OLLI Course Bio

Prof. Basri has taught in the Astronomy Dept. at UC Berkeley for 35 years. His favorite classes were the introductory courses for non-majors and small freshman seminars. He enjoys making science accessible to the general public, and has been given the Sagan award for this talent.

Title: Cosmic Origins

People have always had stories about the origin of the world. Now for the first time we are actually able to observe the formation of stars and planets, galaxies, the elements, and the Universe itself. Just a few physical principles operate to produce it all. I will explain what they are in simple terms (no math!), and how they have worked to produce our current cosmos. I will also introduce you to the observations that produce this solid empirical understanding of cosmic origins.

While no reading is required for this course, there is a very helpful free online book called "Astronomy" that is written at an appropriate level and has a lot of relevant material. Go to the link below and click on the "Contents" button. You can then easily navigate to each of the sections that are listed below to the right of topics.

https://cnx.org/contents/LnN76Opl@18.1:_45u6IpQ@7/Introduction

Syllabus

Week 1  Overview of the Universe; A Star is Born
1.1-1.3

- Cosmic objects: planets, stars, nebulas, galaxies
- A brief review of distances and motions
- Telescopes as time machines
- The interstellar medium: site of star formation

20.1-2

- Gravity and Angular Momentum: the main players
- Observations: Ongoing star formation
- The Role of Magnetic Fields
Skater angular momentum: https://www.youtube.com/watch?v=FmnkQ2ytI08

Week 2  A Planet is Born
    Disks: a pervasive structure 21.3
    Accretion and Aggregation in Disks
    Oligarchic formation of Terrestrial Planets
    Formation of Giant Planets
    Observations: the ubiquitous planetary zoo 21.5
A star is born (drama): https://www.youtube.com/watch?v=mkktE_fs4NA
Star formation simulation: https://www.youtube.com/watch?v=YbdwTwB8jtc
Moon formation simulation: https://www.youtube.com/watch?v=wflmQOZp3hE

Week 3  The Elements are Born
    The Structure and Power of Stars 22.1
    Nuclear Forces: building the elements inside stars
    The role of stellar mass; the lives of stars
    22.4-5
    Observations: star clusters test the theories
    22.2-3
    Stellar deaths: the formation of heavy elements 22.5
Scale of stars: https://www.youtube.com/watch?v=GCTuirkcRwo

Week 4  A Galaxy is Born
    The Milky Way: a Spiral Galaxy
    25.1-2
    Dwarf Galaxies
    26.2-3
    Giant Ellipticals and Galaxy Clusters
    Galaxy Collisions and Mergers 28.2
    Observations: The Assembly of the Milky Way 25.6

Week 5  The Universe is Born
    Equivalence of Mass and Energy 16.2
    Unfolding of the Big Bang 29.3
    Appearance of Particles; Nucleosynthesis
28.3-5

Week 6  The Cosmic Perspective
Inflation: Before the Big Bang  29.6
The Universe as a Spacetime Structure  29.2
The Fate of the Universe
Life in the Universe

30.1-2

Making Meaning in the Cosmos