Astronomy 311

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Course Info

- ***read* course outline**: ***http://wordpress.viu.ca/arkosg***

Notes, Quizzes

- ***notes*** posted ***online*** ahead of time; ***incomplete***
- any deferment requests ***require*** documentation
- ***NO*** "***make-up***" ***work***, ***extra work***, *etc*.

Group Presentation

- **group (3) projects** ***due by end of term***
- ***proposals*** due ***early February***
- ***rubric & guidelines*** are on the ***website***

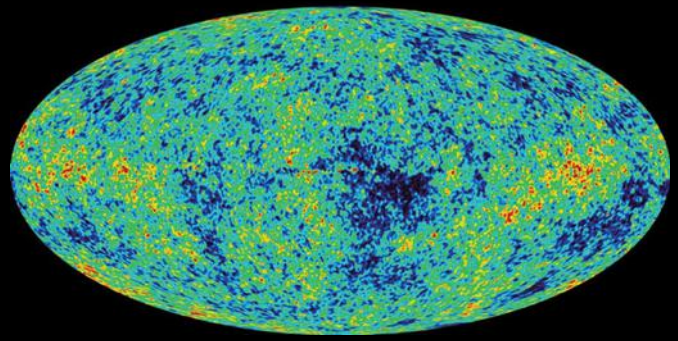
Doing well

- *come to class & participate (active learning!)*
- *put in a solid effort on* ***presentation***
- *study & keep up with material*

CLICKER: *Which faculty do you belong to?*
(a) Sci & Tech
(b) Arts & Humanities
(c) Social Sci
(d) other

CLICKER: *How did you hear about this course?*
(a) VIU calendar
(b) recommended (by advisor, friend, etc.)
(c) course website or poster on campus
(d) other

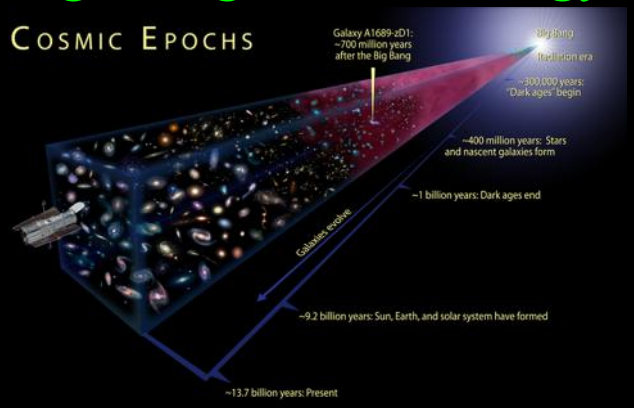
ASTR 311:
Exploring the Universe



Course Overview

- Introduction
- Big Bang & Cosmology
- Our Strange Universe
- Extraterrestrial Life

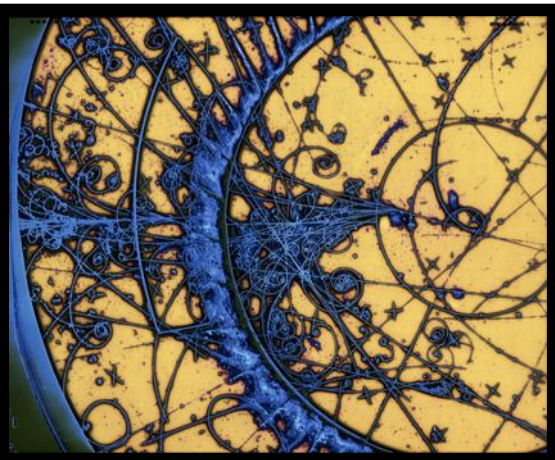
Big Bang & Cosmology



- *how did everything come to be as it is?*

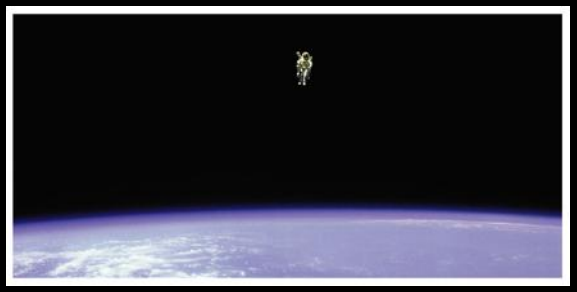
Our Strange Universe

- *time & space* are *NOT absolute…*



• … and the ***subatomic realm*** *operates by very different rules than our everyday world does*

Extraterrestrial Life



• *are we alone?*

"Tatooine": Kepler-16b

Musings…

1) *Where did "everything" come from?*

2) *What is the most likely* ***fate*** *of our universe?*

3) *Are we* ***alone*** *in the galaxy (universe)?*

Q: *How do you* ***tackle*** *questions like these?!?!?*

Science

- astronomy is a ***science***

- ***science*** relies on the ***scientific method***:
  - ***predict*** (*hypothesis* or *model*)
  - ***observe*** (or *experiment*)
  - ***accept***, ***modify*** or ***reject***

- ***iff*** *ideas pass enough testing* → ***Law*** *or* ***Theory***

Q: Can we ever prove that an idea is 100% correct?

Astronomical Distances

- ***astronomical unit*** (AU) ~ 1.5 x 10^8 km
- *average* distance between *centers* of Earth & Sun

- ***light year*** (ly) ~ 10^{13} km (*ten* ***trillion*** *km*)
- *distance* light travels in *one year* (in a vacuum)

- ***parsec*** (pc) ~ 3 ly

Q: *Why* do we use ***these*** units and not *km*?

How far is it to…?

- **Moon**: ~ 400,000 km (~ ***1 light-s***)

- **Sun**: 1 AU (150,000,000 km; ~ ***8 light-min***)

- **Pluto**: 40 AU (~ 6,000,000,000 km; ~ ***5 light-h***)

- **α Centaurii**: ~250,000 AU (40x10^{12} km; ~ ***4 ly***)

- *our* **galaxy** is ~150,000 ly in ***diameter***

Our Cosmic Neighbourhood

- our ***Sun*** is an *average* star

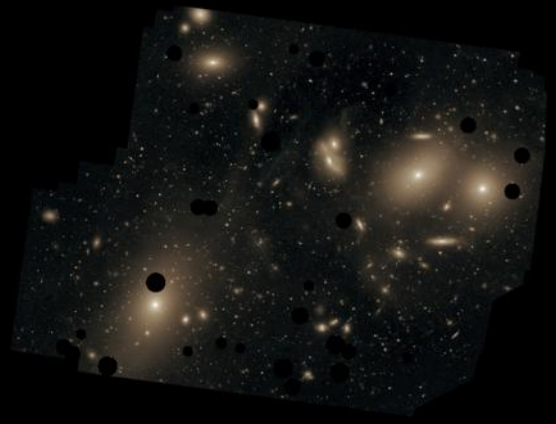
• one of 100+ billion stars in the ***Milky Way*** *galaxy*

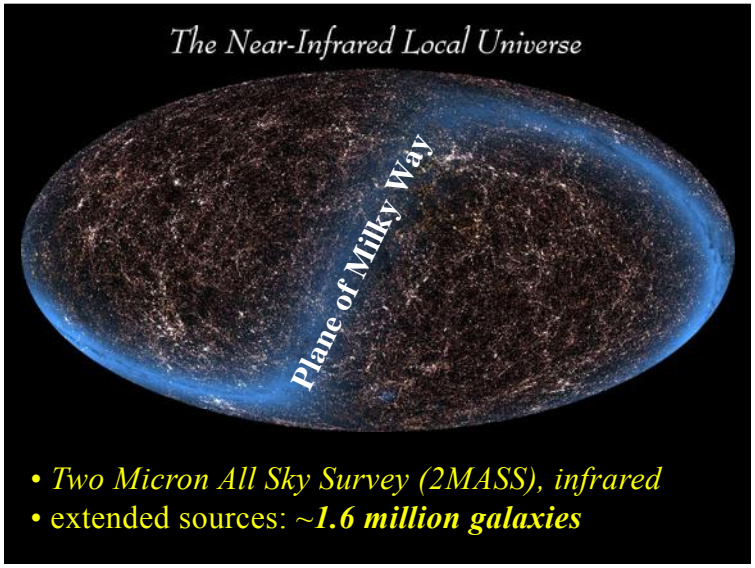
• to count all stars in Milky Way ~ ***3000 years***

Q: Where are we within our ***galaxy***?

• nearest (large) galaxy: ***Andromeda Galaxy (M31)***
• ~2.5 million ly away

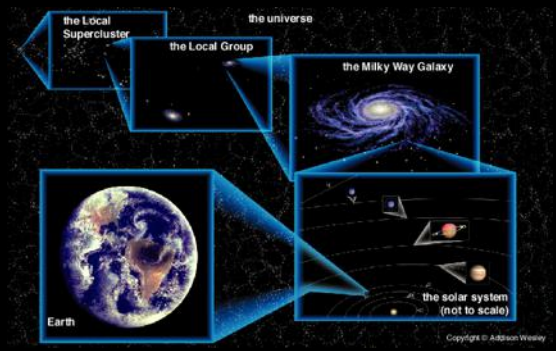
• ***galaxies*** exist in groups called "***clusters***"
• ***clusters*** are grouped into "***superclusters***"





- *Two Micron All Sky Survey (2MASS), infrared*
- extended sources: ***~1.6 million galaxies***

Our Cosmic Address

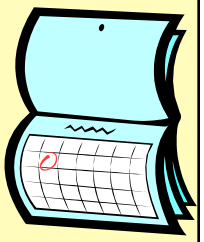


- *Earth, the Solar System, the Milky Way, the Local Group, the Virgo Supercluster, the Universe*

A Sense of Time…

*If the Universe is **14 billion years old,** and we represent the **Big Bang** to the **present** on a **12 month calendar**…*

- ***Big Bang** took place **Jan 1st***
- ***Milky Way** formed in **February***
- ***Earth** formed **mid-August***
- ***simple life** began in **September***



***CLICKER:** When did humans appear?*

(a) mid September
(b) early November
(c) late December

- ***you** were born **a fraction of a second ago!***