

The frontiers of astronomy, 2022

Start date Friday 11 March 2022 **End date** Sunday 13 March 2022

Venue Madingley Hall
Madingley
Cambridge

Tutor **Dr Robin Catchpole** **Course code** 2122NRX080

Director of ISP and LL Sarah Ormrod

For further information intenq@ice.cam.ac.uk

Tutor biography

Dr Robin Catchpole retired as Senior Astronomer at the Royal Observatory Greenwich and currently works at the Institute of Astronomy in Cambridge. Born in 1943, he took a BSc at University College London, before being posted to the Royal Observatory at the Cape of Good Hope. He received a doctorate from the University of Cape Town. In 1991 he returned to the Royal Greenwich Observatory where he worked until it closed in 1998. He has authored and co-authored over 120 research papers and has used telescopes around the world including the Hubble Space Telescope. His research interests include the composition of stars, exploding stars, the structure of our Galaxy and galaxies with central black holes. He has given numerous popular lectures and radio and TV interviews. He also originated the design of the 33-ton bronze truncated cone at the new Astronomy Centre in Greenwich, opened by the Queen in 2007. Robin is currently part of the team intending to build the Solar Pyramid, which will be the largest sundial in the world.

Course programme

Friday

Please plan to arrive between 16:30 and 18:30. You can meet other course members in the Terrace Bar which opens at 18:15. Tea and coffee making facilities are available in the study bedrooms.

19:00 Dinner

20:30-22:00 Contents and Scale of the Universe

22:00 Terrace Bar open for informal discussion

Saturday

07:30 Breakfast (for residents only)

09:00-10:30 Our Solar System

10:30 Coffee

11:00-12:30 Asteroids and impacts: should we worry?

13:00 Lunch

14:00 Free time

16:00 Tea

16:30-18:00 The Evolution of the Sun and stars and origin of the elements

18:00 Free time

18:30 Dinner

20:00-21:30 Visit the Institute of Astronomy to use telescope. If cloudy: The Sun and Climate Change.

21:30 Terrace Bar open for informal discussion

Sunday

07:30 Breakfast (for residents only)

09:00-10:30 Black Holes, Dark Matter and Vacuum Energy

10:30 Coffee

11:00-12:30 Are we alone, in a Universe perfectly suited to our existence?

12:45 Lunch

The course will disperse after lunch

Course syllabus

Aims:

- To give you a deeper understanding of the universe of which you are part.
- To give you an ability to evaluate and put in a broader context, media reports on astronomy.
- To increase your awareness of the world around you, including the origin of everything, and in particular to no longer see the night sky as a painted dome but as a dynamic ever-changing place, a 3-dimensional entity.

Content:

The weekend course will cover the latest thinking on topic such as:

- The nature of stars, galaxies, black holes, dark-matter, vacuum-energy and the role of gravity
- The size of the Universe, the evolution of stars and origins of elements created therein
- The ultimate fate of our Sun and planets
- The origin of our solar system and the variety of environments and landscapes within our solar system
- The threats to life on Earth from cosmic impacts, evidence for past impacts and the probability of future impacts
- The possibility of finding intelligent life elsewhere and why it seems to be silent out there
- The structure of our Sun, its major cycles, the effects of magnetic fields on the solar atmosphere and how this affects Earth
- How the Earth's climate has changed over the long and short timescales and what relevance the Sun might have to short-term climate change on Earth.

Presentation of the course:

Teaching will be in the form of lectures followed by questions from students that will reveal what is difficult for them to understand.

The only topic suitable for a general class discussion is the question as to whether we are alone in the universe and I hope we can discuss this topic together.

I make no promise as it depends on the weather, but propose to make an evening visit to the Institute of Astronomy to use their 16-inch telescope to look at objects in the sky.

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

1. Deeper and better understanding of the night sky.
2. Deeper understanding of the origin of everything they see around them.
3. Broader perspective of ourselves, our civilisation and our Earth, within the context of our Universe.

Reading and resources list

Listed below are a number of texts that might be of interest for future reference, but do not need to be bought (or consulted) for the course.

Author	Title	Publisher and date
Rees, Martin.	<i>Just Six Numbers</i>	Phoenix, Orion Pub Group, 2004.
Rees, Martin.	<i>Our Final Century?</i>	William Heinemann Ltd 2003
Freedman, R A, and Kaufmann, W J..	<i>Universe</i>	Freeman, 2007, 8th edition.
Pasachoff, J M.	<i>Astronomy from the Earth to the Universe</i>	Saunders College Publishing, 1995, 4th edition