

TABLE OF CONTENTS

| | |
|---|----|
| HOW THIS MANUAL CAN BE USED | 1 |
| THE IMPORTANCE OF COSMIC EDUCATION AND THE FIVE GREAT LESSONS | 4 |
| ASTRONOMY | 7 |
| Introduction | 7 |
| Current Scientific Theory About the Creation of the Universe | 8 |
| Background Information | 8 |
| Activity 1: Demonstrating the Big Bang Theory | 15 |
| Activity 2: Demonstrating Hubble's Law | 17 |
| The Life Cycle of Stars | 20 |
| Background Information | 20 |
| Activity 1: Exploring the Life Cycle of a Typical Star | 26 |
| Activity 2: Exploring the Life Cycle of a Giant Star | 28 |
| The Visibility of Stars and the Constellations | 31 |
| Background Information | 31 |
| Activity 1: Understanding the Relationship Between the Earth and the Stars | 37 |
| Activity 2: Identifying Constellations | 39 |
| Activity 3: Exploring the Visibility of Stars in a Constellation | 41 |
| Light-Years | 44 |
| Background Information | 44 |
| Activity 1: Understanding the Light-Year | 50 |
| Activity 2: Using Light-Years to Calculate Distance | 52 |
| Astronomical Tools | 54 |
| Background Information | 54 |
| Activity 1: Exploring How a Refracting Telescope Works | 59 |
| Activity 2: Exploring How a Reflecting Telescope Works | 61 |
| Activity 3: Exploring the Spectrum of a Star | 63 |
| The Solar System | 65 |
| Background Information | 65 |
| Activity 1: Creating a Scale Model of the Milky Way Galaxy | 75 |
| Activity 2: Building a Scale Model of the Sun and the Planets | 77 |
| Activity 3: Identifying Patterns in the Solar System | 80 |

| | |
|--|---------|
| Earth and the Sun | 82 |
| Background Information | 82 |
| Activity 1: Demonstrating the Cycle of Day and Night | 88 |
| Activity 2: Showing Seasonal Changes in the Length of Day and Night | 90 |
| Activity 3: Investigating a Second Cause of the Seasons | 93 |
| The Moon, Tides, and Eclipses | 96 |
| Background Information | 96 |
| Activity 1: Understanding the Relationship Between the Earth and Moon | 102 |
| Activity 1: Understanding the Origins of Tides | 104 |
| Activity 2: Investigating Eclipses and Tides in Depth | 106 |
| Asteroids, Comets, and Meteors | 109 |
| Background Information | 109 |
| Activity 1: Understanding Asteroids, Comets, and Meteors | 114 |
| Activity 2: Recreating Meteor Impact Craters | 116 |
| Outer Space Exploration | 119 |
| Background Information | 119 |
| Activity 1: Exploring the History of Human Space Flight | 130 |
| Activity 2: Exploring Space Flight Beyond the Moon | 132 |
| RESOURCES FOR TEACHERS AND STUDENTS | 134 |
| Print | 134 |
| Web | 139 |
| Audio/Video | 147 |
| TEMPLATES FOR TEACHERS | 150 |
| Measures of Balloon Expansion - Blank Table | 151 |
| Sample Table for Meteor Experiment | 152 |
| GLOSSARY | 153 |
| ECOLOGY | 160 |
| Introduction | 160 |

| | |
|---|---------|
| The Web of Life | 161 |
| Background Information | 161 |
| Activity 1: Exploring the Biomes of the Earth | 168 |
| Activity 2: Understanding Biomes, Ecosystems, and Niches | 170 |
| Activity 3: Understanding the Web of Life | 172 |
| Food Chains | 175 |
| Background Information | 175 |
| Activity 1: Diagramming a Food Chain | 182 |
| Activity 2: Identifying the Roles of Organisms in Food Chains | 185 |
| Activity 3: Creating Compost | 188 |
| Dependence and Interdependence | 191 |
| Background Information | 191 |
| Activity 1: Exploring Population Balance in an Ecosystem | 197 |
| Activity 2: Identifying Succession in a Forest Ecosystem | 199 |
| Activity 3: Creating a Climax Community in the Classroom | 201 |
| Adaptation and Evolution | 205 |
| Background Information | 205 |
| Activity 1: Understanding Innate Abilities and Learned Skills | 211 |
| Activity 2: Understanding Adaptation | 214 |
| Activity 3: Understanding Evolution through Natural Selection | 216 |
| Pollution | 219 |
| Background Information | 219 |
| Activity 1: Identifying Common Pollutants | 223 |
| Water Pollution | 225 |
| Background Information | 225 |
| Activity 1: Investigating Water Pollution | 229 |
| Activity 2: Investigating How a City Deals with Water Pollution | 231 |
| Air Pollution | 233 |
| Background Information | 233 |
| Activity 1: Investigating Air Pollution | 236 |
| RESOURCES FOR TEACHERS AND STUDENTS | 238 |
| Print | 238 |
| Web | 241 |
| Audio/Video | 245 |
| GLOSSARY | 247 |