Appendix 1
Using *Voyager SkyGazer, College Edition*

Voyager SkyGazer, *College Edition*, combines exceptional planetarium software with informative tutorials. Here are just a few of the exciting things your students can do with this powerful tool:

- Use the planetarium features to learn the constellations.
- Use the built-in animations to explore astronomical phenomena such as meteor showers, eclipses, and more.
- Identify nebulae and galaxies that can be observed through a small telescope from your campus.
- Study and map how the sky varies with time of day, time of year, and latitude.
- Observe the Earth/Moon system from another planet within our solar system.

Appendix 3 lists particular resources within *SkyGazer* that you may wish to integrate with various topics in the book. To use these features, note that:

- To access Basic Files, start from the main menu, choose *File, Open Settings* and then select the desired file.
- To access Demo Files, start from the main menu, choose *File, Open Settings* and then select the desired file.
- To access Explore files, start from the main menu and choose *Explore*.

In addition, remember that you can find numerous assignable activities for *SkyGazer* in two places:

1. The Astronomy Place website has a set of worksheets containing approximately 75 *SkyGazer* activities.
2. Additional *SkyGazer* activities can be found in the *Astronomy Media Workbook* supplement (ISBN 0-8053-8755-2) .

Appendix 2
Using the *Cosmos* Series

If you've watched the *Cosmos* series, you won't be surprised to know that the series and Carl Sagan were major influences on the authors of this textbook. (In fact, the lead author changed his graduate study plans from biophysics to astrophysics as a result of watching the series.) Thus, while the series does not correspond directly to the textbook, it makes an outstanding resource for reinforcing key ideas. There are at least two basic ways in which you can use the *Cosmos* series with this textbook:

1. If you can make the series available for students to watch on reserve at your department library, you may wish to assign the *Cosmos* episodes for individual viewing on students' own time. For example, you might assign one episode per week or one episode every two weeks. Although this means that the topics in the episodes might not correspond directly to what you are covering in the book at the same time, it makes it easy for students to plan their viewing time and still serves as a great way to reinforce ideas that students cover in the text at some other time.
   - For a one-semester course focusing on the solar system, we suggest assigning Episodes 1–6.
   - For a one-semester course focusing on stars, galaxies, and cosmology, we suggest assigning Episodes 7–10 and 12 (with 11 and 13 optional).
   - For a one-semester "everything" course, we suggest assigning Episodes 1, 3–6, and 9–10 (with 2, 7, and 8 optional).
2. You may wish to assign shorter segments (or show them in class) at times when their subject matter matches what you are covering in the text. The Section-by-Section Resource Grid (Appendix 3) lists appropriate segments for each section in the textbook.

For reference, the following table on the following two pages lists all the *Cosmos* episodes, each broken down into 12 "scene" titles that correspond to the scene selections on the DVD version of the series.

The *Cosmos* Series: Episode/Scene Titles

Episode 1 The Shores of the Cosmic Ocean	Episode 2 One Voice in the Cosmic Fugue	Episode 3 The Harmony of Worlds
1-1 Druyan Intro	2-1 Opening	3-1 Opening
1-2 Opening	2-2 Spaceship Cosmic Matter	3-2 Astronomers vs. Astrologers
1-3 The Cosmos	2-3 Haike Crab	3-3 Astrology
1-4 Spaceship Universe	2-4 Artificial Selection	3-4 Laws of Nature
1-5 Spaceship Galaxy	2-5 Natural Selection	3-5 Constellations
1-6 Spaceship Stars	2-6 Watchmaker	3-6 Astronomers
1-7 Spaceship Solar System	2-7 Cosmic Calendar	3-7 Ptolemy/Copernicus
1-8 Planet Earth	2-8 Evolution	3-8 Kepler
1-9 Alexandrian Library	2-9 Kew Gardens—DNA	3-9 Kepler and Tycho Brahe
1-10 Ages of Science	2-10 Miller–Urey Experiment	3-10 Kepler's Law
1-11 Cosmic Calendar	2-11 Alien Life	3-11 The Somnium
1-12 End Credits	2-12 Update/End Credits	3-12 End Credits

Episode 4 Heaven and Hell	Episode 5 Blues for a Red Planet	Episode 6 Travelers' Tales
4-1 Opening	5-1 Opening	6-1 Opening
4-2 Heaven and Hell	5-2 Martians	6-2 Voyager, JPL
4-3 Tunguska Event	5-3 Lowell	6-3 Traveller's Routes
4-4 Comets	5-4 Edgar Rice Burroughs	6-4 Dutch Renaissance
4-5 Collisions with Earth	5-5 Goddard	6-5 Huygens
4-6 Planetary Evolution	5-6 Inhabited Planets	6-6 Huygens—Conclusion
4-7 Venus	5-7 Mars	6-7 Traveller's Tales
4-8 Descent to Venus	5-8 Viking Lander	6-8 Jovian System
4-9 Change	5-9 Life on Mars?	6-9 Europa and Io
4-10 Death of Worlds	5-10 Mars Rover	6-10 Voyager Ship's Log
4-11 Conclusion	5-11 Terraforming Mars	6-11 Saturn and Titan
4-12 Update/End Credits	5-12 Update/End Credits	6-12 Update/End Credits

Episode 7 The Backbone of Night	Episode 8 Travels in Space and Time	Episode 9 The Lives of Stars
7-1 Opening	8-1 Opening	9-1 Opening
7-2 What Are the Stars?	8-2 Constellations	9-2 Apple Pie
7-3 Brooklyn Schoolroom	8-3 Time and Space	9-3 The Very Large
7-4 Mythology of Stars	8-4 Relativity	9-4 Atoms
7-5 Ancient Greek Scientists	8-5 Leonardo da Vinci	9-5 Chemical Elements
7-6 Science Blossoms	8-6 Interstellar Travel	9-6 Nuclear Forces
7-7 Democritus	8-7 Time Travel	9-7 The Stars and Our Sun
7-8 Pythagorus	8-8 Solar Systems	9-8 Death of Stars
7-9 Plato and Others	8-9 Cosmic Time Frame	9-9 Star Stuff
7-10 Distance to Stars	8-10 Dinosaurs	9-10 Gravity in Wonderland
7-11 Evidence of Other Planets	8-11 Immensity of Space	9-11 Children of the Stars
7-12 End Credits	8-12 Update/End Credits	9-12 Update/End Credits

The *Cosmos* Series: Episode/Scene Titles (continued)

Episode 10 The Edge of Forever	Episode 11 The Persistence of Memory	Episode 12 Encyclopedia Galactica
10-1 Opening	11-1 Opening	12-1 Opening
10-2 Big Bang	11-2 Intelligence	12-2 Close Encounters
10-3 Galaxies	11-3 Whales	12-3 Refutations
10-4 Astronomical Anomalies	11-4 Genes and DNA	12-4 UFOs
10-5 Doppler Effect	11-5 The Brain	12-5 Champollion's Egypt
10-6 Humeson	11-6 The City	12-6 Hieroglyphics
10-7 Dimensions	11-7 Libraries	12-7 Rosetta Stone
10-8 The Universe	11-8 Books	12-8 SETI
10-9 India	11-9 Computers	12-9 Arecibo
10-10 Oscillating Universe	11-10 Other Brains	12-10 Drake Equation and Contact
10-11 VLA	11-11 Voyager	12-11 Encyclopedia Galactica
10-12 Update/End Credits	11-12 End Credits	12-12 Update/End Credits

Episode 13 Who Speaks for Earth?
13-1 Opening
13-2 Tlingit and Aztec Indians
13-3 Who Speaks for Earth?
13-4 Nuclear War and Balance of Terror
13-5 Alexandrian Library
13-6 Hypatia
13-7 Big Bang and the Stuff of Life
13-8 Evolution of Life
13-9 Star Stuff
13-10 What Humans Have Done
13-11 We Speak for Earth
13-12 Update/End Credits

Appendix 3
Complete Section-by-Section Resource Grid

Four of the key resources available with *The Cosmic Perspective* are the interactive tutorials at Astronomy Place, the topical movies also available at Astronomy Place, the built-in features of *SkyGazer, College Edition*, and the *Cosmos* video series. To help you in deciding when it is appropriate to make use of these resources in your teaching, the following grid matches these resources to sections of the textbook. Note that, if you choose simply to assign entire episodes of the *Cosmos* series, you should refer to the guidelines in Appendix 2.

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
1. Our Place in the Universe					
1.1 A Modern View of the Universe			*From the Big Bang to Galaxies*		1-2 Opening 1-3 The Cosmos 1-4 Spaceship Universe
1.2 The Scale of the Universe	Scale of the Universe Lesson 1 Distances scales: the solar system Lesson 2 Distances scales: stars and galaxies Lesson 3 Powers of 10 *Special: A Tour of the Solar System*	**relative_dist_earth_moon** **sun_relative_moon_orbit** **size_of_mars_orbit** **size_of_jupiter_orbit** **size_of_pluto_orbit** **accurate_model_of_solar_sys** **relative_dist_nearest_star** **relation_dist_speed_time** **size_of_the_milky_way** **dist_to_andromeda_galaxy** **galaxy_clusters_and_struct** **zooming_26_orders_of_mag**		Explore Menu Solar Neighborhood… Paths of the Planets…	1-5 Spaceship Galaxy 1-6 Spaceship Stars 1-7 Spaceship Solar System 1-8 Planet Earth 1-11 Cosmic Calendar
1.3 Spaceship Earth				File: Basic Folder Chicago 10000AD; Dragging the Sky	
1.4 The Human Adventure of Astronomy					
2. Discovering the Universe for Yourself					
2.1 Patterns in the Sky			*The Celestial Sphere*	File: Basic Folder A Celestial Family; Animal Houses; Chart Display Buttons; Constellation Patterns; Full Sky; Milky Way; The Trapezium; Wide Field Milky Way File: Demo Folder Celestial Poles; Water Constellations	
2.2 The Circling Sky			*The Celestial Sphere*	File: Basic Folder Animal Houses; Changing the Location; Day and Night; Follow a Star; Full Sky; Grid Lines; Night Sky in Nairobi; North Pole; North Pole 2; The Little Bear; Winter Sky File: Demo Folder Russian Midnight Sun	

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
2.3 The Reason for Seasons	Seasons		*Time and Seasons*	File: Basic Folder Earth's Seasons; North Pole 3; Precession of the Equinoxes File: Demo Folder Dipper +80000 years Explore Menu Seasons of the Earth… Wobble of the Earth…	
	Lesson 1 Factors affecting seasonal changes	**temperature_vs_distance** **directness_of_light** **flashlight_beams** **flux_of_light_vs_latitude** **why_does_flux_sunlight_vary** **cause_of_seasons** **dist_to_sun_and_earth_tilt**			
	Lesson 2 The solstices and equinoxes	**sun_over_equator_and_tropic** **sun_over_equator_at_equinox** **arctic_circle_sunrise_set**			
	Lesson 3 The Sun's position in the sky	**sun_altitude_vs_lat_season**			
2.4 Precession of Earth's Axis				Explore Menu Precession of the Earth… Wobble of the Earth…	
2.5 The Moon, Our Constant Companion	Phases of the Moon			File: Basic Folder Christmas Eclipse 2000; Eclipse 1991-2 Views; Europe Eclipse 1999; Lunar Eclipse; Moon Along the Ecliptic; Moon Orbit; Phase of the Moon; Shadow over America; South Carolina Eclipse; Totality File: Demo Folder African Eclipse June 2001; American Eclipse 2017-2 views; Drunken Moon; Earth Orbiting the Moon; Earth-Moon from Mars; Orbit of the Moon 2; South Carolina Eclipse-2017 Explore Menu Shadows on the Earth… Phases of the Planets…	
	Lesson 1 The causes of lunar phases	**inner_ss_and_moon_orbit** **cause_of_lunar_phases** **moon_orbit_from_earth** **how_simulate_lunar_phases** **phases_of_the_moon**			
	Lesson 2 Time of day and horizons	**the_horizon** **time_and_location_of_sun**			
	Lesson 3 When the moon rises and sets	**moon_rise_and_set_vs_phase**			
	Eclipses				
	Lesson 1 Why and when do eclipses occur?	**earth_and_lunar_orbits** **cause_of_eclipses_anim** **cause_of_eclipses_tool** **eclipses_twice_a_month** **ecliptic_plane_anim** **moon_orbit_tilt_vs_ecliptic** **moon_orbit_with_nodes** **eclipse_seasons** **precession_of_moon_orbit** **angular_size_of_moon**			
	Lesson 2 Types of solar eclipses	**annular_vs_total_solar** **partial_vs_total_solar** **evolution_of_total_solar** **evolution_of_partial_solar**			
	Lesson 3 Lunar eclipses	**lunar_eclipses** **evolution_of_total_lunar**			
2.6 The Ancient Mystery of the Planets				File: Basic Folder Planet Paths File: Demo Folder Mars in Retrograde Explore Menu The Solar System…	

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
3. The Science of Astronomy					
3.1 Everyday Science					7-2 What Are the Stars? 7-3 Brooklyn Schoolroom 7-4 Mythology of Stars
3.2 The Ancient Roots of Science				File: Demo Folder Ptolemy on Mars	
3.3 Ancient Greek Science				File: Basic Folder Precession of the Equinoxes; Ptolemy on Venus	1-9 Alexandrian Library 1-10 Ages of Science 13-5 Alexandrian Library 13-6 Hypatia
3.4 The Copernican Revolution	Orbits and Kepler's Laws Lesson 2 Kepler's first law Lesson 3 Kepler's second law Lesson 4 Kepler's third law	**drawing_ellipse_with_string** **what_is_a_circle** **orbital_rad_and_orbital_pos** **eccentrcty_and_semimjr_axis** **kepler_2_velocty_vs_orbit_r** **kepler_2_area_and_time_int** **orbit_vs_init_velocty_and_r** **kepler_3_orbit_period_vs_r**		File: Basic Folder Follow a Planet; Phase of Mercury; Planet Orrery; Planet Panel; Planet Paths; Pluto's Orbit; Saturn; Saturn's Phases; Tracking Venus File: Demo Folder Earth and Venus; Hale-Bopp Path; Hyakutake at Perihelion; Hyakutake nears Earth; Pluto's Orbit; Trailing Saturn; Triple Conjunction of 7 BC; Venus-Earth-Moon File: Explore Menu The Solar System… Paths of the Planets… File: Spacecraft Folder Galileo to Jupiter; Giotto encounters Halley; Missions to Jupiter; Ulysses below the Sun; Voyager I and Voyager II	3-7 Ptolemy/Copernicus 3-8 Kepler 3-9 Kepler and Tycho Brahe 3-10 Kepler's Laws 3-11 The Somnium
3.5 The Nature of Science					
3.6 Astrology					3-2 Astronomers vs. Astrologers 3-3 Astrology
S1. Celestial Timekeeping and Navigation					
S1.1 Astronomical Time Periods				File: Demo Folder Venus Transit of 1769	
S1.2 Daily Timekeeping				File: Basic Folder Analemma; Challenging the Time; Chart Clock; Rubber Horizon	
S1.3 The Calendar	Seasons Lesson 2 The solstices and equinoxes	**sun_over_equator_at_equinox** **arctic_circle_sunrise_set**			
S1.4 Mapping Locations in the Sky			*The Celestial Sphere* *Time and Seasons*	File: Basic Folder Grid Lines; Precession of the Equinoxes File: Demo Folder Celestial Poles	

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
S1.5 Understanding Local Skies	Seasons Lesson 3 The Sun's position in the sky	**sun_altitude_vs_lat_season**		File: Basic Folder Changing the Time; Chart Clock; Day and Night; Defining the Horizon; Dragging the Sky; Night Sky in Nairobi; Rubber Horizon; Startup; Sunset in Winnipeg; Three Cities; Winter Milky Way; Winter Sky File: Demo Folder Russian Midnight Sun	
S1.6 Principles of Celestial Navigation				File: Basic Folder Changing the Location	
4. A Universe of Matter and Energy					
4.1 Matter and Energy in Everyday Life					9-2 Apple Pie 9-3 The Very Large 9-4 Atoms 9-5 Chemical Elements
4.2 A Scientific View of Energy					
4.3 The Material World					7-5 Ancient Greek Scientists 7-6 Science Blossoms 7-7 Democritus 7-8 Pythagorus 7-9 Plato and Others
4.4 Energy in Atoms					
5. The Universal Laws of Motion					
5.1 Describing Motion: Examples from Everyday Life					3-4 Laws of Nature
5.2 Newton's Laws of Motion					
5.3 The Force of Gravity	Orbits and Kepler's Laws Lesson 1 Gravity and orbits Lesson 2 Kepler's first law Lesson 3 Kepler's second law Lesson 4 Kepler's third law	**orbit_trajectory_cannonball** **cannonball_mass_vs_orbit** **acceleration_due_to_gravity** **feather_and_hammer_on_moon** **drawing_ellipse_with_string** **what_is_a_circle** **orbital_rad_and_orbital_pos** **eccentrcty_and_semimjr_axis** **kepler_2_velocty_vs_orbit_r** **kepler_2_area_and_time_int** **orbit_vs_init_velocty_and_r** **kepler_3_orbit_period_vs_r**	*Orbits in the Solar System*		
5.4 Tides					

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
5.5 Orbital Energy and Escape Velocity				File: Basic Folder Follow a Planet; Phase of Mercury; Planet Orrery; Planet Panel; Planet Paths; Pluto's Orbit; Saturn; Saturn's Phases; Tracking Venus File: Demo Folder Earth and Venus; Hale-Bopp Path; Hyakutake at Perihelion; Hyakutake nears Earth; Pluto's Orbit; Trailing Saturn; Triple Conjunction of 7 BC; Venus-Earth-Moon File: Explore Menu The Solar System… Paths of the Planets… File: Spacecraft Folder Galileo to Jupiter; Giotto encounters Halley; Missions to Jupiter; Ulysses below the Sun; Voyager I and Voyager II	
5.6 The Acceleration of Gravity					
6. Light: The Cosmic Messenger					
6.1 Light in Everyday Life	Light and Spectroscopy Lesson 1 Radiation, light and waves				
6.2 Properties of Light		**surface_waves_in_pond**			
6.3 The Many Forms of Light		**anatomy_of_a_wave** **visible_light_waves** **electromag_spectrum**			
6.4 Light and Matter	Light and Spectroscopy Lesson 2 Spectroscopy Lesson 3 Atomic spectra – emission and absorption lines Lesson 4 Thermal radiation	**intro_to_spectroscopy** **de-excitation_and_emission** **production_of_emission_line** **energy-level_diagrams** **composition_mystery_gas** **photo-excitation_of_atom** **production_of_absorp_line** **spectrum_of_low-dens_cloud** **thermal_radiation** **wiens_law**			
6.5 The Doppler Shift	The Doppler Effect Lesson 1 Understanding the Doppler Shift Lesson 2 Using emission and absorption lines to measure the Doppler Shift	**examples_of_motion** **hearing_the_doppler_effect** **cause_of_doppler_effect** **doppler_shift_vs_velocity** **position_observer_vs_source** **doppler_effect_for_light** **doppler_shift_emission_line** **determine_velocity_gas** **doppler_shift_absorp_line** **determine_velocity_cold_gas**			
7. Telescopes: Portals of Discovery					
7.1 Eyes and Cameras: Everyday Light Sensors					

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
7.2 Telescopes: Giant Eyes					
7.3 Uses of Telescopes					
7.4 Atmospheric Effects on Observations	Light and Spectroscopy Lesson 1 Radiation, light and waves	**surface_waves_in_pond** **anatomy_of_a_wave** **visible_light_waves** **electromag_spectrum**			
7.5 Telescopes Across the Spectrum	Light and Spectroscopy Lesson 2 Spectroscopy Lesson 3 Atomic spectra – emission and absorption lines Lesson 4 Thermal radiation	**intro_to_spectroscopy** **de-excitation_and_emission** **production_of_emission_line** **energy-level_diagrams** **composition_mystery_gas** **photo-excitation_of_atom** **production_of_absorp_line** **spectrum_of_low-dens_cloud** **thermal_radiation** **wiens_law**			10-11 VLA
8. Welcome to the Solar System					
8.1 Comparative Planetology	Formation of the Solar System Lesson 1 Comparative Planetology	**PlanetInfo1** **PlanetInfo2**			
8.2 The Layout of the Solar System	Orbits and Kepler's Laws Lesson 2 Kepler's first law Lesson 3 Kepler's second law Lesson 4 Kepler's third law	**drawing_ellipse_with_string** **what_is_a_circle** **orbital_rad_and_orbital_pos** **eccentrcty_and_semimjr_axis** **kepler_2_velocty_vs_orbit_r** **kepler_2_area_and_time_int** **orbit_vs_init_velocty_and_r** **kepler_3_orbit_period_vs_r**	*History of the Solar System* *Orbits in the Solar System*	File: Basic Folder Follow a Planet; Phase of Mercury; Planet Orrery; Planet Panel; Planet Paths; Pluto's Orbit; Saturn; Saturn's Phases; Tracking Venus File: Demo Folder Earth and Venus; Hale-Bopp Path; Hyakutake at Perihelion; Hyakutake nears Earth; Pluto's Orbit; Trailing Saturn; Triple Conjunction of 7 BC; Venus-Earth-Moon File: Explore Menu The Solar System… Paths of the Planets…	
8.3 A Brief Tour of the Solar System	*Special: A Tour of the Solar System*			File: Spacecraft Folder Galileo to Jupiter; Giotto encounters Halley; Missions to Jupiter; Ulysses below the Sun; Voyager I and Voyager II	6-2 Voyager, JPL
8.4 Exploring the Solar System	Scale of the Universe Lesson 1 Distances of scale: our solar system	**relative_dist_earth_moon** **sun_relative_moon_orbit** **size_of_mars_orbit** **size_of_jupiter_orbit** **size_of_pluto_orbit** **accurate_model_of_solar_sys**			
9. Formation of the Solar System					
9.1 The Origin of the Solar System: The Nebular Theory	Formation of the Solar System Lesson 1 Comparative planetology	**comparative_planetology** **orbit_and_rotation_planets**	*History of the Solar System*		

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
9.2 Orderly Motion in a Collapsing Nebula	Formation of the Solar System Lesson 2 Formation of the protoplanetary disk	**collapse_of_solar_nebula** **formation_protoplanet_disk** **why_does_disk_flatten** **formation_circlular_orbits** **temp_distribution_of_disk** **condensate_regions_in_disk**	*Orbits in the Solar System*		
9.3 Two Types of Planets	Formation of the Solar System Lesson 3 Formation of Planets	**summary_condensates_in_disk** **accretion_and_planets** **nebular_capture_and_jovians** **the_solar_wind**	*History of the Solar System*		
9.4 Explaining Leftovers and Exceptions to the Rules			*History of the Solar System*		
9.5 How Old is the Solar System?					
9.6 Other Planetary Systems	Extrasolar Planetary Detection Lesson 1 Taking a picture of a planet Lesson 2 Stars' wobbles and properties of planets Lesson 3 Planetary transits	**luminosity_of_planet** **angular_sep_vs_distance** **angular_sep_jupiter_sun** **stellar_motion_and_planets** **oscillation_of_absorp_line** **determine_star_velocty_vs_t** **star_orbit_vs_planet_mass** **determine_planet_mass_orbit** **planetary_transits**			7-10 Distance to Stars 7-11 Evidence of Other Planets
10. Planetary Geology: Earth and the Other Terrestrial Worlds					
10.1 Planetary Surfaces	Formation of the Solar System Lesson 1 Comparative Planetology	**PlanetInfo1** **PlanetInfo2**		File: Demo Folder Earth and Venus; Venus-Earth-Moon File: Explore Menu The Solar System… Paths of the Planets…	
10.2 Inside the Terrestrial Worlds					
10.3 Shaping Planetary Surfaces: The Four Basic Geological Processes	Shaping Planetary Surfaces Lesson 1 The four geological processes Lesson 2 What do geological processes depend on? Lesson 3 Planet surface evolution	**production_of_a_crater** **volcanic_eruption_and_lava** **tectonics_convect_of_mantle** **plate_tectonics_on_earth** **water_erosion** **history_of_cratering** **tectonics_and_heat_transfer** **history_volcanism_tectonics** **history_of_erosion** **evolution_of_planet_surface**			
10.4 A Geological Tour: The Moon and Mercury					

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
10.5 A Geological Tour: Mars					5-2 Martians 5-3 Lowell 5-4 Edgar Rice Burroughs 5-5 Goddard 5-6 Inhabited Planets 5-7 Mars
10.6 A Geological Tour: Venus					4-7 Venus 4-8 Descent to Venus 4-9 Change 4-10 Death of Worlds 4-11 Conclusion
10.7 Earth and Geological Destiny	Shaping Planetary Surfaces Lesson 2 What do geological processes depend on? Lesson 3 Planet surface evolution	**history_of_cratering** **tectonics_and_heat_transfer** **history_volcanism_tectonics** **history_of_erosion** **evolution_of_planet_surface**			
11. Planetary Atmospheres: Earth and the Other Terrestrial Worlds					
11.1 Atmospheric Basics					
11.2 The Greenhouse Effect and Planetary Temperature	Surface Temperature of Terrestrial Planets Lesson 1 Energy balance Lesson 2 Role of planet's distance from the Sun Lesson 3 Role of planet's albedo Lesson 4 Role of planet's atmosphere	**thermal_equilibrium** **temp_vs_size_and_day_length** **temp_vs_day_length** **temp_vs_orbital_r** **temp_vs_reflectivity** **the_greenhouse_effect** **which_molecules_greenhouse** **predicted_temp_of_planets**			
11.3 Atmospheric Structure					
11.4 Weather and Climate					
11.5 Sources and Losses of Atmospheric Gas			*History of the Solar System*		
11.6 The Climate Histories of Mars, Venus and Earth					
12. Jovian Planet Systems					
12.1 The Jovian Worlds: A Different Kind of Planet	Formation of the Solar System Lesson 1 Comparative Planetology	**PlanetInfo1** **PlanetInfo2**			6-7 Traveller's Tales 6-8 Jovian System
12.2 Jovian Planet Interiors					
12.3 Jovian Planet Atmospheres					
12.4 Jovian Planet Magnetospheres					

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
12.5 A Wealth of Worlds: Satellites of Ice and Rock				File: Basic Folder Tracking Jupiter and Io File: Demo Folder Backside of Jupiter; Locked on Dione; Three Moons on Jupiter	6-9 Europa and Io 6-10 Voyager Ships' Log 6-11 Saturn and Titan
12.6 Jovian Planet Rings				File: Basic Folder Saturn	
13. Remnants of Rock and Ice: Asteroids, Comets, and Pluto					
13.1 Remnants from Birth			*History of the Solar System*		
13.2 Asteroids					
13.3 Meteorites					
13.4 Comets			*Orbits in the Solar System*	File: Basic Folder Orbit of Hale-Bopp File: Demo Folder Hale-Bopp Path; Hyakutake at Perihelion; Hyakutake nears Earth File: Spacecraft Folder Giotto encounters Halley	
13.5 Pluto: Lone Dog, or Part of a Pack?	Formation of the Solar System Lesson 3 Formation of Planets	**summary_condensates_in_disk** **accretion_and_planets** **nebular_capture_and_jovians** **the_solar_wind**		File: Basic Folder Pluto's Orbit File: Demo Folder Pluto's Orbit	
13.6 Cosmic Collisions: Small Bodies Versus the Planets					4-3 Tunguska Event 4-4 Comets 4-5 Collisions with Earth
14. Planet Earth: Seen in a New Light					
14.1 How is Earth Different?					
14.2 Our Unique Geology	Shaping Planetary Surfaces Lesson 1 The four geological processes Lesson 2 What do geological processes depend on? Lesson 3 Planet Surface Evolution	**production_of_a_crater** **volcanic_eruption_and_lava** **tectonics_convect_of_mantle** **plate_tectonics_on_earth** **water_erosion** **history_of_cratering** **tectonics_and_heat_transfer** **history_volcanism_tectonics** **history_of_erosion** **evolution_of_planet_surface**			

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
14.3 Our Unique Atmosphere and Oceans	Surface Temperature of Terrestrial Planets				
	Lesson 1 Energy balance	**thermal_equilibrium** **temp_vs_size_and_day_length** **temp_vs_day_length**			
	Lesson 2 Role of planet's distance from the Sun	**temp_vs_orbital_r**			
	Lesson 3 Role of planet's albedo	**temp_vs_reflectivity**			
	Lesson 4 Role of planet's atmosphere	**the_greenhouse_effect** **which_molecules_greenhouse** **predicted_temp_of_planets**			
14.4 Climate Regulation and the Carbon Dioxide Cycle					
14.5 Life on Earth			*Search for Extraterrestrial Life*		2-7 Cosmic Calendar 2-8 Evolution 2-9 Kew Gardens—DNA 2-10 Miller-Urey Experiment
14.6 Our Future: Survival Lessons from Other Worlds					
S2. Space and Time					
S2.1 Einstein's Revolution					8-2 Constellations
S2.2 Relative Motion					
S2.3 The Reality of Space and Time					8-3 Time and Space 8-4 Relativity
S2.4 Is it True?					
S2.5 Toward a New Common Sense					
S2.6 Ticket to the Stars					8-5 Leonardo da Vinci 8-6 Interstellar Travel 8-7 Time Travel
S3. Spacetime and Gravity					
S3.1 Einstein's Second Revolution					
S3.2 The Equivalence Principle					
S3.3 Understanding Spacetime					
S3.4 A New View of Gravity	Black Holes				
	Lesson 1 What are black holes?	**escape_velocity_earth** **orbital_trajectory_and_r** **escape_velocity_and_r** **orbital_r_vs_planet_r** **g_vs_dist_black_hole** **determine_event_horizon** **schwarzschild_r**			
	Lesson 2 The search for black holes	**formation_xray_bin** **rotation_galactic_center** **orbital_velocity_mass_and_r** **evidence_of_black_hole**			
S3.5 Is it True?					

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
S3.6 Hyperspace, Wormholes, and Warp Drive					
S3.7 The Last Word					
S4. Building Blocks of the Universe					
S4.1 The Quantum Revolution					
S4.2 Fundamental Particles and Forces					
S4.3 The Uncertainty Principle					
S4.4 The Exclusion Principle					
S4.5 Key Quantum Effects in Astronomy					
15. Our Star					
15.1 Why Does the Sun Shine?			*The Sun*		
15.2 Plunging to the Center of the Sun: An Imaginary Journey			*The Sun*		
15.3 The Cosmic Crucible			*The Sun*		9-6 Nuclear Forces 9-7 The Stars and Our Sun
15.4 From Core to Corona			*The Sun*		
15.5 Solar Weather and Climate			*The Sun*		
16. Properties of Stars					
16.1 Snapshot of the Heavens				File: Basic Folder Large Stars; More Stars; Star Color and Size; Tracking Altair; Tracking Proxima Centauri File: Demo Folder Barnard's Star	
16.2 Stellar Luminosity	Measuring Cosmic Distances Lesson 2 Stellar parallax	**intro_to_parallax** **parallax_of_nearby_star** **parallax_angle_vs_distance** **measuring_parallax_angle**		File: Basic Folder Large Stars; More Stars; Star Color and Size	
16.3 Stellar Surface Temperature	The Hertzsprung-Russell Diagram Lesson 1 The Hertzsprung-Russell (H-R) Diagram Lesson 2 Determining stellar radii	**generate_hr_diagr** **temp_and_luminosity** **determine_stellar_sizes**		File: Basic Folder Large Stars; More Stars; Star Color and Size	
16.4 Stellar Masses	The Hertzsprung-Russell Diagram Lesson 3 The main sequence	**stellar_mass_and_hr_diagr**			
16.5 The Hertzsprung-Russell Diagram		**hydrostatic_equilibrium**			
16.6 Star Clusters	Stellar Evolution Lesson 1 Main-sequence lifetimes Lesson 4 Cluster Dating	**main-seq_lifetime_and_mass** **star_cluster_evolving** **hr_diagr_and_age_of_cluster**		File: Demo Folder Circling the Hyades; Flying around Pleiades; The Tail of Scorpius	
17. Star Stuff					
17.1 Lives in the Balance	Stellar Evolution Lesson 1 Main-sequence lifetimes	**main-seq_lifetime_and_mass**	*Lives of Stars*		

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
17.2 Star Birth			*Lives of Stars*		
17.3 Life as a Low-Mass Star	Stellar Evolution Lesson 2 Evolution of a low mass star	**death_sequence_of_sun** **stages_low-mass_death_seq**	*Lives of Stars*		
17.4 Life as a High-Mass Star	Stellar Evolution Lesson 3 Late stages of a high-mass star	**death_seq_of_high-mass_star**	*Lives of Stars*	File: Demo Folder Crab from Finland	9-8 Death of Stars 9-9 Star Stuff
17.5 The Lives of Close Binary Stars	Stellar Evolution Lesson 1 Main-sequence lifetimes Lesson 2 Evolution of a low mass star Lesson 3 Late stages of a high-mass star Lesson 4 Cluster Dating	**main-seq_lifetime_and_mass** **death_sequence_of_sun** **stages_low-mass_death_seq** **death_seq_of_high-mass_star** **star_cluster_evolving** **hr_diagr_and_age_of_cluster**	*Double Stars*		
18. The Bizarre Stellar Graveyard					
18.1 A Star's Final Battle	Stellar Evolution Lesson 1 Main-sequence lifetimes	**main-seq_lifetime_and_mass**			
18.2 White Dwarfs	Stellar Evolution Lesson 2 Evolution of a low mass star	**death_sequence_of_sun** **stages_low-mass_death_seq**			
18.3 Neutron Stars	Stellar Evolution Lesson 3 Late stages of a high-mass star	**death_seq_of_high-mass_star**			
18.4 Black Holes: Gravity's Ultimate Victory	Black Holes Lesson 1 What are black holes? Lesson 2 The search for black holes	**escape_velocity_earth** **orbital_trajectory_and_r** **escape_velocity_and_r** **orbital_r_vs_planet_r** **g_vs_dist_black_hole** **determine_event_horizon** **schwarzschild_r** **formation_xray_bin** **rotation_galactic_center** **orbital_velocity_mass_and_r** **evidence_of_black_hole**			9-10 Gravity in Wonderland 9-11 Children of the Stars
18.5 The Mystery of Gamma-Ray Bursts					
19. Our Galaxy					
19.1 The Milky Way Revealed			*The Milky Way Galaxy*	File: Basic Folder Milky Way; Wide Field Milky Way; Winter Milky Way	
19.2 The Star–Gas–Star Cycle					
19.3 Galactic Environments			*The Milky Way Galaxy*	File: Basic Folder Lagoon Nebulae Explore Menu Solar Neighborhood…	
19.4 The Milky Way in Motion			*The Milky Way Galaxy*		

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
19.5 The Mysterious Galactic Center	Detecting Dark Matter in a Spiral Galaxy		*The Milky Way Galaxy*		
	Lesson 1 Introduction to rotation curves	**motion_merrygoround** **rotation_merrygoround** **rotation_of_solar_system** **adjust_mass_of_sun** **rotation_of_spiral_galaxy** **edge_and_face_spiral_gal** **meas_doppler_shifts_for_gal**			
	Lesson 2 Determining the mass distribution	**orbital_velocity_mass_and_r** **mass_vs_dist_solar_system** **mass_vs_dist_galaxy**			
20. Galaxies: From Here to the Horizon					
20.1 Islands of Stars					10-2 Big Bang
20.2 Galaxy Types			*From the Big Bang to Galaxies*	File: Basic Folder Galaxies in Coma	10-3 Galaxies 10-4 Astronomical Anomalies
20.3 Measuring Cosmic Distances	Measuring Cosmic Distances			File: Basic Folder Galaxies in Coma	10-5 Doppler Effect 10-6 Humeson 10-7 Dimensions 10-8 The Universe
	Lesson 1 Radar	**radar_pulses**			
	Lesson 2 Stellar parallax	**intro_to_parallax** **parallax_of_nearby_star** **parallax_angle_vs_distance** **measuring_parallax_angle**			
	Lesson 3 Standard candles: main sequence stars and Cepheid variables	**flux_of_star_vs_distance** **bright_stars_near_or_lum** **main_seq_as_standard_candle** **cepheid_as_standard_candle**			
	Lesson 4 Standard candles: white dwarf supernovae and spiral galaxies	**suprnova_as_standard_candle** **tully_fisher_relationship** **galaxy_as_standard_candle** **summary_of_distance_methods**			
	Hubble's Laws				
	Lesson 1 Hubble's Law	**discover_hubble_law** **measure_hubble_constant**			
20.4 Measuring Cosmic Ages	Hubble's Laws				
	Lesson 2 The expansion of the universe	**cause_of_hubble_law** **expansion_and_hubble_law** **relation_dist_and_velocity** **peculiar_velocities**			
	Lesson 3 The age of the universe	**estimate_age_of_universe** **age_and_hubble_constant**			
21. Galaxy Evolution					
21.1 Looking Back Through Time			*From the Big Bang to Galaxies*		
21.2 Galaxy Formation			*From the Big Bang to Galaxies*		
21.3 Why Do Galaxies Differ?			*From the Big Bang to Galaxies*		
21.4 Starburst Galaxies					

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
21.5 Quasars and Other Active Galactic Nuclei	Black Holes				
	Lesson 1 What are black holes?	escape_velocity_earth orbital_trajectory_and_r escape_velocity_and_r orbital_r_vs_planet_r g_vs_dist_black_hole determine_event_horizon schwarzschild_r			
	Lesson 2 The search for black holes	formation_xray_bin rotation_galactic_center orbital_velocity_mass_and_r evidence_of_black_hole			
21.6 Shedding Light on Protogalactic Clouds					
22. Dark Matter and the Fate of the Universe					
22.1 The Mystery of Dark Matter	Orbits and Kepler's Laws				
	Lesson 1 Gravity and orbits	orbit_trajectory_cannonball cannonball_mass_vs_orbit acceleration_due_to_gravity feather_and_hammer_on_moon			
	Lesson 2 Kepler's first law	drawing_ellipse_with_string what_is_a_circle orbital_rad_and_orbital_pos eccentrcty_and_semimjr_axis			
	Lesson 3 Kepler's second law	kepler_2_velocty_vs_orbit_r kepler_2_area_and_time_int			
	Lesson 4 Kepler's third law	orbit_vs_init_velocty_and_r kepler_3_orbit_period_vs_r			
22.2 Dark Matter in Galaxies	Detecting Dark Matter in a Spiral Galaxy				
22.3 Dark Matter in Clusters	Lesson 1 Introduction to rotation curves	motion_merrygoround			
22.4 Dark Matter: Ordinary or Extraordinary?		rotation_merrygoround			
22.5 Structure Formation		rotation_of_solar_system adjust_mass_of_sun rotation_of_spiral_galaxy edge_and_face_spiral_gal meas_doppler_shifts_for_gal	*From the Big Bang to Galaxies*		
	Lesson 2 Determining the mass distribution	orbital_velocity_mass_and_r mass_vs_dist_solar_system mass_vs_dist_galaxy			
	Lesson 3 Where is the dark matter?	stellar_mass_vs_dist_galaxy evidence_of_dark_matter determine_distrib_dark_mat			
22.6 The Universe's Fate	Fate of the Universe				
	Lesson 1 The role of gravity	fate_of_launched_cannonball escape_velocity_vs_mass determine_velocty_cannonbll universe_and_mass_density			
	Lesson 2 The role of dark energy	universe_and_dark_energy			
	Lesson 3 Fate and history of the universe	universe_history_and_fate			

The Cosmic Perspective CHAPTER/SECTION	Astronomy Place Online TUTORIAL	Cosmic Lecture Launcher CD-ROM APPLETS	Astronomy Place Online MOVIE	*Voyager: SkyGazer* CD-ROM, v. 3.4	Carl Sagan's *COSMOS* Segment VHS or DVD
23. The Beginning of Time					
23.1 Running the Expansion Backward	Hubble's Laws				
	Lesson 1 Hubble's Law	**discover_hubble_law** **measure_hubble_constant**			
	Lesson 2 The expansion of the universe	**cause_of_hubble_law** **expansion_and_hubble_law** **relation_dist_and_velocity** **peculiar_velocities**			
	Lesson 3 The age of the universe	**estimate_age_of_universe** **age_and_hubble_constant**			
23.2 A Scientific History of the Universe			*From the Big Bang to Galaxies*		13-7 Big Bang and the Stuff of Life 13-8 Evolution of Life 13-9 Star Stuff
23.3 Evidence for the Big Bang					
23.4 Inflation					
23.5 Did the Big Bang Really Happen?					13-10 What Humans Have Done 13-11 We Speak for Earth
24. Life Beyond Earth: Prospects for Microbes, Civilizations, and Interstellar Travel					
24.1 The Possibility of Life Beyond Earth			*Search for Extraterrestrial Life*		
24.2 Life in the Solar System					5-8 Viking Lander 5-9 Life on Mars?
24.3 Life Around Other Stars	Extrasolar Planetary Detection				2-11 Alien Life
	Lesson 1 Taking a picture of a planet	**luminosity_of_planet** **angular_sep_vs_distance** **angular_sep_jupiter_sun**			
	Lesson 2 Stars' wobbles and properties of planets	**stellar_motion_and_planets** **oscillation_of_absorp_line** **determine_star_velocty_vs_t** **star_orbit_vs_planet_mass** **determine_planet_mass_orbit**			
	Lesson 3 Planetary transits	**planetary_transits**			
24.4 The Search for Extraterrestrial Intelligence					12-8 SETI 12-9 Arecibo 12-10 Drake Equation and Contact
24.5 Interstellar Travel					12-2 Close Encounters 12-3 Refutations 12-4 UFOs
24.6 A Paradox: Where Are the Aliens?					12-11 Encyclopedia Galactica

Appendix 4
Sample Syllabus

Many problems that tend to arise in classes can be alleviated if you are very clear about your expectations of students. One way to make your expectations clear is with a detailed syllabus. On the pages that follow, we offer a sample syllabus, adapted from one of lead author Jeffrey Bennett's courses. If you've never taught before, you might wish to use this as a starting point for creating your own syllabus. Otherwise, it might simply provide you with a few ideas of things to add or change in your current syllabus format. Most of the sample syllabus should be self-explanatory, but we offer a few notes about particular elements and modifications you might want to consider:

- Office hours/open review sessions: Notice the implementation of the ideas discussed under Personalizing the Impersonal Classroom (page 45), bullet 4—referring to office hours as "review sessions" and holding some of them in a less intimidating location than an office.
- Course Requirements and Grading: Obviously, this is just one model of how grades might be assigned. The important part is that the requirements and grading policy are spelled out clearly, so that students know exactly what you expect of them. Here are a few notes on specific parts of our requirements:
  - Regarding the on-line quizzes: We have chosen to require the basic quiz for each chapter as a way of making sure students come prepared to class. We would also like students to complete the conceptual quizzes, but we don't require them. Instead, we let students known that many of the questions on their midterm and final exams will be taken verbatim from the conceptual quizzes. This gives them ample incentive to complete them as part of their studying.
  - We also include "class participation" as a way of encouraging students to attend class and to come prepared. Obviously, this is easier to implement in smaller classes. However, you can still have a class participation component to grades in larger classes if you use interactive lecturing techniques (see page 43). For example, collecting worksheets or using electronic transmitters (see the articles posted at http://ganesh.colorado.edu/nick/TeachTech1.pdf and http://ganesh.colorado.edu/nick/TeachTech2.pdf) for short in-class activities will give you both an attendance record and some indication of whether students came to class prepared. *Note:* It's a good idea to make the class participation grade as objective as possible, since subjective grades are more likely to generate complaints and arguments. One strategy we've used is to assume that everyone starts with a perfect score of 10 points for their class participation, which is subject to reduction for absences or being clearly unprepared. For example, we usually allow two absences or unprepared days without penalty, but each absence thereafter is a 1-point deduction, and being unprepared (e.g., being unable to even begin on a class activity) is a 1/2-point deduction. For students with legitimate excuses, you may want to have a make-up policy for absences; we generally ask students to let us know *in advance* if they are going to miss class.
  - Observing Sessions: Unless it's truly impossible, we hope that you will find a way to give your students some type of evening observing opportunity. If your campus has telescopes available, perhaps you can have a few nights reserved for your class. If not, perhaps you can do some naked-eye observing, teaching the students some prominent constellations (which they usually love to learn). Also try to take advantage of any "special" observing

opportunities, such as meteor showers or eclipses. We've sometimes had students meet in the early morning, well outside town, to observe meteor showers or bright planets. Such events can be a lot of fun for both you and the students.

  - We did not include any major project in our requirements, but some teachers like to have a project component to final grades. You can easily make a project from some of our end-of-chapter Web Projects or from observing projects. Another project that we have sometimes used and that students seem to enjoy is a Book Review. For this project, students select a nonfiction book that is relevant to the course (e.g., topic areas might include the history of astronomy, recent discoveries in astronomy, or books about the space program or space policy) and then write a 3–5 page critical book review. (Many students have never written a critical book review, so we suggest they look at book reviews in the Sunday New York Times. Also, you may wish to have students get your "OK" on their book selections before they begin, so that you can make sure they've chosen a real science book rather than something quacky.)

- Regarding the "common courtesy guidelines": It would be nice if we could assume that all students would treat each other and you with proper respect—but we all know that this does not occur automatically these days. We therefore include these explicit guidelines and we've found far fewer problems in class since we started including them. Perhaps the root of most classroom behavior problems is simply that students have gotten away with so much in high school that they have no idea what constitutes "normal" classroom behavior until you spell it out for them.
- The section entitled "Can I Get the Grade I Really Want?" should get students' attention. It is all part of our ongoing emphasis on the fact that the key to student success is hard work.
- The schedule is designed to fit on one page so students can pin it to a wall and keep track easily. This particular schedule follows the basic plan of Sample Outline 2 on page 8. It is meant to serve as a template that you can adapt if you wish, since it is already sized properly to fit on one page. If you have a MWF class rather than a T/Th class, you can instead use the following cells as your basic template:

Mondays		**Wednesdays**		**Fridays**	
Mar 4	Reading: Chapter 8 On-line quiz: Chapter 8 basic	Mar 6	Viewing (optional): *Cosmos* ep. 4	Mar 8	*Homework 4 due*

- *Note:* on the first day of class, you may also wish to hand out the Assignment 1 that we describe on page 39; this can be a good way to get a sense of where your students are coming from, as well as to get students excited about what they'll be learning in the class.
- *Note:* If you choose to make use of the *Cosmos* videos, as we do on this schedule, you can do so in a variety of ways. For example, you can have the videos on reserve at the library for students to watch on their own time. You might also arrange evening showings at a time that works for most of your students (and others can watch them on their own). If you really want the students to come to the viewings, provide cookies or other refreshments that will encourage mingling after the video.

Introductory Astronomy 1: The Solar System Syllabus

Dr. Jeffrey Bennett

Tu, Th 12:30 – 1:45 pm, Duane Physics Building, Room 1B30

Office: Stadium room 119. Phone: 303-440-9313
E-mail: jbennett@casa.colorado.edu; personal web page: www.jeffreybennett.com
Office hours/open review sessions:

- Tu, Th: 2–3 pm, at my office.
- W, F: 12:30–1:30pm—Look for me in the main dining area of the Student Union; I'll try to be at a table near the northwest corner.
- If these hours do not work for you, e-mail me to make an appointment for a time that will be convenient.

General Information

Astronomy 1 is one of two general courses in introductory astronomy. In this class we concentrate on the development of human understanding of the universe and survey current understanding of our planetary system. The other semester (Astronomy 2) explores our understanding of the structure and evolution of stars and galaxies, and current scientific theories concerning the history of the Universe.

No scientific or mathematical background is assumed, beyond the entrance requirements to the University. Astronomy is a *science*, however, so you will be expected to develop your critical thinking skills in order to understand and apply the scientific method. In terms of mathematics, we will use only arithmetic and a bit of simple algebra.

Although I have taught this course many times previously, there is always room for improvement. Please feel free to make comments, criticisms, or suggestions at any time. I will make any adjustments that are necessary to ensure that you find the course both challenging and rewarding.

Required Textbooks/Media

The textbook for this course is *The Cosmic Perspective, Third Edition*, by Bennett, Donahue, Schneider, and Voit. You will also need a personal access kit for the Astronomy Place website and the *SkyGazer* CD, both of which should have come with your book if you purchased a new copy. (Note: If you purchased a used copy of the book, you can buy access to the website on-line at www.astronomyplace.com.)

Course Requirements and Grading

Your final grade will be based on the following work:

- Six homework assignments. *Late homework will be accepted only if you have made prior arrangements and there is a very good reason for the lateness.*
- Scores from on-line quizzes. *You may take a quiz as many times as you wish BEFORE its due date, and you will be credited with your highest score. If you take a quiz late, you will be credited with the first score you get, minus a 10% late penalty.*

- Class Participation: During classes, we will engage in discussions and occasional activities, some of which may involve completing worksheets. Participation in these activities will form part of your final grade.
- Observing Sessions: We will have several nights where the campus observatory is reserved for our class. You are required to attend at least one of these observing sessions and complete the observing worksheet that will be given to you when you arrive.
- Exams: We will have two in-class midterms and one final exam.

Calculating Your Final Grade

Your final course grade will be weighted as follows:

Homework	25%
Quizzes	10%
Class Participation	10%
Observing Sessions	5%
Midterm 1	10%
Midterm 2	15%
Final Exam	25%
Total	100%

A final score of 99–100% will be an A+; 92–98 is an A; 90–91 is an A–; the pattern continues for each lower grade.

Common Courtesy Guidelines

For the benefit of your fellow students and your instructors, you are expected to practice common courtesy with regard to all course interactions. For example:

- Show up for class on time.
- Turn off your cell phones before class begins!
- Do not leave class early, and do not rustle papers in preparation to leave before class is dismissed.
- Be attentive in class; stay awake, don't read newspapers, etc.
- If you must be late or leave early on any particular day, please inform your instructor or TA in advance.
- Play well with others. Be kind and respectful to your fellow students and your teachers.

You can expect your grade to be lowered if you do not practice common courtesy.

Can I Get the Grade I Really Want?

Yes—but it will depend on your effort. It does not matter whether you have even learned anything about astronomy before or whether you are "good" in science. What does matter is your willingness to work hard. Astronomy is a demanding course, in which we will move quickly and each new topic will build on concepts covered previously. If you fall behind at any time, you will find it extremely difficult to get caught back up. If you want to get a good grade in this class, be sure to pay special attention to the following:

- Carefully read the section in the Preface of your textbook called "How to Succeed in Your Astronomy Course." It describes how much time you should expect to spend studying outside class and lists a number of useful suggestions about how to study efficiently.
- When you turn in assignments of any kind, make sure they are done clearly and carefully. Refer to the separate handout on "Presenting Homework and Writing Assignments."

- Don't procrastinate. The homework assignments will take you several hours, so if you leave them to the last minute you'll be in trouble—and it will be too late for you to ask for help. Both quizzes and homework need to be completed on time if you want to avoid late penalties.
- Don't miss class, and make sure you come to class prepared, having completed the assignments due by that date.
- Don't be a stranger to your instructor—come see me in office hours, even if you don't have any specific questions.
- If you find yourself confused or falling behind for any reason at any time, let me know immediately! No matter what is causing your difficulty, I are quite willing to work with you to find a way for you to succeed—but I can't help if we don't know there's a problem.

A Closing Promise

All the hard work described above might sound a bit intimidating, but I can make you this promise: Few topics have inspired humans throughout the ages as much as the mysteries of the heavens. This class offers you the opportunity to explore these mysteries in depth, learning both about our tremendous modern understanding of the universe and about the mysteries that remain. If you work hard and learn the material well, this class will be one of the most rewarding classes of your college career.

Schedule

The indicated assignments should be completed *before* class on the listed date.
Listen in class and check your e-mail for updates to the schedule or syllabus.

Tuesdays		Thursdays	
Aug 24	First day of class	Aug 26	Reading: Chapter 1 Viewing (optional): *Cosmos* ep. 1
Aug 31	On-line Quiz: Ch. 1 Basic Viewing (optional): *Cosmos* ep. 2	Sep 2	Reading: Chapter 2 On-line Quiz: Ch. 2 Basic
Sep 7	Reading: Chapter 3 Viewing (required): *Cosmos* ep. 3 On-line Quiz: Ch. 3 Basic	Sep 9	HOMEWORK 1 DUE
Sep 14	Reading: Chapter S1 On-line quiz: Ch. S1 Basic	Sep 16	Reading: Chapter 4 On-line Quiz: Ch. 4 Basic
Sep 21	Reading: Chapter 5 On-line Quiz: Ch. 5 Basic	Sep 23	HOMEWORK 2 DUE
Sep 28	Reading: Chapters 6 On-line Quiz: Ch. 6 Basic	Sep 30	Reading: Chapter 7 On-line Quiz: Ch. 7 Basic
Oct 5	FIRST MIDTERM (IN CLASS)	Oct 7	Reading: Chapter 8 On-line Quiz: Ch. 8 Basic
Oct 12	Reading: Chapter 9 On-line Quiz: Ch. 9 Basic	Oct 14	HOMEWORK 3 DUE Viewing (optional): *Cosmos* ep. 4
Oct 19	Reading: Chapter 10 On-line Quiz: Ch. 10 Basic	Oct 21	
Oct 26	Reading: Chapter 11 On-line Quiz: Ch. 11 Basic	Oct 28	HOMEWORK 4 DUE
Nov 2	Viewing (optional): *Cosmos* ep. 5	Nov 4	SECOND MIDTERM (IN CLASS)
Nov 9	Reading: Chapter 12 On-line Quiz: Ch. 12 Basic	Nov 11	HOMEWORK 5 DUE
Nov 16	Reading: Chapter 13 On-line Quiz: Ch. 13 Basic	Nov 18	Viewing (optional): *Cosmos* ep. 6
Nov 23	Reading: Chapter 14 On-line Quiz: Ch. 14 Basic	Nov 25	Thanksgiving Holiday – No class!
Nov 30		Dec 2	HOMEWORK 6 DUE
Dec 7	Reading: Chapter 24 On-line Quiz: Ch. 24 Basic		
Final Exam: Monday, Dec. 14, 3:30 P.M.–6:30 P.M.			

**** Observatory nights (weather dependent): Aug. 30, Sep 22, Oct 6, Nov 4, Dec 1.***

Appendix 5
Handout on Homework Presentation

If you assign written work to your students, you'll find that it is far easier to grade if it is turned in in a form that is easy for you to read. For our own classes, we have developed a one-page handout that describes clearly what we expect of our students when they turn in written work. The handout appears on the next page. You may feel free to photocopy it and hand it out to all your students in any of your courses. Note that these guidelines apply both to printed and e-mailed assignments.

— Handout appears on next page —

Presenting Homework and Writing Assignments

All work that you turn in should be of *collegiate quality:* neat and easy to read, well organized, and demonstrating mastery of the subject matter. Future employers and teachers will expect this quality of work. Moreover, although submitting homework of collegiate quality requires "extra" effort, it serves two important purposes directly related to learning:

1. The effort you expend in clearly explaining your work solidifies your learning. In particular, research has shown that writing and speaking trigger different areas of your brain. By writing something down—even when you think you already understand it—your learning is reinforced by involving other areas of your brain.
2. By making your work clear and self-contained (that is, making it a document that you can read without referring to the questions in the text), you will have a much more useful study guide when you review for a quiz or exam.

The following guidelines will help ensure that your assignments meet the standards of collegiate quality:

- Always use proper grammar, proper sentence and paragraph structure, and proper spelling.
- All answers and other writing should be fully self-contained. A good test is to imagine that a friend is reading your work and ask yourself whether the friend would understand exactly what you are trying to say. It is also helpful to read your work out loud to yourself, making sure that it sounds clear and coherent.
- In problems that require calculation:
  - Be sure to *show your work* clearly. By doing so, both you and your instructor can follow the process you used to obtain an answer. Also, please use standard mathematical symbols, rather than "calculator-eze." For example, show multiplication with the x symbol (not with an asterisk), and write 10^5, not 10^5 or 10E5.
  - *Word problems should have word answers.* That is, after you have completed any necessary calculations, any problem stated in words should be answered with one or more *complete sentences* that describe the point of the problem and the meaning of your solution.
  - Express your word answers in a way that would be *meaningful* to most people. For example, most people would find it more meaningful if you express a result of 720 hours as 1 month. Similarly, if a precise calculation yields an answer of 9,745,600 years, it may be more meaningful in words as "nearly 10 million years."
- Finally, pay attention to details that will make your assignments *look* good. For example:
  - If you are turning in your work electronically (e.g., by e-mail), be sure that you still follow standard rules of writing. For example, avoid typing your work in all caps or using the shorthand that you may use when sending instant messages to friends.
  - If you are turning in your work on printed paper, try to make it look as professional as possible. For example, use standard-size white paper with clean edges (that is, do not tear paper out of notebooks, because it will have ragged edges), and staple all pages together rather than using paper clips or folded corners (because clips and corners tend to get caught with other students' papers). Ideally, turn in your work as typed pages. If you must hand write it, please print neatly— we will not grade papers that are difficult to read.
  - Include illustrations whenever they help explain your answer, and make sure your illustrations are neat and clear. For example, if you graph by hand, use a ruler to make straight lines. If you use software to make illustrations, be careful not to make them overly cluttered with unnecessary features.