COSMOLOGY WITH MATLAB (WITH COMPANION MEDIA PACK)

By Dan Green

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This volume makes explicit use of the synergy between cosmology and high energy physics, for example, supersymmetry and dark matter, or nucleosynthesis and the baryon-to-photon ratio. In particular the exciting possible connection between the recently discovered Higgs scalar and the scalar field responsible for inflation is explored.

The recent great advances in the accuracy of the basic cosmological parameters is exploited in that no free scale parameters such as h appear, rather the basic calculations are done numerically using all sources of energy density simultaneously. Scripts are provided that allow the reader to calculate exact results for the basic parameters. Throughout MATLAB tools such as symbolic math, numerical solutions, plots and "movies" of the dynamical evolution of systems are used. The GUI package is also shown as an example of the real time manipulation of parameters which is available to the reader.

All the MATLAB scripts are made available to the reader to explore examples of the uses of the suite of tools which are available. Indeed, readers should be able to engage in a command line "dialogue" or go on to edit the scripts and write their own versions.

Contents:

- Introduction
- From the Big Bang
- Inflation and Big Bang Issues
- Fluctuations to Perturbations
- The Cosmic Microwave Background
- Large Scale Structure
- The Higgs Boson and Inflation
- *Appendices:*
  - MATLAB Tools
  - Power Law, RD or MD Formulae
  - Symbol and Acronym Tables
  - MATLAB Script (with Companion Media Pack)

Readership: Graduate students and researchers in physics.

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COSMOLOGY WITH MATLAB (WITH COMPANION MEDIA PACK) By Dan Green Bibliography

- Rank: #1889890 in eBooks
- Published on: 2016-07-14

- Released on: 2016-07-14
- Format: Kindle eBook

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Green is a freelance journalist.

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