



# THE UNIVERSE UNRAVELLED

## COSMOLOGY, GRAVITATION AND ELEMENTARY PARTICLES

What are we? Where do we come from? Where are we going? In the language of physics, these become: What is the structure of matter? How did the Universe evolve? How will it evolve in the future? John Wheeler's famous mantra, IT from BIT, envisaged the Universe as an information structure of BITs. And, of course, so IT is, fundamentally quantum and statistical, the many-paths/many-worlds story with our Universe expanding from a initial hot dense state. This idea of an expanding Universe grew out of observations of the motions of the galaxies around us, and a series of discoveries turned the idea of expansion into a convincingly demonstrated aspect of reality. A notable piece of the evidence of this hot big bang is the fossil thermal radiation left from the

past. There is an intimate entanglement of theory with precision 'first-light' and other cosmic data. Examination of the properties of this radiation, and of the galaxies and the nature of space-time around them, shows that the expansion is well described by Einstein's theory of gravity, general relativity. This theory tells us that there is a warped side to our Universe: objects and phenomena that are made from warped space and warped time. Three examples are black holes, the big-bang in which our Universe was born, and ripples in the fabric of space-time called gravitational waves. These lectures will unravel the story of our Universe and broaden the enquiry into the vast sweep of ideas about the nature of our Universe. Its a fascinating story.


**KIP S. THORNE**

The Warped Side of our Universe: From the Big Bang to Black Holes and Gravitational Waves


**P JAMES PEEBLES**

Discovering the Large-Scale Nature of the Physical Universe


**J. RICHARD BOND**

Cosmic Information Theory and Analysis: IT from BIT, from BITs in IT


**JOHN ELLIS**

Answering Gauguin's questions with the Large Hadron Collider

### ICTS PUBLIC LECTURES

TUESDAY 13 DECEMBER 2011, 2.00 PM, HOMI BHABHA AUDITORIUM, TIFR, MUMBAI

**ALL ARE WELCOME**