

# Lecture 10 – 17 February 2009



- **SCIENCE TOPICS:**  
Telescopes (cont.)  
Inventory of Solar System
- **READING**  
Ch 3.2, 3.4, Ch 4, 4.1-4.2  
Beware of excessive detail  
in the textbook

**HWK 3: Due tonight**  
**HWK 4: Out now, due**  
**Tuesday, 24 February**  
**2009, 11:59pm**  
**COMPREHENSION 01:**  
**Thursday, 19 Feb 2009**

## PRACTICE

p.94 Review: 2-4, 11, 14  
p.94-95 Self-Test: 1,2,9,13  
p.95 Problems: 3, 9

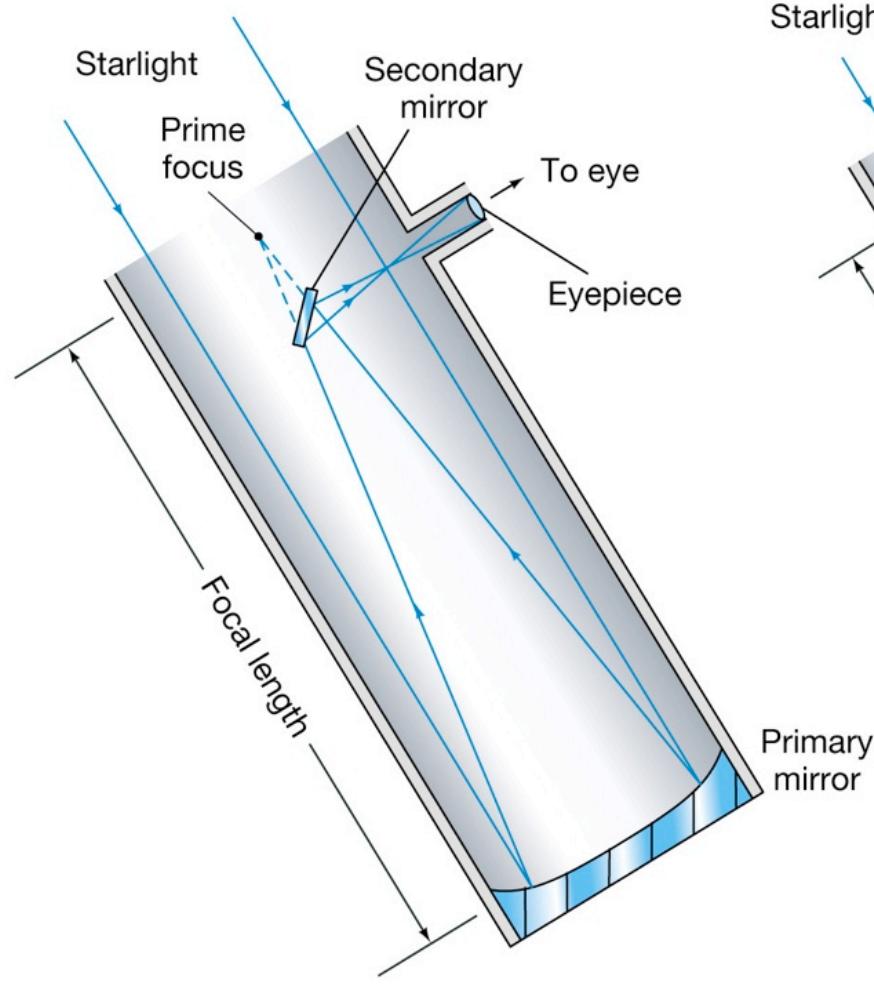
# About Comprehension I

- **When and Where:** Thursday, 19 February 2009 in this classroom, during regular class time
- **Format and Time Limit:**  
A passage of unseen text relevant to the course. 20 multiple choice questions; 1 mark per question. **ALL** the information you need to answer the questions will be provided in the text.
- **What to Bring:**
  - your PSU ID card
  - #2 pencils and eraser
  - a calculator
- **Other Rules and Regulations:**
  - closed book, closed notes
  - work on your own
  - items other than the above out of sight (especially cellphones)

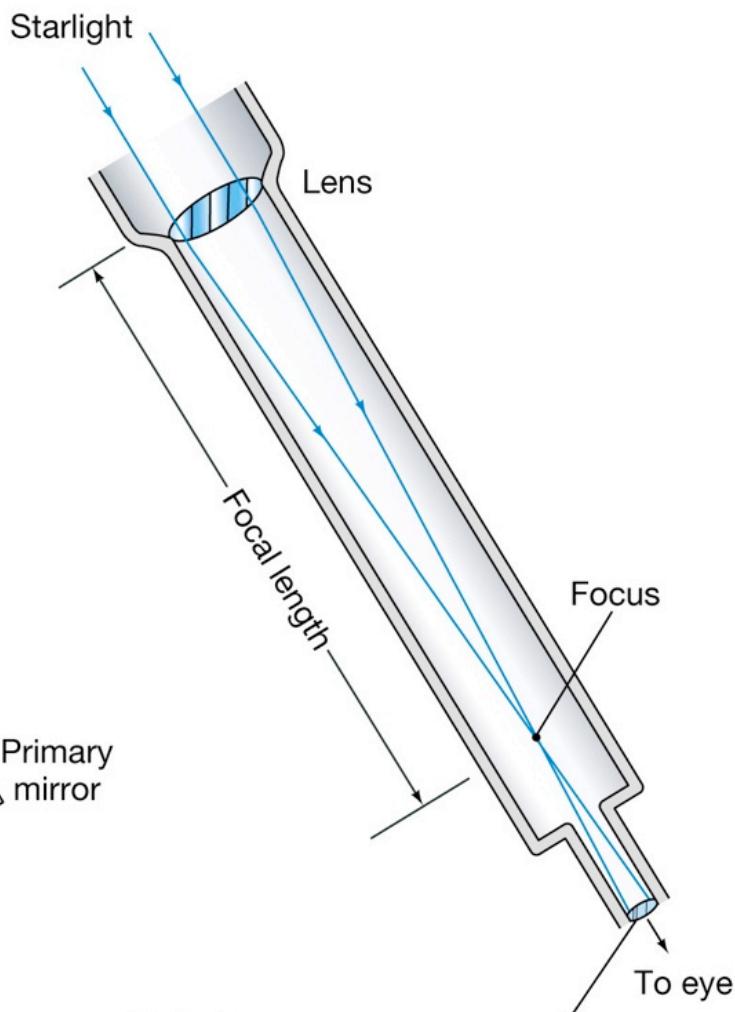
# **Handed-in**

- Calculator
- Scarf

## Reflector (mirror at bottom)



## Refractor (lens at top)

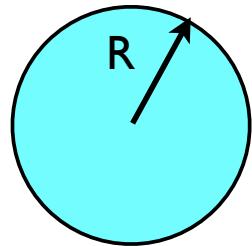


# Cerro Paranal, Chile



# Functions of the Telescope

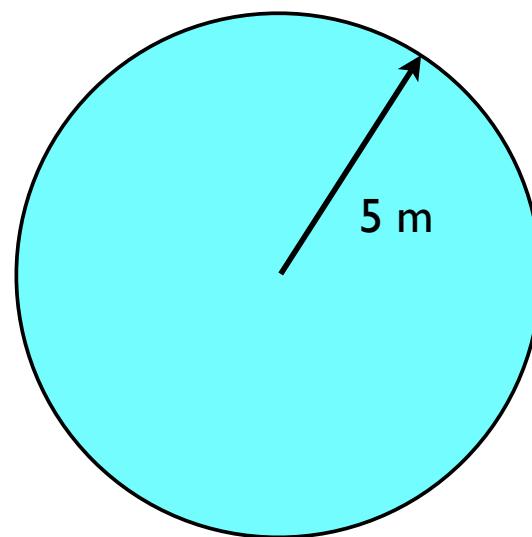
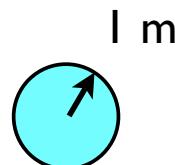
- Collect a lot of light
  - Make objects appear brighter
- Resolve
  - Make sharper, clearer images to reveal detail
- Magnify
  - Over-rated



$R$ =Radius  
Area,  $A = \pi R^2$   
 $\pi = 3.14$

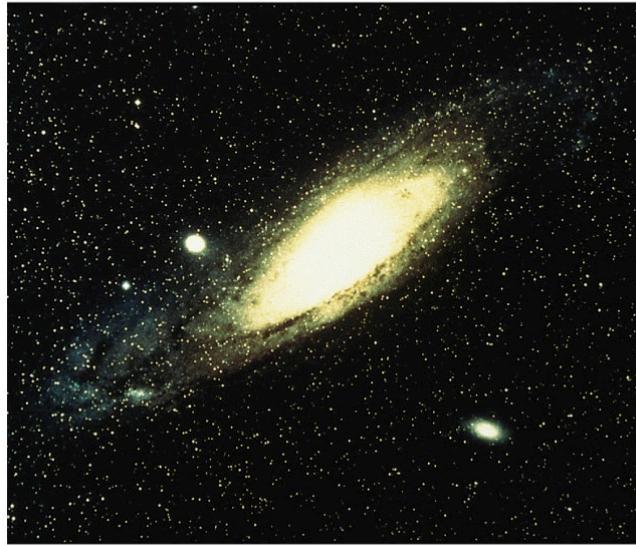
and don't forget that  
diameter = 2 x radius

Compare the collecting  
areas of two different  
telescopes

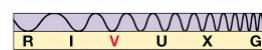




(a)



(b)

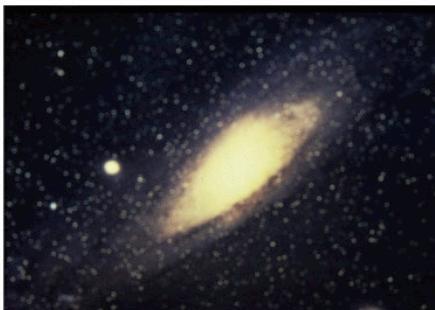




(a)



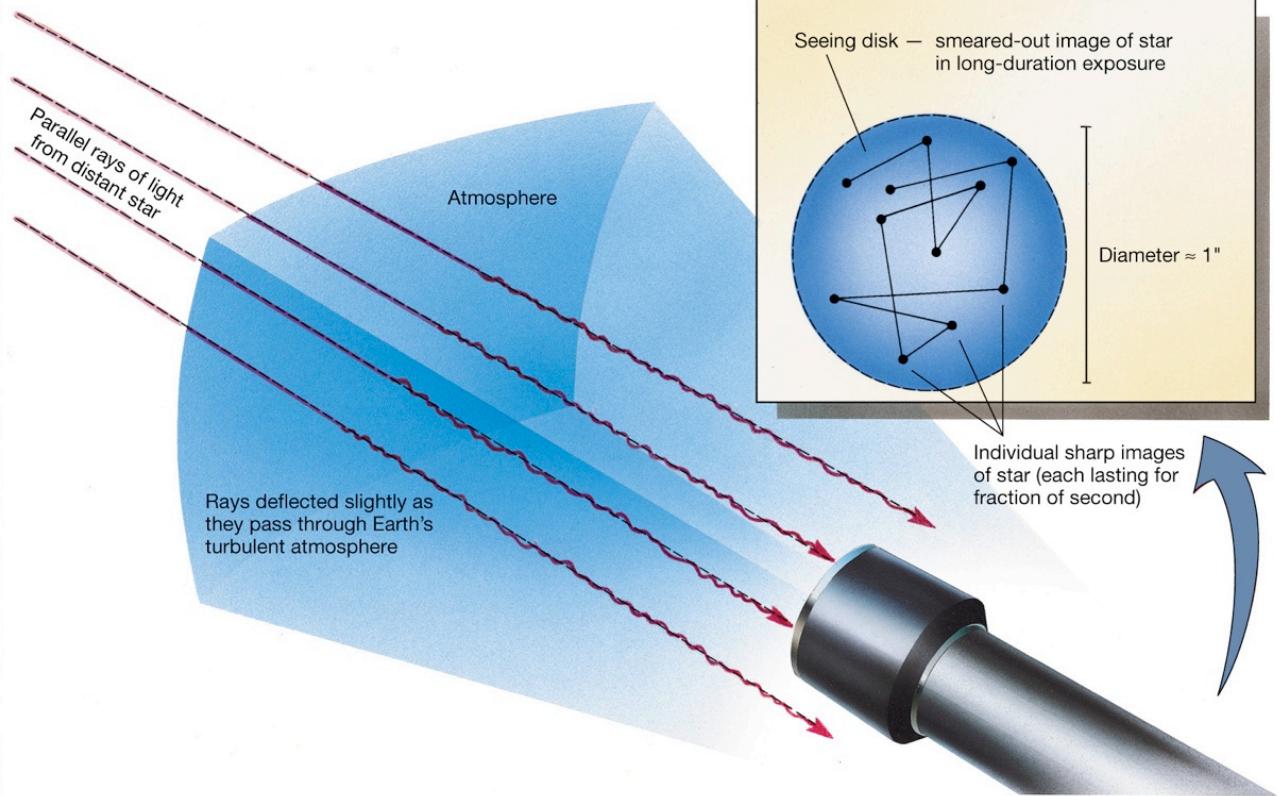
(b)



(c)



(d)



## Mauna Kea, Hawaii



## Cerro Tololo Interamerican Observatory, Chile



- High Altitude (above “the weather”)
- Dry
- Dark

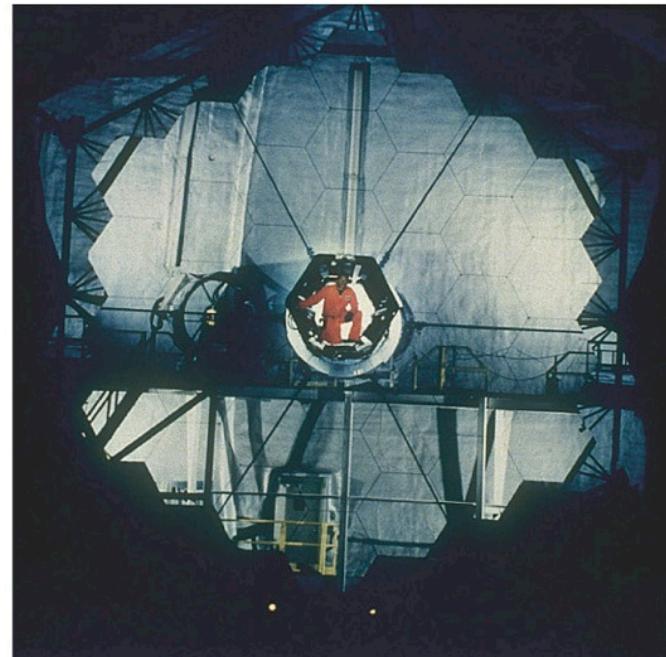
# **Modern Large Telescopes**

Hobby Eberly Telescope



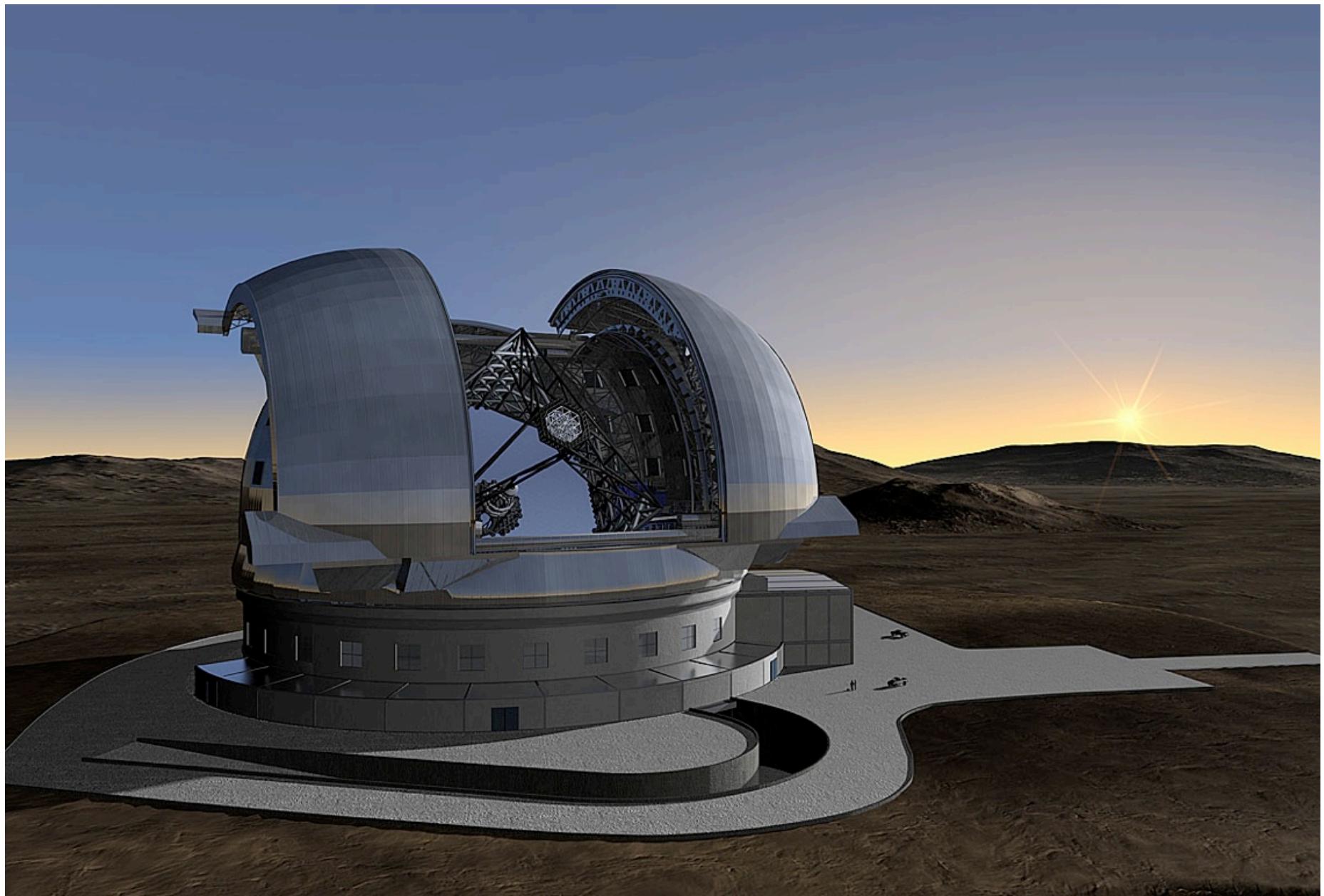
Owned and operated by:  
UT Austin, Penn State, Stanford,  
LMU (Munich), Göttingen

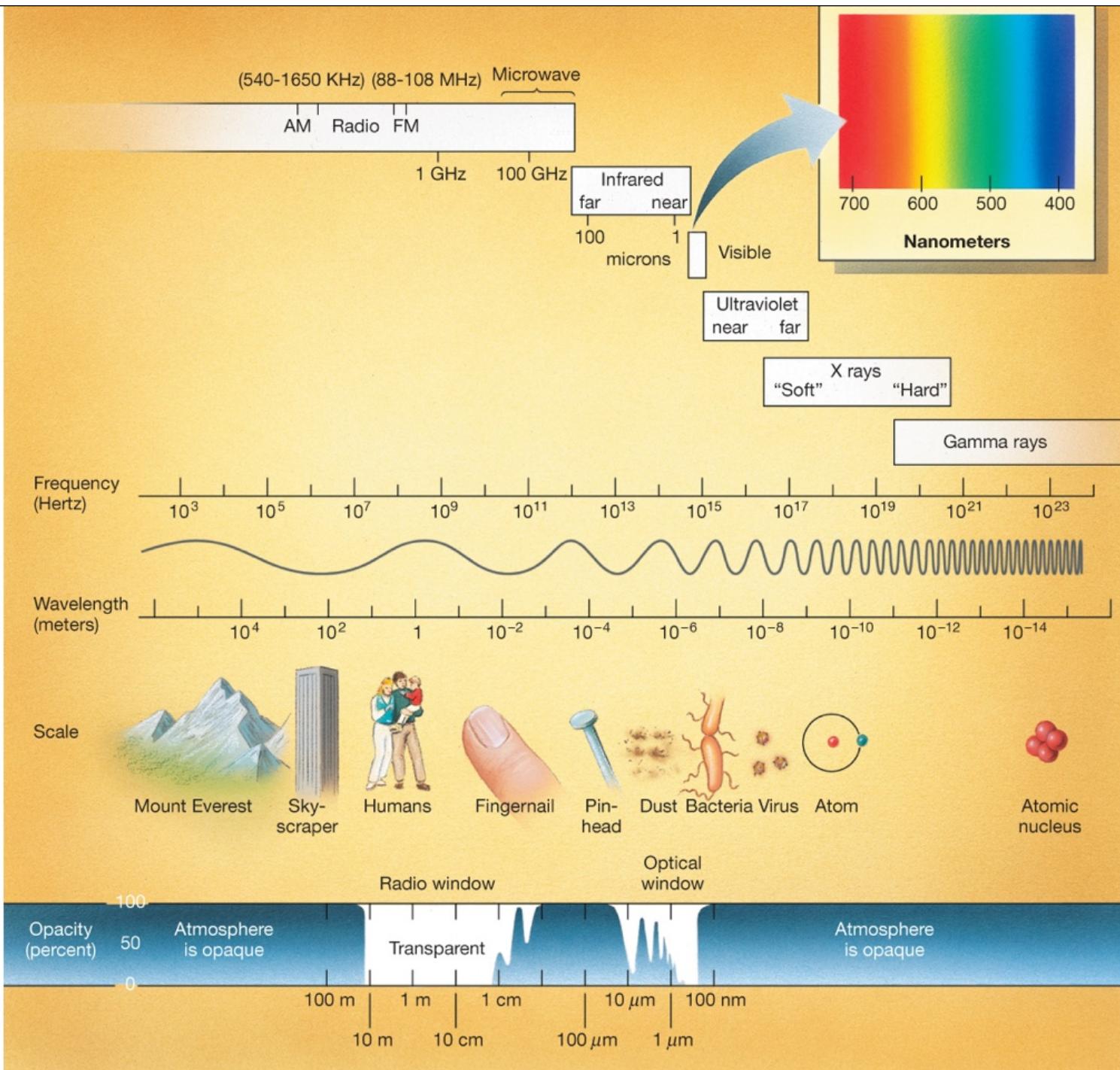
Keck I Telescope



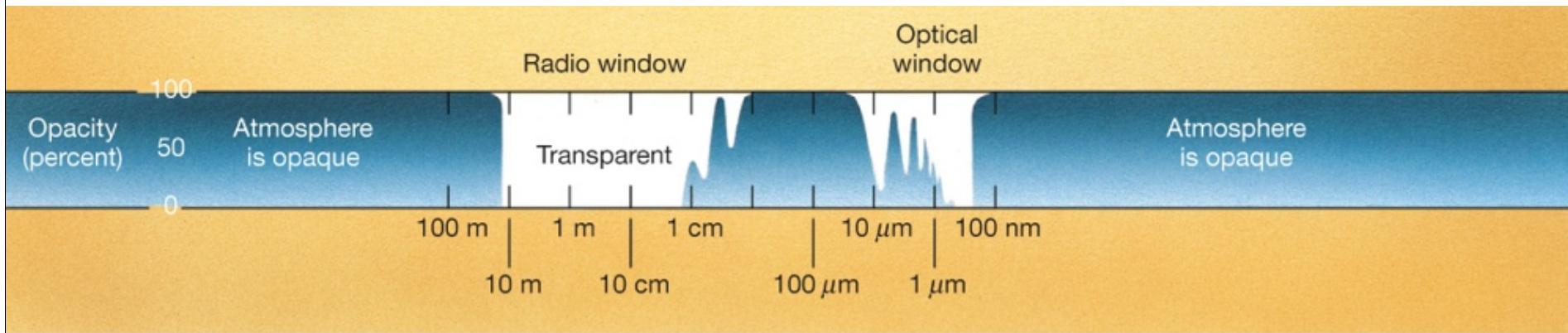
Owned/operated by:  
University California,  
Caltech

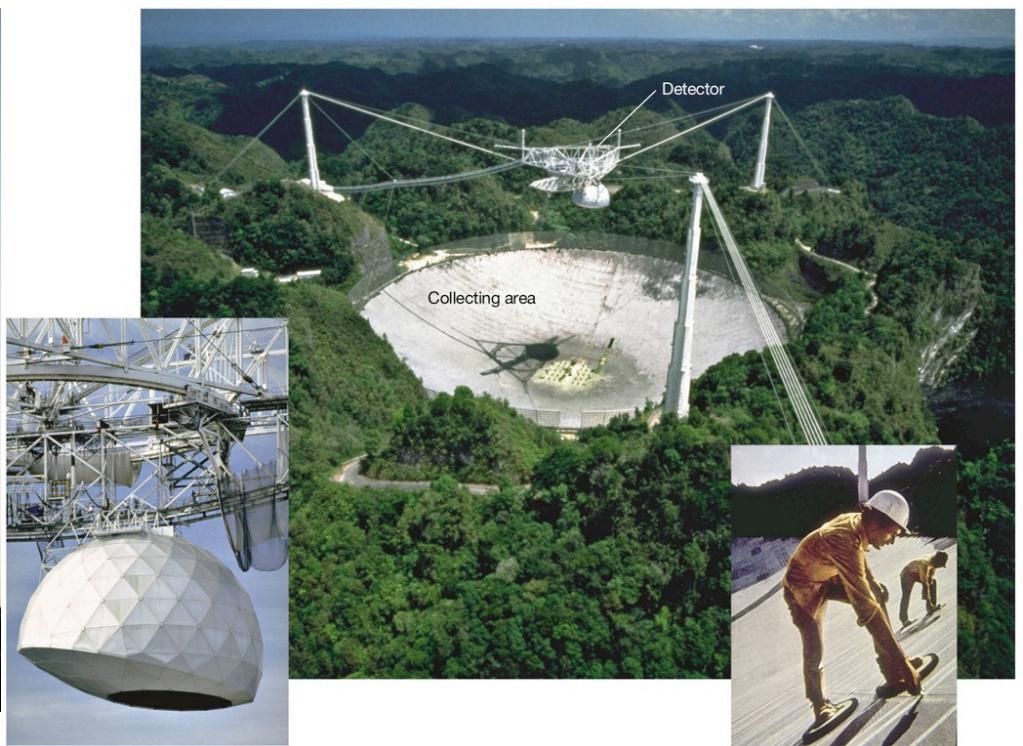
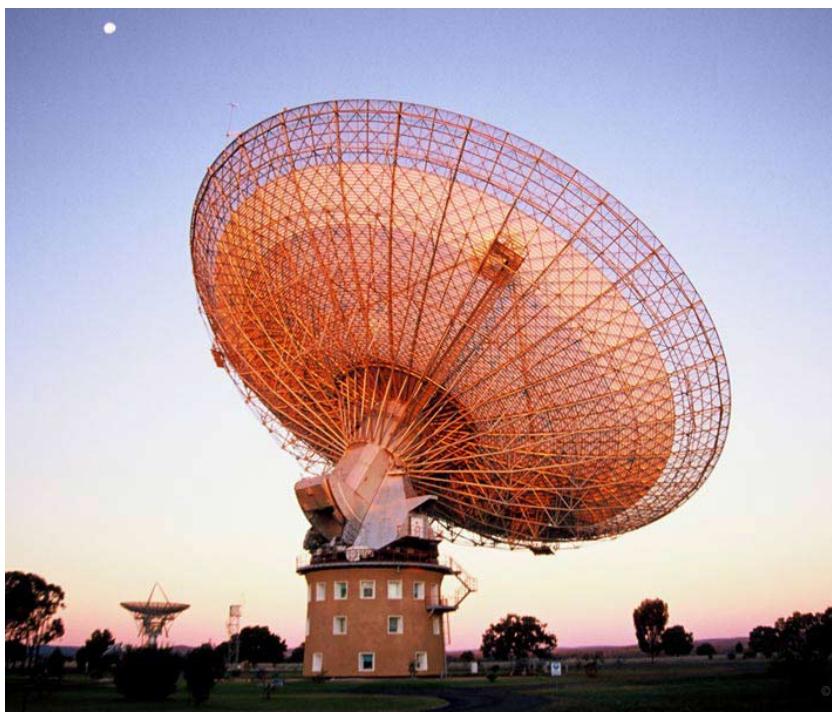
# The European ELT





# Atmospheric Transmission

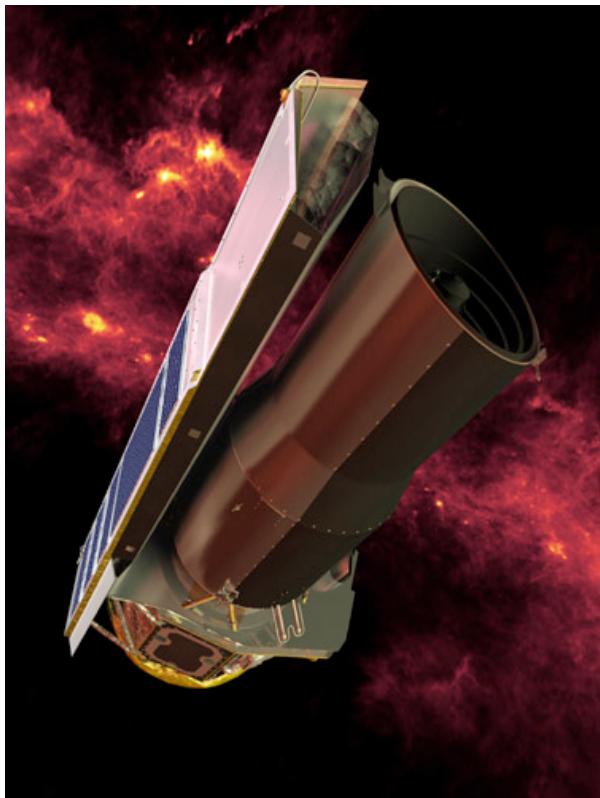




(a)

(b)

# Telescopes in Space



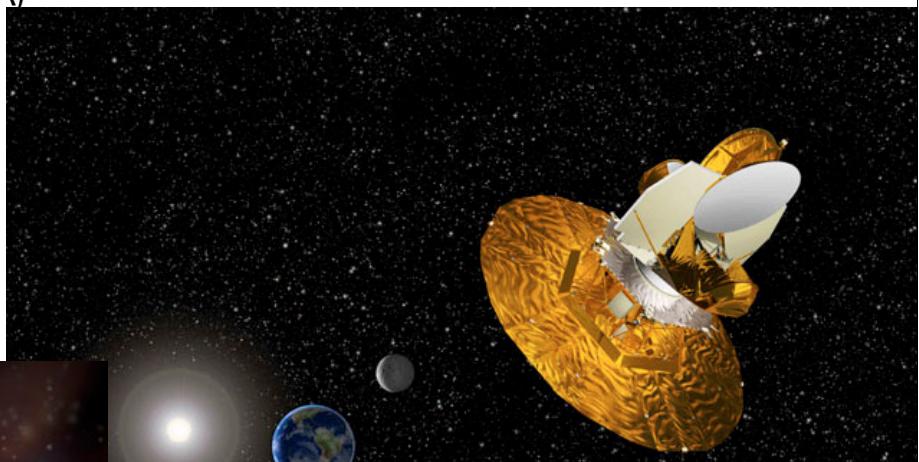
**Spitzer  
Space  
Telescope;  
“near” to  
“mid”  
InfraRed**



**Hubble Space  
Telescope**

(NASA)

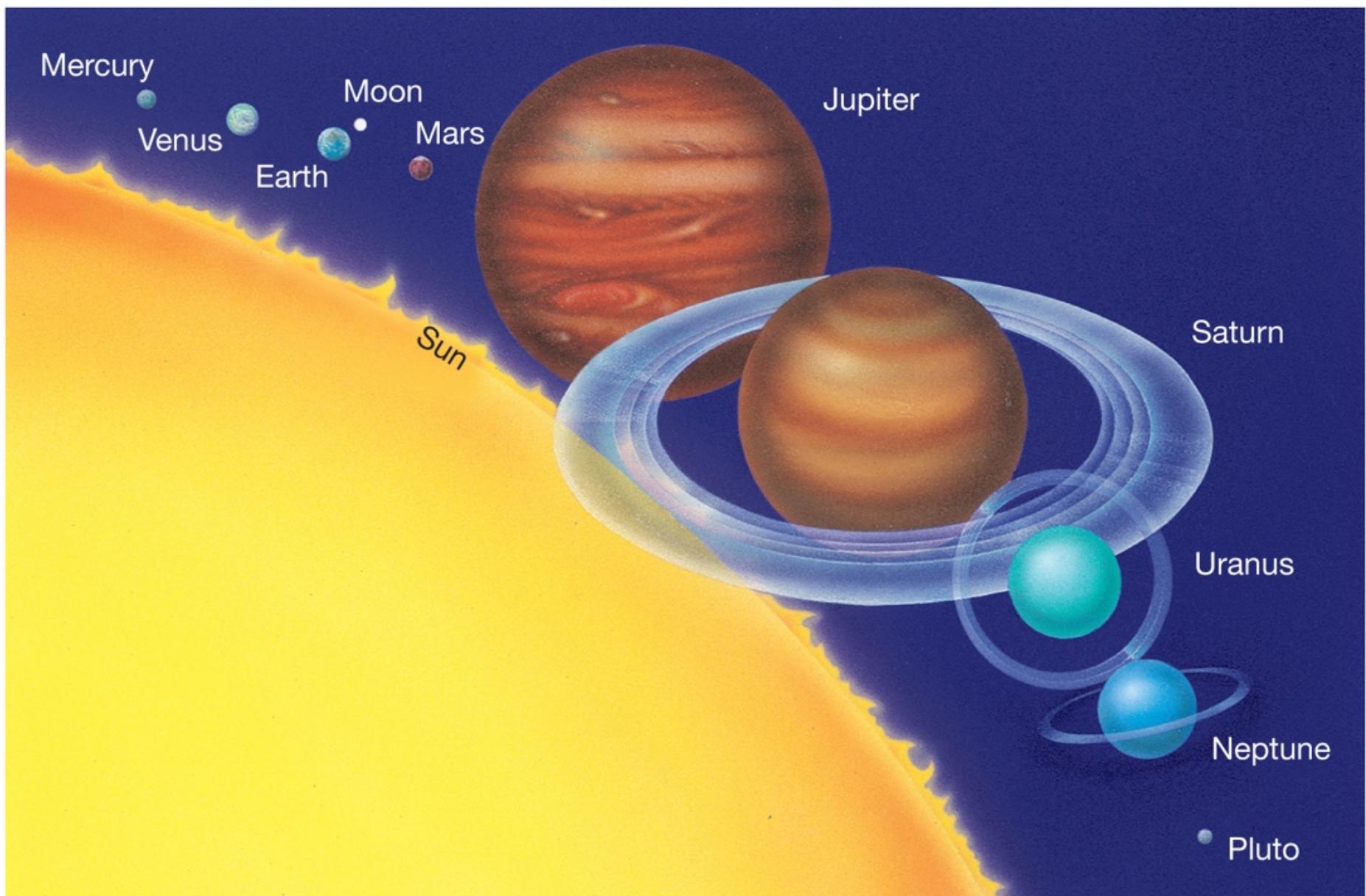
**Wilkinson  
Microwave  
Anisotropy  
Probe**



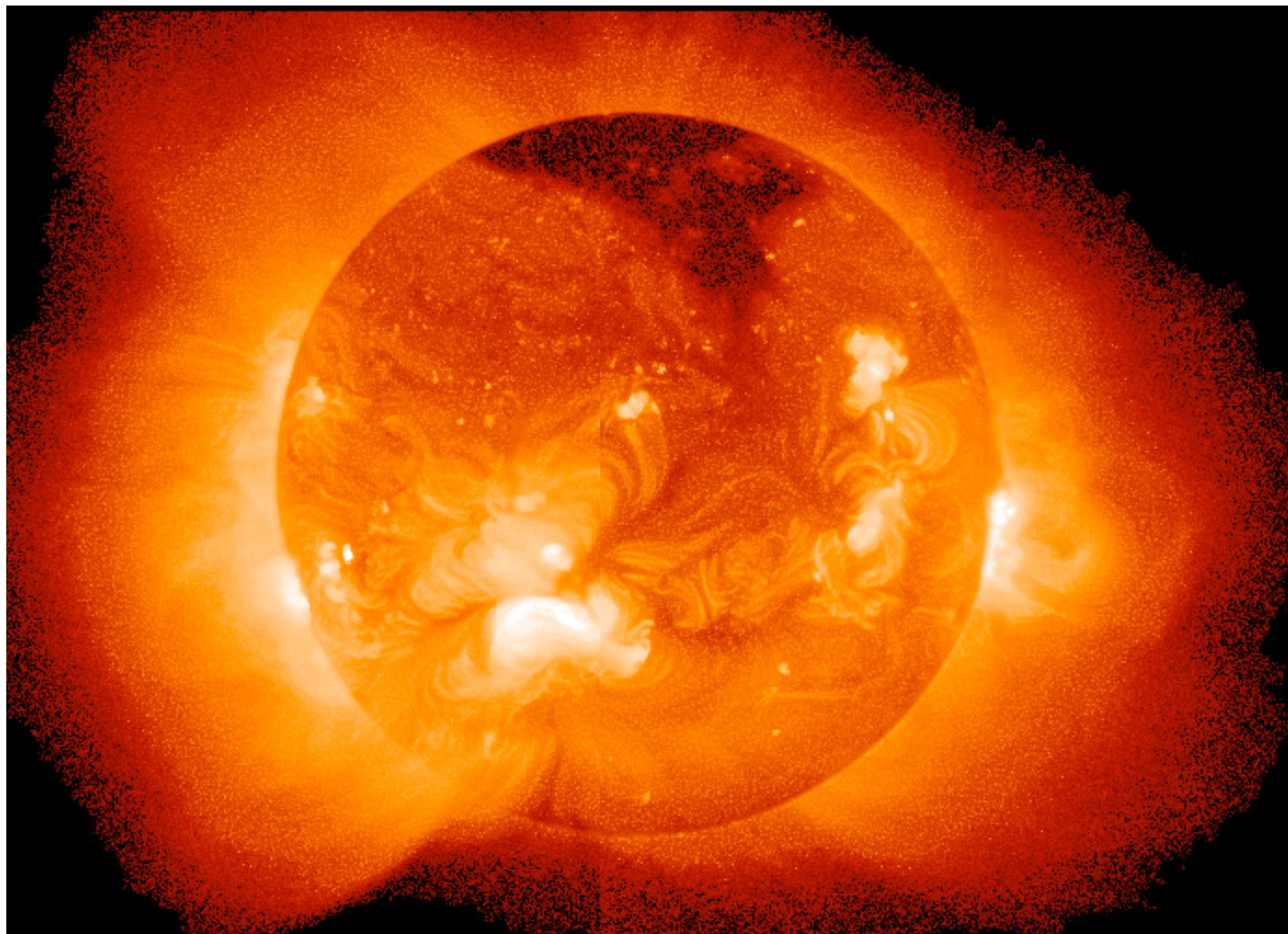
*Chandra X-Ray Observatory*

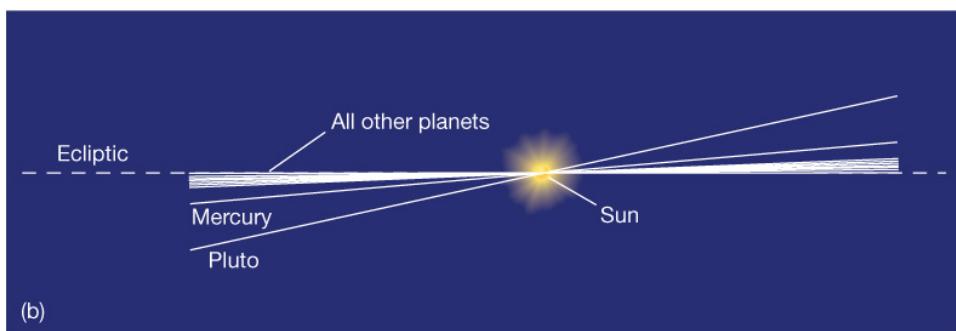
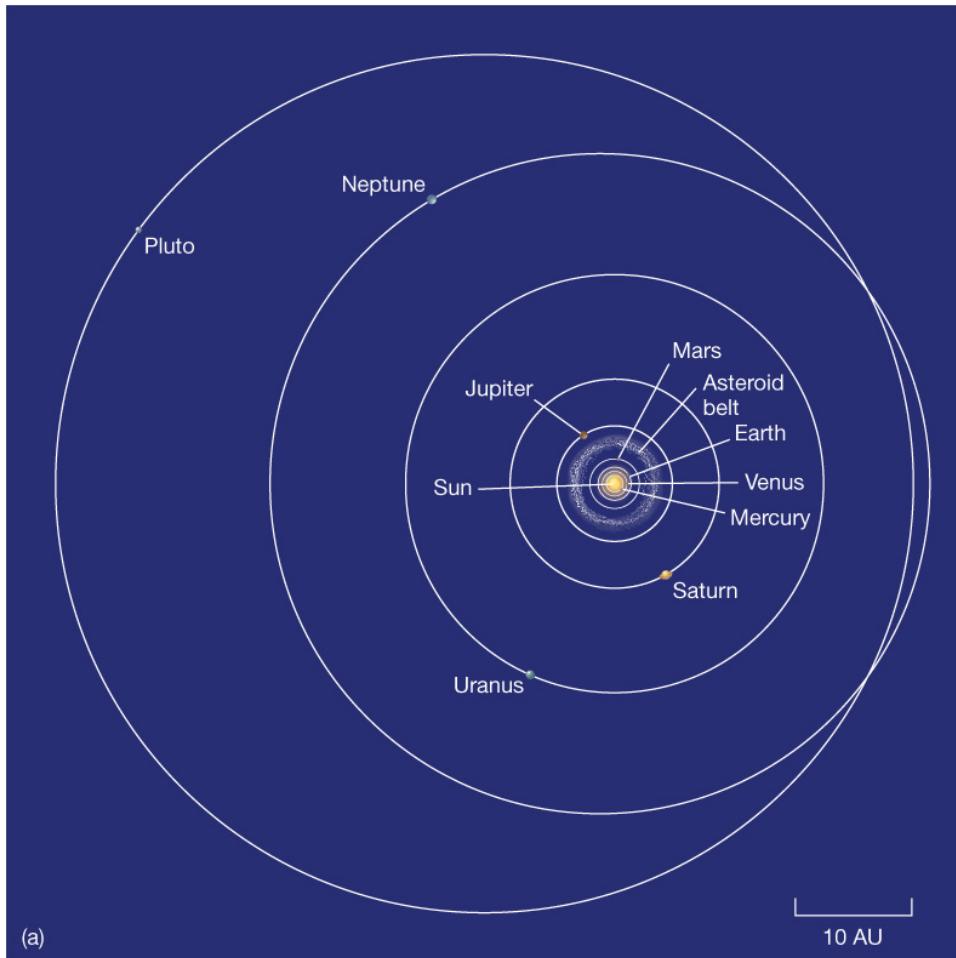
# **Inventory of the Solar System**

# The Planets



# The Sun





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