UNIVERSITY OF CAMBRIDGE

Institute of Continuing Education

Our expanding universe

Start date	16th June 2019	**End date**	16th June 2019
Venue	Madingley Hall Madingley Cambridge		
Tutor	Dr Matthew Bothwell	**Course code**	1819NDX039

Director of Academic Centres Sarah Ormrod

For further information on this course, please contact Head of Academic Centre Administration, Zara Kuckelhaus zara.kuckelhaus@ice.cam.ac.uk or 01223 746204

To book See: www.ice.cam.ac.uk or telephone 01223 746262

Tutor biography

Matt is the outreach facilitator at the Institute of Astronomy, University of Cambridge. He obtained his Master's degree at the University of Southampton, while carrying out research at the Harvard Center for Astrophysics. He then returned to the UK in 2007, completing his PhD at the University of Cambridge in 2011. After a year working as a researcher at the University of Arizona, he returned to Cambridge in 2012. Matt is a science communicator, who gives astronomy talks and lectures on almost any area of astronomy to a wide range of ages. When he is not doing outreach, Matt is an observational astronomer, who uses a range of state-of-the-art observing facilities to study the evolution of galaxies across cosmic time.

Course programme

09:30	Terrace bar open for pre-course tea/coffee
10:00 – 11:15	**Session 1: The Big Bang for Beginners**
11:15	Coffee
11:45 – 13:00	**Session 2: The distant Universe at long wavelengths**
13:00	Lunch
14:00 – 15:15	**Session 3: Radio astronomy and the ancient Universe**
15:15	Tea
15:30 – 16:45	**Session 4: Measuring the age of the Universe (practical session)**
16:45	Day-school ends

Course syllabus

Aims:

- To understand the history of 20th century cosmology: the observations and debates that led to our current understanding of the Universe we live in.
- To cover some of the observational techniques astronomers use to study the distant Universe
- To understand how astronomers measure the rate of expansion of the Universe

Content:

The 20th century was a transformative time for our understanding of our Universe. In this course we will learn about the observations and arguments that paved the way to the knowledge that we live in an expanding Universe that started with a big bang. We'll look at the ways astronomers study the early Universe, which is a very different place to the Universe today. Finally, we will look at how astronomers measure the expansion rate of our Universe, and use that to calculate our own estimate of the Universe's age.

Presentation of the course:

The course will primary be taught in lecture format, with time for questions and discussion. There will also be a Tutor-led practical exercise.

As a result of the course, within the constraints of the time available, students should be able to:

- Understand the physical evidence for the Big Bang and the expansion of the Universe
- Understand that the Universe is changing over time, and gain a broad perspective of the techniques astronomers use to study the Early Universe.
- Understand the terms 'dark matter' and 'dark energy'
- Be familiar with techniques used to measure the expansion rate of the Universe

Reading and resources list

Listed below are texts that might be of interest should you wish to supplement your learning on the course. Any essential reading is marked with an asterisk *

Author	Title	Publisher and date
Max Tegmark	*Our Mathematical Universe*	Knopf 2014
Steven Weinberg	*The First Three Minutes*	Basic Books 1993
Andrew Liddle	*An Introduction to Modern Cosmology*	Wiley-Blackwell 2015

Website addresses

Khan academy cosmology lectures:
https://www.khanacademy.org/science/cosmology-and-astronomy/universe-scale-topic#big-bang-expansion-topic

Additional information

Venue

Details of how to find Madingley Hall can be found on our website:
http://www.ice.cam.ac.uk/who-we-are/how-to-find-the-institute

Refreshments

Tea and coffee and lunch will be provided. If you have any specific dietary requirements or allergies and have not already advised us, please inform our Admissions Team on ice.admissions@ice.cam.ac.uk or +44 (0)1223 746262.

Note Students of the Institute of Continuing Education are entitled to 20% discount on books published by Cambridge University Press (CUP) which are purchased at the Press bookshop, 1 Trinity Street, Cambridge (Mon-Sat 9am – 5:30pm, Sun 11am – 5pm). A letter or email confirming acceptance on to a current Institute course should be taken as evidence of enrolment.

Information correct as of: 10 June 2019