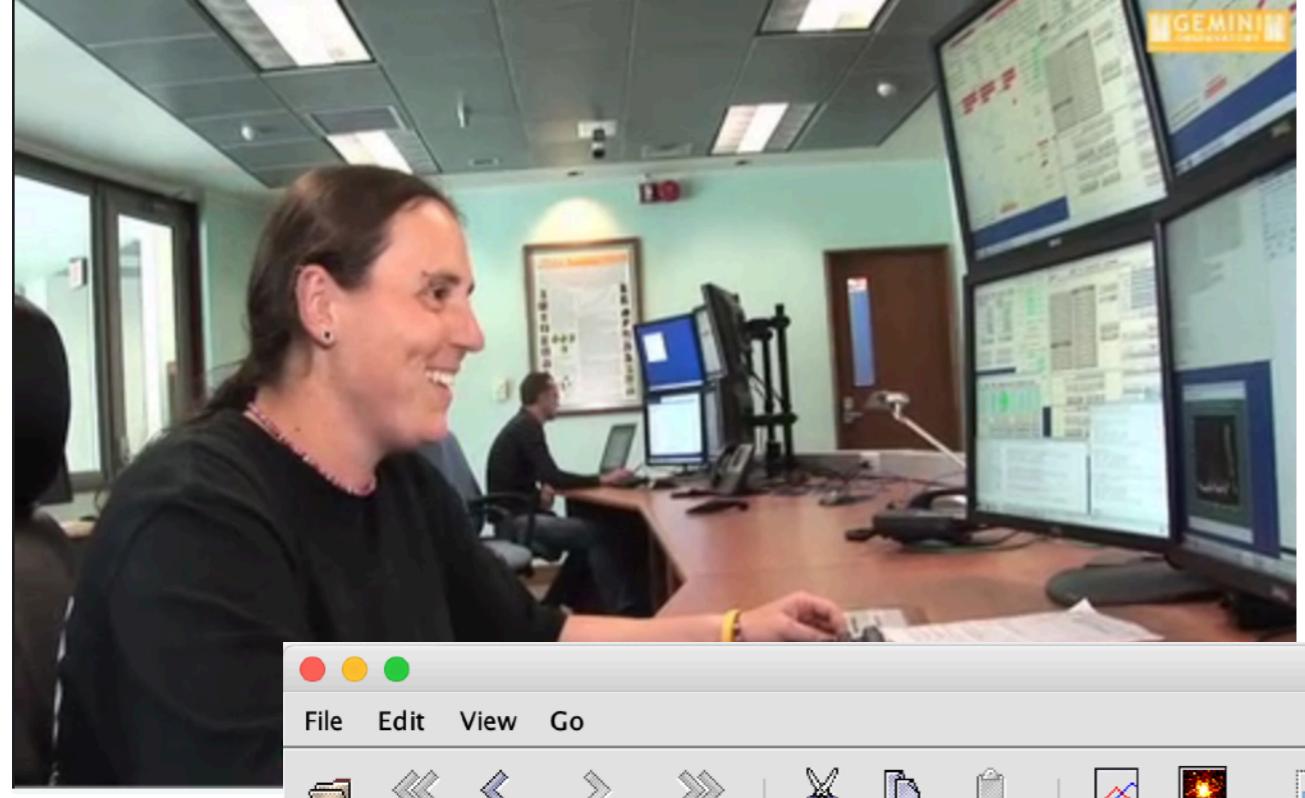
# Project Scope

- The Observatory Control System (OCS) was lunched in 2000.
- AURA\* wants Estcium to improve the software modules that interface with users (e.g. observer).
- The core functions of OCS will be operated by the existing system.

\* the Association of Universities for Research in Astronomy (AURA)

# Project Constraints

- The existing system has poor documentation.
- This is an offshore project where the developer team located in Thailand.
- The project involves knowledge specific domain (i.e. extremely large telescope management system)



Gemini OT - Science Program

File Edit View Go Help

Open Prev Back Forward Next Cut Copy Paste Plot Image Libraries Apply Reapply Conflict Sync

**Observation**

An observation is the smallest entity that can be scheduled and observed.

Observation Name: NICI Observation

Observation Id:

Priority: High Medium Low

Status

Phase 2 Status: Phase 2 Exec Status: Pending Phase 2 Completion

QA State: Undefined  Override (No Data)

Dataflow Step: No Data

**Observing Time**

Class: Science Setup Type: Full Setup (10 mins)

Planned	Program	Partner	Non-charged	Elapsed
00:10:08	Total 00:00:00	00:00:00	00:00:00	00:00:00

**Time Correction Log**

Timestamp	Correction	Charge Class	Comment
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Correction: Subtract  minutes from

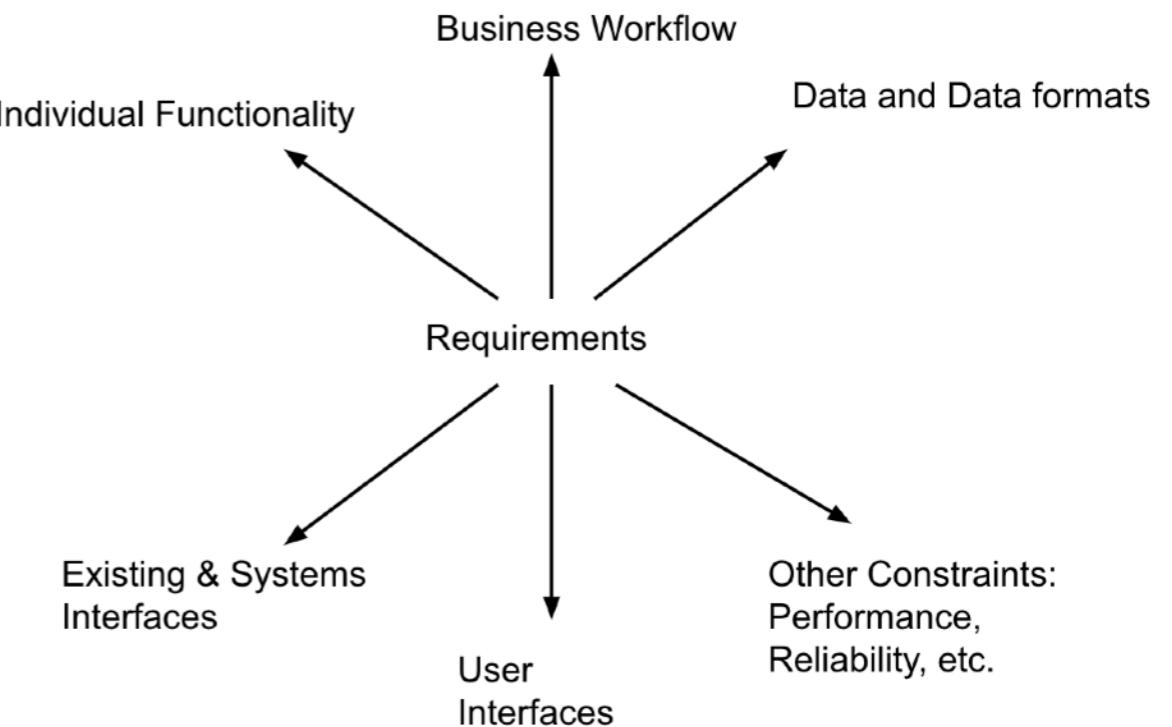
Comment:  Apply Correction

Show

# Extract Requirements

- Identify actors (e.g. user, observers)
- Identify functional/non-functional requirements
- Identify users' scenarios

## 6-Dimensions of Detailed Requirements Elicitation



# The workflow of the Gemini operation



## Gemini



**Astronomer**



**Science observer**



**Operation staff**

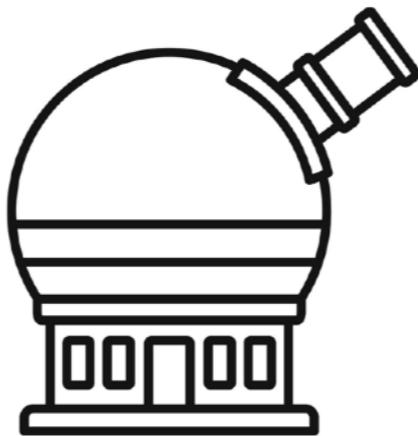


**Visitor**



**Supporter**

# The workflow of the Gemini operation



## The observation flow



**Astronomer**

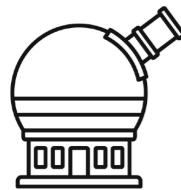


**Science observer**



**Operation staff**

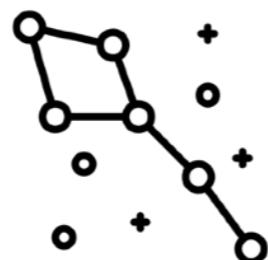
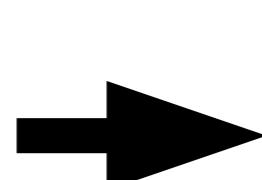
# The workflow of the Gemini operation



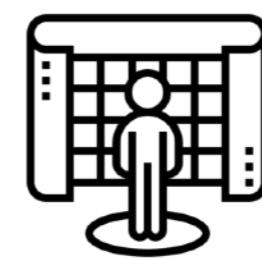
## The observation flow



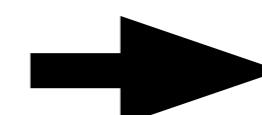
**Astronomer**



**Create a science plan**



**Test a science plan via  
the virtual telescope  
and interactive observing mode**



**Submit a science plan  
to the system**



**A created  
science plan**



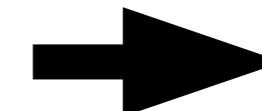
**Science observer**



**Validate a science  
plan**



**Transform a science plan  
to an observing program**

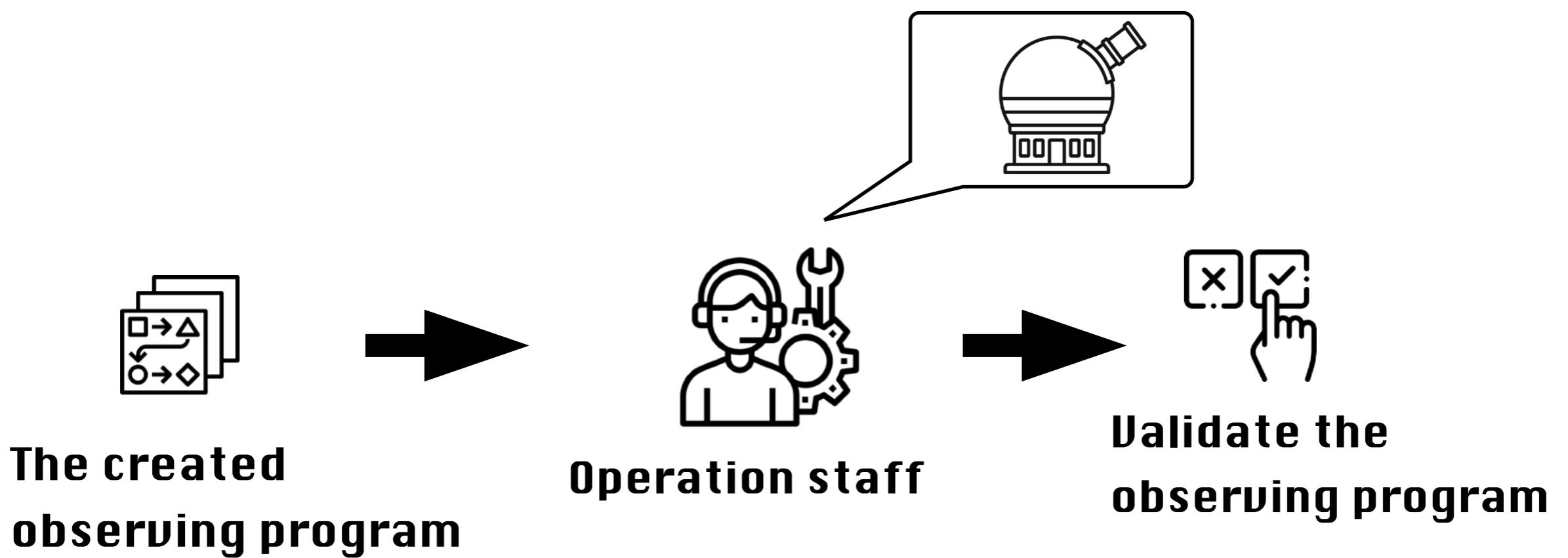


**Submit an observing program  
to the system**

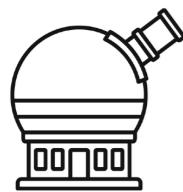
# The workflow of the Gemini operation



## The observation flow



# The workflow of the Gemini operation



## The observation flow



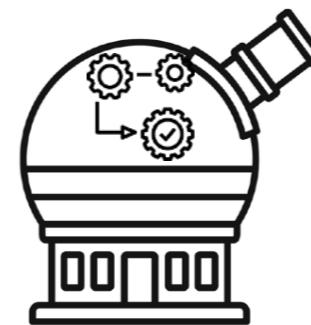
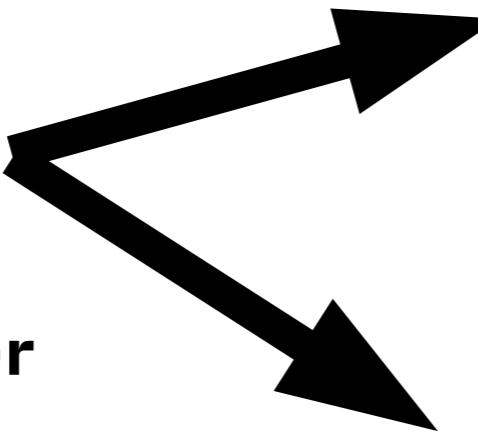
An approved  
science plan



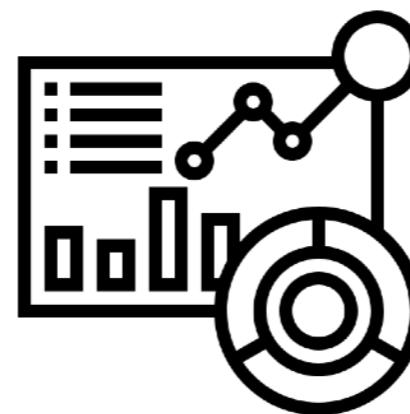
An approved  
observing program



**Science observer**

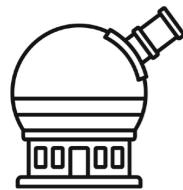


Execute the  
approved plan

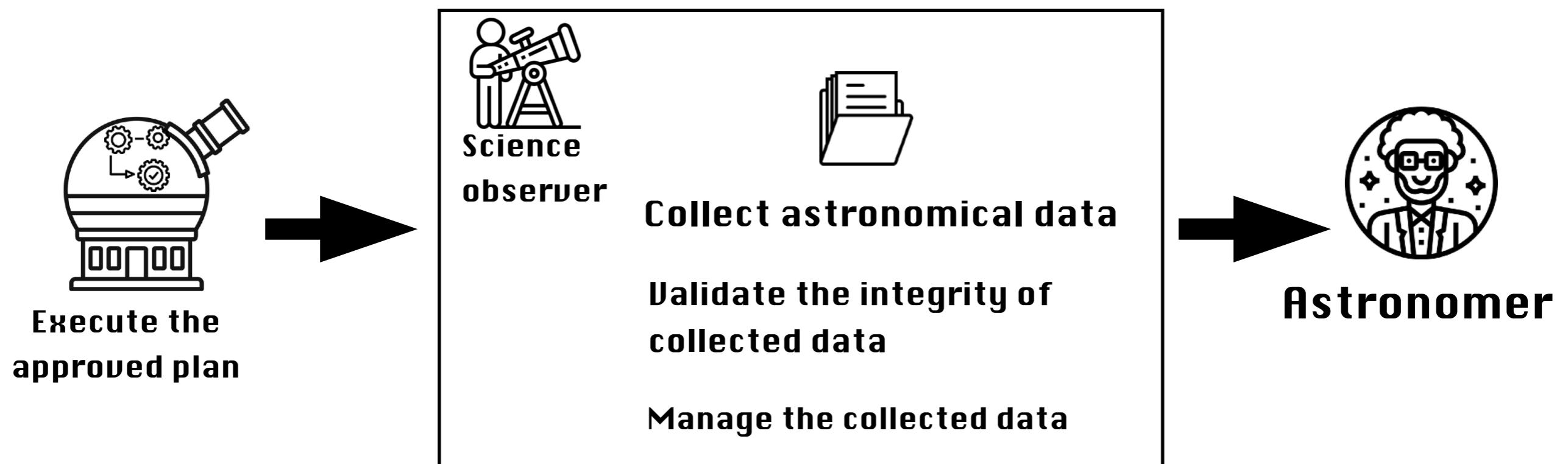


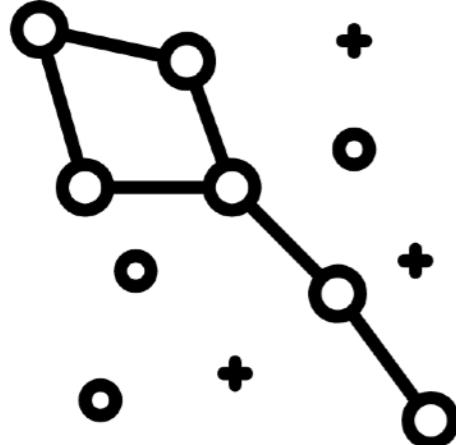
Monitor the progress of  
science plan execution

# The workflow of the Gemini operation



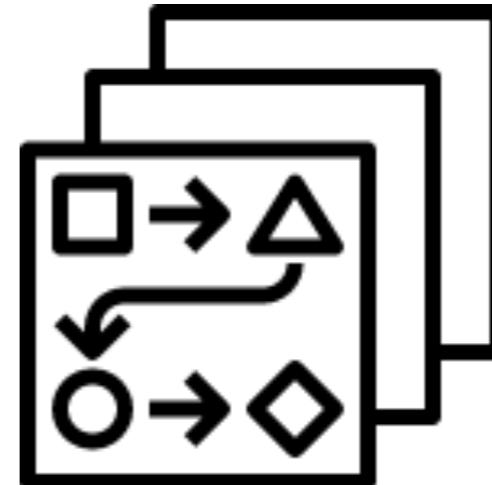
## The observation flow





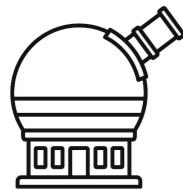
## **Science plan**

- Creator
  - Submitter
  - Funding
  - Objective
  - Stars system
  - Schedule (date, time)
  - Telescope location
  - Data processing requirements
    - File type
    - File quality
    - Image processing
      - B&W
      - color
      - contrast
      - brightness
      - Saturation



- Observing program
    - Movement
    - Lens
    - Filters
    - Focus
    - Light detector
    - Special equipment

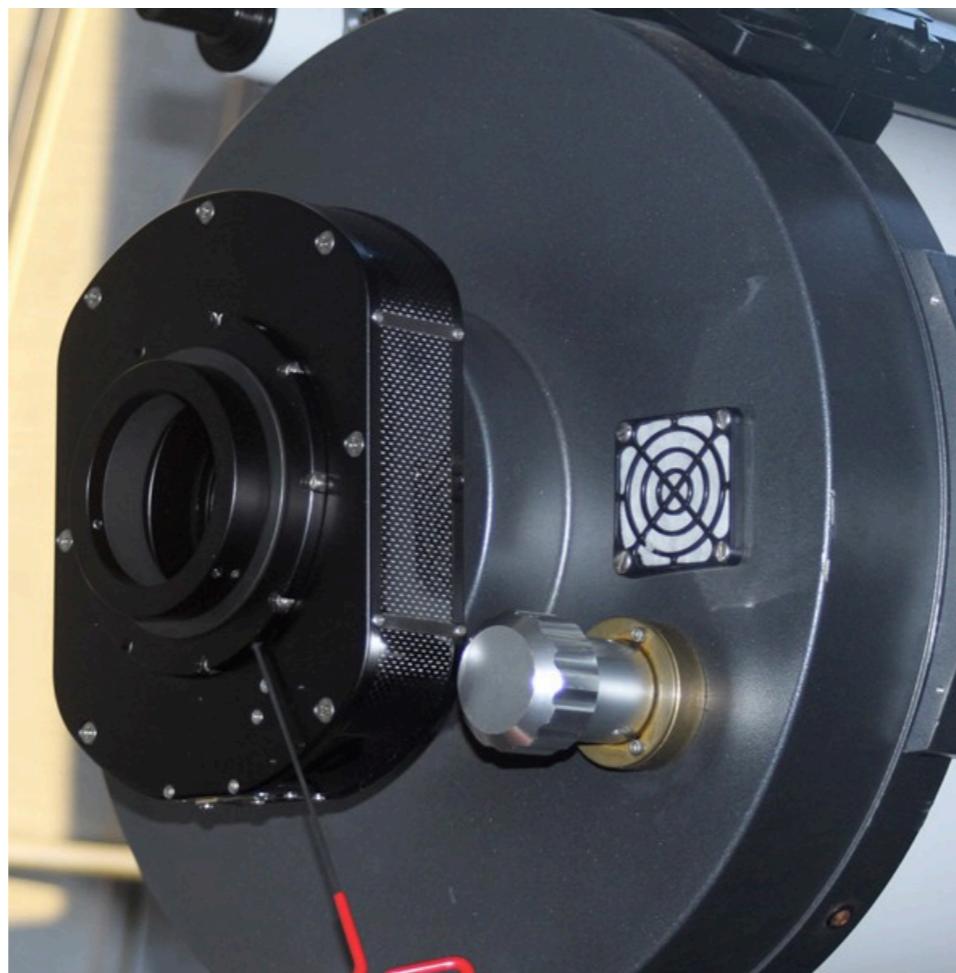
# The workflow of the Gemini operation



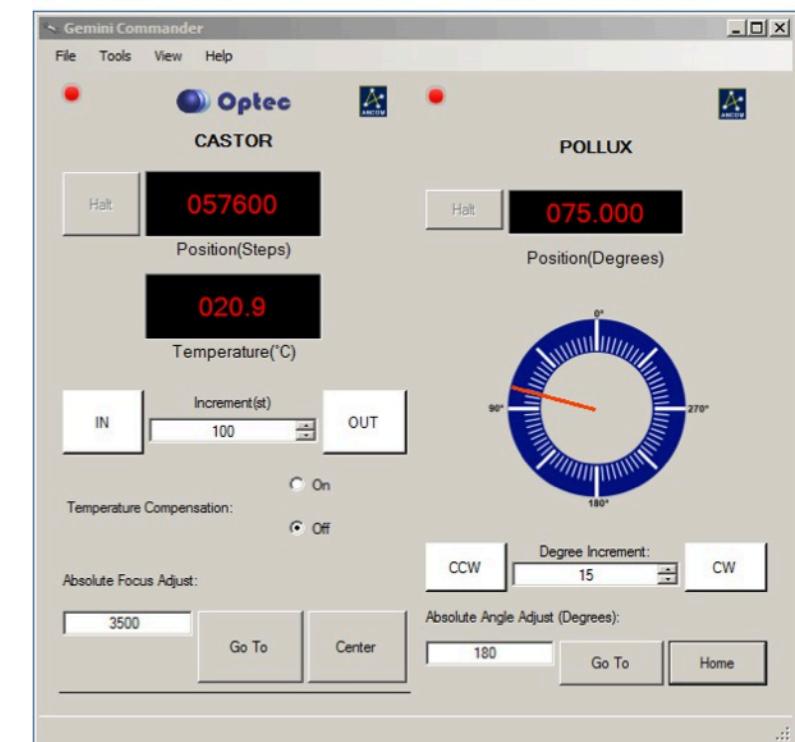
## Installing special equipments and sub-systems



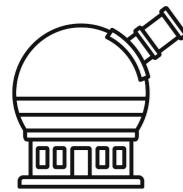
Visitor



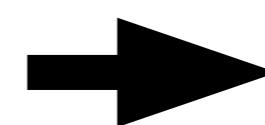
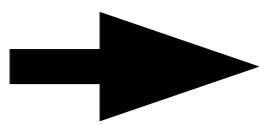
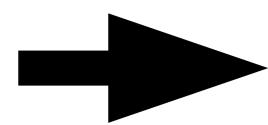
Gemini Focusing Rotator System



# The workflow of the Gemini operation



## Installing special equipments and sub-systems

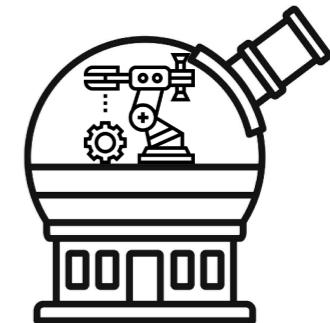
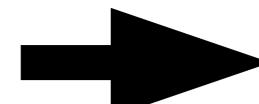
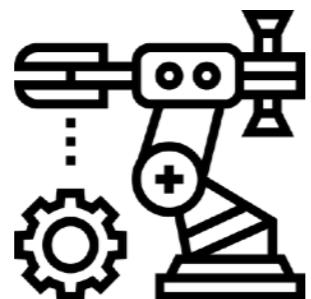


install new  
configurations

Visitor

propose to install  
a special device to Gemini

Supporter validate  
the device and configurations



Pass the device to  
the operation staff

Operation staff

install the device