The phases of the Moon (cont'd); oddballs in the sky; exam review

Astronomy 101
Syracuse University, Fall 2016
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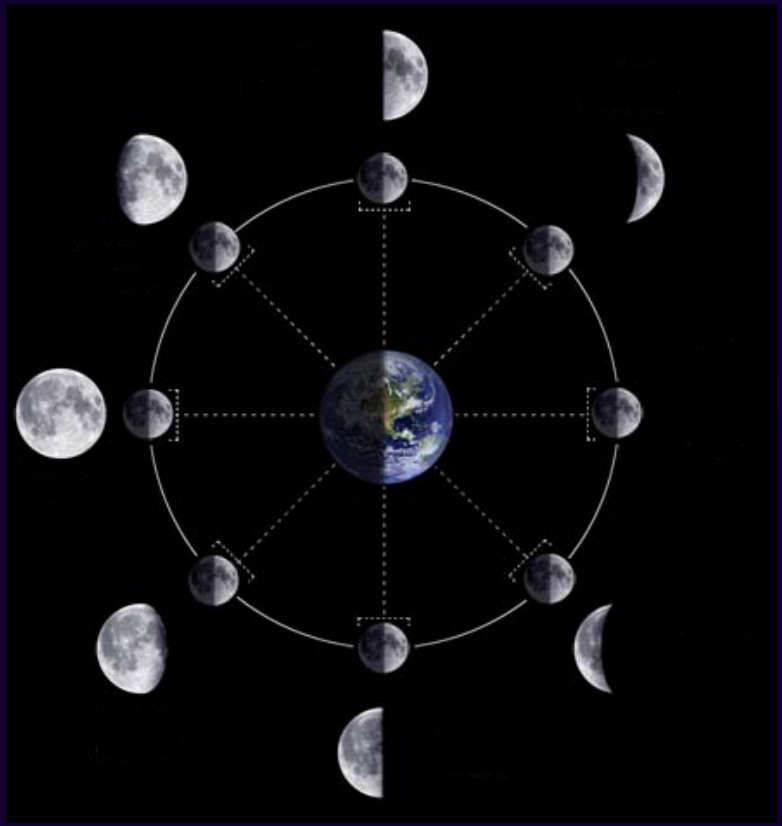
Announcements

- Exam is on Thursday (discussed later)
- I will be alternating between preparing for the exam and helping people study tomorrow
- If I'm not in room 215 or the Clinic, come see me
- I've been somewhat swamped; if I didn't respond to your email, please send it again (except for things I address in class today)



You can figure all of this out by drawing pictures.

Do this on warmup problems, tutorials, exams...

Complete *Lecture Tutorials* pp. 81-88.

When the waxing half moon is just rising over the horizon, it is closest to:

A: 6AM
B: Noon
C: 6PM
D: Midnight

As seen in the Northern Hemisphere, which part of a waning crescent moon will be lit?

A: The right part
B: The left part

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The planets: what has gone wrong?

Demo on *Stellarium*

The planets: what has gone wrong?

Demo on *Stellarium*

Sometimes some planets appear to go backwards ("retrograde motion").

This tells us that celestial sphere model can't be literally true. Why does it work for everything else?

- The celestial sphere model works if things appear to only rotate around the Earth.
- The stars are so far away that only the Earth's rotation matters
- The Earth orbits the Sun, so we just pretend that the Sun is on a different sphere turning a bit slower, taking into account both our revolution around it and our rotation
- The Moon orbits the Earth, so we again put the Moon on a different sphere, turning slower
- ... but how can we get a sphere to go forwards and backwards?
- **The celestial sphere model gets the motion of the planets badly wrong**

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Oh, you sweet summer child...

Why are the changes in the seasons in *Game of Thrones* so terrifying?

... they're unpredictable!

We've long used the immutability of the sky as a symbol for constancy. The cycles of the Sun, Moon, and stars don't ever change, but some things do!

These unexpected things in the sky once terrified people; now we know why they happen.

Eclipses

You know that during a new moon, the Moon lies roughly between the Earth and the Sun.

However, the Moon's orbit is tilted just a bit, so it usually passes over or under the Sun.

If it passes in front, you get a solar eclipse!
This terrified many of the ancients – "the Sun got eaten! We're doomed!"

Eclipses

You know that during a full moon, the Earth lies roughly between the Moon and the Sun.

Same deal: usually the Earth's shadow misses the Moon. Sometimes it doesn't!

Here some light is refracted by the atmosphere. The blue component is scattered away by the atmosphere; the red component bends and hits the Moon.

Meteors

Orbits of things in the Solar System are not always close to circular.

There are lots of small things in the Solar System, many of which have elongated orbits that sometimes cross ours.

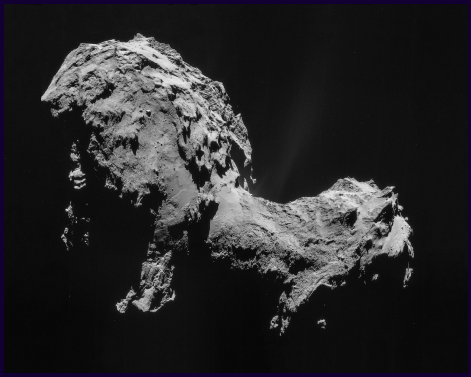
Meteors:

- Little rocky or metallic bits of matter that orbit the Sun
- Sometimes they get to Earth and glow as atmospheric drag heats them
- Sometimes they hit the surface, and we get chunks of space-slag
- Historical cultures sometimes used them as easy access to metal

Comets

Comets are "dirty snowballs" whose orbits are *highly* elongated.

- Mostly made of ice
- When they get close to the Sun, the heat melts bits off of them
- This stream of stuff reflects sunlight and makes the comet's "tail"
- Historical cultures were often terrified of them, but they're just space-snowballs



The exam

- Around 30 multiple choice questions
- All you need is a pencil

The exam: what to study

The exam covers, in descending order of emphasis:

- The material in the *Lecture Tutorials*
- The material in the labs
- The material we talked about in class that was *not* in the Lecture Tutorials, including demos, videos, etc.
- The material in the textbook

Any questions?