Cosmology:

Lecture course
University Groningen
Feb.-Apr. 2009

Literature

Course Book

- Introduction to Cosmology

  B. Ryden; Addison-Wesley, 2003

  … very good, highly accessible and clear text.

Literature

Course Favorites:

- Cosmological Physics
  J. Peacock; Cambridge Univ. Press,1999
  Solid and thorough text on physical cosmology,
  nearly all to be found in here, sometimes very much Peacock's view of things …
  Highly recommended !

- Cosmology, the Science of the Universe
  E. Harrison; Cambridge Univ. Press, 1981 (2nd ed. 2000)
  beautiful textbook on background and foundations of modern cosmology; providing both historical insight as well as genuine essence of physics. Great Read !!!

- Cosmology,
  the Origin and Evolution of Cosmic Structure
  P. Coles, F. Lucchin; Wiley, 1995 (2nd ed. 2002)
  in particular 2nd ed. is a very much improved text, providing a good feeling of the involved physics.

Literature

Additional Key References

- Gravitation and Cosmology
  S. Weinberg; Wiley, 1972
  A Classic !!!
  Focus on general relativistic background

- Principles of Physical Cosmology
  P.J.E. Peebles; Princeton Univ. Press, 1993

- The Early Universe
  E. Kolb; M. Turner; Addison-Wesley, 1990
  wonderful textbook focussing on the physics of the Early Universe, demanding yet highly gratifying.

- Cosmology and Astrophysics through Problems
  T. Padmanabhan; Wiley, 1972
  book with large number of insightful problem sets, including large number of cosmology ones

- Modern Cosmological Observations and Problems
  G. Bothun; Taylor & Francis, 1998

Additional Key References

- The Cosmological Distance Ladder
  M. Rowan-Robinson; Freeman, 1985
  by now largely outdated, yet very good and balanced overview of (most) relevant issues

- Critical Dialogues in Cosmology
  ed. N. Turok; World Scientific, 1997
  reports on a meeting commemorating the "Great Debate" (Shapley-Curtis)
  in a cosmological context: set of confrontations on major cosmological topics

More Popular Cosmology Books

- The First Three Minutes
  S. Weinberg; New York: Basic Books, 1997

- The Big Bang
  J. Silk; Freeman, 1989

- Your Cosmic Context; An Introduction to Modern Cosmology
  T. Duncan, C. Tyler
  very basic, not many equations, but fun to read and browse

- A Brief History of Time
  S. Hawking, Bt Bound, 1999

More Popular Cosmology Books

- The Elegant Universe:
  Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory
  B. Greene; Vintage 2000
  A very interesting and well-written account of the new, and exciting, developments in quantum cosmology, string and brane cosmology

General Relativity

- Gravitation
  C.W. Misner, J.A. Wheeler, K.S. Thorne; Freeman, 1973
  Biblical (also in proportion)

- Problem Book in Relativity and Gravitation
  A. Lightman, R. Price; Princeton Univ. Press, 1975

- General Relativity from A to B
  R. Geroch; Univ. Chicago Press, 1981
  excellent qualitative introduction of basics GR

1	Feb. 10 (c) Feb. 12 (c)	**The Hot Big Bang:** a Review and Introduction **The metric Universe:** General Relativity, basics and essentials
2	Feb. 17 (c) Feb. 19 (c)	**The Cosmological Principle:** Cosmic Time and Weyl's Postulate **Observational Evidence Cosmological Principle** Observational Evidence Isotropic Universe Observational Evidence Homogeneous Universe
3	Feb. 24 (c) Feb. 26 (c)	**Robertson-Walker metric** Cosmological Redshift Hubble Expansion Cosmological Observables in a Geometric Universe Observational Cosmology

4	Mar. 3 (c) Mar. 5 (c)	Friedman Equations Cosmological Parameters: Hubble parameter, Omega, q and curvature Cosmic Components: Radiation, (Dark) Matter and Dark Energy
5	Mar. 10 (c) Mar. 12 (c)	Cosmological FRW Solutions: Radiation- and Matter-dominated Universes, Radiation-Matter Equivalence Dark Energy and Cosmic Acceleration General FRW solutions, Matter-Dominated Universes, Flat Universes, ... Cosmic Horizons
6	Mar. 17 (c) Mar. 19 (c)	Measuring Cosmological Parameters The Age of the Universe Concordance Cosmology Thermal History of the Universe Primordial Nucleosynthesis

7	Mar. 24 (c) Mar. 26 (c)	The Cosmic Microwave Background: Recombination, Decoupling and Freeze-out Thermalization and Blackbody Spectrum of the CMB Anisotropies of the CMB	Mar. 27 (w)	
8	Mar. 31 (c) Apr. 2 (c)	The problems of standard cosmology: Flatness Problem, Horizon Problem, Structure Problem, Monopole Problem Inflation & the Inflationary Universe	Apr. 3 (c)	Chronicle of the Universe from Neutrino Decoupling back to the Planck Time

Student Presentations: Early Cosmology

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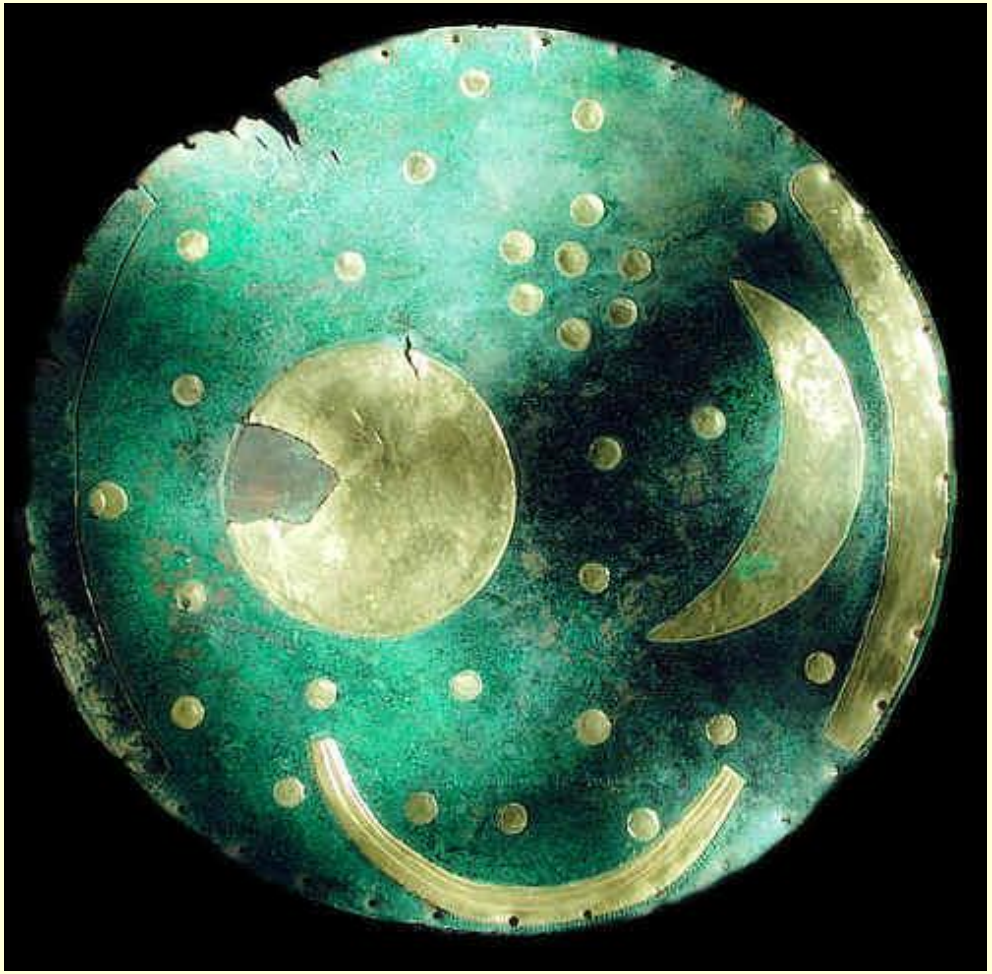
Inform yourself about the cosmological worldviews and "scientific" endeavours and progress of one of the following individuals or civilizations.

Find out how they thought about questions such as:

- How large is the Universe
- What is it made of ?
- What is its origin ? Its fate ?
- What is the human place in it ?

Presentation: week Sep. 20



Student Presentations: Early Cosmology Topics

- Aboriginals
- Neolithic Near-East (Catal Huyuk)
- Neolithic Europe (Stonehenge)
- Celtic Cosmology
- Ancient Egyptians
- Ancient Sumerians
- Ancient Babylonians
- Zarathustra & ancient Persia
- Mani & Manicheism
- Ancient Chinese Cosmology
- Hindu Cosmology
- Buddha & Buddhist Cosmology
- Thales
- Anaximander
- Pythagoras
- Democritus
- Epicurus
- Plato
- Aristoteles
- Aristarchus
- Lucretius
- Ptolemaeus
- Jewish Cosmology
- (Medieval) Islamic Cosmology
- Nasir al-Din al-Tusi
- Norse (Germanic, Icelandic) Cosmology
- Byzantine Cosmology
- Medieval (Western-European) Cosmology
- Maya Cosmology
- Aztec Cosmology
- Inca Cosmology
- Navajo cosmology
- Cree cosmology
  (& North-American Indians of the plain)
- Northwest Coast Indian cosmology
- Inuit Cosmology
- Polynesian Cosmology
- Copernicus
- Giordano Bruno
- Johannes Kepler
- Rene Descartes
- Baruch Spinoza
- Isaac Newton
- Gottfried Leibniz
- Immanuel Kant
- Edgar Allen Poe
- Flying Spaghetti Monster