

ASTR1210: Introduction to the Sky and Solar System

Spring 2017



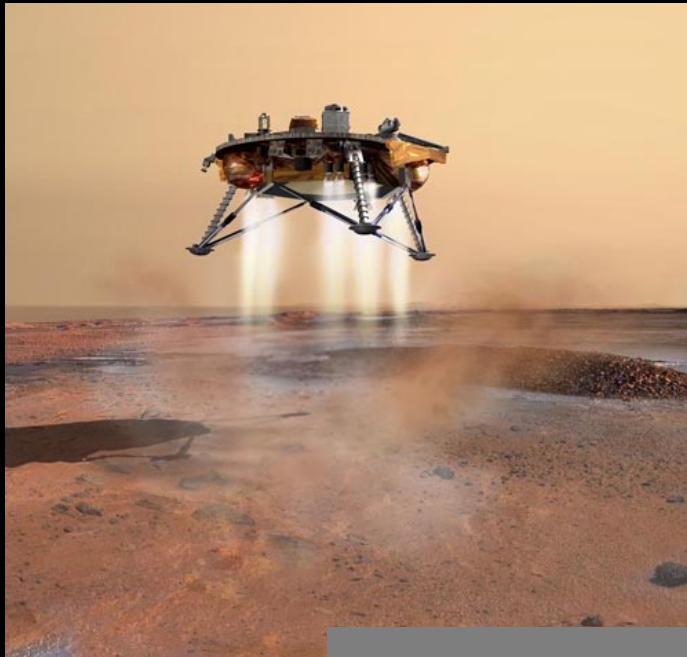
Today's Lecture:

- 1. Golden Age of Astronomy**
- 2. Syllabus**
- 3. Overview**

I. Exciting Time in Astronomy

- Spacecraft to every traditional planet, including Pluto
- Telescopic view to the edge of observable Universe
- Basic understanding of our place in Universe
- Many open questions
- Goal: properties (what) and processes (why)

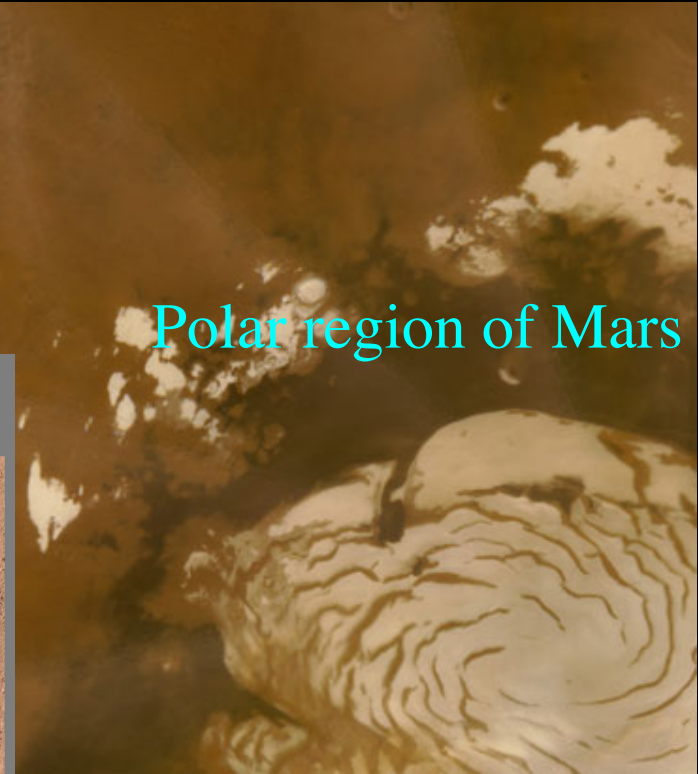
Phoenix landing on Mars in 2008



Phoenix



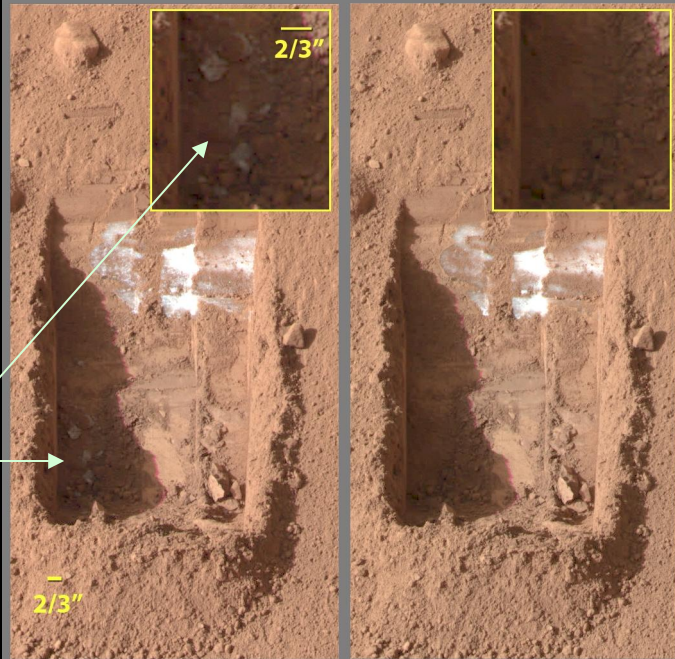
Polar region of Mars



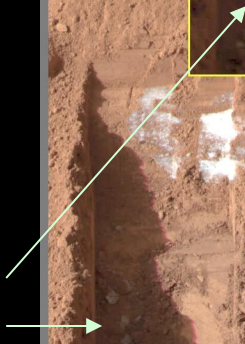
Ice of CO₂

Sol 20

Sol 24



Water ice



Mars Rover “Opportunity”

(landed Jan. 2004)

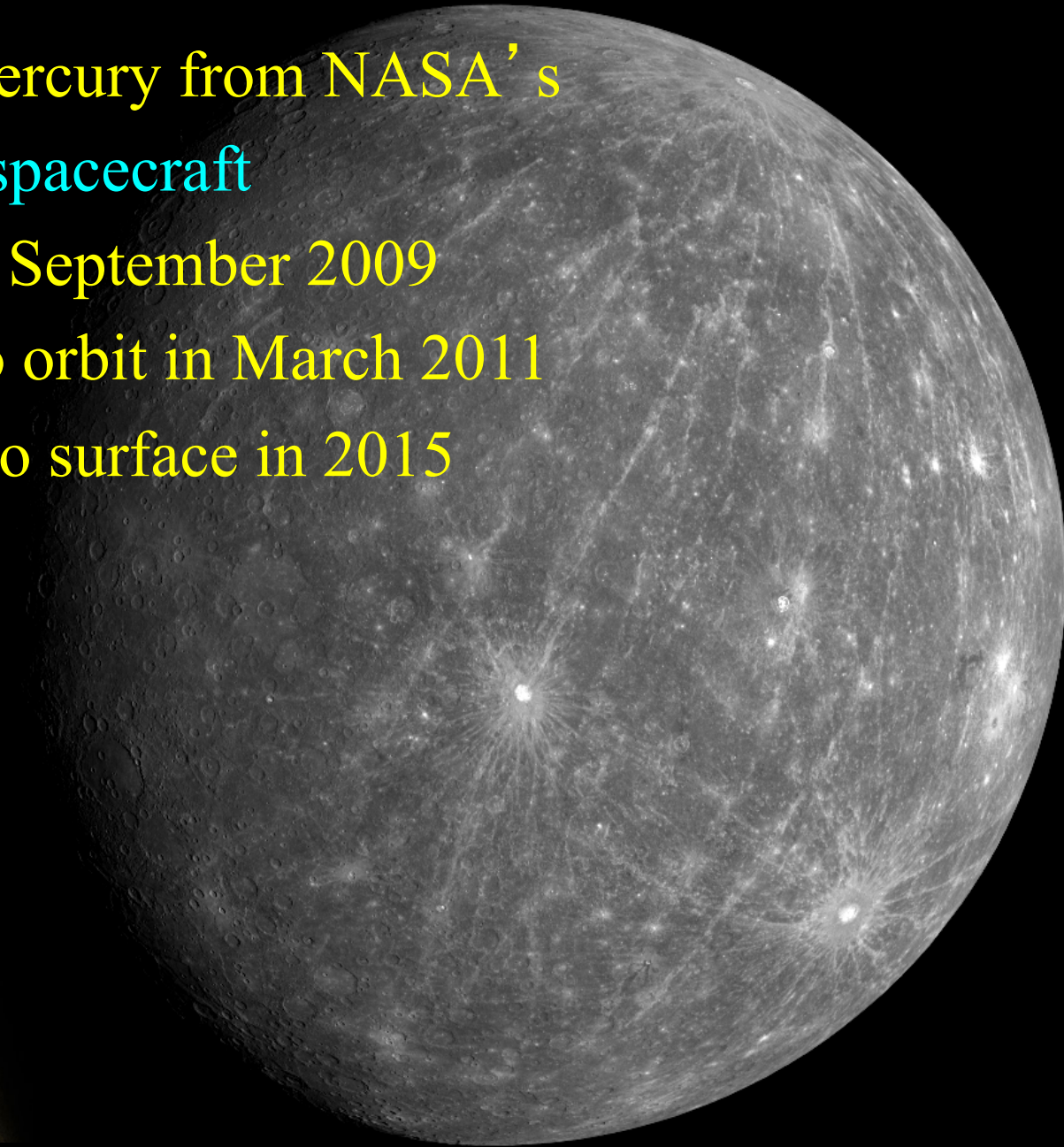
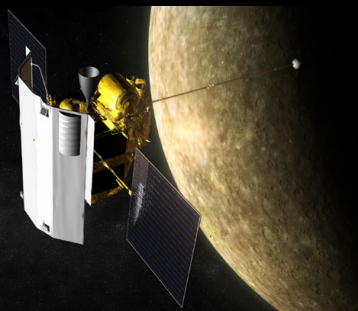


Image of Mercury from NASA's
Messenger spacecraft

3rd flyby in September 2009

Entered into orbit in March 2011

Crashed onto surface in 2015

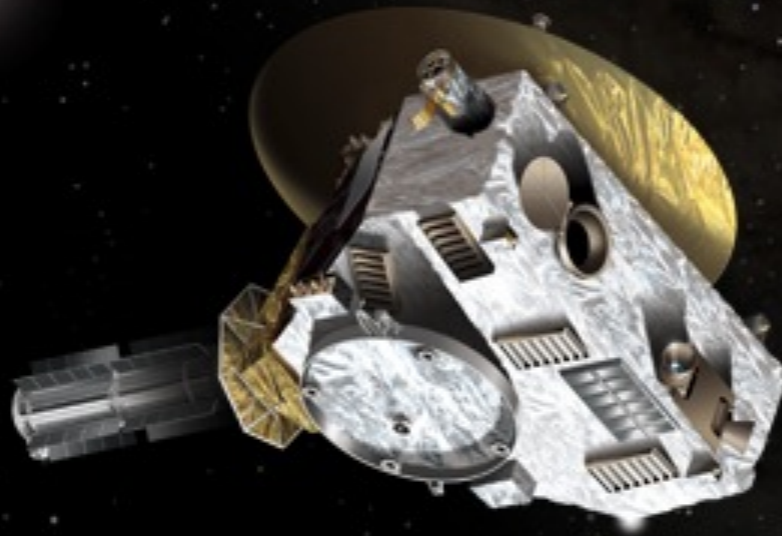


Appearing in the sky of Mercury...

Mission to Pluto

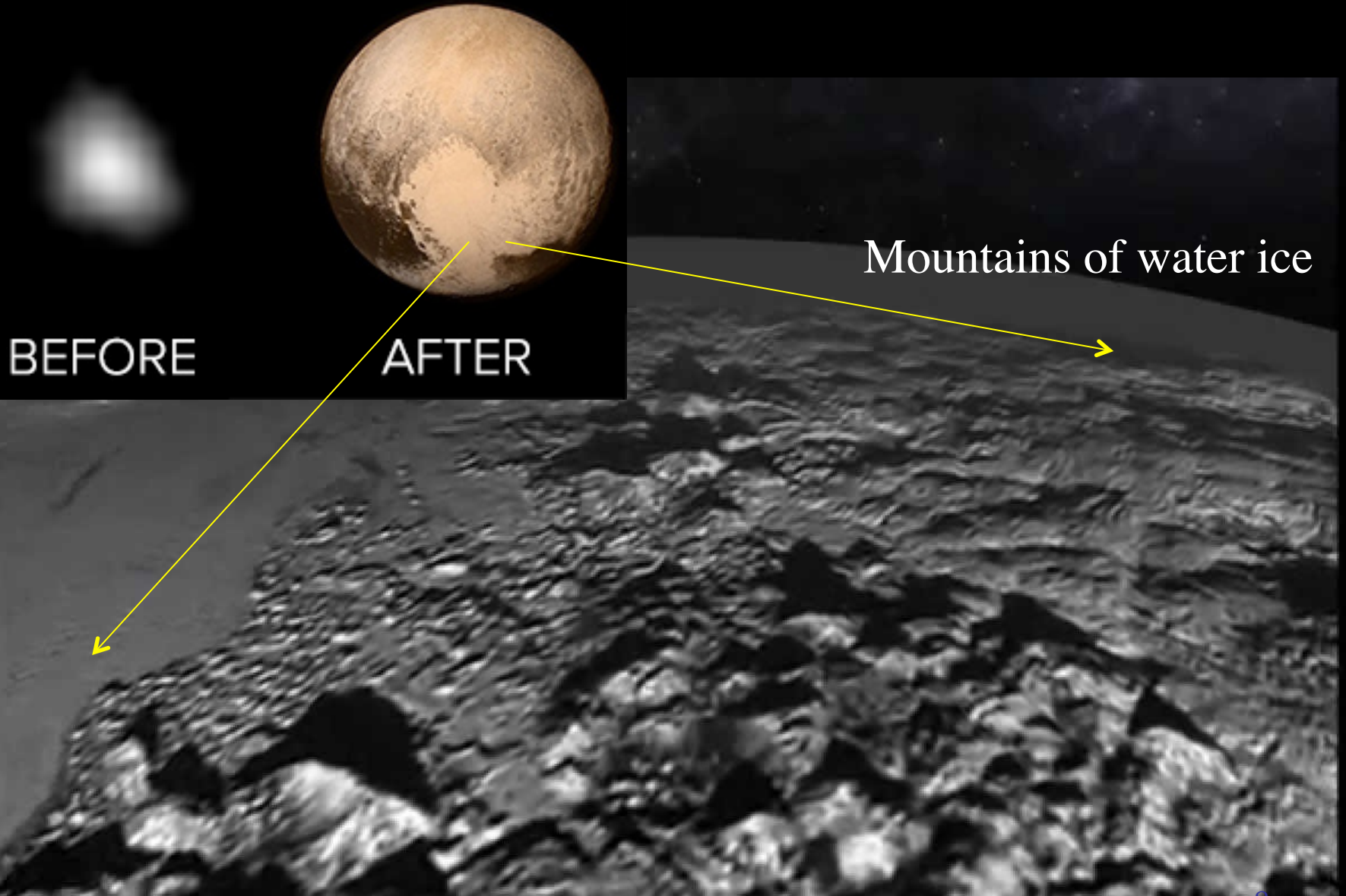
New Horizons Spacecraft's Jupiter flyby

Launched Jan 21, 2006



Flew by Pluto in July 2015

Pluto flyby



Mountains of water ice

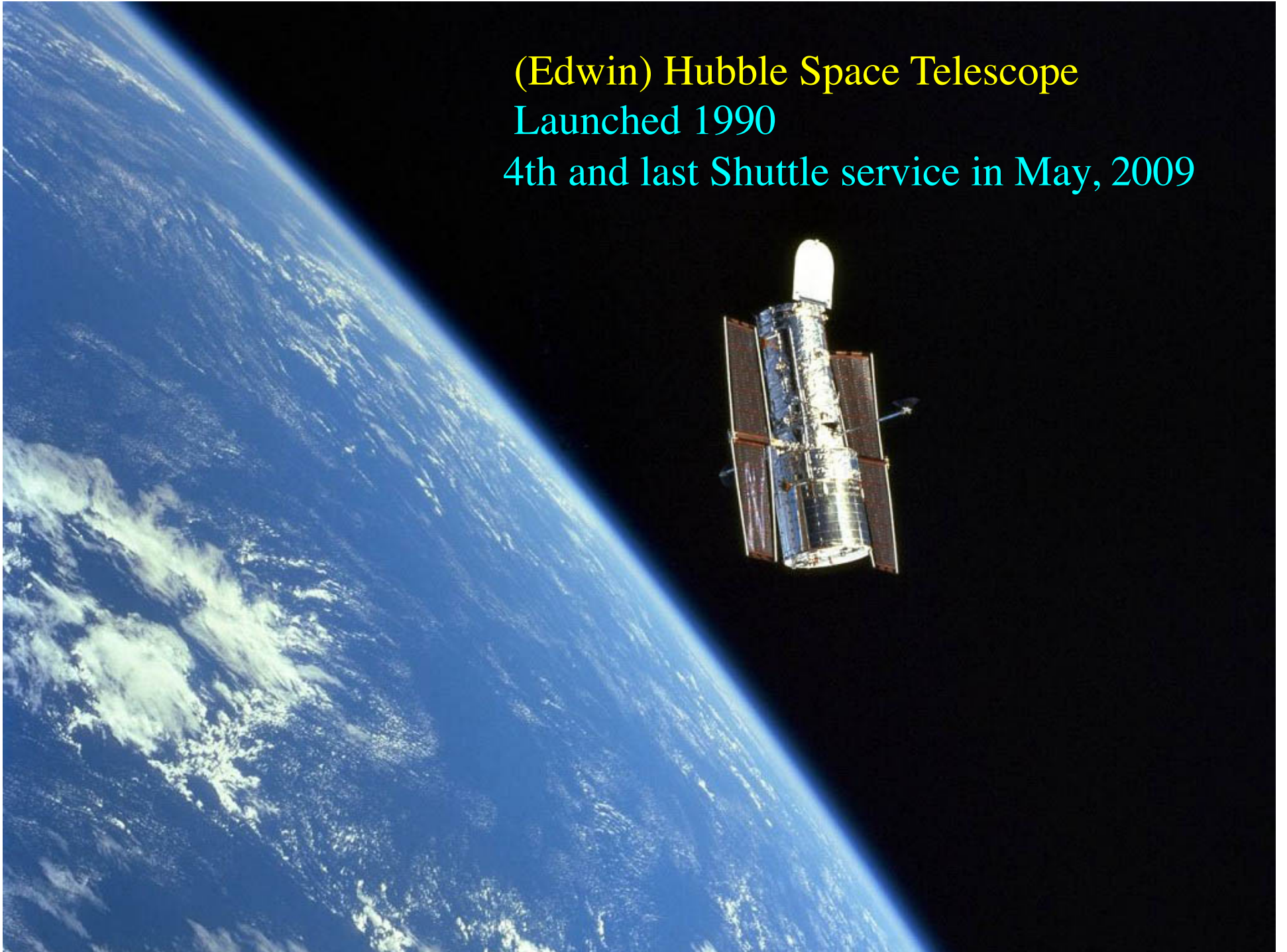
BEFORE

AFTER

Exciting Time in Astronomy

- Spacecraft to every planet, except Pluto
- Telescopic view to the edge of observable Universe
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- Goal: properties (what) and processes (why)

(Edwin) Hubble Space Telescope
Launched 1990
4th and last Shuttle service in May, 2009





The image shows the Kepler Space Telescope in space. The telescope is a large, cylindrical instrument with a blue solar panel array extending from its side. It is positioned in the foreground, angled towards the viewer. In the background, there is a vast field of stars. To the left, a yellow star is shown with a thin, elliptical orbit around it. To the right, the Earth is visible as a blue and white sphere. The overall scene is set against a dark, star-filled sky.

Kepler Space Telescope, launched 2009

Looking for planets around
other stars

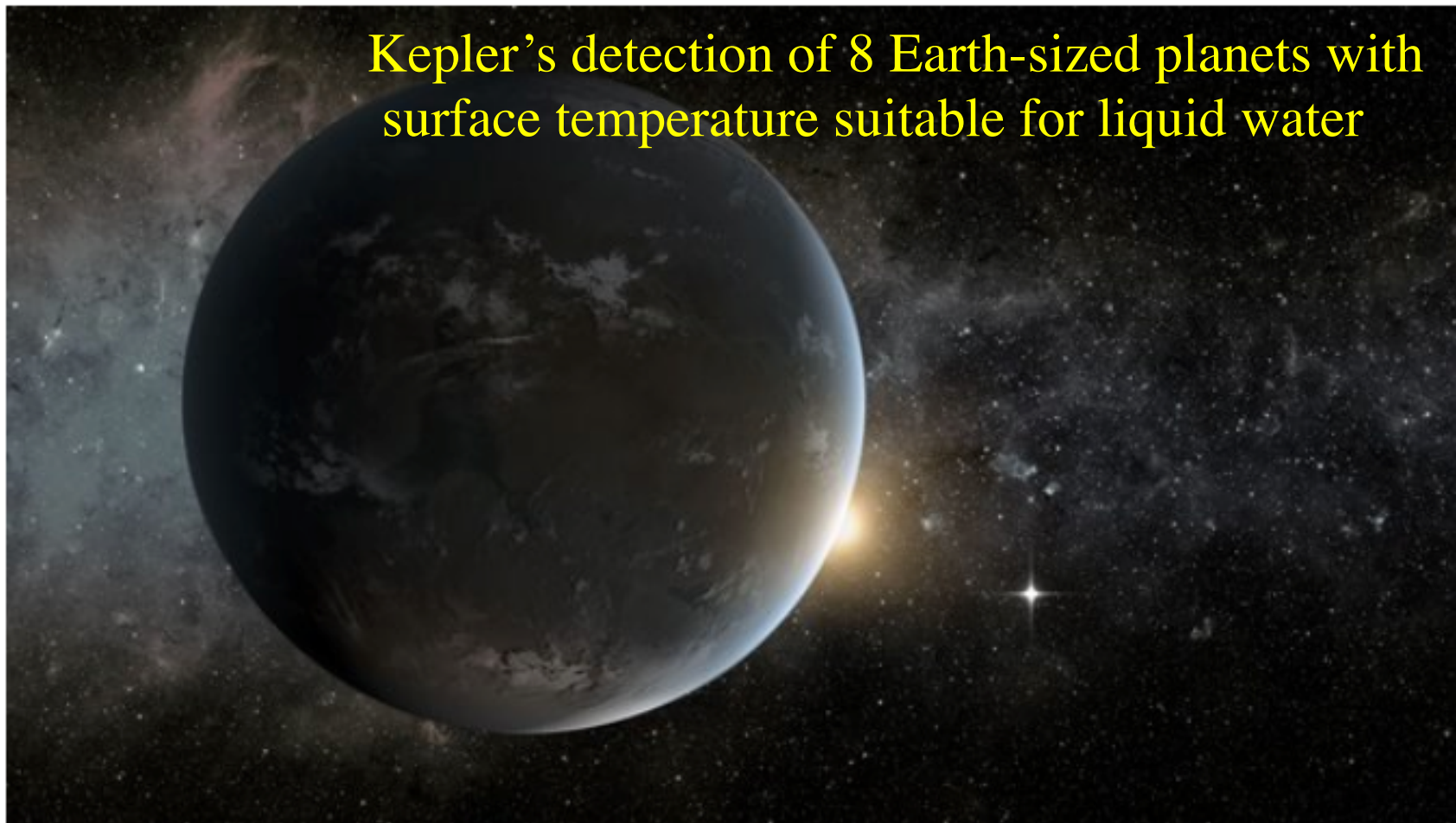
>3,000 confirmed planets so far
many more planet candidates

SPACE & COSMOS

So Many Earth-Like Planets, So Few Telescopes

By DENNIS OVERBYE JAN. 6, 2015

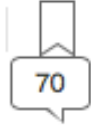
Kepler's detection of 8 Earth-sized planets with surface temperature suitable for liquid water



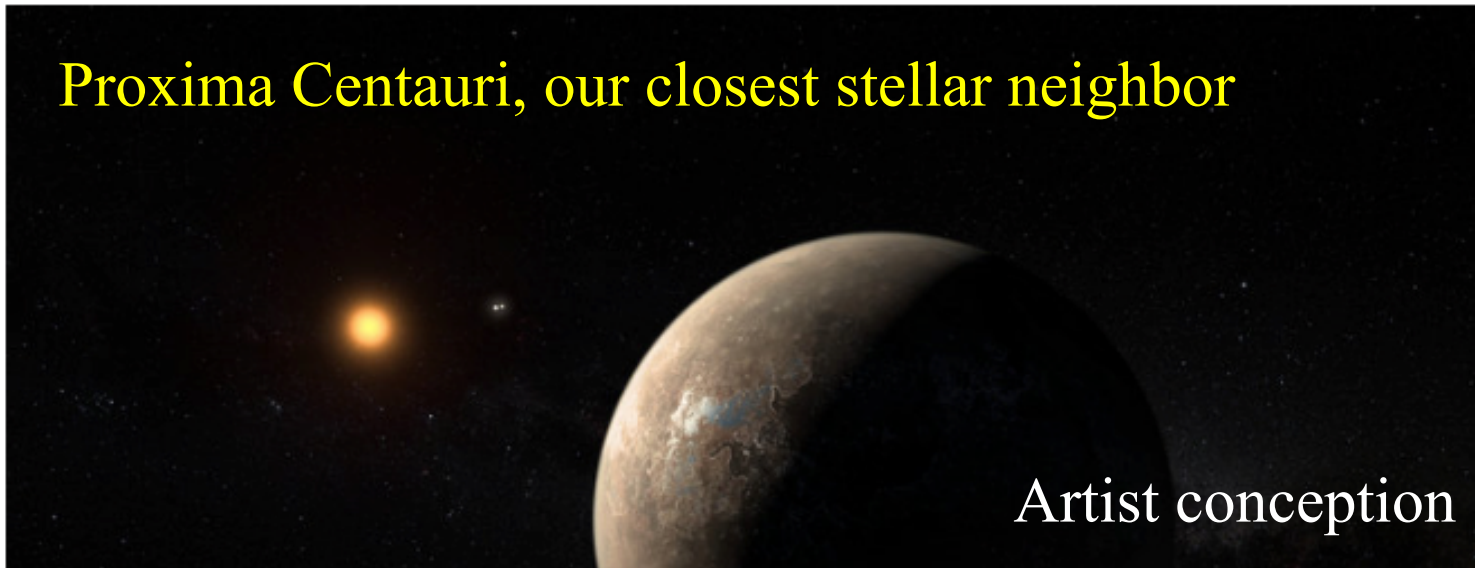
SCIENCE

One Star Over, a Planet That Might Be Another Earth

By KENNETH CHANG AUG. 24, 2016



Proxima Centauri, our closest stellar neighbor



Artist conception

Can get latest Astronomy news at

- Universe Today

<http://www.universetoday.com>

- Astronomy Picture of the Day (apod)

<https://apod.nasa.gov/apod/astropix.html>

(link not active)

Exciting Time in Astronomy

- Spacecraft to every planet, except Pluto
- Telescopic view to the edge of observable Universe
- Basic understanding of our place in Universe
- Many open questions
- Goal: properties (what) and processes (why)

II. Syllabus

Prerequisites

None

A relatively non-mathematical introduction to the astronomy of the Solar System and the night sky.

Satisfies 3 hours of the Science and Math area requirement

ASTR 1210 and 1220

Two independent courses, can take
one or other or both in any order

ASTR 1210: Sky and Solar System

ASTR 1220: Stars, Galaxies, and the
Universe

Some overlap possible

Rest of today's lecture: syllabus &
overview

ASTR 1210: Introduction to the Sky and the Solar System

Section 002

Schedule number 10401

Tuesday & Thursday 12:30-1:45 PM

Clark 107

Instructor

Zhi-Yun Li 李志云

Office: ASTR 268



E-mail: ZL4H@virginia.edu

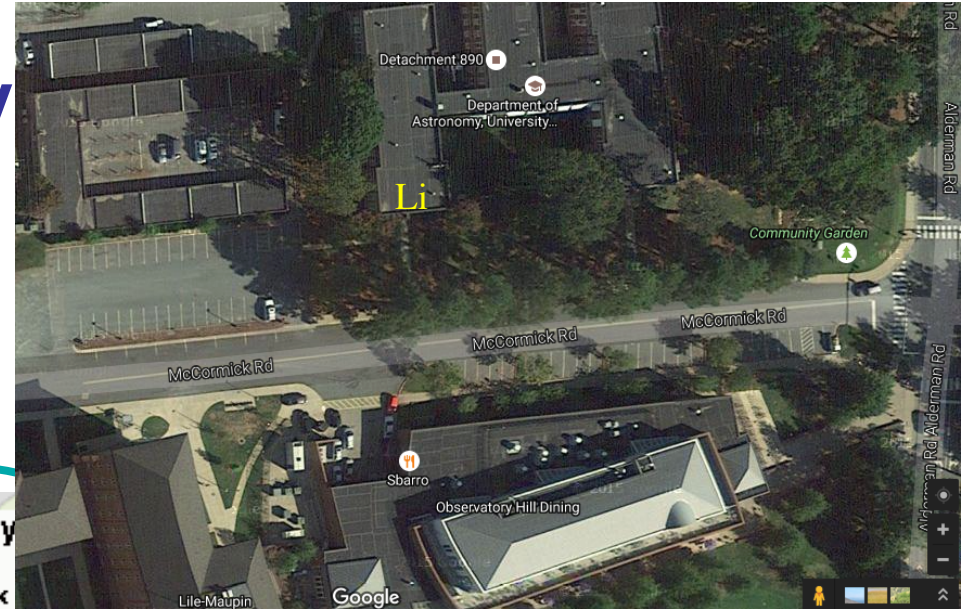
Phone: 924-4886

Office hours:

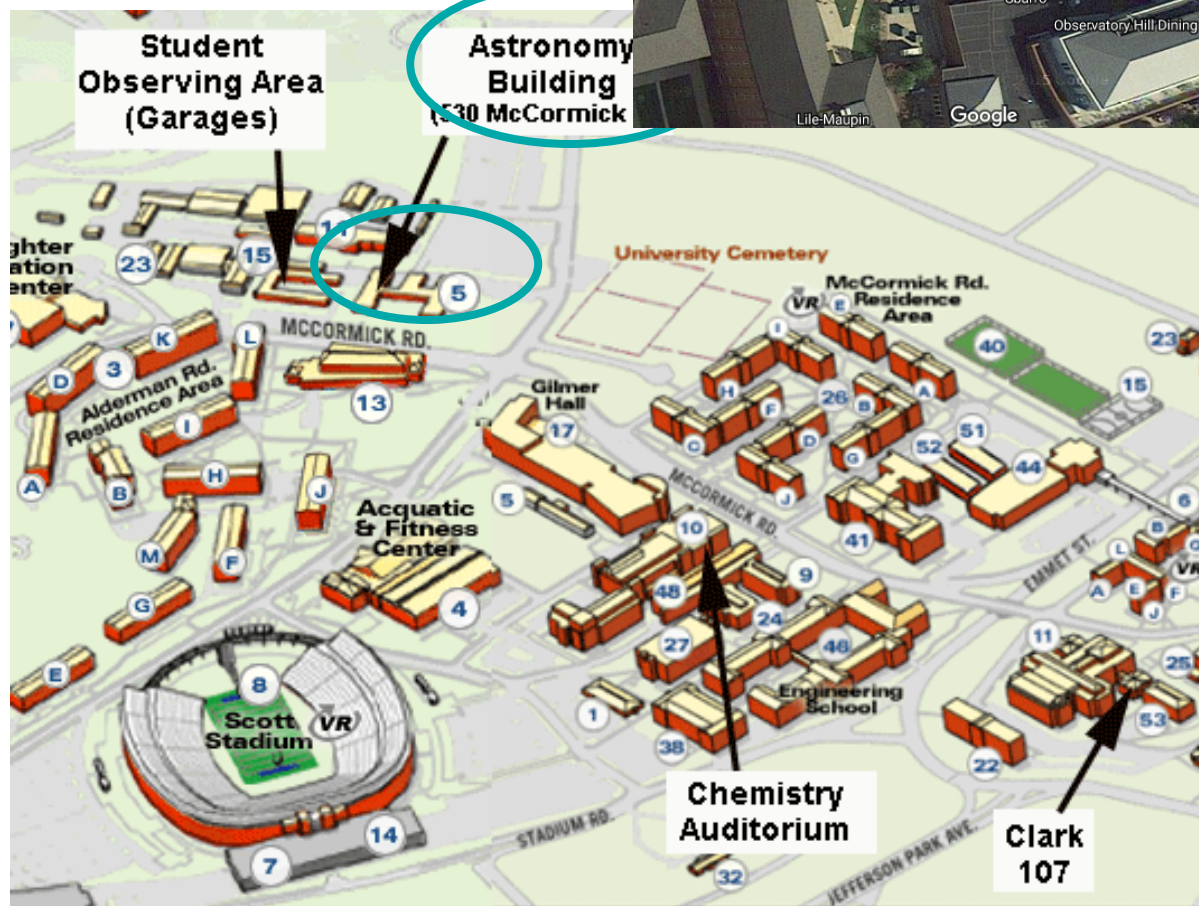
TuTh 2:00-3:15PM or by
appointment or
any time

Office in Astronomy Building

RM 268, West Wing,
first on the left



← west



Organization

Class website in the UVa Collab system at
<https://collab.itc.virginia.edu/portal>

Textbook: The Cosmic Perspective, 8th Edition by Bennett, Donahue, Schneider, & Voit (Publisher: Pearson)

Some bundled with MasteringAstronomy (~\$200 new, at University Bookstore)

New without MasteringAstronomy (~\$180 at Bookstore)

Used 7th or even 6th edition without MasterAstronomy ok, some copies from University Bookstore (much cheaper than new, ~\$100)

Cheaper option: rent eText at <http://www.coursesmart.com>, or rent textbook from University Bookstore

Clickers: iclicker2 (University Bookstore, ~\$55), iclicker or iclicker+ (new or used), **or web-based REEF polling (~\$15 for 6 months, use own internet enabled devices, such as smart phone, iPad, iPod Touch, tablet, or laptop)**

* email me if you want to borrow a clicker remote from me

In-Class Quizzes and Final

- **Three in-class quizzes, roughly one per month**
- **True-false, or multiple choice, or short answer type**
- **Final about twice as long, comprehensive same general style**
- **Quizzes must be taken at the scheduled time**
see me before quiz if conflict

Grades

Will drop the lowest grade of the three quizzes

In-Class Quizzes: 25% each of the remaining two quizzes

Final exam: 35%

In-Class clicker exercises: 10%

Constellation Lab: 5%

Telescope Lab: 3% (extra credit)

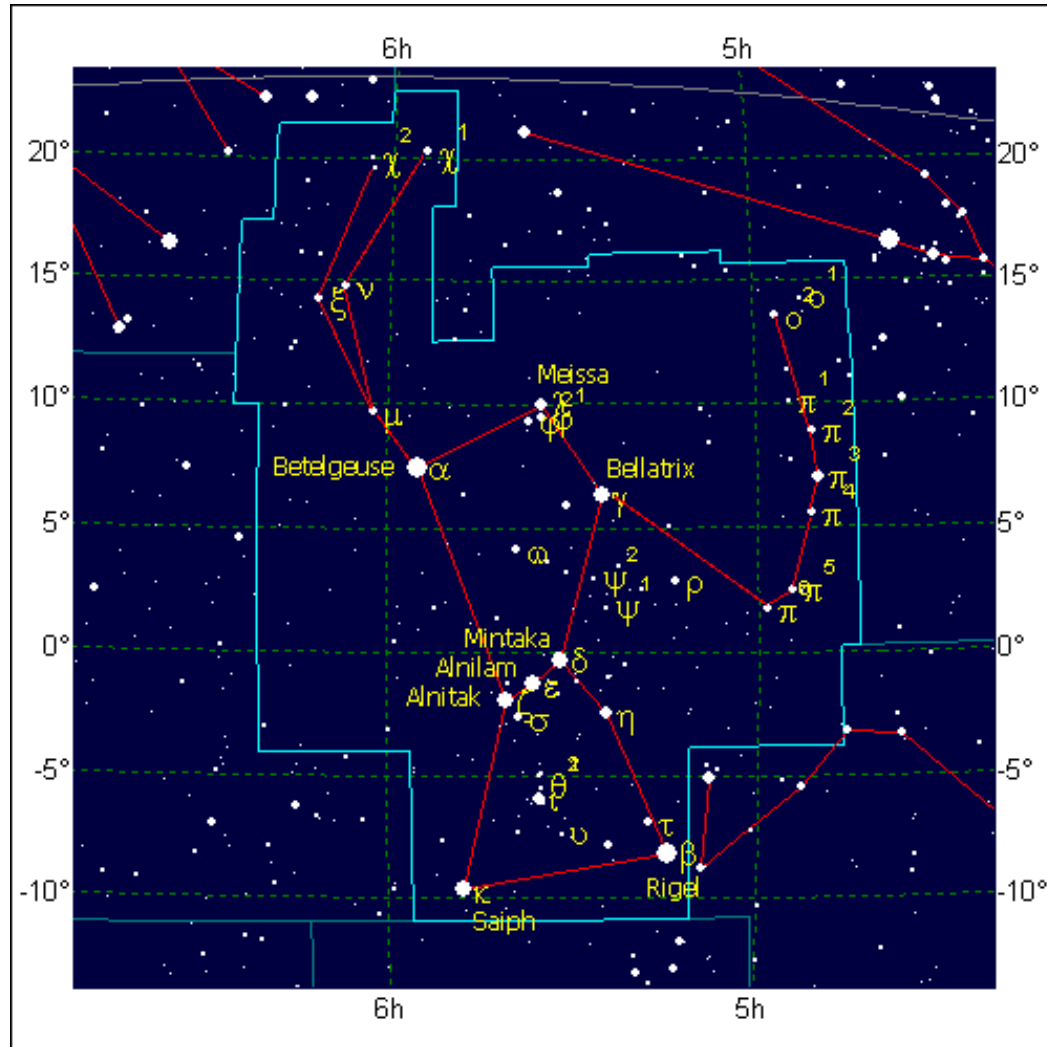
Constellation Lab

- **Required** to do this lab.
- Takes about one hour on a **clear night**.
- Labs are cancelled if it is cloudy. Call the Night Lab Status Line after 6:30 pm at 924-7238.
- **Do labs early in the semester to avoid being clouded out.**
- Worth 5% of final grade if done on or before **Thursday April 20**. Lab is worth no more than 1/2 after the deadline.
- open Mondays, Tuesdays, Wednesdays, & Thursdays
two sessions per night: 9-10pm and 10-11pm
- You **must sign up in advance** through lab website at <https://saturn.astro.virginia.edu/index.php>

What to do in Constellation Lab?

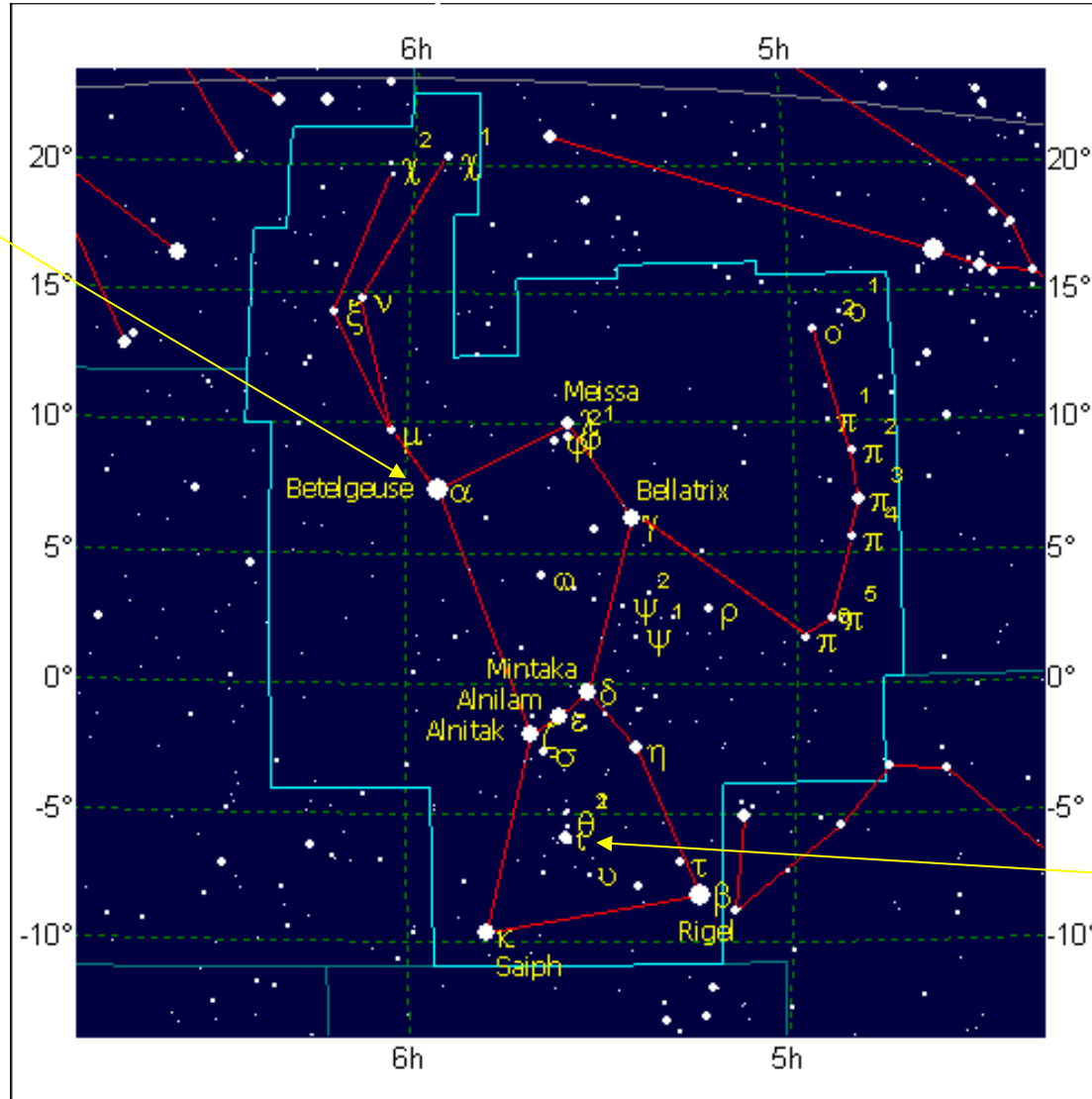
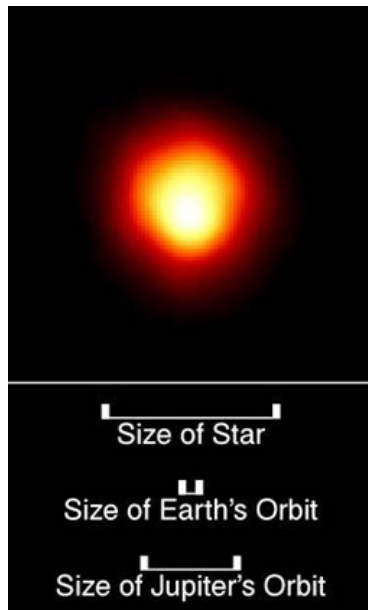
- You learn the constellations and bright stars in the sky.
 - You will hear a short lecture, e.g., Orion
 - complete a worksheet about the sky, and be quizzed on bright stars and constellations.
 - The lab is graded pass/fail.
 - You may retake the lab if you fail.
 - Bring some thing to write with (& red flashlight if you have one)

Orion, The Hunter

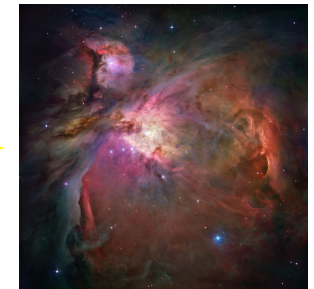


No prior knowledge required, can be done early in semester

Betelgeuse



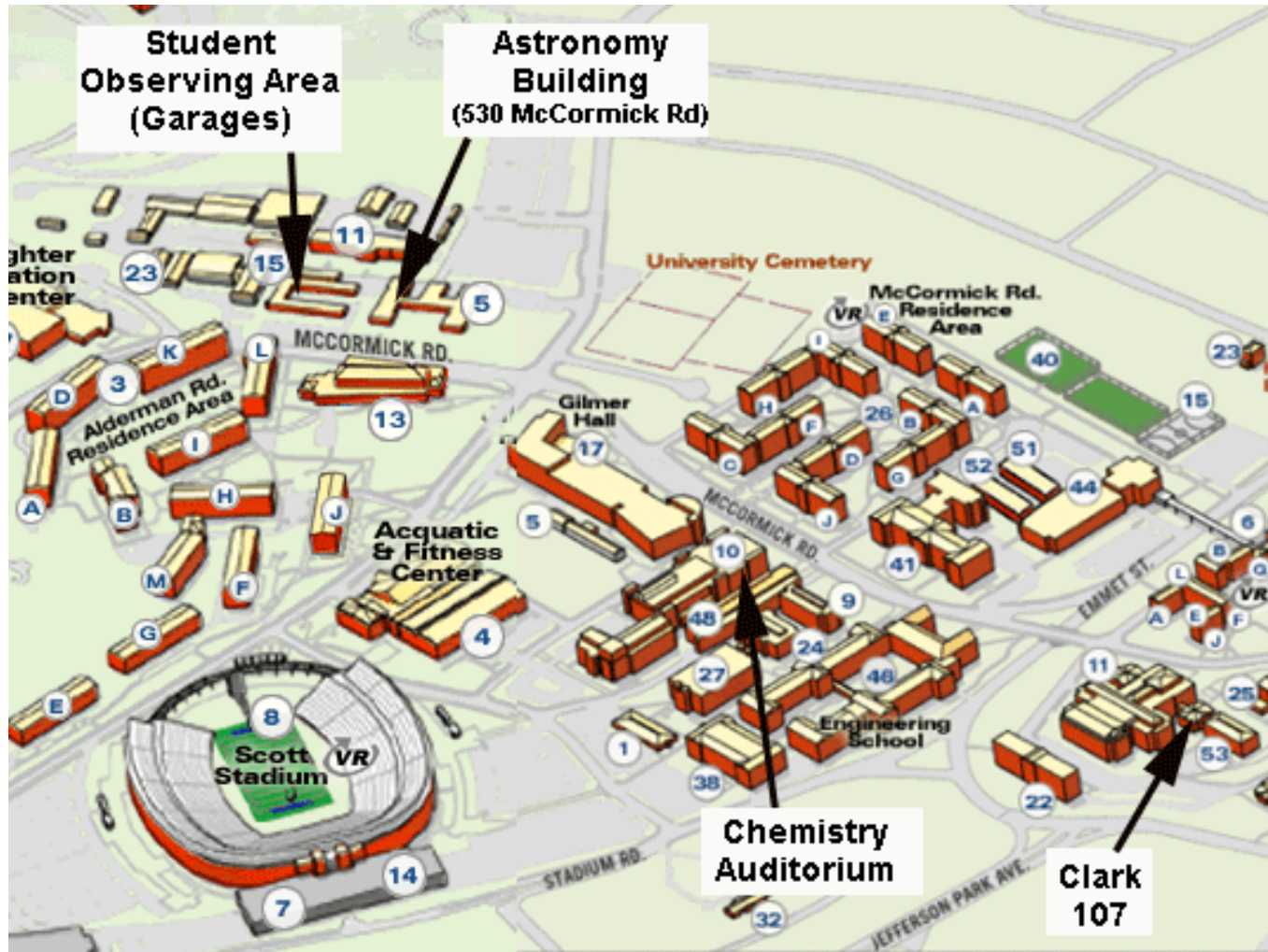
Orion Nebula



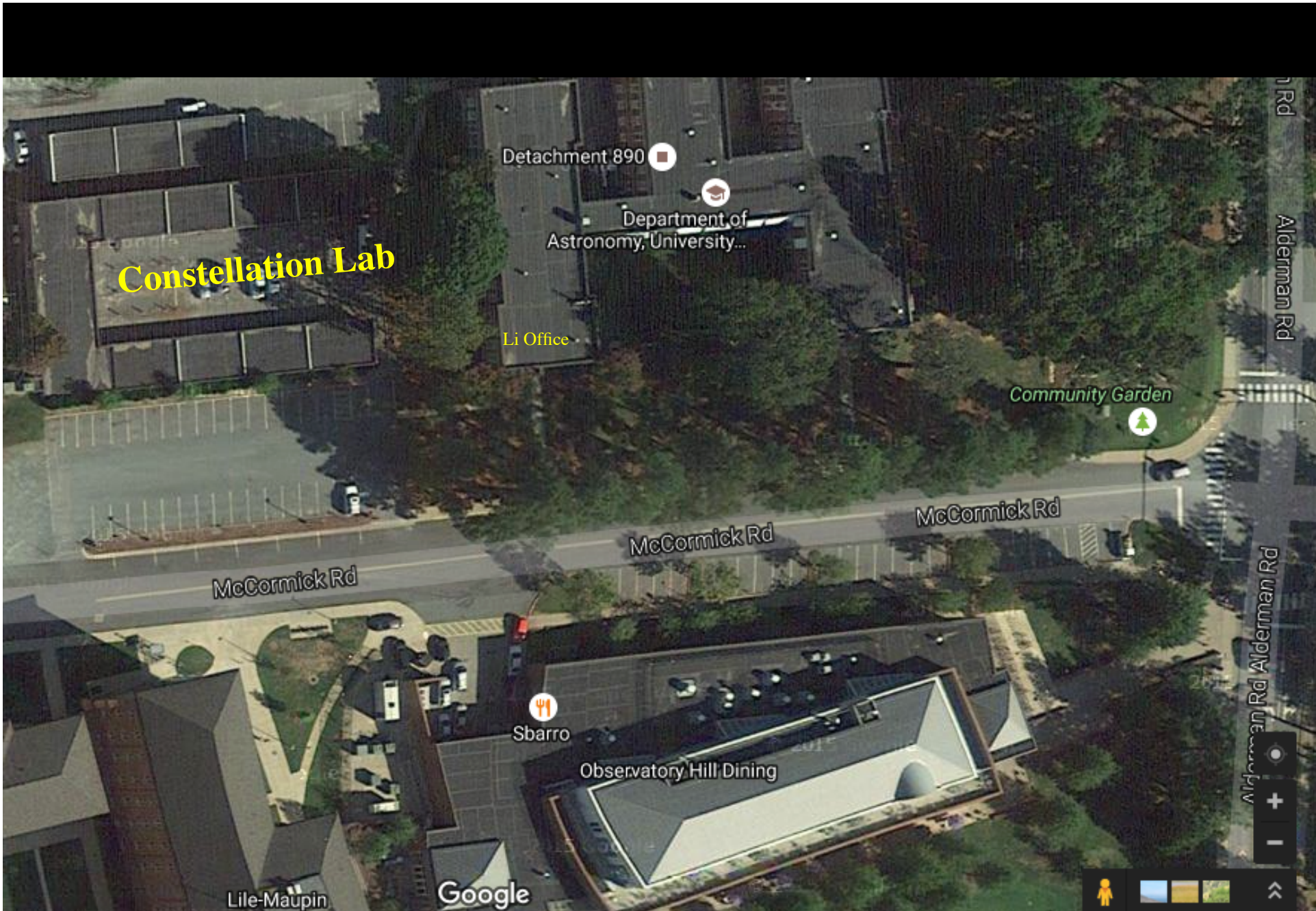
What to do in Constellation Lab?

- You learn the constellations and bright stars in the sky.
 - You will hear a short lecture
 - complete a worksheet about the sky (with a partner), and be quizzed on several stars and constellations.
 - The lab is graded pass/fail.
 - You may retake the lab if you fail.
 - Bring some thing to write with (e.g., pen)
 - Be on time. Dress warmly.
 - Will be asked to write instructor name on lab sheet (Li); graded sheet will be given to me for record.

Where is Constellation Lab?




Details next



Lab should be easy to do...

“Eighty percent of success is showing up.”
-Woody Allen

Telescope Observing Lab

- The Telescope Observing Lab is optional. Extra credit of 3% final grade if done before or on **Monday, May 1**, last day of lab
- You will visit the historic McCormick Observatory 
- The lab is graded pass/fail. You must get 75% to pass the lab. You may retake the lab if you fail.

Telescope Observing Lab



26 inches, once largest in the US



Telescope Observing Lab

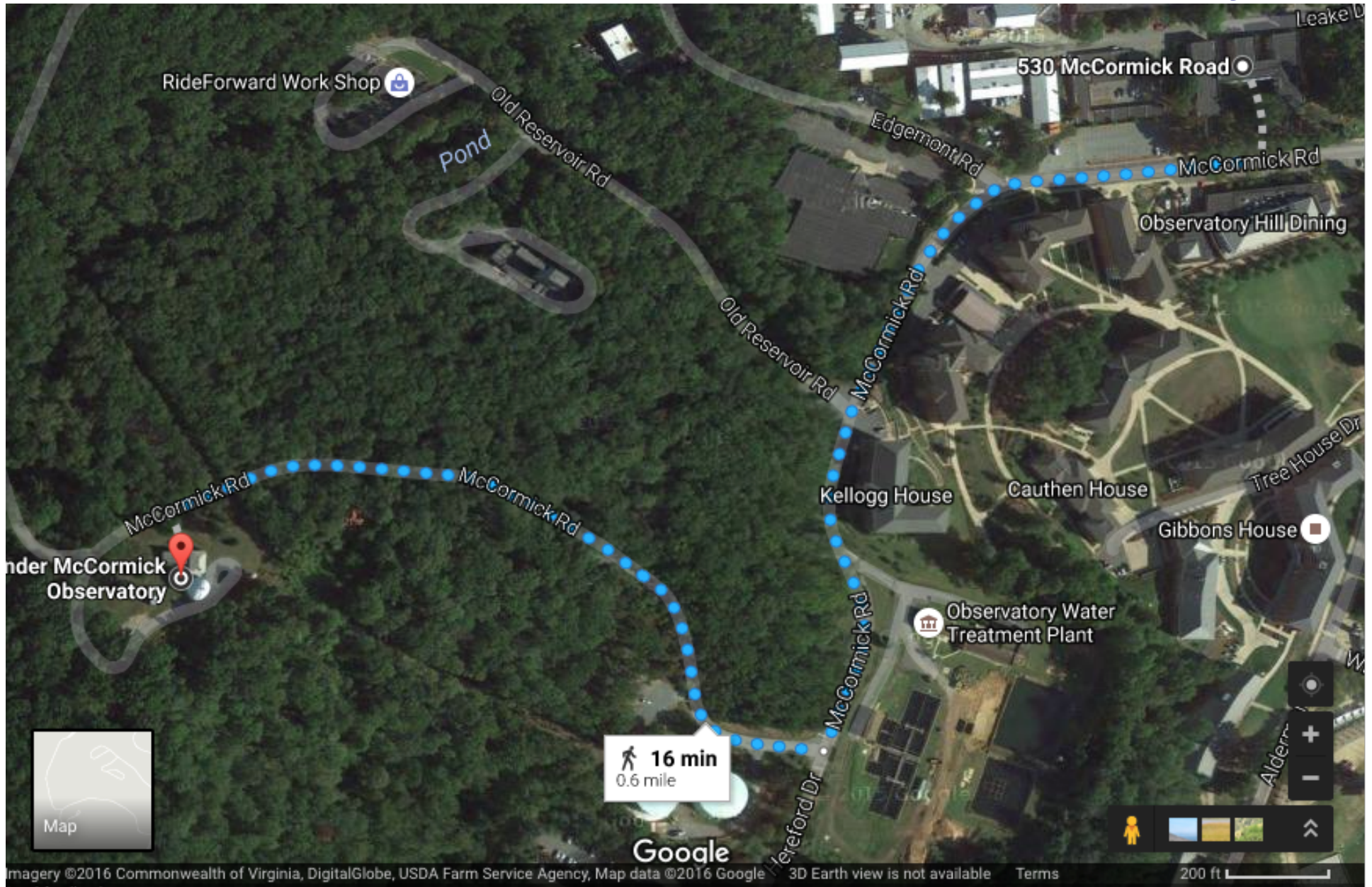
- The Telescope Observing Lab is optional. Extra credit of 3% final grade if done before or on Monday, May 1.
- You will visit McCormick Observatory
- Open Mondays & Thursdays (clear nights only, call 924-7238 after 6:30pm for weather), 9-11pm
- The lab is graded pass/fail. You must get 75% to pass the lab. You may retake the lab if you fail.
- Must sign up in advance at lab same website

<https://saturn.astro.virginia.edu/index.php>

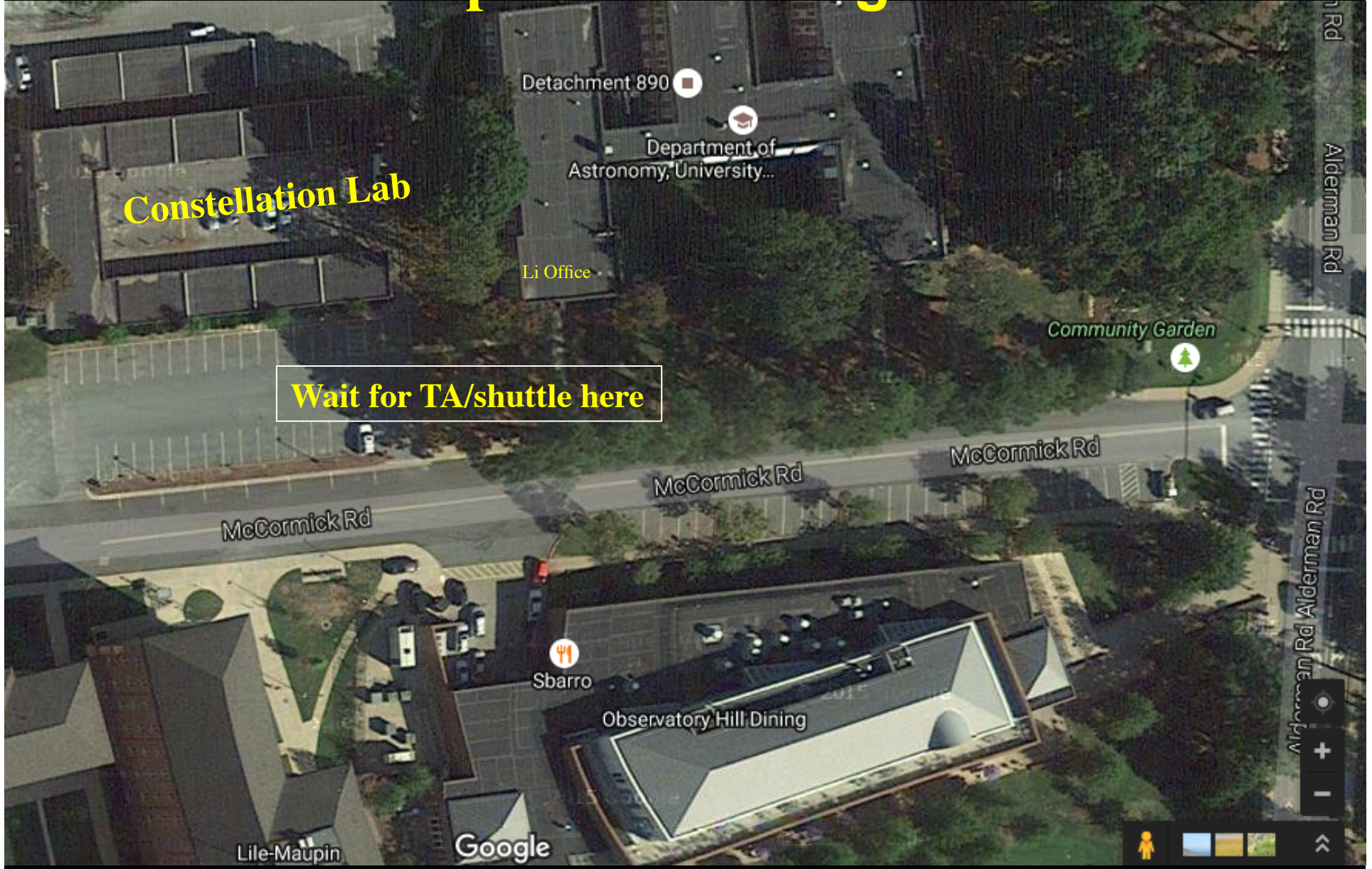
Telescope Observing: where?

- You should meet at the Astronomy Department sign in front of the Astronomy Building (across from the O-Hill dining hall).
- The teaching assistant will shuttle people up to the observatory in a van, or you can drive your own car after **checking in** in front of the Astronomy Building (see maps).
- **Dress warmly.**

Where is McCormick Observatory?



Telescope Lab Meeting Location



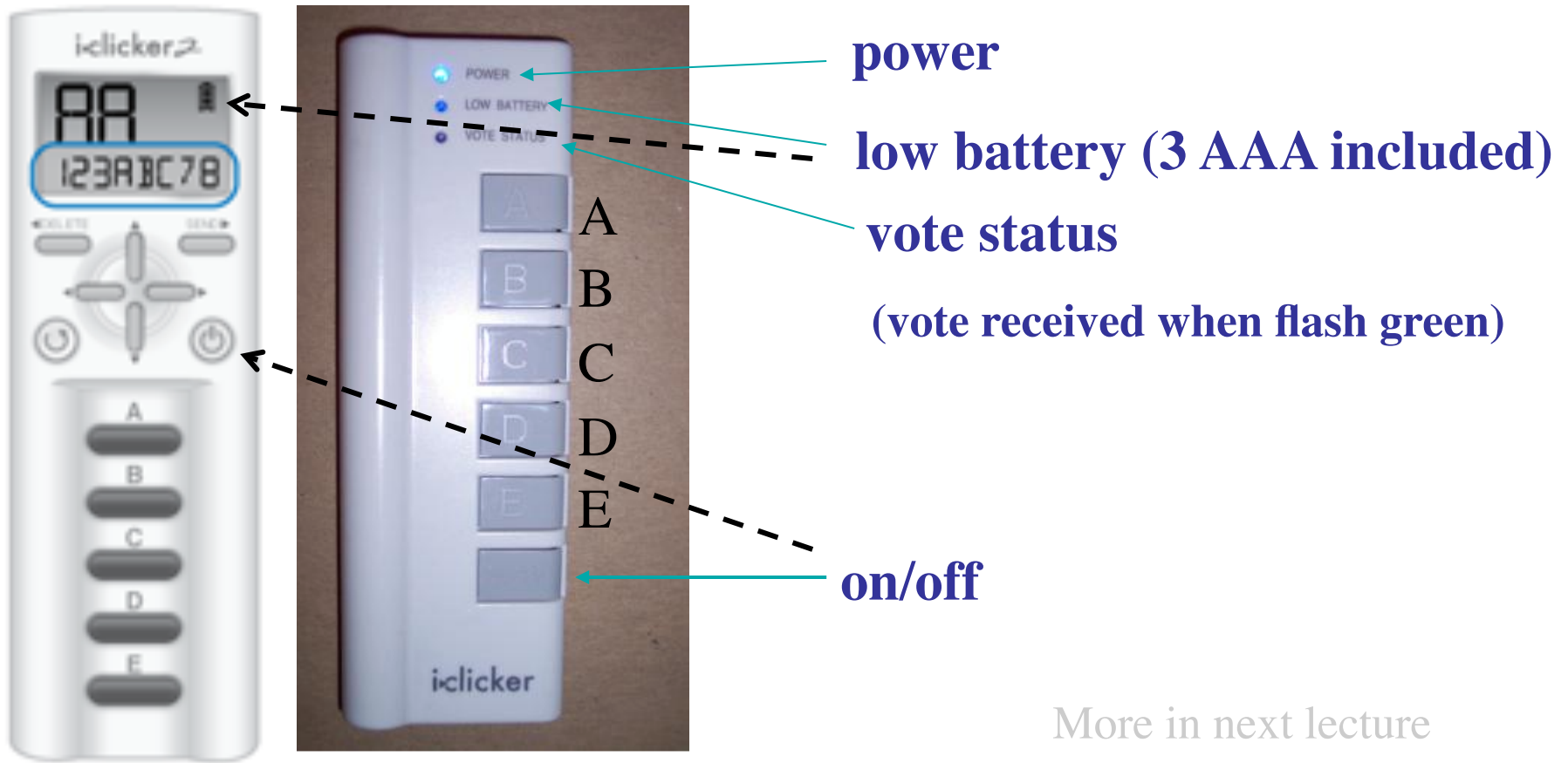
Recap: Labs

	Nights	Times	Begins	Ends
Constellation Lab	Mon-Thurs	9 & 10 pm	Jan 23 (M)	May 2
Telescope Lab	Mon & Thurs	9 – 11 pm	Jan 30 (M)	May 1

- **Constellation lab required, April 20 deadline for full credit**
- **Telescope lab optional, less slots, plan early**
- **Impossible to do both labs in one night**
- **Both require signup in advance AND clear sky**
- **Instructions at lab website**
- **No labs during Spring break**
- **More info, contact Andy Lam (KL4SF@virginia.edu, TA for this class)**

iClicker for Classroom Exercises

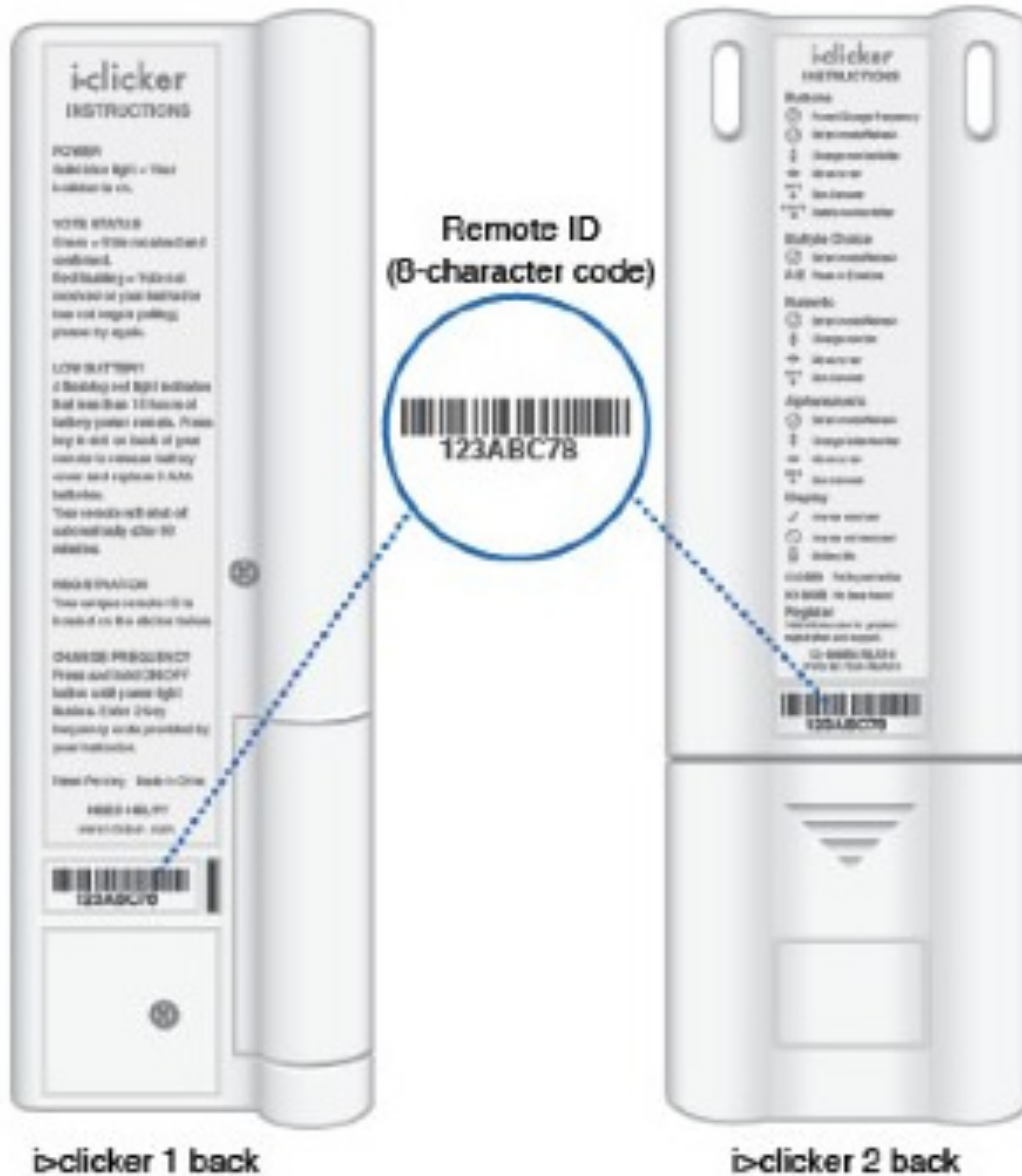
- During most classes, I will ask you to respond to a number of questions (typically 2-4) using iClicker (from bookstore)



nt of i>clicker with power turned on.

More in next lecture

iClicker ID & Registration



- Clicker ID (or remote ID)
A series of 8 numbers & letters

May contain 1 but not I
0 but not O

* If ID unclear, come see me

Online Registration of iClickers

You must register your iClicker at **UVa Collab** site (not iclicker site)

<https://collab.itc.virginia.edu/portal>

The screenshot shows the UVa Collab portal interface. The top navigation bar includes the UVa Collab logo and several dropdown menus for workspace, course, and user selection. The main content area is titled "17Sp ASTR 1210-002 (CGAS): i>clicker" and contains a "Student Registration" button. Below this, the "i>clicker Student Registration" section provides instructions on how to register using an 8-character Remote ID or a 12-character GO ID. A registration form with a text input field and a "Register" button is present. At the bottom, a table displays a list of registered i>clicker accounts.

i>clicker ID	Date Registered	
96E56E1D	Aug 13, 2014	Remove

Web-based “REEF polling”

- **Cheaper option: ~\$15 per semester**
- **An App on your web-enabled device**
smart phone, iPod-touch, iPad, laptop etc
- **To buy, download an app from**
<http://support.reef-education.com>
- **Free trial for 14 days**
- **Create an account**

Looks like

2. Choose to create a new account.

REEF
Education™

Sign In to My Account

Email

Password

Keep me signed in

Sign In

Forgot Password?

Create a New Account

Join an Instant Session

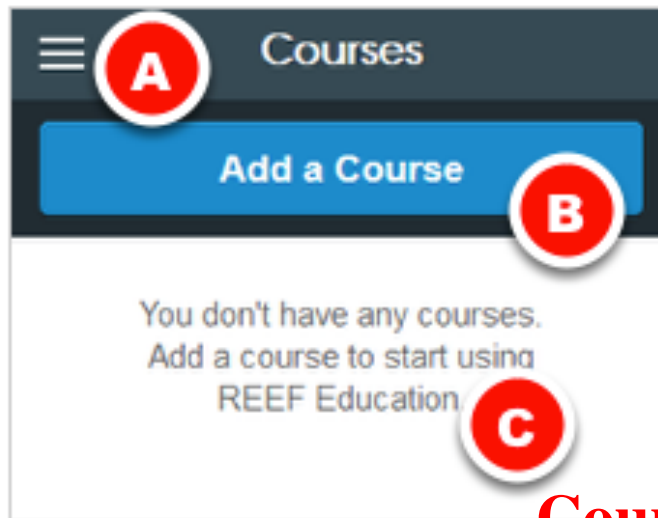
Will ask about school:

University of Virginia Main Campus

Student ID (optional):

Please use 7 digit SIS ID
(not 9 digit UVA student ID)

5. Review the options on your Courses screen.



Course to select

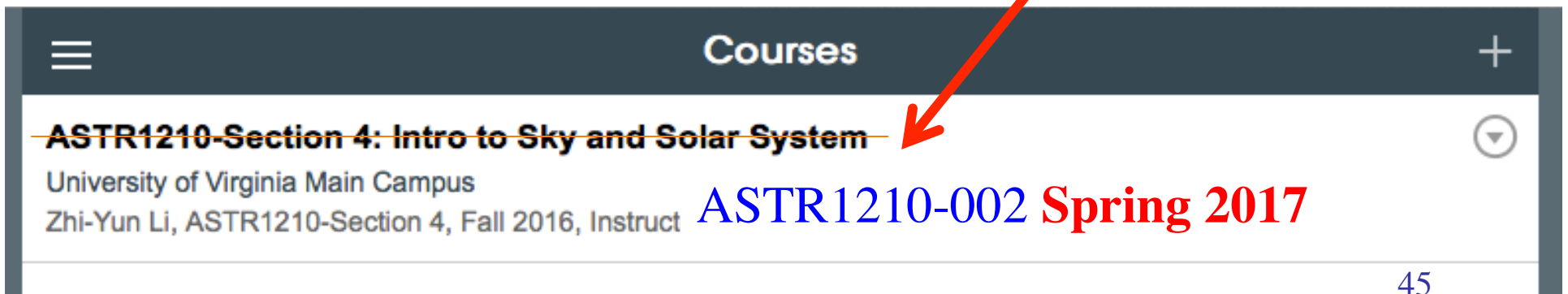
The **Courses** screen opens each time you sign in.

A - Navigation menu

B - Add a course

C - Your list of added courses appears here

University of Virginia main campus
Search for "Li"



ASTR1210-002 Spring 2017

Your vote with REEF will be sent to my computer directly

No need to register REEF account on Collab (unlike clicker remotes)

Home 14F ASTR 1210-004 (CGAS): i>clicker

Announcements Student Registration Instructor Report

Site Info

Ask a Librarian

i>clicker i>clicker Student Registration

Syllabus

Help

Enter your 8-character i>clicker Remote ID or 12-character i>clicker GO ID below. You may register multiple remotes/i>clicker GO accounts or remove a registration entry at any time.

Your i>clicker Remote/GO ID: Register

i>clicker ID	Date Registered	
96E56E1D	Aug 13, 2014	Remove

Grade for Classroom Exercises

- During most classes, I will ask you to respond to a number of questions (typically 2-4) using iClicker
- 2 points for each correct answer, 1 point for each incorrect answer, 0 for no answer
- if you forget to bring clicker, write down answers on a piece of paper with **your name on it, date it** and give to me after class; to be tallied **at end of semester**
- 85 points maximum, **no make-ups**
- 10% of final grade
- Cannot use another student's iClicker to answer questions for them

Lectures: Basically follow structure of the textbook, with some newer materials.

Study textbook carefully.

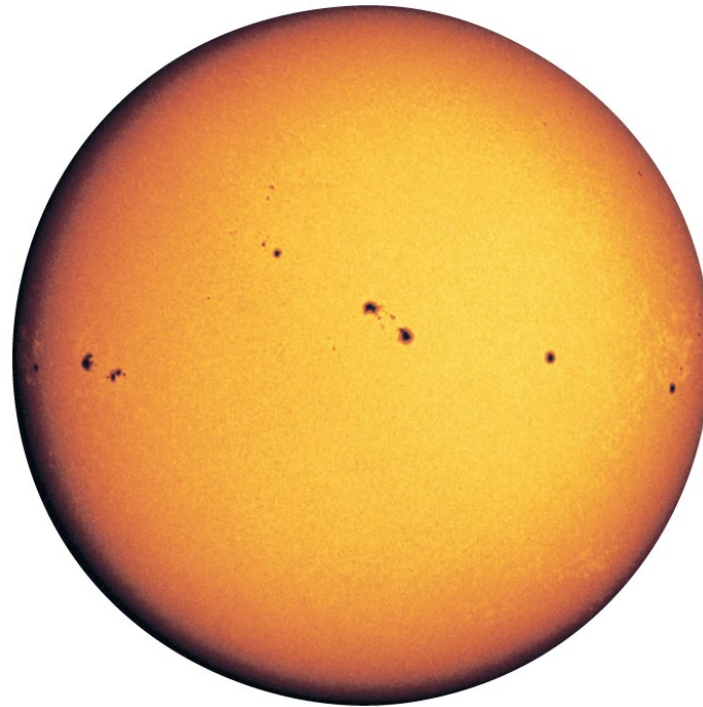
Attendance Important

Honor Pledge: all written work for credit should be pledged

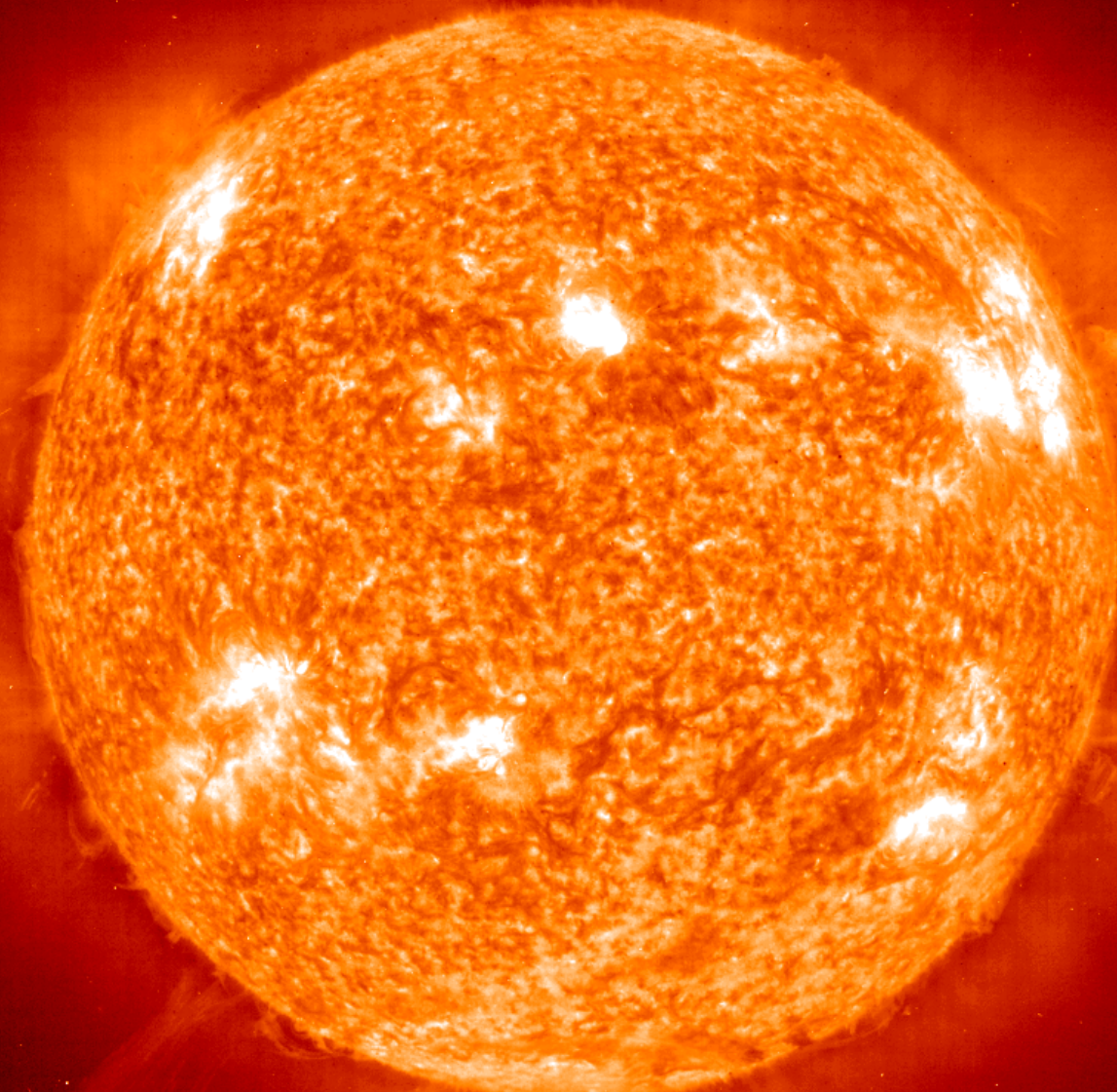
Turn off cell phone before class begins (except when you need to use it for REEF polling)

Questions?

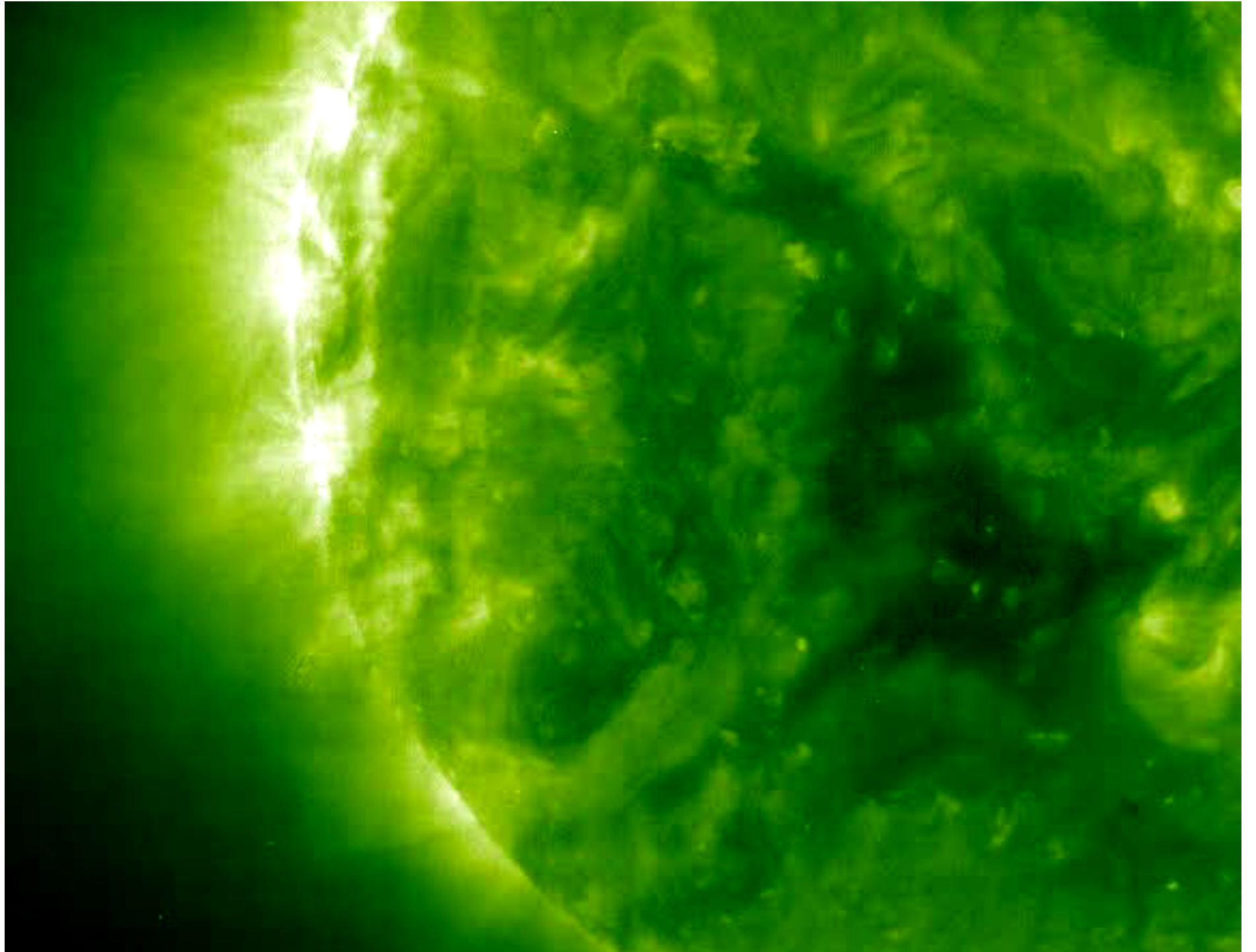
3. Overview of Course Material



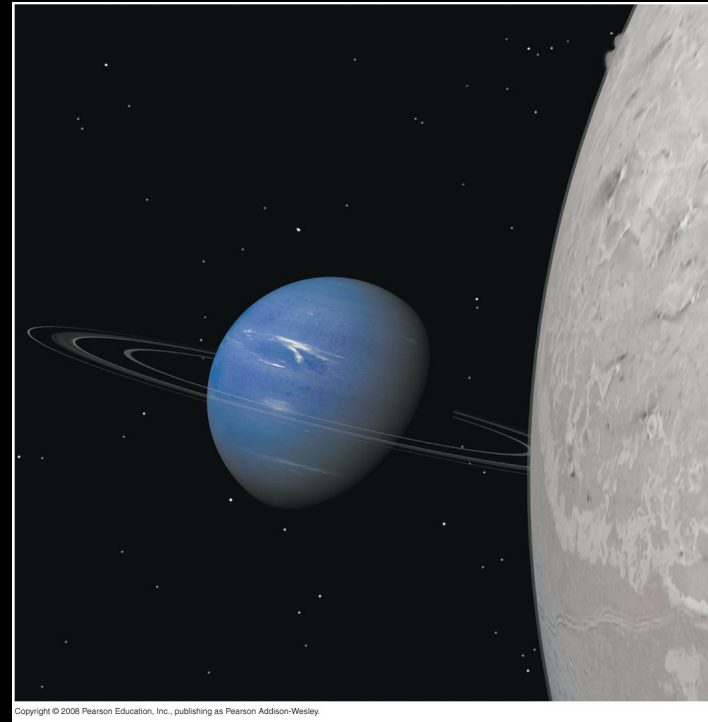
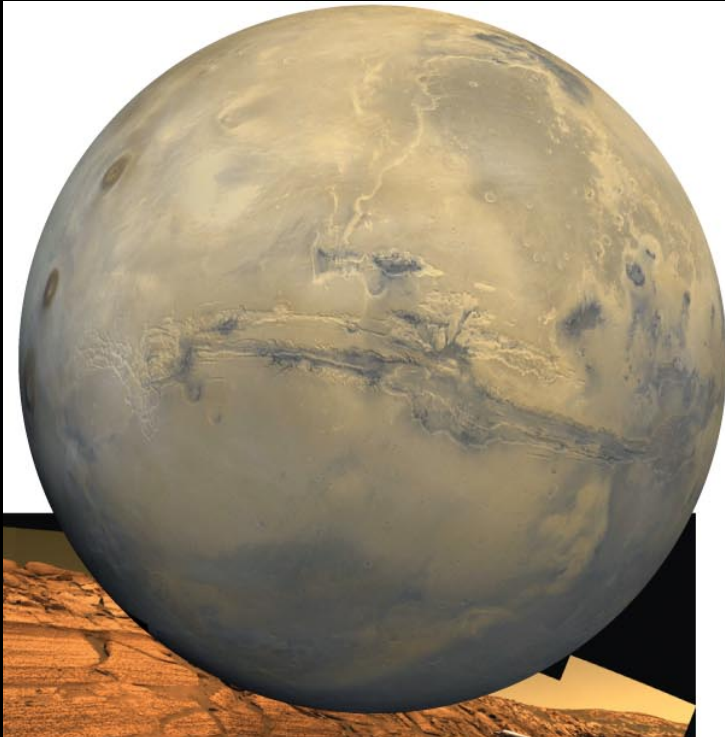
The Sun



The Sun, an average star: a large, glowing ball of gas that generates heat and light through nuclear fusion



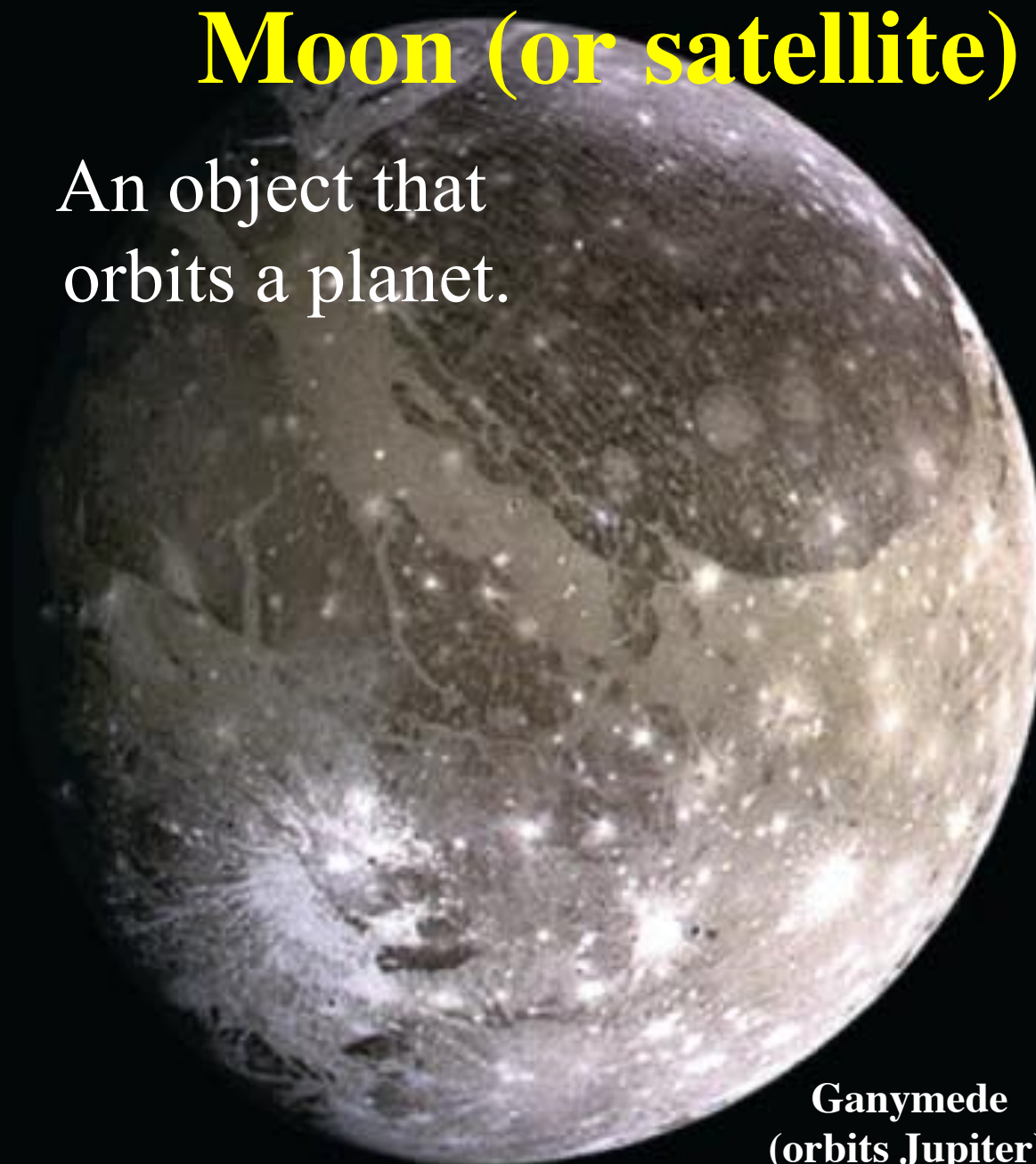
Planets



Moderately large objects that orbit a star; shine by reflected light. Planets may be rocky, gaseous or icy in composition.

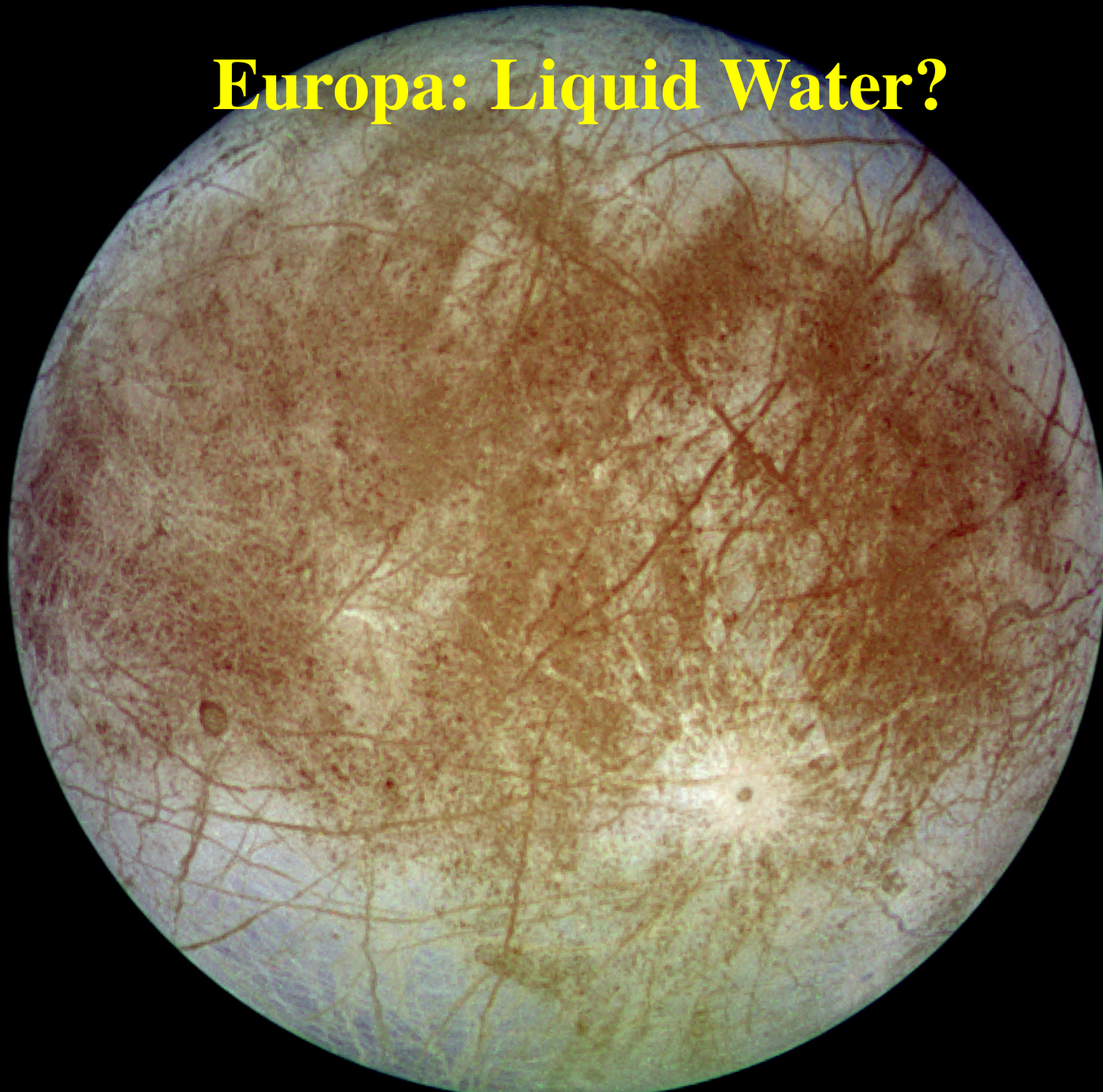
Moon (or satellite)

An object that
orbits a planet.



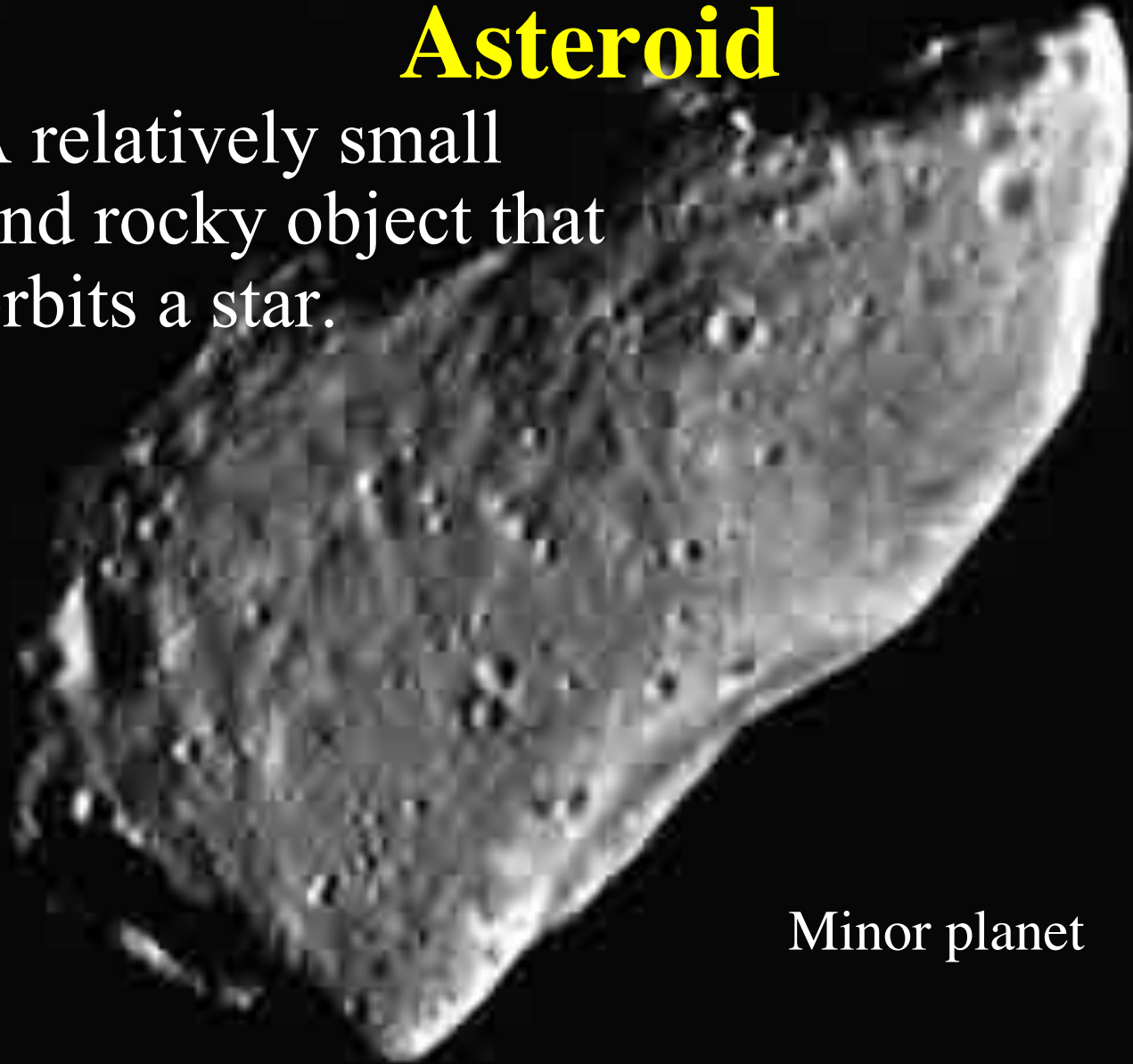
**Ganymede
(orbits Jupiter)**

Europa: Liquid Water?



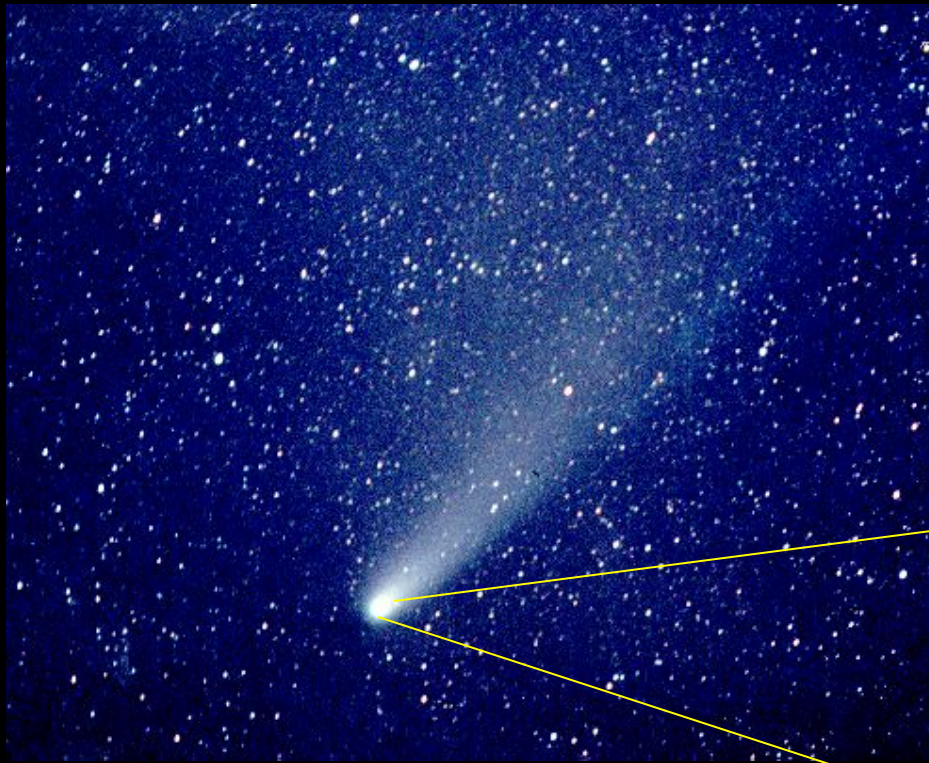
Asteroid

A relatively small
and rocky object that
orbits a star.

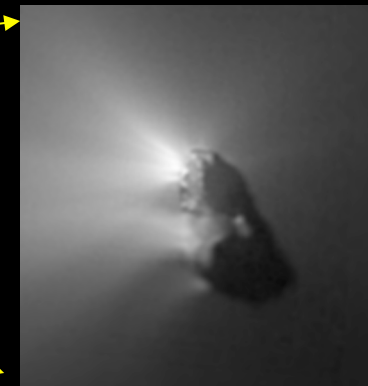


Minor planet

Comet



A relatively small and icy object that orbits a star.

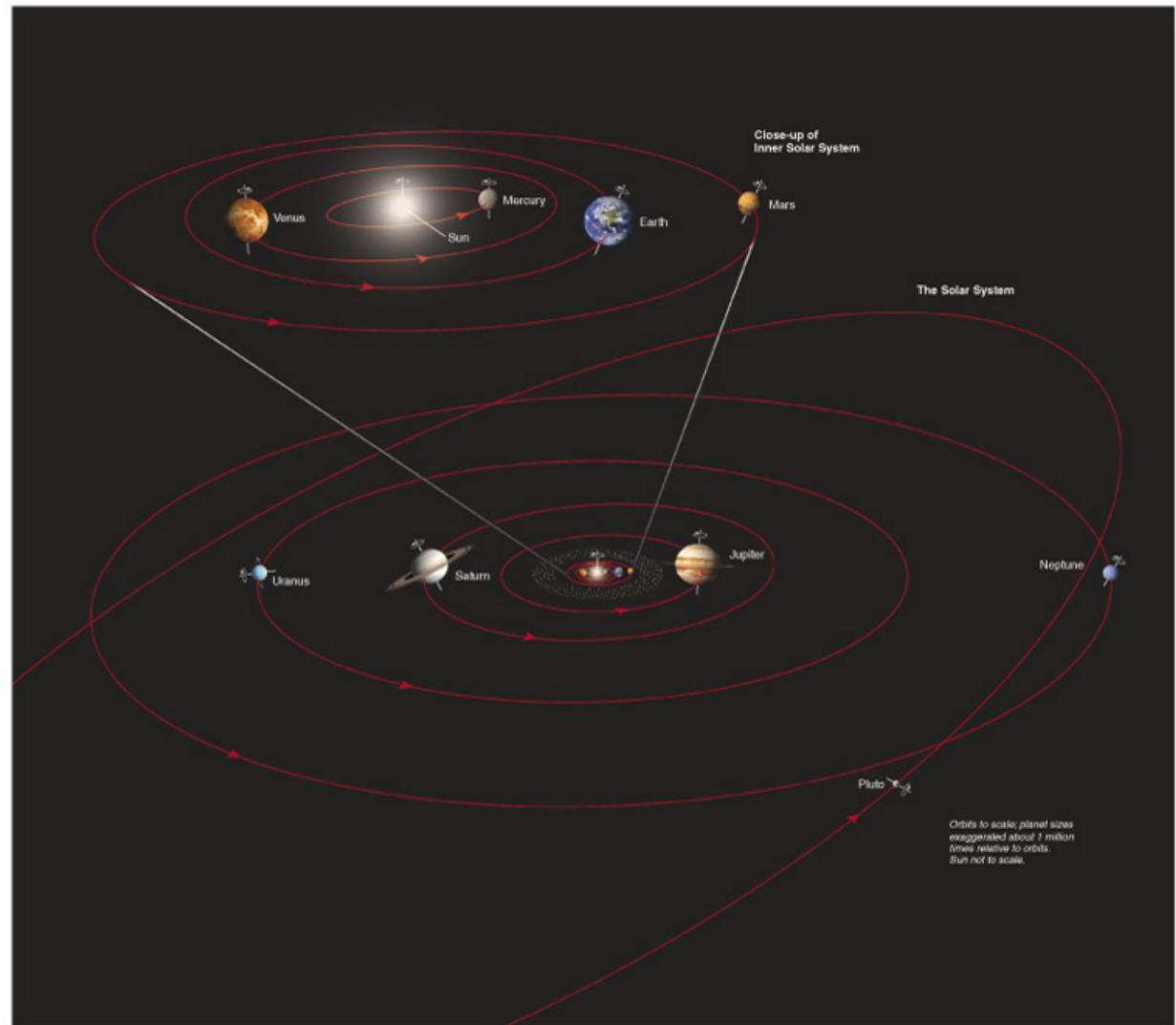


nucleus

Solar (Star) System

A star and all
the material
that orbits it,
including its
planets, their
moons,
asteroids &
comets

Goal: what & why



Tools of Astronomy

- Telescopes
- Laws of Nature
- (Limited) Math



Large Binocular Telescope (LBT)

Tools of Astronomy

- Telescopes
- Laws of Nature
- (Limited) Math

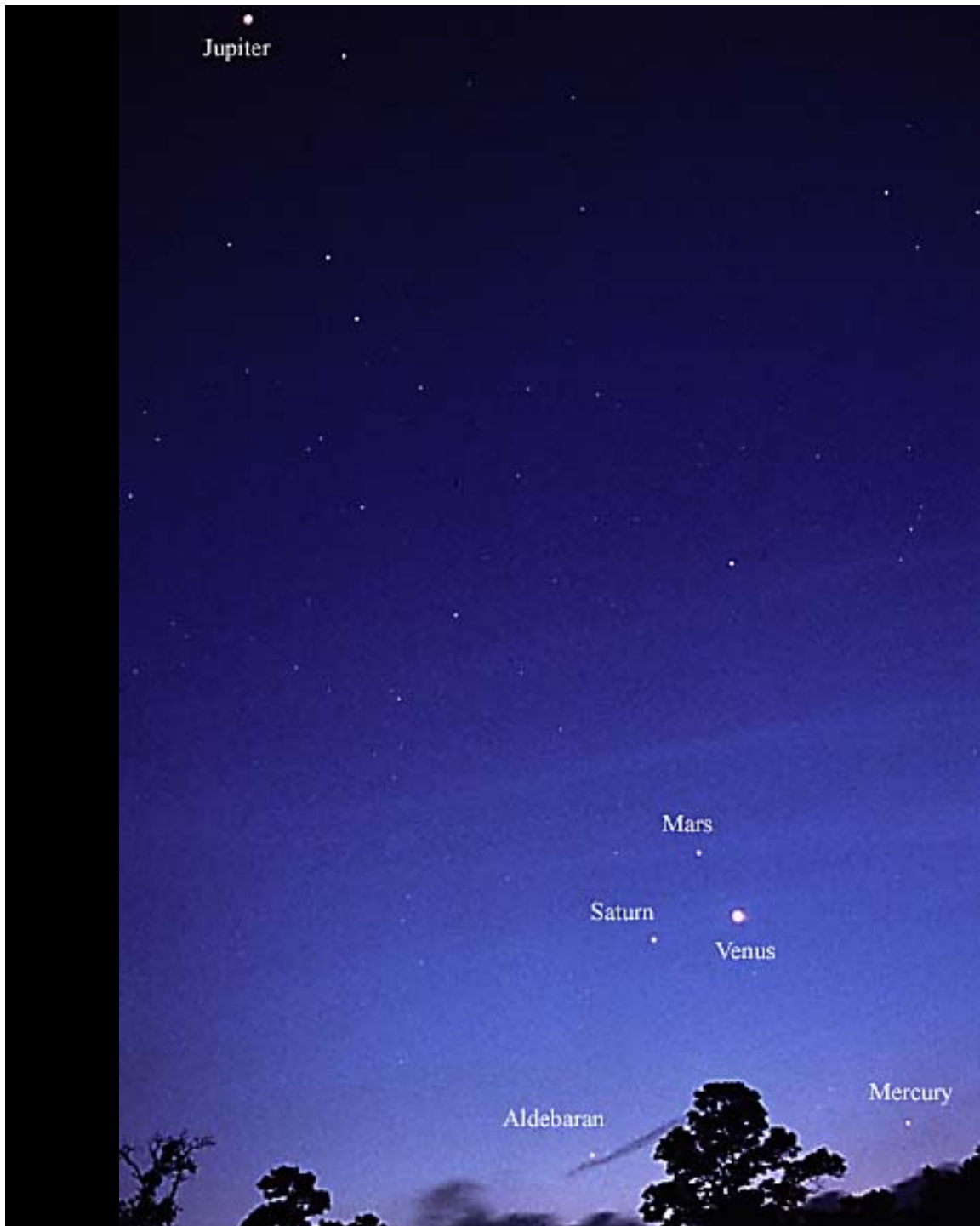


Force = mass x acceleration
(or $F = ma$)

Sun in the Sky



ASTR1210: [The Sky](#) and the Solar System



**Movements of
planets in the
sky, and birth of
modern science**

Recap: Course Outline

- Putting Solar System in Perspective
- Introduction to Sky & History of Astronomy
- Light, Telescope, & Laws of nature
- Planets, Moons, Asteroids & Comets
- The Sun (if time)
- Life in the Universe

(see lecture schedule in syllabus for detail) next slide

TENTATIVE COURSE SCHEDULE

Week 1: Overview and Syllabus (Ch. 1)

Week 2: Discovering the Universe (Ch. 2) **Details in lecture power-point**

Week 3: The Science of Astronomy (Ch. 3) **To be posted on Collab**

Week 4: Making Sense of the Universe (Ch. 4)

FIRST IN-CLASS QUIZ – Thursday, February 16

Week 5: Light and Matter (Ch. 5)

Week 6: Telescope (Ch. 6)

**Exams to be proctored & graded
by TA**

Week 7: Solar System Overview (Ch. 7)

Week 8: Origin of Solar System (Ch. 8)

Week 9: Planetary Geology I (Ch. 9)

May need sub lectures if travel

SECOND IN-CLASS QUIZ – Thursday, March 23

Week 10: Planetary Geology II (Ch. 9)

Week 11: Planetary Atmospheres (Ch. 10)

Week 12: Jovian Planets (Ch. 11)

THIRD IN-CLASS QUIZ – Tuesday, April 18

Week 13: Moons and Rings of Jovian Planets (Ch. 11)

Week 14: Asteroids, Comets and Pluto (Ch. 12)

Week 15: Extrasolar Planets (Ch. 13), Life in Universe (Ch. 24), Sun (Ch.14, if time)

FINAL EXAM – May 6, Saturday (2:00 - 5:00PM)

Next Lecture

- Practice with iclicker and web-based REEF
- Putting solar system in cosmic perspective (Chap. 1 of textbook)

Reading: Syllabus

Bring iClicker remote or web-enabled device for REEF polling to class next time