

<<现代宇宙学>>

图书基本信息

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## 前言

The Men of the Great Assembly had three sayings: "Be patient before reaching a decision; Enable many students to stand on their own; Make a fence around your teaching." Ethics of the Fathers 1:1 There are two aspects of cosmology today that make it more alluring than ever. First, there is an enormous amount of data. To give just one example of how rapidly your knowledge of the structure of the universe is advancing, consider galaxy surveys which map the sky. In 1985, the state-of-the-art survey was the one carried out by the Center for Astrophysics; it consisted of the positions of 1100 galaxies. Today, the Sloan Digital Sky Survey and the Two Degree Field between them have recorded the 3D positions of half a million galaxies. The other aspect of modern cosmology which distinguishes it from previous efforts to understand the universe is that we have developed a consistent theoretical framework which agrees quantitatively with the data. These two features are the secret of the excitement in modern cosmology: we have a theory which makes predictions, and these predictions can be tested by observations. Understanding what the theory is and what predictions it makes is not trivial. First, many of the predictions are statistical. We don't predict that there should be a hot spot in the cosmic microwave background (CMB) at  $RA = 15h, dec = 27^\circ$ . Rather, predictions are about the distribution and magnitude of hot and cold spots. Second, these predictions, and the theory on which they are based, involve lots of steps, many arguments drawn from a broad range of physics. For example, we will see that the distribution of hot and cold spots in the CMB depends on quantum mechanics, general relativity, fluid dynamics, and the interaction of light with matter. So we will indeed follow the first dictum of the Men of the Great Assembly and be patient before coming to judgment. Indeed, the fundamental measures of structure in the universe—the power spectra of matter and radiation—agree extraordinarily well with the current cosmological theory, but we won't have the tools to understand this agreement completely until Chapters 7 and 8. Sober minds have always known that it pays to be patient before pronouncing judgment on ideas as lofty as those necessary to understand our Universe. The modern twist on this "Be patient" theme is that we need to set up the framework (in this case Chapters

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### 内容概要

There are two aspects of cosmology today that make it more alluring than ever. First, there is an enormous amount of data. To give just one example of how rapidly our knowledge of the structure of the universe is advancing, consider galaxy surveys which map the sky. In 1985, the state-of-the-art survey was the one carried out by the Center for Astrophysics; it consisted of the positions of 1100 galaxies. Today, the Sloan Digital Sky Survey and the Two Degree Field between them have recorded the 3D positions of half a million galaxies.

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在哥伦比亚大学获博士学位。

进入费米国家实验室和芝加哥大学前在哈佛大学做研究员。

在宇宙论方面发表了七十多篇论文，其中大部分是关于宇宙的微波背景和大尺度结构。

目次：标准模型及其它；平坦扩张的宇宙；远离平衡态；波尔兹曼方程；爱因斯坦方程；初始条件；多样性；各项异性；多样性的探测；弱透镜化和偏振；分析；附录A：部分习题解答；附录B：常数；附录C：特殊函数；附录D：符号；参考文献；索引。

读者对象：理论物理、天体物理和宇宙学等专业的高年级本科生、研究生和相关专业的科研人员。

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### 编辑推荐

《现代宇宙学》的特色：（1）讲解了现代宇宙学的理论基础，处理方法和具体解释，阐明了当前在宇宙学研究中的深刻思想；（2）涵盖了过去十年中在宇宙学研究中的重大进展；（3）包括了上百幅很有特色的教学图片。

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