

“The First Three Minutes: A Modern View of the Origin of the Universe”

Syllabus and Information

Peter Fisher

January 11, 2021

Meeting time

Wednesdays, 7-8:30 pm via Zoom. The zoom link will be sent in a separate email.

Meeting Format

Please connect at 7 pm as the meeting will start at 7:05 pm sharp and conclude at 8:25 pm. The first meeting on January 11 will be an introduction and welcome to the course. There is no assigned reading for the first meeting. After the first meeting, a chapter from the text is assigned to read before the meeting. The Syllabus below shows the reading assignment for each meeting. Supplementary readings will be made available as needed, but reading them is optional.

The first half of each meeting after the first will be devoted to a discussion of that week's chapter. A five-minute break will occur at about 7:40 pm. The second half of the meeting will delve into one or two key aspects of that week's material.

Class members may participate as they wish – if you want to just follow the presentations and discussions with your camera on or off, that is fine. If you would like to participate in the discussion or ask questions, having your camera turned on helps me moderate the conversation. If you prefer to have your camera off and raise your hand in the Participant's window or alert me in the chat, please do.

There will be occasions where I will want to present something for 10-15 minutes without interruption. I will indicate these times. I will do this when I think the class needs to hear a full exposition of something before answering questions.

Readings

I will refer to our text as "Weinberg." Weinberg is very well written and complete, but dense in places. You may have to re-read parts several times to follow his exposition. Some may wish to read the whole book in advance and re-read the chapter assigned for each week. Please do whatever works for you. In particular, feel free to read ahead.

Course Material and asking questions

We will explore the first three minutes of the universe and understand how the earliest elements formed and how several generations of physicists, astrophysicists, and astronomers constructed this remarkable picture. In the early universe, space and time relate differently from our everyday experience. At various times, the unusual rules of quantum mechanics dictate what happens. You should expect there will be ideas that you do not understand and, at times, you may not even know what question to ask! If this happens, it is okay – the purpose of this class is to untangle these things together. I will be your guide but do not be surprised if I get sometimes lost too.

If you would like to email me questions before class or send me questions in the chat during the class meeting, please do so, and I will treat them anonymously.

Webpage

All course materials (messages, further reading, course information) will be available on the course webpage at tinyurl.com/firstthreeminutes.

Course Support

If you have any trouble using Zoom, please contact CCAE by phone at 617 547 6789 or email zoom@ccae.org for help. If you have other problems or questions about the course:

Cambridge Center for Adult Education

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617.547.6789

ccae.org

or contact me at fisher_p@me.com.

The Syllabus

Meeting	Date	Assigned Chapter	Major topics
1	January 13, 2021	None	Weinberg, light, telescopes, redshift
2	January 20, 2021	I. Introduction: The Giant and the Cow	Distances in the universe, galaxies
3	January 27, 2021	II. The Expansion of the Universe	Cosmic expansion, Cepheid stars, measuring distances
4	February 3, 2021	III. The Cosmic Microwave Radiation Background	Black body radiation, temperature, radiometers
5	February 10, 2021	IV. Recipe for a Hot Universe	Particle creation and annihilation, the temperature history of the universe
6	February 17, 2021	V. The First Three Minutes	Nuclear reactions
7	February 24, 2021	VI. A Historical Diversion	
8	March 3, 2021	VII. The First One-hundredth second	Quarks, quark-gluon plasma, virtual particles
9	March 10, 2021	VIII. Epilogue: The Prospect Ahead	
10	March 17, 2021	None	Dark energy, nucleosynthesis in stars and neutron stars