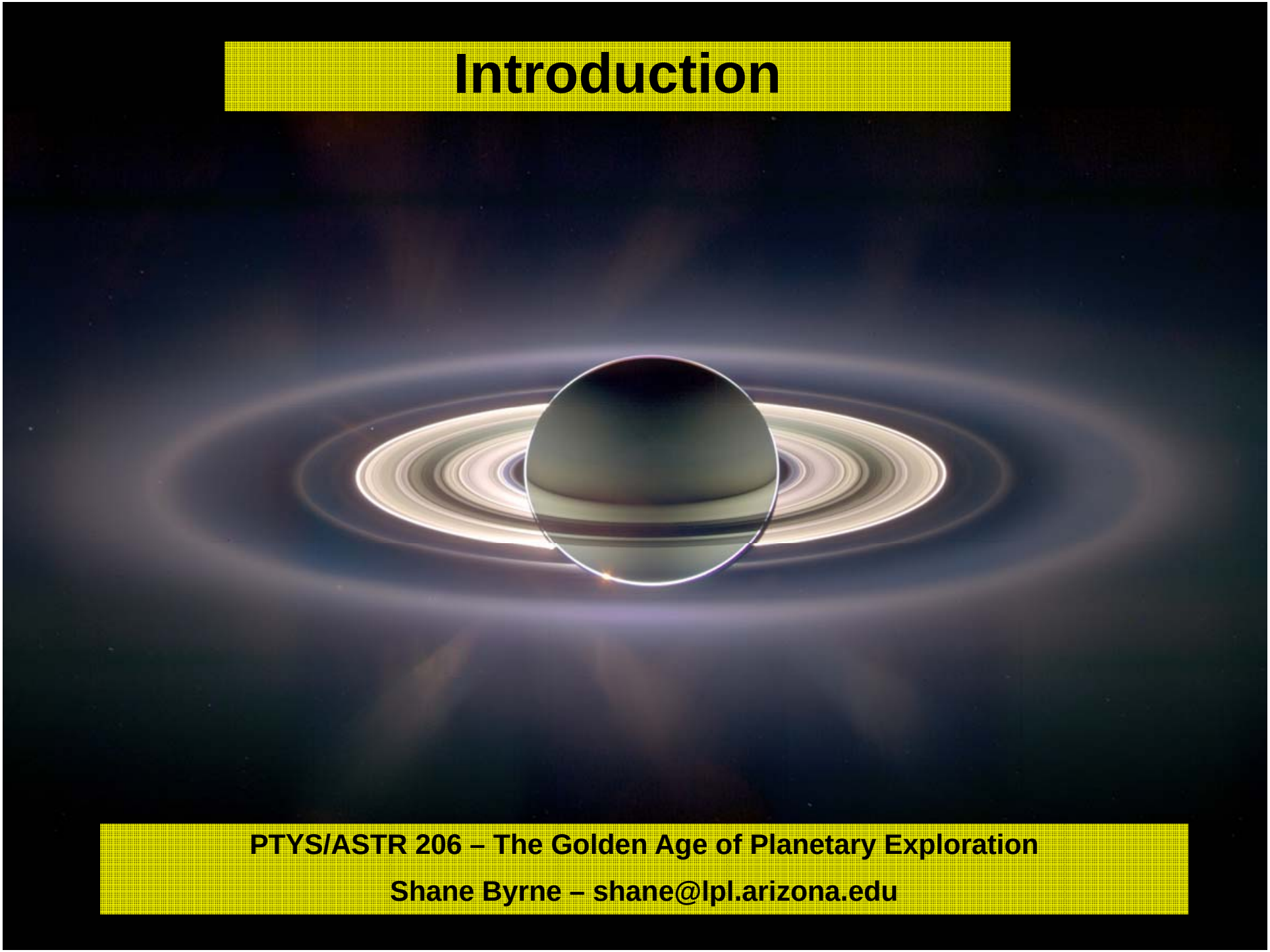
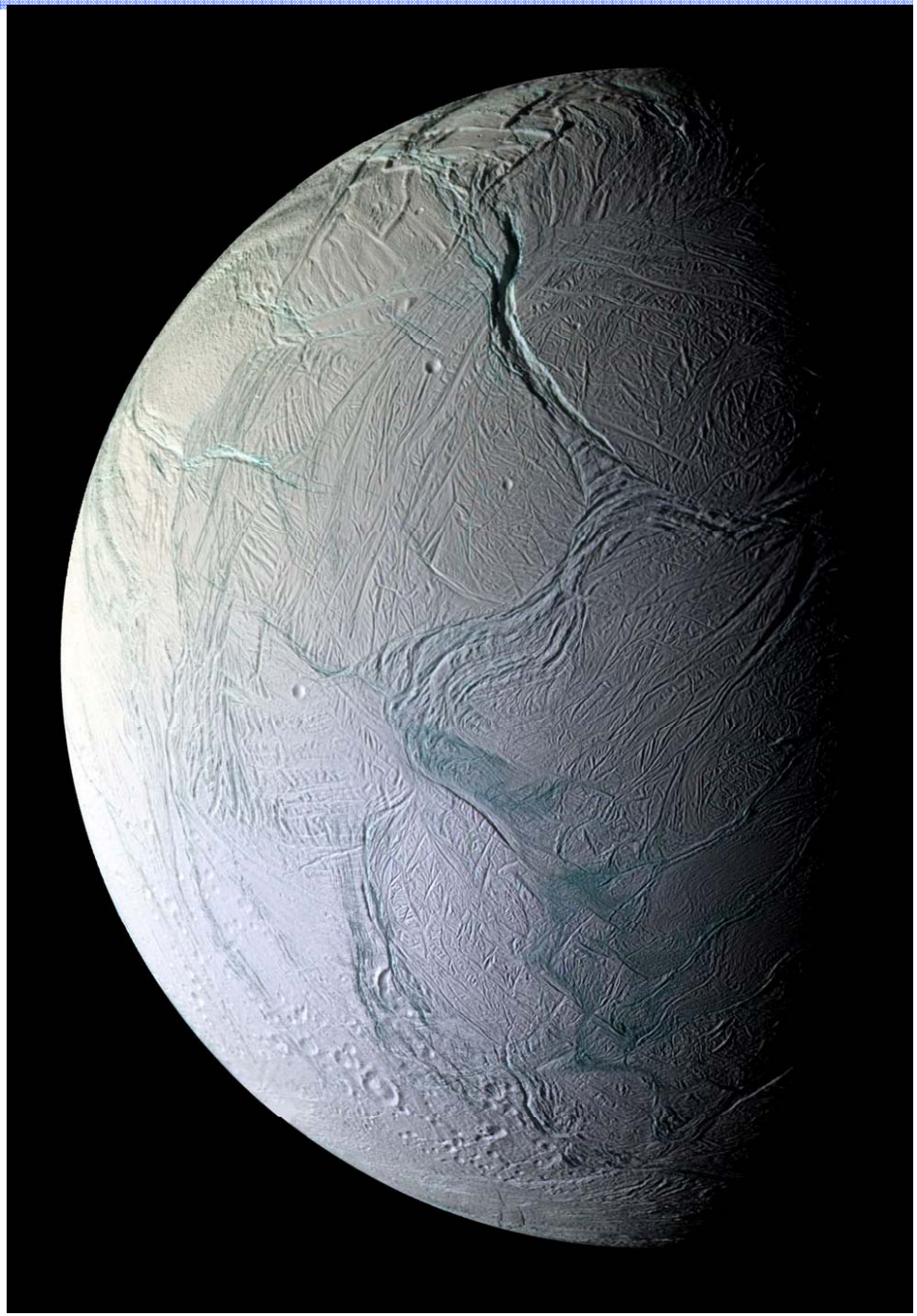
Introduction



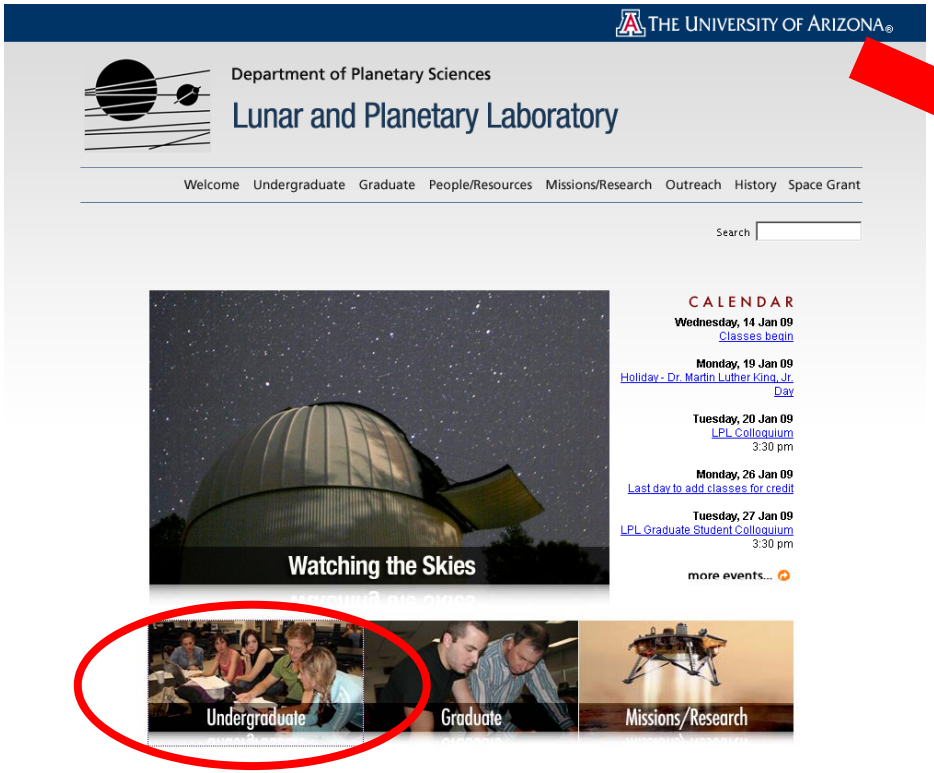
PTYS/ASTR 206 – The Golden Age of Planetary Exploration

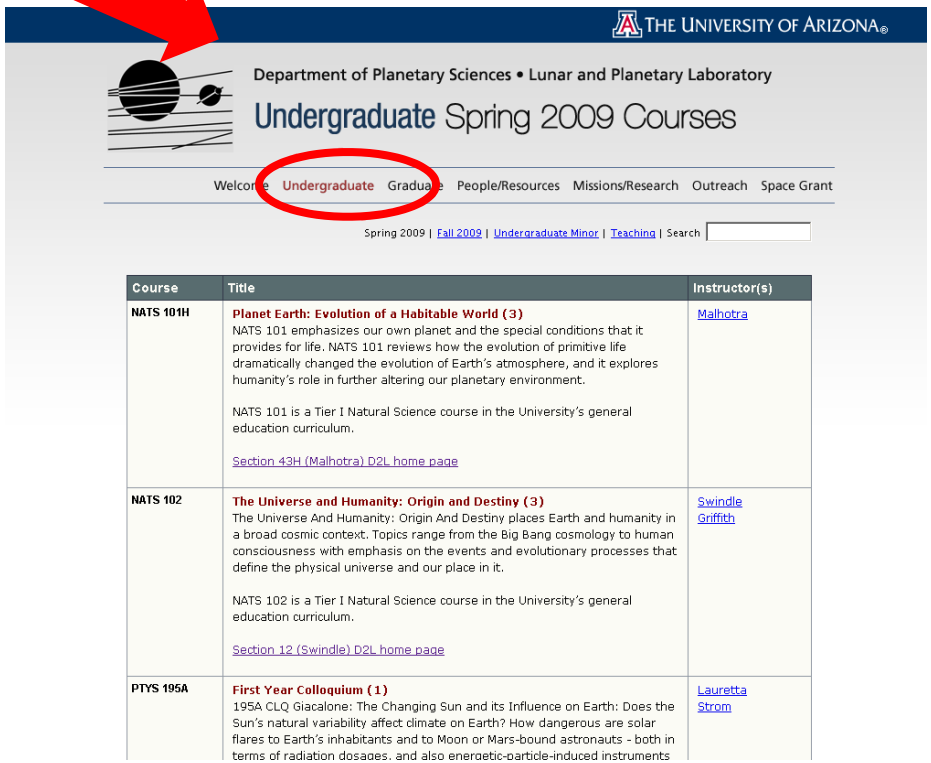
Shane Byrne – shane@lpl.arizona.edu

- **Location & Time**
  - Tuesdays and Thursdays
  - 12:30 - 1:45 PM
  - Kuiper Space Sciences, 308
- **Instructor**
  - Shane Byrne
    - Room 524, 626-0407
    - shane@lpl.arizona.edu 626-0407
    - Kuiper Space Sciences 524
- **Teaching Assistants**
  - Kevin Jones
    - kbjones@email.arizona.edu 621-6000
    - Gould-Simpson, 511
  - Priyanka Sharma
    - psharma@lpl.arizona.edu 621-7274
    - Kuiper Space Sciences, 316



- **The course website will have everything…**
  - **Start at www.lpl.arizona.edu**





- **Or just go directly to http://www.lpl.arizona.edu/~shane/PTYS_206**

- **http://www.lpl.arizona.edu/~shane/PTYS_206/**

PTYS/ASTR 206
The Golden Age of Planetary Exploration

Dr. Shane Byrne — 626-0407 — 524 Kuiper Building

HOME SCHEDULE LECTURES HOMEWORKS EXAMS

— Welcome to the course website for PTYS/ASTR 206 (section 3)—

The goals of this course are to give the student an introduction to the solar system and the ways in which we explore it. See the schedule for a full listing of lecture topics.

Instructor: Shane Byrne, Assistant Professor of Planetary Sciences.
Office hours Tuesday and Thursday 1:45-4pm, room 524.
(Or by appointment)

TAs: Kevin Jones, Graduate Student in Geosciences
Office hours ...TBA

Priyanka Sharma, Graduate Student in Planetary Sciences
Office hours ...TBA

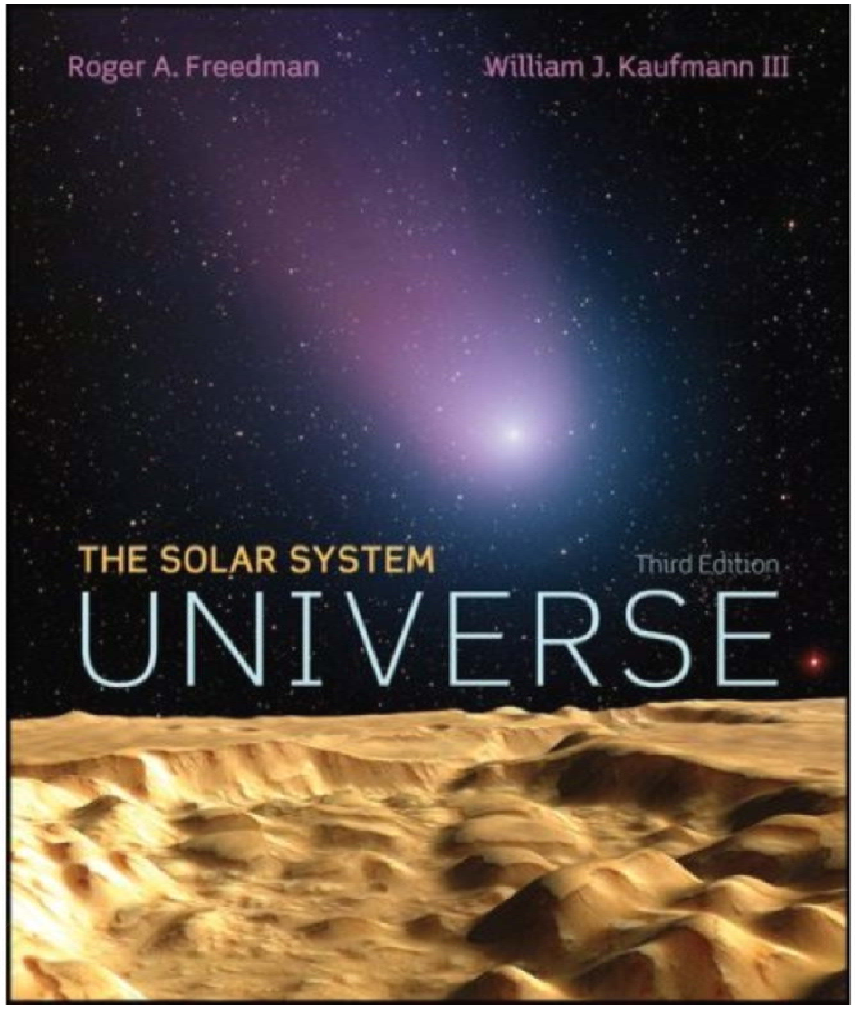
General Info

- This is section 3 of PTYS/ASTR 206.
- Course syllabus - including grading policies.
- Lectures take place in room 308 of the Kuiper building, Tuesday and Thursday 12:30-1:45pm.

Announcements

- First lecture - Thursday 1/15

- **You need the course text book**



- **Assigned reading**
- **Homework problems**
- **Extra explanations**

- **Read the course syllabus**
  - **It has interesting info – like how we calculate your grade!**
  - **If you're <1% from a grade boundary, I'll round upwards.**

Grading policy:

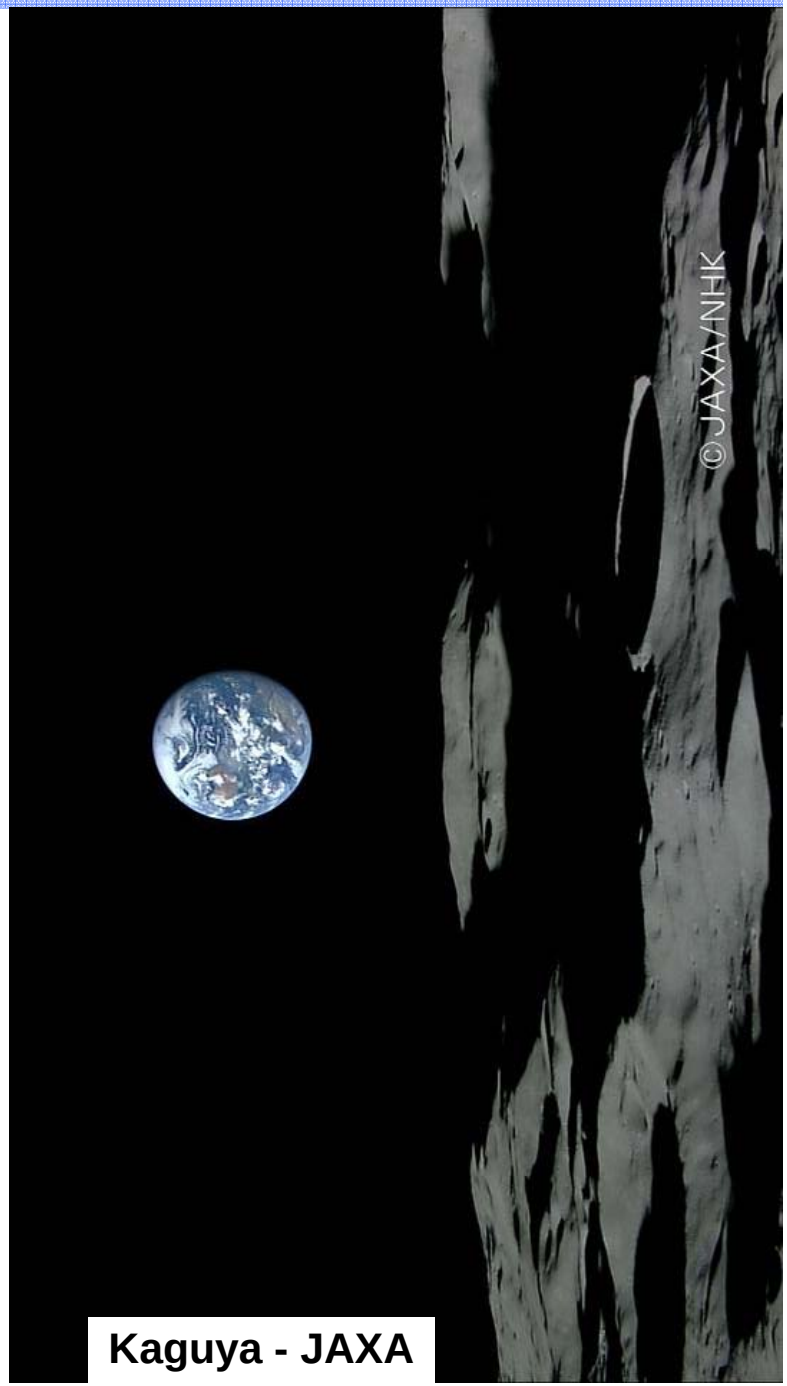
Final grades are determined from:

Homework assignments	30%
In-class activities	20%
Mid-term exams	25%
Final exam	25%

Grades will be assigned according to the following scale.

90-100%	A
75-89%	B
60-74%	C
50-59%	D
0-49%	E

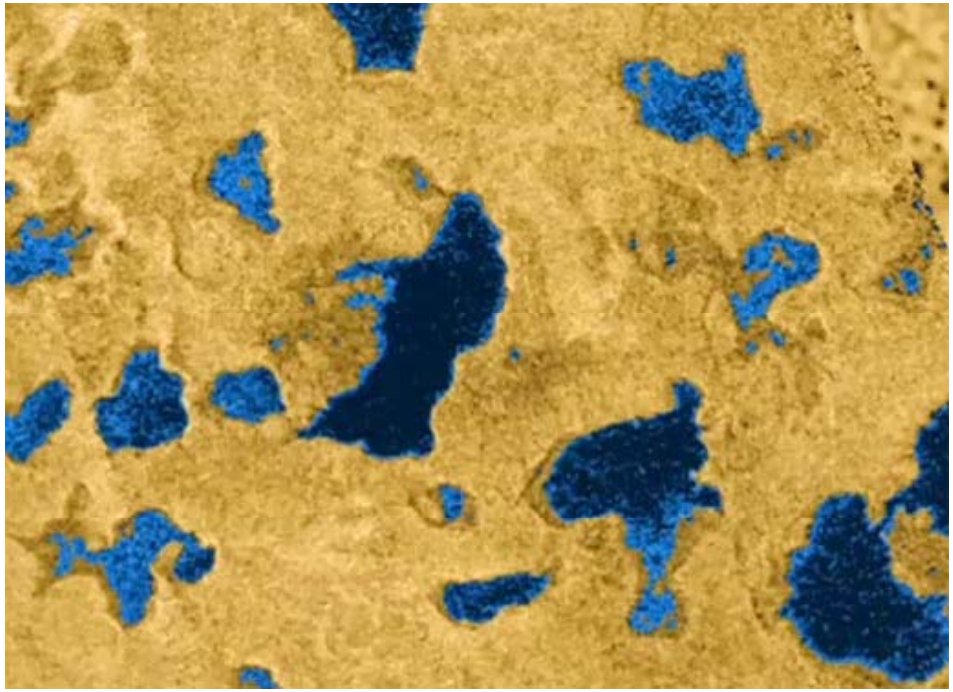
- **Homeworks: 6 x 5% = 30%**
  - One week
  - Due in Class
  - Collaborate – don't copy
- **In-class activities: 5 x 4% = 20%**
  - We use the 5 best of 6 total
  - At pseudo-random times
  - 10-15 minutes
  - No make-up assignments
- **Mid-Terms: 2 x 12.5% = 25%**
  - One class period for each
  - Multiple choice
- **Final: 25%**
  - Scheduled by University on 5/12
  - 1/3 of the questions will be recycled
    - 'Free' points if you read the solutions



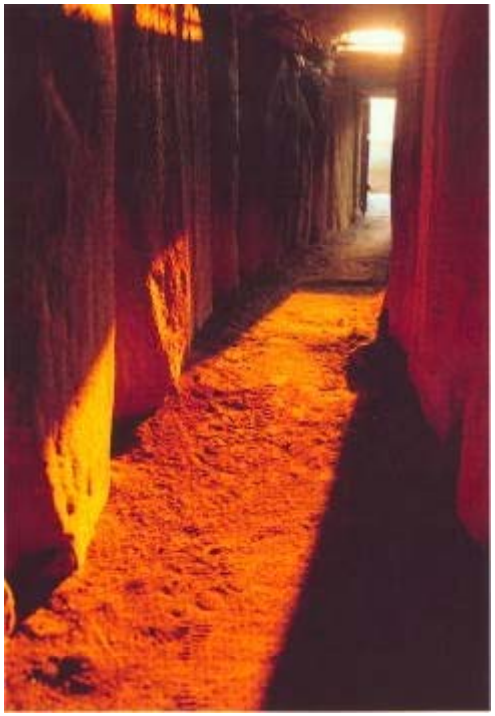
Kaguya - JAXA

- **A Golden Age of exploration?**

- **This is a special time for planetary science…**



- **Planetary science has been around a while**



Newgrange
~3000 BC

- **Solstices**
- **Equinoxes**

Scientific Thought

Ancient Greeks
500-0 BC

- **Spherical Earth**
- **Size of the World**
- **Geometry of Eclipses**

Scientific Thought + Telescopes

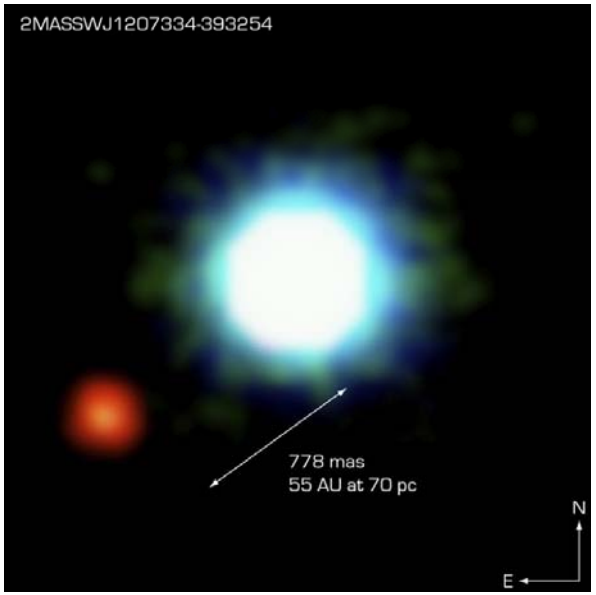
Copernicous, Galileo, Kepler, Newton etc…
1600 AD

- **Heliocentric solar system**
- **Physics**
- **Describing gravity & orbits**

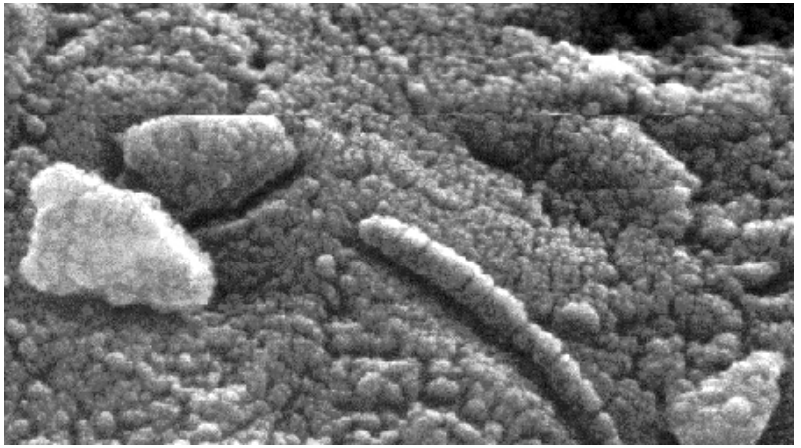
- Things really took off in the 1960s
- Modern instruments allow us to ask more interesting questions
  - Was there life on Mars?
  - How did the solar system form?
  - Are Earth-like planets rare or common?
  - How are we changing the Earth?

Scientific Thought + Telescopes + spacecraft

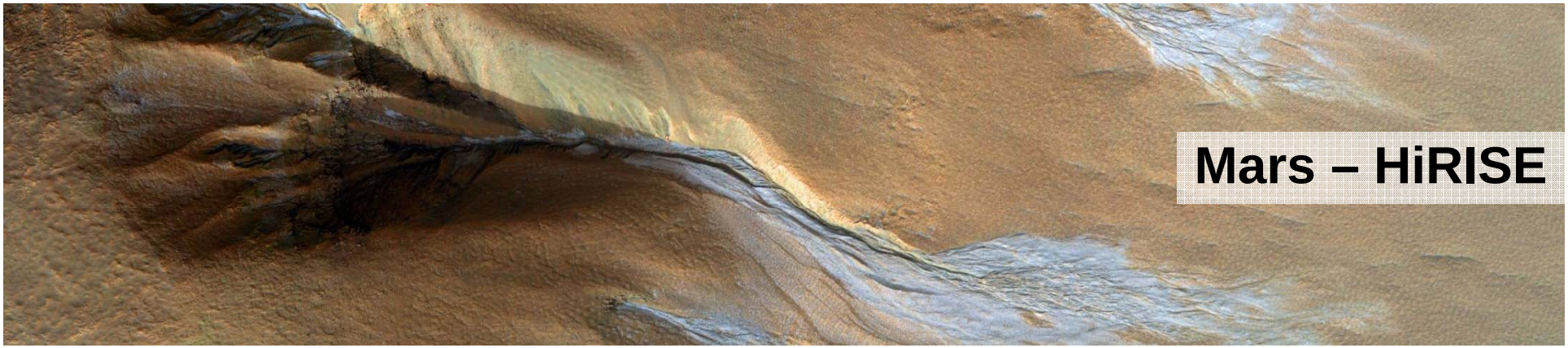
- The new Kepler ->
  - Searching for extrasolar planets
  - 7 weeks to Launch

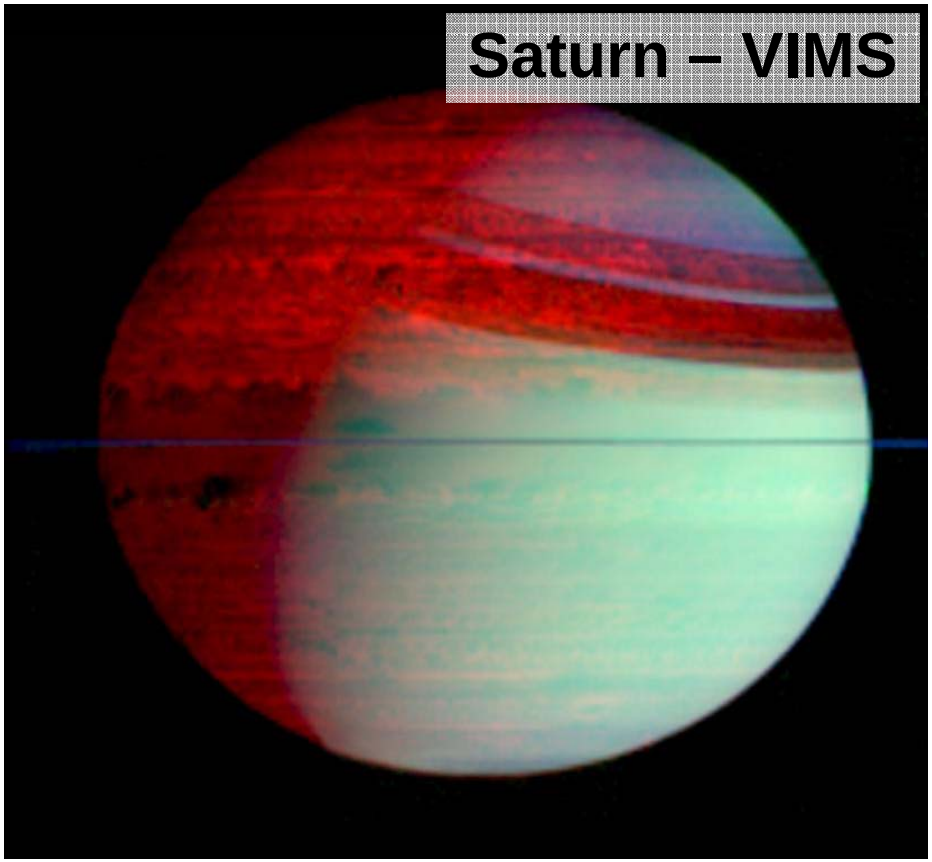


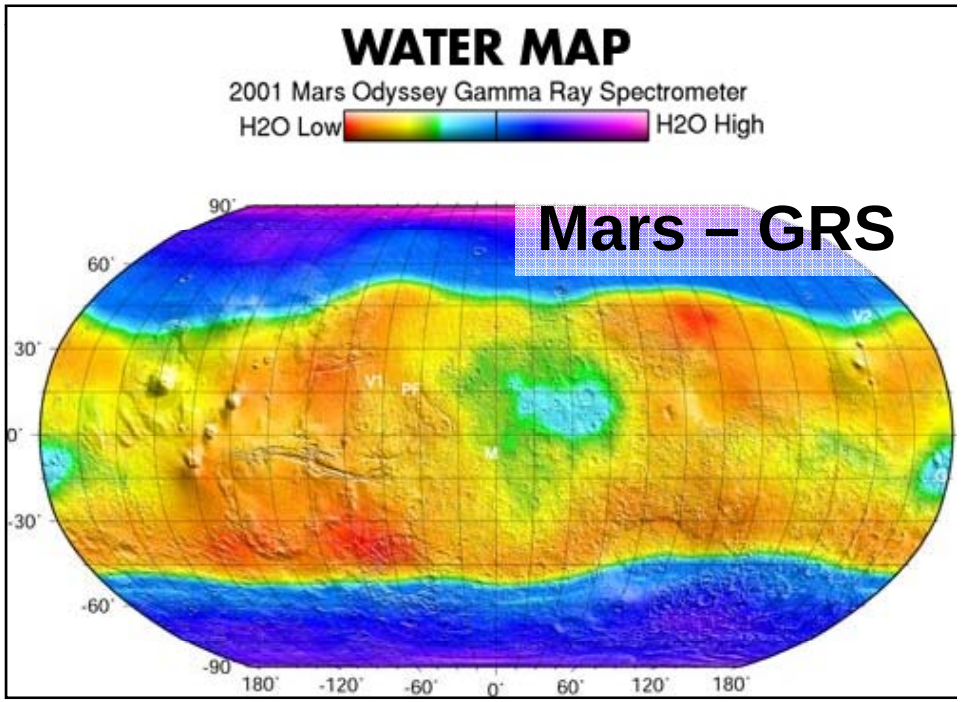
- **Relevant to Earthlings?**
  - **In lots of ways…Earth is one part of a bigger system**
  - **Solar Activity**
    - **Disrupts communications**
    - **Danger to power grids**
    - **Climate controls?**
  - **Impacts**
    - **50-100yrs - Tunguska (1908) style events**
    - **Rarer kill-us-all (65 Ma) style events**
  - **Environmental monitoring on Earth**
    - **Climate change**
    - **Ozone depletion**
    - **Deforestation**
  - **Comparative planetology**
    - **Earth history/processes**
    - **Origins of life**
  - **Philosophical**
    - **Life elsewhere**
    - **Basic urge to explore**



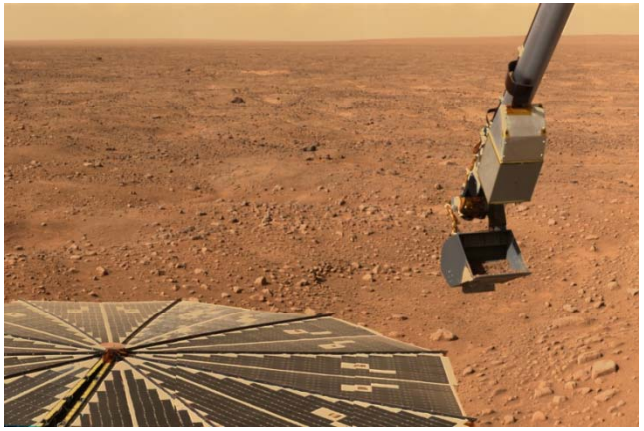
- **Planetary Science at LPL – Orbiting instruments**





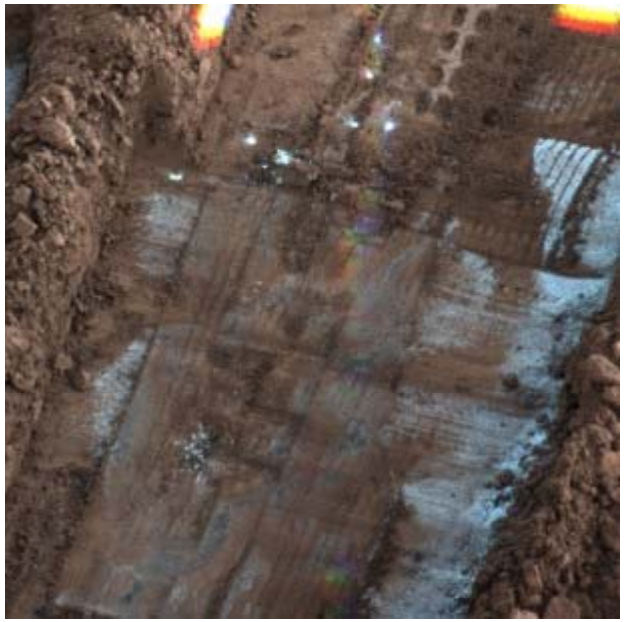


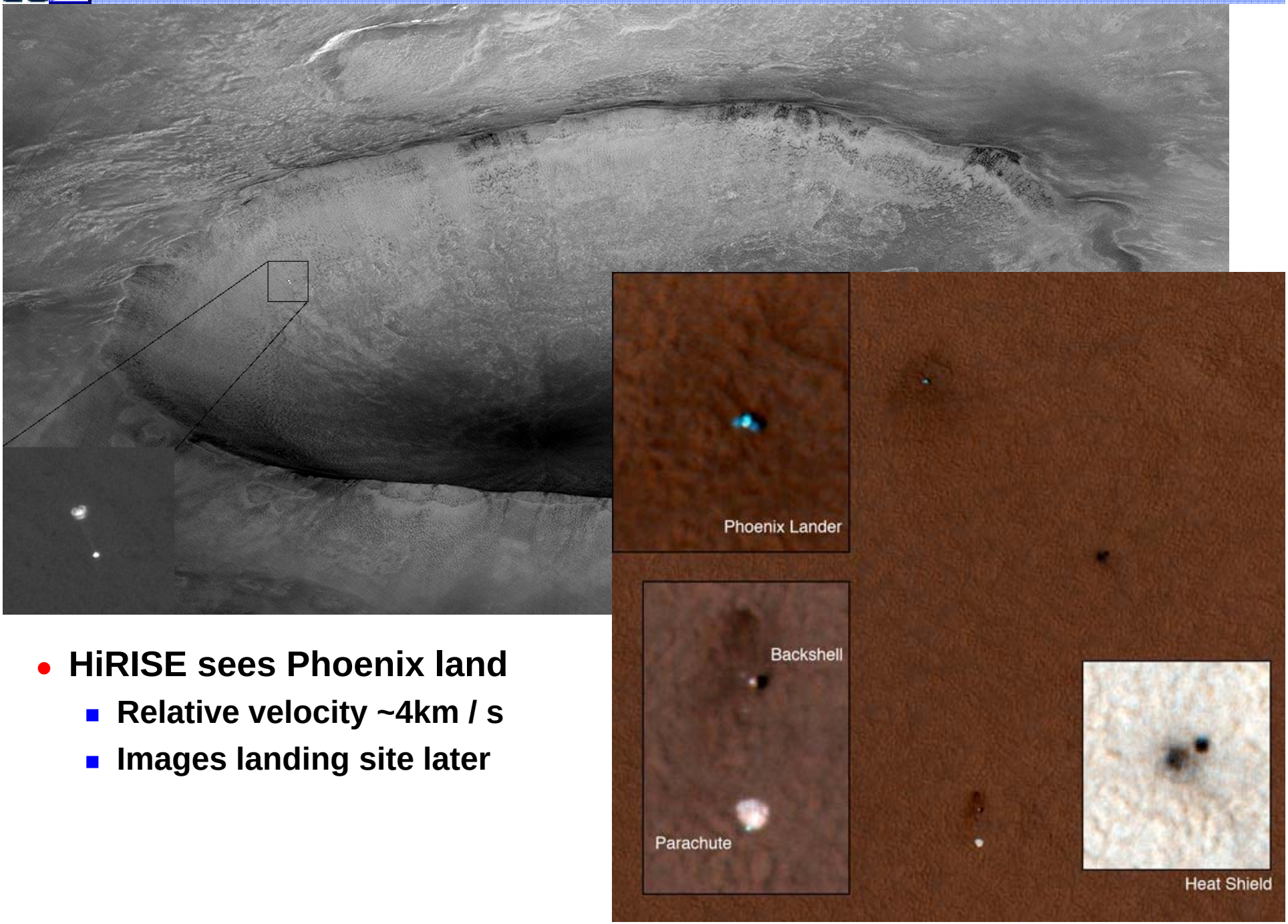
- **Planetary Science at LPL**
  - **Landers**



Phoenix Lander

Cameras on Huygens probe



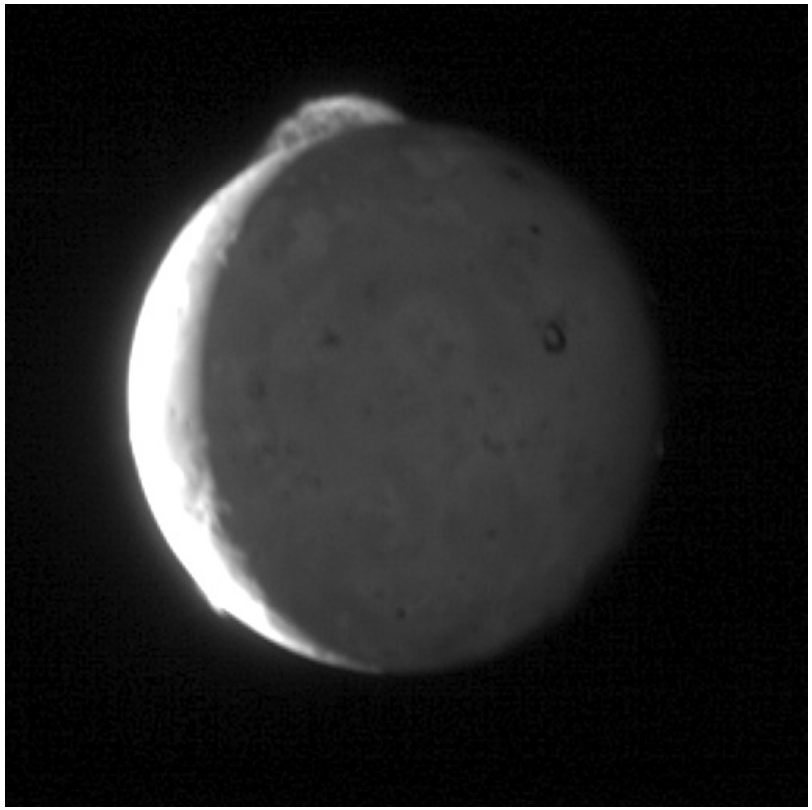


- **HiRISE sees Phoenix land**
  - **Relative velocity ~4km / s**
  - **Images landing site later**

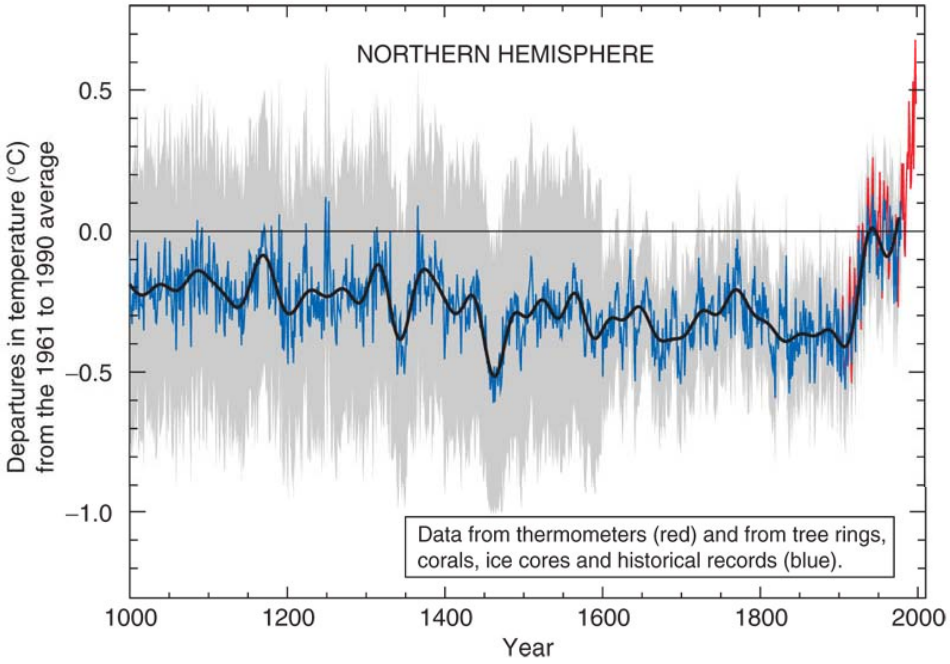
- **Topics – see website**
  - **How the solar system works**
    - **Gravity**
    - **Light and heat**
    - **Geologic processes**
    - **How we explore the solar system**
  - **Solar system objects**
    - **History and current state**
  - **How the solar system formed**
  - **Other solar systems**
  - **Special topic – to be voted on**
- **Objects to study**
  - **One (mediocre) star**
  - **8 planets**
    - **4 Terrestrial – Mercury, Venus, Earth & Mars**
    - **2 Gas Giants – Jupiter, Saturn**
    - **2 Ice Giants – Neptune, Uranus**
  - **Dwarf planets**
  - **Moons**
  - **Comets, Asteroids**

Dates	Tuesday 12.30-1.45pm	Thursday 12.30-1.45pm
1/13 - 1/15		Introduction Scales in Planetary Science
1/20 - 1/22	Exploring the solar system from the Earth	Orbits and gravity **Homework 1 assigned**
1/27 - 1/29	Days, seasons and Lunar phases	Craters Everywhere **Homework 1 due**
2/3 - 2/5	Light and heat from planets and stars	The Sun **Homework 2 assigned**
2/10 - 2/12	Terrestrial planet interiors and surfaces	The Moon **Homework 2 due**
2/17 - 2/19	Mercury	**First Mid-Term Exam**
2/24 - 2/26	Planetary atmospheres	Venus **Homework 3 assigned**
3/3 - 3/5	Mars - Early History	Mars - Recent History **Homework 3 due**
3/10 - 3/12	Processes unique to Earth	Asteroids and Meteorites **Homework 4 assigned**
3/17 - 3/19	**Spring Break**	
3/24 - 3/26	Special topic - TBD from class vote	Gas giants: Jupiter and Saturn **Homework 4 due**
3/31 - 4/2	Jupiter's Moons: Volcanoes and Oceans	**Second Mid-term Exam**
4/7 - 4/9	Saturn's Rings and Moons	Titan **Homework 5 assigned**
4/14 - 4/16	Ice giants: Uranus and Neptune	Moons of Uranus and Neptune **Homework 5 due**
4/21 - 4/23	Pluto and the rest of the Kuiper belt	Comets **Homework 6 assigned**
4/28 - 4/30	Formation of the Solar System	Extrasolar Planets **Homework 6 due**
5/5 - 5/7	Origins of life - here and elsewhere	**UA Reading Day**
5/12 - 5/14	**Final Exam** **11am - 1pm**	

- **Any Prerequisites?**
  - **Tier II NATS class requires completion of two tier I classes**
  - **Math involved at all stages – <u>but emphasis will be on concepts</u>**
  - **Familiarity with:**
    - **Algebra – manipulating equations**
    - **Basic Exponents e.g. solve $2^x = 4$**
    - **Very basic trig. e.g. know what sin, cos and tan mean.**
    - **A calculator/computer/iPhone that performs these functions**
  - **Familiarity helpful:**
    - **Astronomy, geology etc…**
  - **Most of all – a willingness to think!**
  - **We can help anyone who wants to help themselves**



- **Your last science class?**
- **You might not even like science**
  - **…but you'll be dealing with scientific decisions for your whole life**
  - **e.g. what will society do about this…**



- **Where will we get our energy from a few decades from now?**
- **What are acceptable pollution levels?**
- **How much should we spend on the space program?**
  - **Any guesses on the current amount??**

- **When someone says their results are scientific – what do they mean?**

- **More general comments…**

- **In the classroom**
  - **Use common sense and courtesy**
  - **Turn cell phones and other communication devices off!**
  - **No food or drink allowed in the lecture hall (except bottled water).**
  - **Constructive participation is strongly encouraged (feel free to ask questions – please!!).**

- **Outside the class**
  - **Do the reading assignments!**
  - **Start homework assignments early!**
  - **Be careful of Academic Integrity.**
  - **Contact any of us for help when you need it**