

About the *Instructor's Guide*

This *Instructor's Guide* contains resources designed for use with the textbook *The Cosmic Perspective*, third edition, in either its complete form or in the two available split forms (*The Solar System: The Cosmic Perspective Volume 1* or *Stars, Galaxies, and Cosmology: The Cosmic Perspective Volume 2*).

The introductory sections contain material designed to help you prepare for your course. The bulk of the guide then is organized chapter-by-chapter, with teaching hints and answers to questions and problems from the text.

This *Instructor's Guide* is also available in the Instructor's Resource area on the text website, www.astronomyplace.com.

If you have additional questions or comments about *The Cosmic Perspective*, you may contact the authors directly by e-mailing the lead author, Jeffrey Bennett—jeff@bigkidscience.com or jbennett@casa.colorado.edu.

Table of Contents

About the <i>Instructor’s Guide</i>.....	iii
Which Version of <i>The Cosmic Perspective</i> Fits Your Course?.....	1
Courses Suited to <i>The Cosmic Perspective</i>	1
Alternate Versions of <i>The Cosmic Perspective</i>	1
Resources and Supplements for <i>The Cosmic Perspective</i>.....	2
The Astronomy Place Website (www.astronomyplace.com)— <i>the</i> On-line Resource for You and Your Students	2
Additional Student Supplements for <i>The Cosmic Perspective</i>	3
Instructor Supplements for <i>The Cosmic Perspective</i>	4
Sample Course Outlines	5
What if I Want to Teach Stars and Galaxies Before the Solar System?.....	5
To Math or Not to Math?	6
Sample Outline 1: One Semester, Solar System Emphasis	7
Sample Outline 2: One Semester, Solar System/Sky Emphasis	8
Sample Outline 3: One Semester, Stars/Galaxies/Cosmology Emphasis	9
Sample Outline 4: One Semester, Stars/Galaxies/Cosmology Emphasis with Relativity.....	10
Sample Outline 5: One Semester, “Everything” Course.....	11
Sample Outline 6: One Semester, “Everything” Course (Solar System Last).....	13
Sample Outline 7: One Quarter, Solar System Emphasis.....	15
Sample Outline 8: One Quarter, Stars/Galaxies/Cosmology Emphasis.....	16
Sample Outline 9: One Quarter, Stars/Galaxies/Cosmology Emphasis with Relativity	17
The Pedagogical Approach of <i>The Cosmic Perspective</i>	18
Themes of <i>The Cosmic Perspective</i>	18
Pedagogical Principles of <i>The Cosmic Perspective</i>	19
The Topical Structure of <i>The Cosmic Perspective</i>	21
Part I—Developing Perspective (Chapters 1–3, S1)	21
Part II—Key Concepts for Astronomy (Chapters 4–7)	23
Part III—Learning From Other Worlds (Chapters 8–14)	23
Part IV—A Deeper Look at Nature (Chapters S2–S4)	25
Part V—Stellar Alchemy (Chs. 15–18).....	26
Part VI—Galaxies and Beyond (Chapters 19–24)	26
Chapter Structure in <i>The Cosmic Perspective</i>	28
Basic Structural Elements	28
Additional “Feature” Elements.....	29
Getting the Most Out of Each Chapter	30

Preparing Your Course: Suggestions for First-Time Astronomy Teachers.....	31
What is Teaching All About?	31
General Notes on Course Preparation	31
Setting Your Grading Policy.....	33
Weighting the Components of the Final Grade.....	34
The Grading Scale.....	35
Setting Your Homework Policy.....	35
Selective Homework Grading.....	36
Homework Help	36
Setting Your Testing Policy	37
Multiple-Choice or Essay?	37
Should You Give Short Quizzes?	37
How About Exams?	38
The Test Bank	39
The First Day of Class	39
Suggested First Day Assignment	39
Structuring Class Sessions	40
Evaluating Your Teaching	40
Post-Lecture Evaluations.....	40
Feedback on Homework.....	41
Notes on Interpreting Evaluations.....	41
Suggestions on Making Your Lectures Interactive	43
Basic Interactions.....	43
Collaborative Learning	44
Avoiding Intimidation.....	44
Personalizing the Impersonal Classroom	45
Resources on Interactive Teaching.....	46
Chapter-by-Chapter Guides	
Part I: Developing Perspective.....	47
Chapter 1. Our Place in the Universe.....	47
What's New in the Third Edition That Will Affect My Lecture Notes?	47
Teaching Notes (By Section)	48
Answers/Discussion Points for Think About It Questions	50
Solutions to End-of-Chapter Problems (Chapter 1)	50
Chapter 2. Discovering the Universe for Yourself.....	54
What's New in the Third Edition That Will Affect My Lecture Notes?	54
Teaching Notes (By Section)	54
Answers/Discussion Points for Think About It Questions	57
Solutions to End-of-Chapter Problems (Chapter 2)	58
Chapter 3. The Science of Astronomy.....	60
What's New in the Third Edition That Will Affect My Lecture Notes?	60
Teaching Notes (By Section)	61
Answers/Discussion Points for Think About It Questions	62
Solutions to End-of-Chapter Problems (Chapter 3)	63

Chapter S1. Celestial Timekeeping and Navigation	64
Teaching Notes (By Section)	64
Answers/Discussion Points for Think About It Questions.....	65
Solutions to End-of-Chapter Problems (Chapter S1).....	66
Part II: Key Concepts for Astronomy	70
Chapter 4. A Universe of Matter and Energy	70
Teaching Notes (By Section)	70
Answers/Discussion Points for Think About It Questions.....	71
Solutions to End-of-Chapter Problems (Chapter 4)	72
Chapter 5. The Universal Laws of Motion	75
What's New in the Third Edition That Will Affect My Lecture Notes?	75
Teaching Notes (By Section)	76
Answers/Discussion Points for Think About It Questions.....	77
Solutions to End-of-Chapter Problems (Chapter 5)	78
Chapter 6. Light: The Cosmic Messenger.....	84
What's New in the Third Edition That Will Affect My Lecture Notes?	84
Teaching Notes (By Section)	84
Answers/Discussion Points for Think About It Questions.....	85
Solutions to End-of-Chapter Problems (Chapter 6)	85
Chapter 7. Telescopes: Portals of Discovery	89
What's New in the Third Edition That Will Affect My Lecture Notes?	89
Teaching Notes (By Section)	90
Answers/Discussion Points for Think About It Questions.....	90
Solutions to End-of-Chapter Problems (Chapter 7)	91
Part III: Learning from Other Worlds	95
Chapter 8. Welcome to the Solar System	95
What's New in the Third Edition That Will Affect My Lecture Notes?	95
Teaching Notes (By Section)	95
Answers/Discussion Points for Think About It Questions.....	96
Solutions to End-of-Chapter Problems (Chapter 8)	96
Chapter 9. Formation of the Solar System	98
What's New in the Third Edition That Will Affect My Lecture Notes?	98
Teaching Notes (By Section)	98
Answers/Discussion Points for Think About It Questions.....	100
Solutions to End-of-Chapter Problems (Chapter 9)	101
Chapter 10. Planetary Geology: Earth and the Other Terrestrial Worlds	104
What's New in the Third Edition That Will Affect My Lecture Notes?	104
Teaching Notes (By Section)	104
Answers/Discussion Points for Think About It Questions.....	105
Solutions to End-of-Chapter Problems (Chapter 10)	106
Chapter 11. Planetary Atmospheres: Earth and the Other Terrestrial Worlds.....	108
What's New in the Third Edition That Will Affect My Lecture Notes?	108
Teaching Notes (By Section)	108
Answers/Discussion Points for Think About It Questions.....	109
Solutions to End-of-Chapter Problems (Chapter 11)	110

Chapter 12. Jovian Planet Systems	112
What's New in the Third Edition That Will Affect My Lecture Notes?	112
Teaching Notes (By Section)	112
Answers/Discussion Points for Think About It Questions	114
Solutions to End-of-Chapter Problems (Chapter 12)	114
Chapter 13. Remnants of Rock and Ice: Asteroids, Comets, and Pluto	116
What's New in the Third Edition That Will Affect My Lecture Notes?	116
Teaching Notes (By Section)	117
Answers/Discussion Points for Think About It Questions	118
Solutions to End-of-Chapter Problems (Chapter 13)	119
Chapter 14. Planet Earth: Seen in a New Light	121
What's New in the Third Edition That Will Affect My Lecture Notes?	121
Teaching Notes (By Section)	122
Answers/Discussion Points for Think About It Questions	123
Solutions to End-of-Chapter Problems (Chapter 14)	124
Part IV: A Deeper Look at Nature	126
Chapter S2. Space and Time	126
General Notes on Part IV (Chapters S2–S4).....	126
General Notes on Chapter S2	126
Teaching Notes (By Section)	127
Answers/Discussion Points for Think About It Questions	129
Solutions to End-of-Chapter Problems (Chapter S2)	130
Chapter S3. Spacetime and Gravity	134
Teaching Notes (By Section)	134
Answers/Discussion Points for Think About It Questions	135
Solutions to End-of-Chapter Problems (Chapter S3)	136
Chapter S4. Building Blocks of the Universe	140
Teaching Notes (By Section)	140
Answers/Discussion Points for Think About It Questions	141
Solutions to End-of-Chapter Problems (Chapter S4)	142
Part V: Stellar Alchemy	146
Chapter 15. Our Star	146
What's New in the Third Edition That Will Affect My Lecture Notes?	146
Teaching Notes (By Section)	146
Answers/Discussion Points for Think About It Questions	148
Solutions to End-of-Chapter Problems (Chapter 15)	148
Chapter 16. Properties of Stars	151
What's New in the Third Edition That Will Affect My Lecture Notes?	151
Teaching Notes (By Section)	151
Answers/Discussion Points for Think About It Questions	153
Solutions to End-of-Chapter Problems (Chapter 16)	153
Chapter 17. Star Stuff	157
What's New in the Third Edition That Will Affect My Lecture Notes?	158
Teaching Notes (By Section)	158
Answers/Discussion Points for Think About It Questions	160
Solutions to End-of-Chapter Problems (Chapter 17)	160

Chapter 18. The Bizarre Stellar Graveyard	162
What's New in the Third Edition That Will Affect My Lecture Notes?	162
Teaching Notes (By Section)	163
Answers/Discussion Points for Think About It Questions.....	164
Solutions to End-of-Chapter Problems (Chapter 18)	164
Part VI: Galaxies and Beyond.....	168
Chapter 19. Our Galaxy	168
What's New in the Third Edition That Will Affect My Lecture Notes?	168
Teaching Notes (By Section)	168
Answers/Discussion Points for Think About It Questions.....	169
Solutions to End-of-Chapter Problems (Chapter 19)	170
Chapter 20. Galaxies: From Here to the Horizon	172
What's New in the Third Edition That Will Affect My Lecture Notes?	172
Teaching Notes (By Section)	172
Answers/Discussion Points for Think About It Questions.....	173
Solutions to End-of-Chapter Problems (Chapter 20)	173
Chapter 21. Galaxy Evolution.....	175
What's New in the Third Edition That Will Affect My Lecture Notes?	175
Teaching Notes (By Section)	175
Answers/Discussion Points for Think About It Questions.....	177
Solutions to End-of-Chapter Problems (Chapter 21)	177
Chapter 22. Dark Matter and the Fate of the Universe	178
What's New in the Third Edition That Will Affect My Lecture Notes?	179
Teaching Notes (By Section)	179
Answers/Discussion Points for Think About It Questions.....	180
Solutions to End-of-Chapter Problems (Chapter 22)	181
Chapter 23. The Beginning of Time	183
What's New in the Third Edition That Will Affect My Lecture Notes?	183
Teaching Notes (By Section)	184
Answers/Discussion Points for Think About It Questions.....	185
Solutions to End-of-Chapter Problems (Chapter 23)	186
Chapter 24. Life Beyond Earth:	
Prospects for Microbes, Civilizations, and Interstellar Travel.....	188
What's New in the Third Edition That Will Affect My Lecture Notes?	188
Teaching Notes (By Section)	188
Answers/Discussion Points for Think About It Questions.....	189
Solutions to End-of-Chapter Problems (Chapter 24)	190

Appendix 1. Using <i>Voyage SkyGazer, College Edition</i>.....	192
Appendix 2. Using the <i>Cosmos</i> Series	193
The <i>Cosmos</i> Series: Episode/Scene Titles	194
The <i>Cosmos</i> Series: Episode/Scene Titles (continued)	195
Appendix 3. Complete Section-by-Section Resource Grid.....	197
Appendix 4. Sample Syllabus: Introductory Astronomy 1.....	213
General Information	215
Required Textbooks/Media	215
Course Requirements and Grading.....	215
Calculating Your Final Grade.....	216
Common Courtesy Guidelines.....	216
Can I Get the Grade I Really Want?	216
A Closing Promise.....	217
Schedule.....	218
Appendix 5. Handout on Homework Presentation	219
Presenting Homework and Writing Assignments.....	220