

“Astronomy is more than a spectator sport”

*“where we are & how we
got here” & “where we are
going (Pt 1)”*

Tim Ewbank
2nd May 2017

*“To know where we’re going,
we have to know where we are.*

*To know that, we have to know where we came from
& how we got here”*

Recap “*where we came from & how we got here*”

	Rocketry	Photography	Telescopes (inc. non-optical)	Spectroscopy
Solar System	<ul style="list-style-type: none"> • exploration 	★	★	★
Stellar		<ul style="list-style-type: none"> • absolute distances • Supernovae 	<ul style="list-style-type: none"> • Pulsars, quasars etc 	<ul style="list-style-type: none"> • H-R classification • Age • Motion
Galaxy		<ul style="list-style-type: none"> • classification of galaxies 	★	<ul style="list-style-type: none"> • radial velocity
Universe			<ul style="list-style-type: none"> • multi-wavelength images • Existence of CMB radiation 	<ul style="list-style-type: none"> • (combined with redshift) • Universal inflation
Other		<ul style="list-style-type: none"> • Gravitational lensing 		

Questions from last week?

- ❖ **what force causes matter in the universe to move?**
gravity; all constituent parts of the universe are attracted to some other constituent; this attraction creates the motion.
- ❖ **Do all galaxies rotate in the same directions?**
yes, with 'arms' trailing (only identified exception is NGC 4622, probably because of a past interaction with another galaxy)

Change to Course Content

- Today: “where we are”
- 25 April: “how we got here”
- 2 May: “where we’re going”
- ~~9 May: Observing (D Jones)~~
- 16 May: Ways of engaging



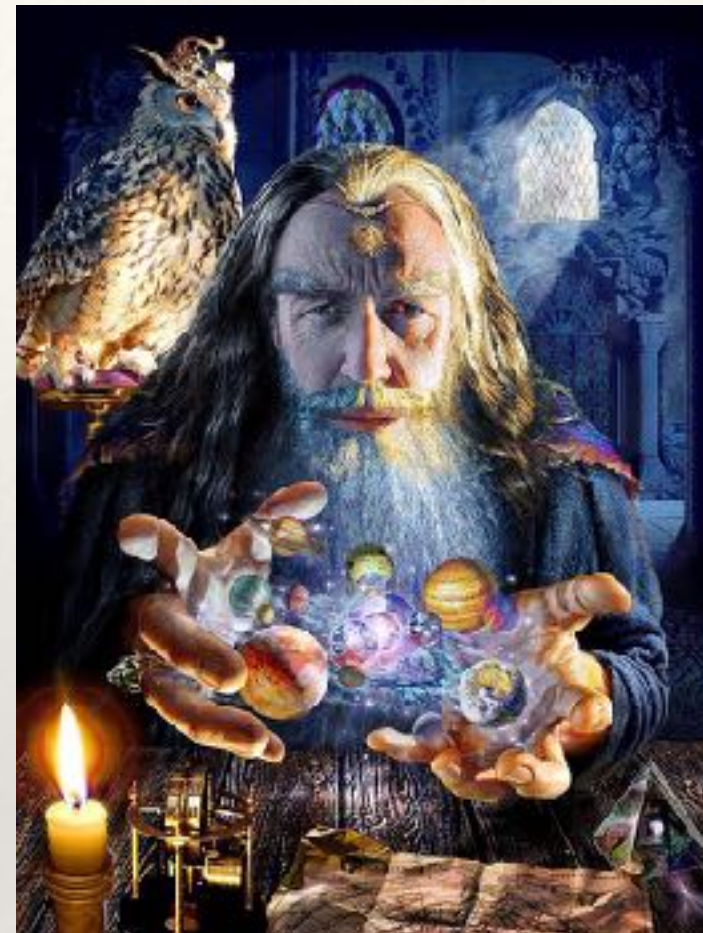
Class on 9th May is cancelled.

Key content will be absorbed into weeks 3 & 5

Today's Agenda

Personal observing

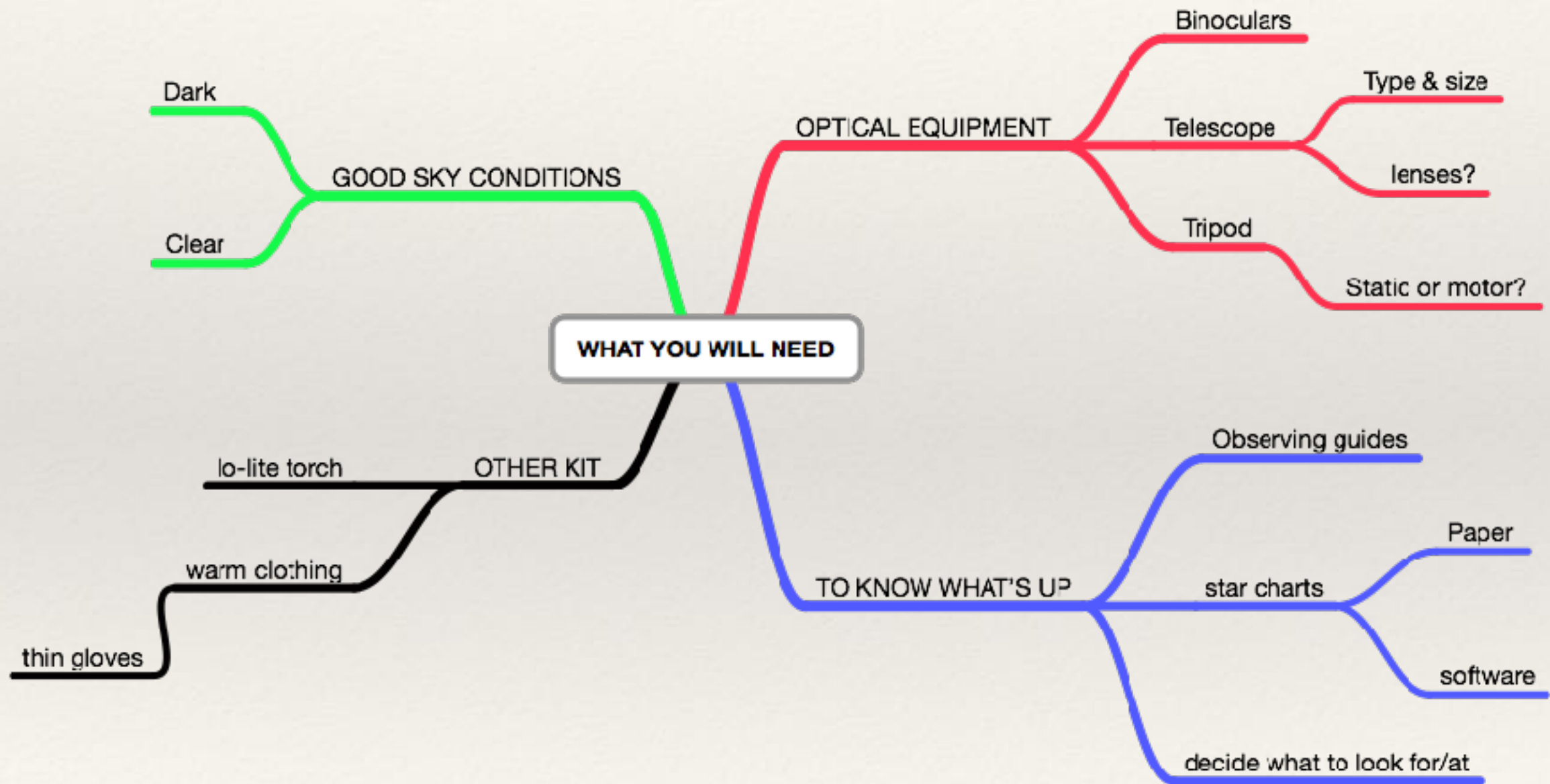
- What you will need
- Equipment & information



How will it all end?

- Earth
 - Solar system
 - Galaxy
 - Universe
-
- Homework assignment

Personal Observing



Telescope Features



Sighting scope

Eyepiece

Controller

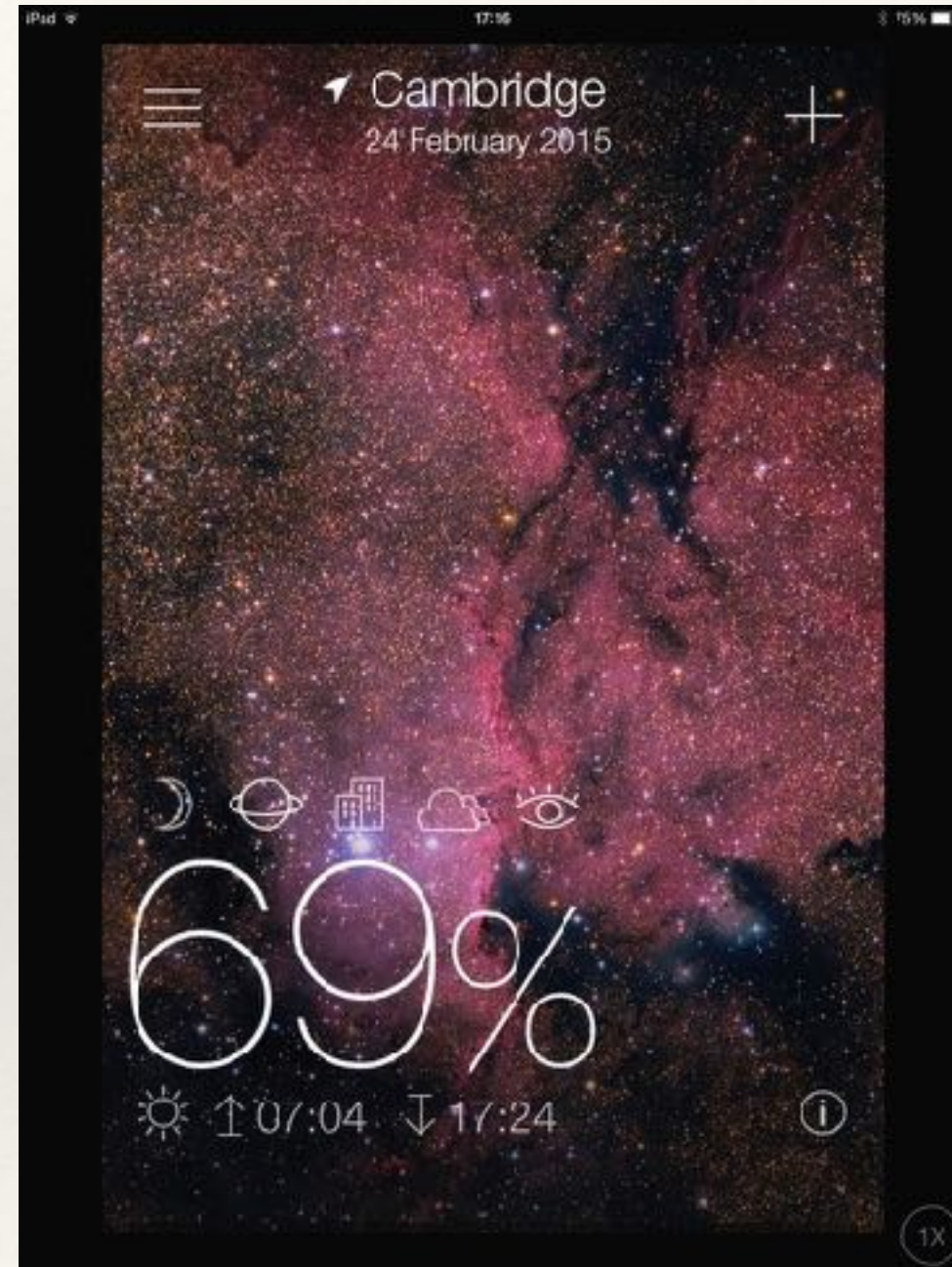
Fork mount

Motor drive

Meade LX200

Factors Influencing Sky Conditions

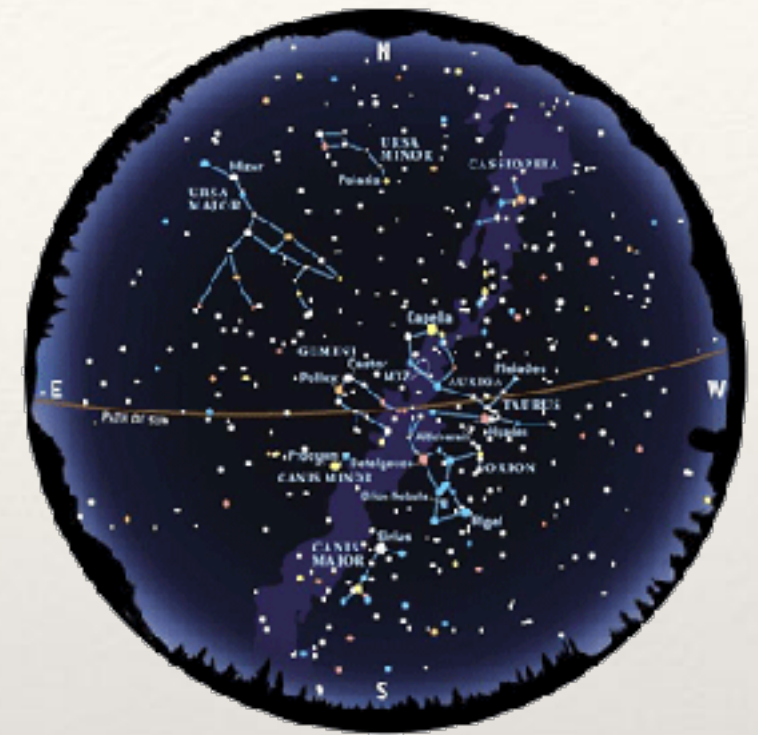
- ❖ Phase of the moon
- ❖ Degree of cloud cover
- ❖ Weather
- ❖ Atmosphere
- ❖ Time of year
- ❖ Light pollution level



SkyLive screenshot

How do you know what's up there?

- ❖ Star charts, planisphere
- ❖ Tablet apps.
 - Star Walk or SkyView
 - Stellarium Mobile (£1.49)
- ❖ Computer software
 - Stellarium (iOS free)
 - Starry Night (MS on Apple; £12.35)



Huge
Range

What to look at

- ❖ Moon
- ❖ Planets
- ❖ Comets
- ❖ Meteor showers & satellites
- ❖ Deep Sky Objects

- ❖ probably not:
 - Individual stars
 - Sun



Deep Sky - Messier Objects

- ❖ Published 1784
- ❖ 110 objects:
 - 6 Galactic nebulae
 - 28 Open clusters (M45, M37, M44)
 - 4 planetary nebulae
 - 29 Globular clusters (M13, M5)
 - 40 Galaxies (M31, M81 & 82)
 - 3 “other”
- ❖ Majority visible in northern hemisphere
- ❖ Messier Marathon



My Observing Experience

- ❖ Owned 3 telescopes over 15 years & 2 pairs of binos
- ❖ Approx 6 additional lenses
- ❖ Binocular adapter
- ❖ Few astrophotography attempts
- ❖ Sold in 2012

- ❖ Now use Star Walk, binos & internet!



Observatories of the World

- ❖ Attributes of an observatory
- ❖ Geographical Distribution
- ❖ European Southern Observatory
- ❖ Space telescopes

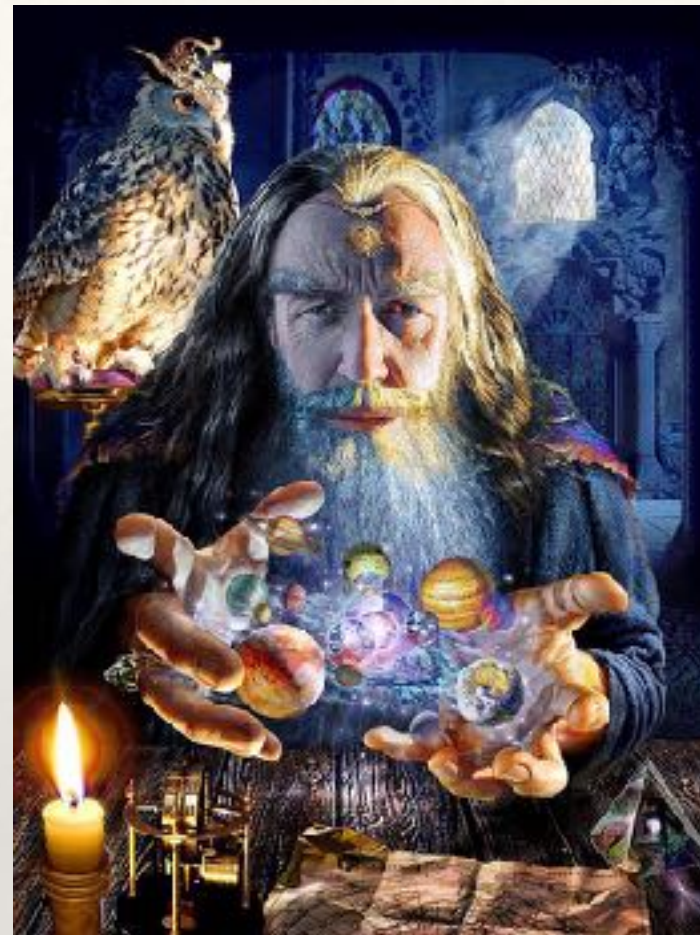
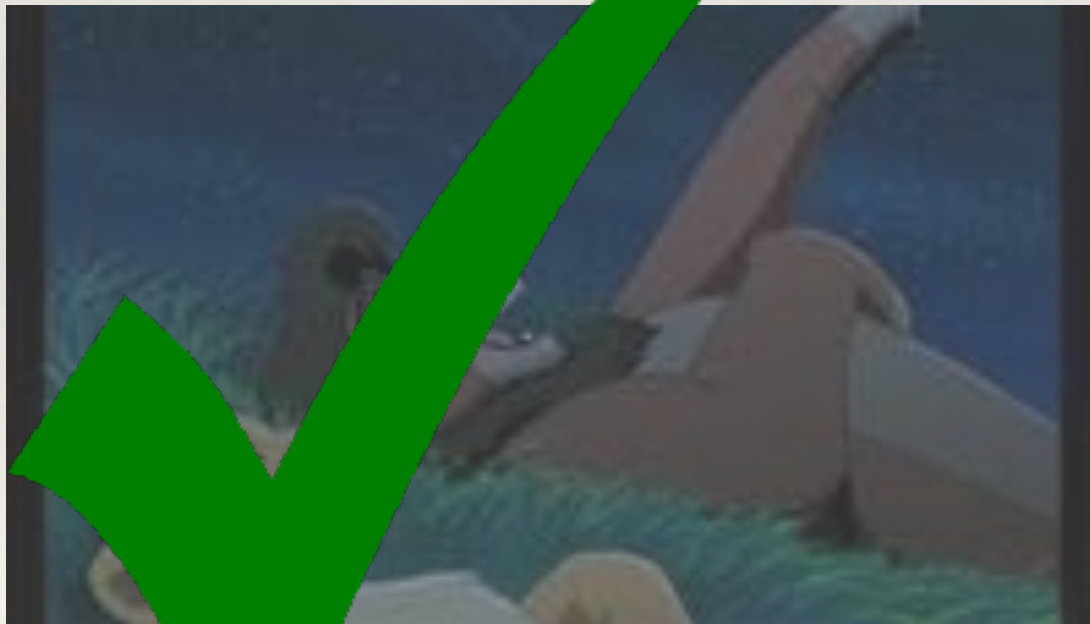


Information & links will be in slides

Today's Agenda

Personal observing

- What you will need
- Equipment & information



How will it all end?

- Earth
- Solar system
- Galaxy
- Universe

- Homework assignment

How will it all end? the Earth

❖ At least two possibilities:

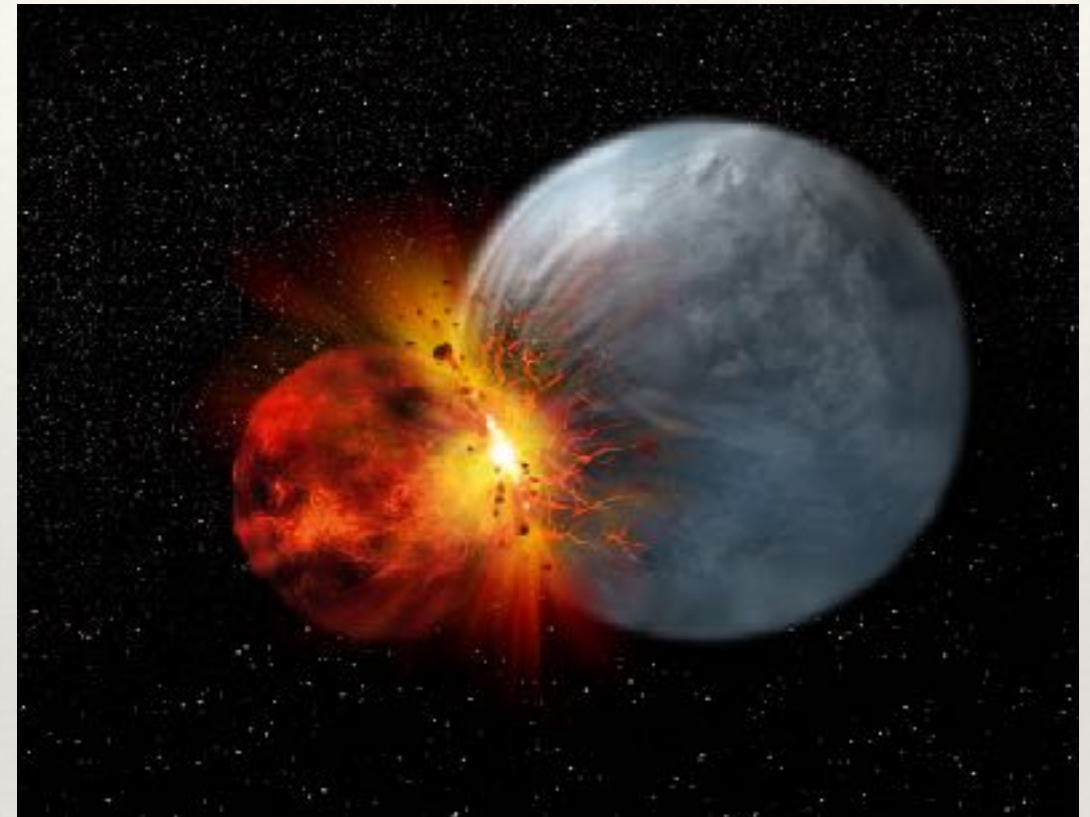
- unique to earth
- linked to future of solar system

❖ **Meteorite collision**

- 65 mybp dinosaur extinction
- Feb 2013 Chelyabinsk; 2009 Sudan
- 26 'city killer' meteorite strikes since 2000
- NASA's MPC tracks about 750,000 asteroids (inc 10,000 are NEOs)

Proposals

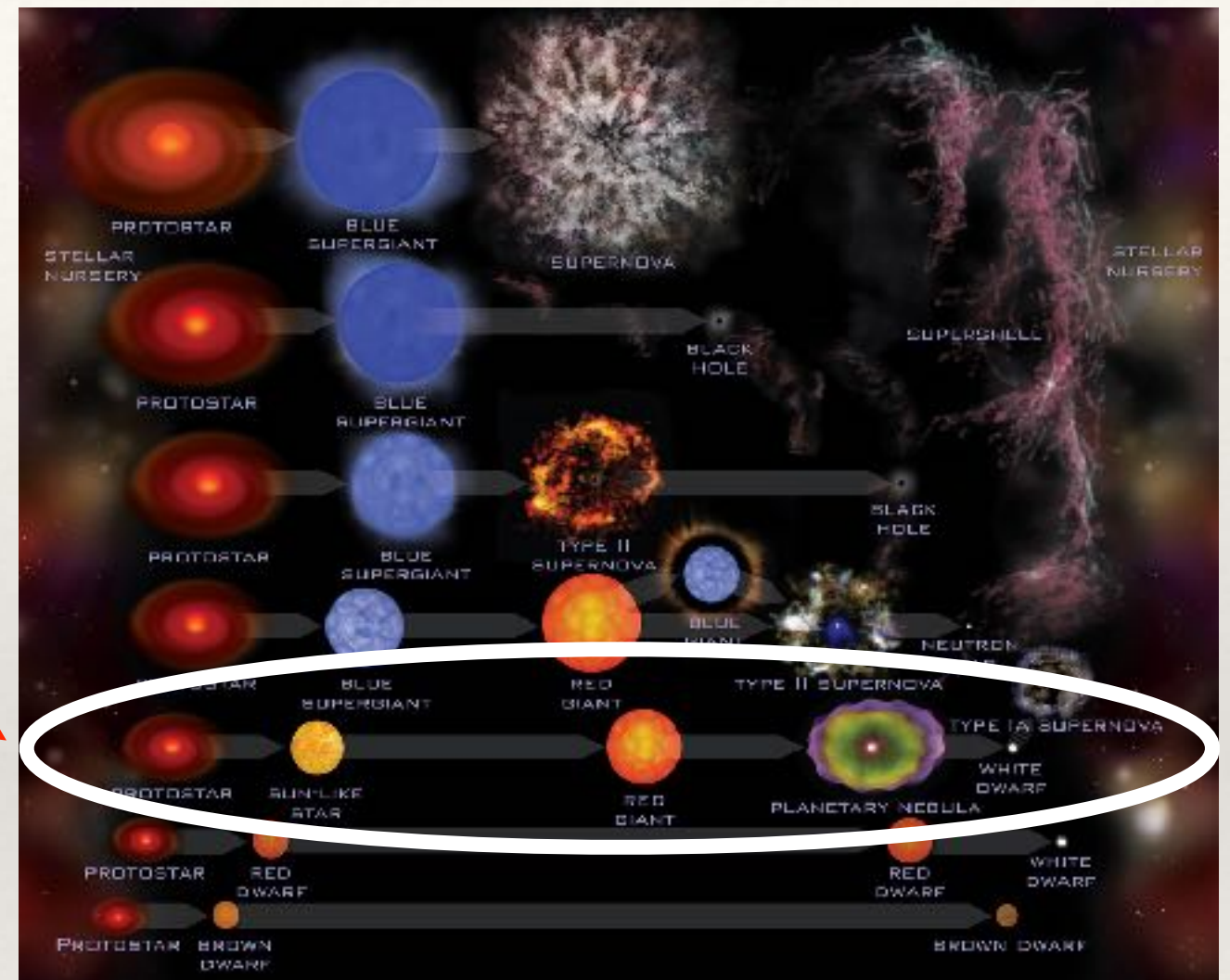
- UN 2013 call for international warning network
- Several sky survey telescopes (mostly IR) proposed or under-construction Asteroid Redirect Robotic Mission (ARRM)



https://www.youtube.com/watch?v=PIbGuKQS_F8&feature=youtube_gdata

How will it all end? Solar system

- ❖ Future of the sun can be confidently predicted from lifecycle of similar stars



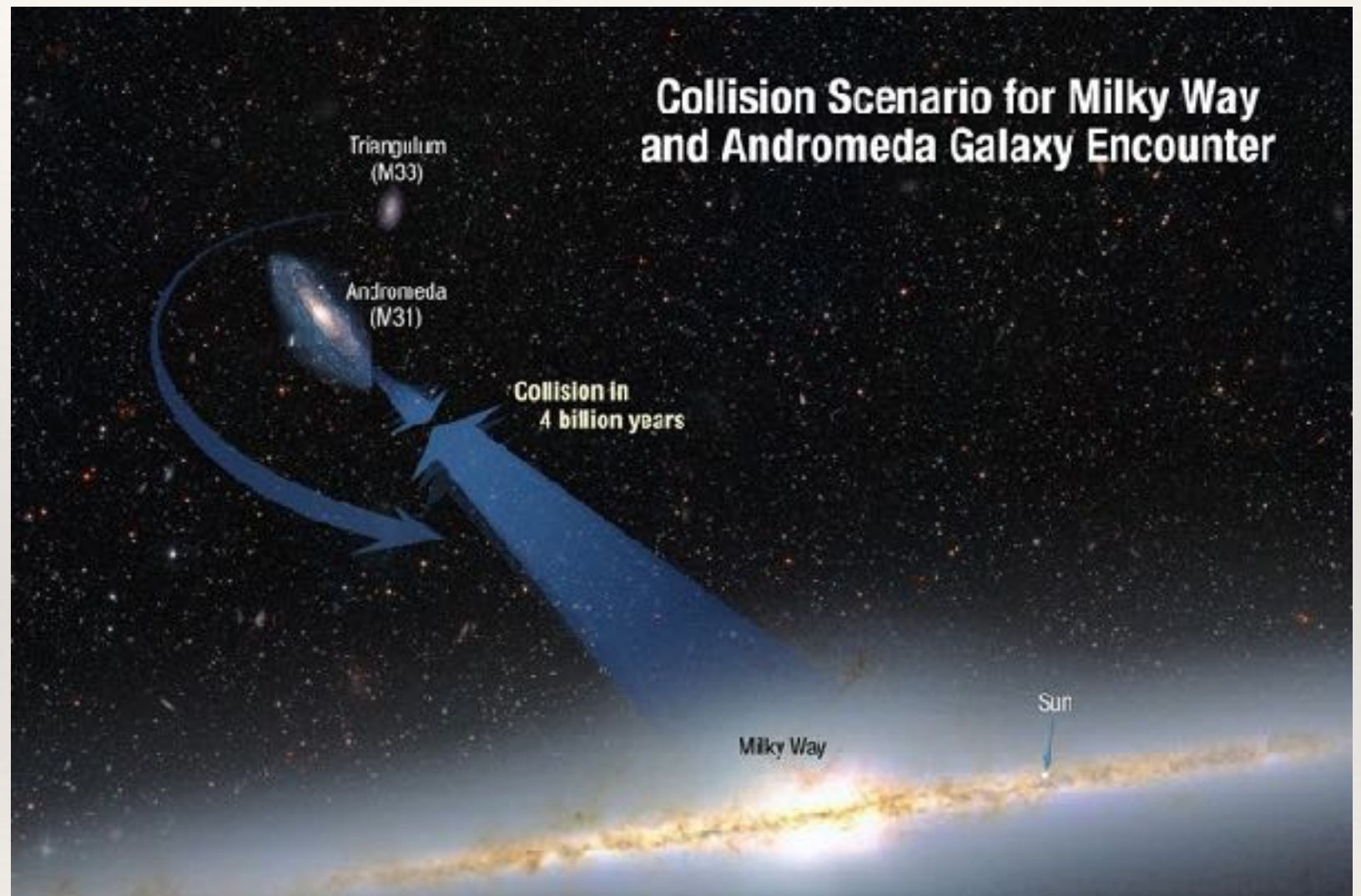
<https://www.youtube.com/watch?v=iauIP8swfBY>

Fortunately, timescale is approx 5 by from now

How will it all end? Milky Way

"The next major cosmic event to affect our galaxy ... the titanic collision of our Milky Way galaxy with the neighboring Andromeda galaxy"

NASA 31 May 2012



NASA

<http://apod.nasa.gov/apod/ap130514.html>

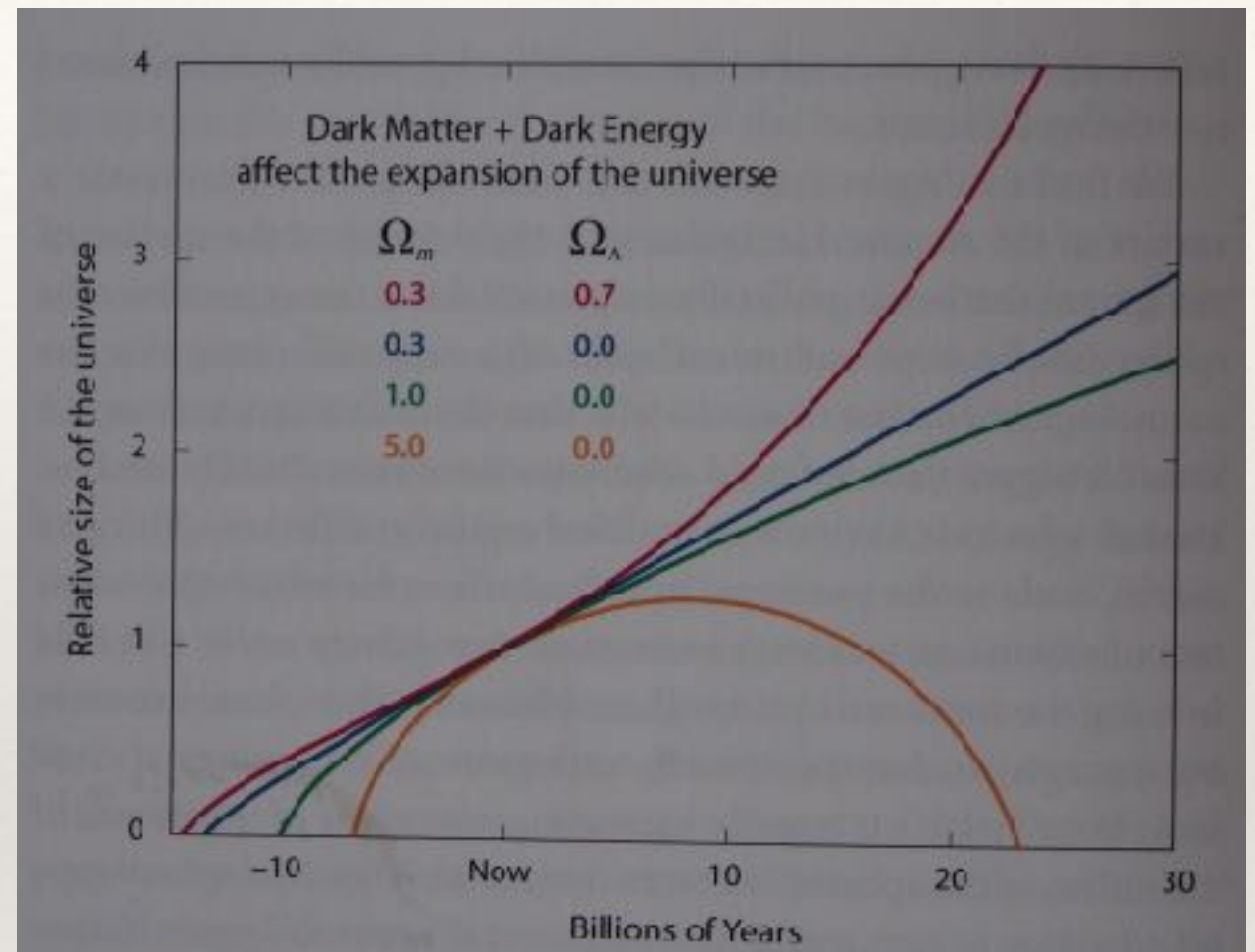
How will it all end? The universe

❖ Continual expansion v “The Big Crunch”

❖ 2011 Nobel Prize for Physics

“for the discovery of the accelerating expansion of the Universe through observations of distant supernovae”

<http://www.nobelprize.org/mediaplayer/?id=1725>



Ostriker & Mitton 2013

Study suggests continual expansion is more likely than Big Crunch

What is driving continual expansion remains unclear

The Future of the Universe: Multiverse

An alternative to The Big Crunch is that there is not one universe but an infinite number, that may be linked.



Somewhat difficult to prove empirically!

Homework Assignment

What do you think is the likelihood of discovering intelligent life in the universe?



Background

<http://www.seti.org/drakeequation>

Calculation:

http://www.classbrain.com/artmovies/publish/article_50.shtml



Next week

- ❖ Likelihood of Intelligent Life discussion
- ❖ “Where we are going” (Pt 2)
 - current research directions
- ❖ Ways of getting involved in astronomy
 - inc Citizen Science
- ❖ Your feedback on the course