

## Overview of Astronomy

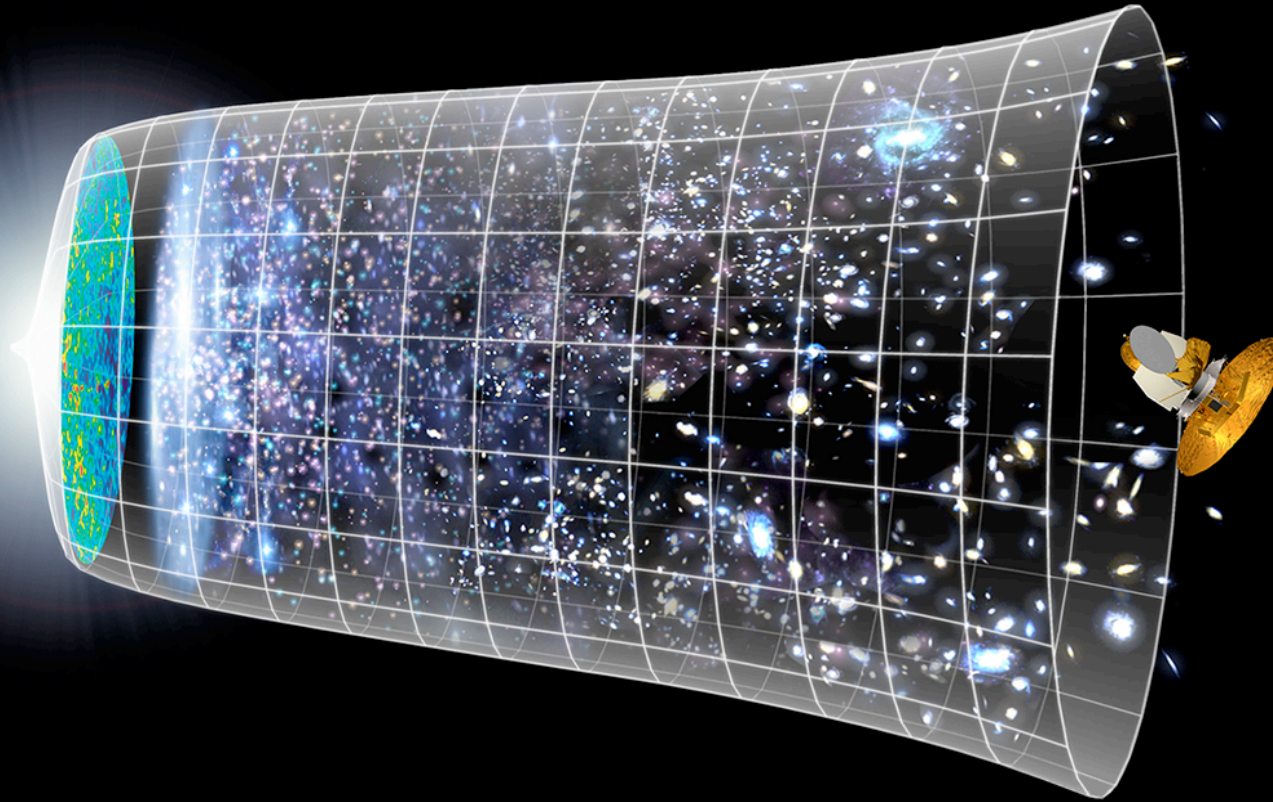
What it is: the study of the natural world beyond Earth, but also a means to understand Earth as a planet and host for life in that broader context.



# Hubble Deep Field



# From the Big Bang to Now



# The Context

Homo Sapiens have arrived on this pale blue dot in the last few minutes of the Sagan “Cosmic Year.”

What next?

Books:

The Singularity is Near – Ray Kurzweil (keyboard for blind, Chief Engineer of Google)

Who Owns the Future – Jaron Lanier (pioneer of virtual reality)

## What next for humanity?

Homo Sapiens likely still evolving biologically, would be different a million or billion years from now, but probably irrelevant.

Exponentially rapid change: rate of change proportional to current “amount.” The power of compound interest, a fixed “percentage per year” or “doubling time.” Example – the population of feral hogs in Texas is doubling every 5 years.

Population growth – things that are good for limiting (war, disease, starvation) are bad sociologically. Space travel is an unlikely solution.

In some areas - science, engineering - the “amount” is current knowledge.

Not in all things, e.g. transportation. Steve Earle lyrics:

**"Here I am in the 21st century  
I have to say it ain't as cool as I hoped it would be  
No man on the moon, nobody on Mars  
Where the hell is my flying car?  
Ain't nothing even like a teletransporter so far"**

but Genomics, Nanotechnology, Robotics – GNR

# What next for humanity?

Extrapolate current trends in GNR, exponential growth in technology, can predict a technological “Singularity” about 2040 – 2050.

Singularity: machines, maybe nanobots, attain the complexity of the human brain.

Self-evolving machines can share knowledge rapidly at essentially the speed of light, not the chemical speeds of the human brain, nor the slow rate of “book learning.”

We will be able to tinker with our genes, bodies, brains, become “superhuman.”

Kurzweil – the utopian view. Our exponentially evolving intelligence will expand to fill the Universe (and maybe the next one).

Bill Joy (founder of Sun Computers), Sir Martin Rees (Cambridge) – the dystopian view. There are great potential dangers we must anticipate and attempt to control. **Centre for the Study of Existential Risk** recently founded at Cambridge by Rees with Huw Price, Bertrand Russell Professor of Philosophy, Cambridge, Jaan Tallinn, Co-founder of Skype.

Extreme case - all agree self-replicating superintelligent robots in the natural environment would be very dangerous.

# The Big Issues

Can non-biological entities, machines, become conscious?

Can we beat the speed of light?

Is there science or engineering that should be “prohibited?”

These issues may transcend current perceived problems: the national debt, social security, war, climate change, population.

Something is going to happen around 2040...