

Astronomy 350:

The Big Bang, Black Holes, and the End of the Universe

Lecture 1

January 19, 2022

Announcements:

- Welcome!
- Syllabus is online

Today's Agenda

1. Overview and Appetizer

2. Course Mechanics

Introductions: I

Getting to know me

www: A350 Staff

Getting to know you

▷ in-class discussions, after class, office hours

Getting to Know You: Poll

Vote your conscience! = Say what you *really* think!

No answers are wrong!

There is evidence that the Universe has expanded from an initial **hot**, **dense**, state = **big bang**

In your opinion, how strong is evidence for the big bang?

A Way strong! Airtight!

B Pretty strong, a best bet, but not a sure thing

C Not so strong, a risky bet

ω **D** Totally weak! And the evidence has other explanations

E There isn't any real evidence for a big bang

Welcome!

This course sweeping in scale
science applied to the biggest picture
→ the most sweeping course you can take
north of Green street.

Note: you are (at great expense)
attending the **University** of Illinois
you have been promised the Universe...
→ it's right there in the name!

In this course, **we deliver!**

This course spans a huge range of scales in space and time

in space:

subatomic 10^{-33} cm, to the solar system 10^{10} km across
to Milky Way 100,000 light-years across,
to edge of observable universe 10's of billions of light years,
to unobservable universe beyond

also sweeping in time:

10^{-43} sec after big bang
to billions of years in future of cosmos

and we will see a wide span gravity's effects

from a distant whisper to a scream into a black hole

Taking Astr 350 Here and Now: A Wise Choice

Great **time** to take the course:

This very moment is the Golden Age of Cosmology
new results flooding in—some during this semester!

★ many **Nobel Prizes** for *cosmology*—most recently 2019!

★ many **Nobel Prizes** for *black holes*—most recently 2020!

We are very lucky to live in an age in which we are still making discoveries. It is like the discovery of America—you only discover it once.

— Cosmologist Richard Feynman, *The Character of Physical Law*

Illinois—Home of the Universe and of Black Holes

Also great **place** to take this course:

Illinois has major research efforts in cosmology
and in black holes, and in their interplay
both theoretical and observational
that builds on a 50+ year history

including your truly:

element production in the big bang, dark matter,
cosmic production of high-energy particles

so: you are getting the story

↘ from the horse's mouth—so to speak

Appetizer: Course Goals

The Big Picture

My goal in this course:

get a familiarity with the biggest picture science can paint

- partly phenomenology—*what* we know: “just the facts”
- but also: *how* and *why* things are as we see them

Will apply physical principles = laws of nature:

⇒ “get under the hood” and see what makes the universe tick

Today: **Preview of Coming Attractions**

∞ A brief, whirlwind tour
don't need to take notes...

Business

Syllabus

will highlight main points here...

you should **read the whole thing carefully**

Note: this course will rely heavily on the Web.

course page is source for all course information and assignments

Prerequisites: *None!*

Note: Physics and Calculus are **not** required!

If you have had these, great, but no problem if you haven't!

Course Mode and COVID

We are beginning online.

- medical need for instructor in light of COVID Delta
- not done lightly, I appreciate your patience

Will we shift to in person?

- Frankly, I don't know. I hope so.
- Depends on progress of COVID
- I will keep you updated

COVID Policies - see Syllabus

If we do return to **face-to-face**:

do not come to class if you have COVID

Introductions: II

Let's introduce ourselves. Please give

- you name
- where you're from—what feels like home to you
- your major(s)
- a fun fact about you we probably don't know

Example:

- I'm Brian Fields
- I've lived in Champaign for going on 24 years
- as an undergrad I majored in Physics and (barely) in English
- a dog named Chewie is just offscreen for most Zoom lectures