

Program	Time	Description	Other Recommended Programs to Tie With This Program (though not required)	Grade 3 Standard	Grade 4 Standard	Grade 5 Standard	Grade 6 Standard	Grade 7 Standard	Grade 8 Standard	High School Standards
Solar Observation (Weather Permitting)	30 mins	Observe the Sun through solar glasses as well as our hydrogen-alpha solar telescope to see the solar chromosphere and possible sunspots, prominences, and filaments. Students will also be shown a live view of the Sun beforehand and observable features will be discussed. Images and movies from space-based solar-monitoring observatories showing solar and solar-related activity will also be shown with narration. If numerous sunspots are visible, we may also set up a white-light solar telescope for detailed sunspot observations.	Spectroscopy Talk and Demo	Embedded Technology & Engineering, Standard 6 - The Universe, Standard 10 - Energy, Standard 12 - Forces of Nature	Standard 6 - The Universe Standard 10 - Energy Standard 12 - Forces of Nature	Standard 10 - Energy	Standard 6 - The Universe		Standard 12 - Forces of Nature	Chemistry II: Standard 1 - Structure of Matter Earth Science: Standard 1 - The Universe Earth Science: Standard 2 - Energy in the Earth System Physical World Concepts: Standard 3 - Waves and Optics Physical World Concepts: Standard 4 - Electricity and Magnetism Physics Standard 3 - Waves Physics Standard 4 - Optics Physical Science: Standard 2 - Energy
Star Chamber Visit	30 mins	Visit Dyer Observatory's land sculpture <i>The Star Chamber</i> , a walk-in camera obscura (pinhole camera). Students will observe images of the surrounding trees and sky as they are projected onto the floor and walls of the Star Chamber via a small hole at the center of the Chamber's dome. While there, students will learn about the <i>analemma</i> , why we have seasons, and why the Sun's position with respect to the horizon changes over the year.	Sundials		Standard 6 - The Universe Standard 11 - Motion		Standard 6 - The Universe			Earth Science: Standard 1 - The Universe Physical World Concepts: Standard 3 - Waves and Optics Physics Standard 3 - Waves Physics Standard 4 - Optics Physical Science: Standard 2 - Energy
Sundials	30 mins	Using Dyer Observatory's <i>Sundial Garden</i> and <i>Solstice/Equinox Stones</i> of the <i>Star Chamber</i> , we will demonstrate how and why time can be determined by the position of the Sun. In addition, students will construct basic sundials on their own using a paper template.	Star Chamber Visit		Standard 6 - The Universe		Standard 6 - The Universe			Earth Science: Standard 1 - The Universe
Telescope Types & Tour of Dyer Telescopes	45 mins	Dyer Observatory has four telescope installations, three of which are mounted in domes on top of the observatory and are still actively used for observation. Students will first tour Dyer's largest telescope, the Seyfert Telescope, and gain an understanding of its history, how it functions, how it compares to other observatory telescopes, and what it has been used to observe and study. Students will then move to the DeWitt Telescope, the smallest and oldest telescope we still actively use. The astronomer will make use of the telescope's "open-truss" design to better show students how the telescope is able to gather and focus light to form an image. Next, we will move to our 14" robotic telescope, the Bergquist Telescope, which has been modified to be accessible over the Internet. We will log in to the telescope to show students how computerized telescopes are able to locate objects at the push of a button. Finally, we will move to the Dyer residence, which currently houses the Cooke Telescope, Vanderbilt University's original telescope. We will explain how this telescope is different from the others housed at Dyer as well as what role it has played in shaping the history of how we view the universe.	Solar Observation, Telescopic Observation of Venus	Embedded Technology & Engineering,	Standard 10 - Energy					Earth Science: Standard 1 - The Universe Physical World Concepts: Standard 3 - Waves and Optics Physics Standard 3 - Waves Physics Standard 4 - Optics Physical Science: Standard 2 - Energy
Meteorite Collection Visit	10 mins	Dyer Observatory has a collection of nickel-iron and stony-iron meteorites as well as a number of tektites on display. Students will be given the opportunity to observe the collection while our astronomer provides an explanation of how meteorites form, what the differences are in various types of meteorites, and how tektites form. Students will also be given the opportunity to hold some of these 4.5 billion-year-old objects.		Standard 7 - The Earth		Standard 10 - Energy				Earth Science: Standard 1 - The Universe Earth Science: Standard 2 - Energy in the Earth System
Large-Print Image Tour	15 mins	Dyer Observatory also has five large-print images from the Hubble Space Telescope as well as a large-print image of the telescope itself. Our astronomer will provide explanations of what the images show, what we can learn from them, and how all of the images are ultimately related to one another. Afterwards, students will move to the library to see our 1/5th-scale model of the Hubble Space Telescope, which is on extended loan to us from the Space Telescope Science Institute. The astronomer will provide details about Hubble such as its actual size, orbital parameters, and capabilities.	Sizes and Scales, Planet Walk				Standard 6 - The Universe			Chemistry II - Standard 2 - States of Matter Earth Science: Standard 1 - The Universe Physical World Concepts: Standard 3 - Waves and Optics Physics Standard 4 - Optics
Telescopic Observation of Venus (Weather and Venus Permitting)	15 mins	We can use the Seyfert Telescope to view Venus if it is far enough from the Sun to be viewed safely. This gives students an opportunity to see that other planets go through phases like the Moon. We will also discuss what causes the phases and why this phenomenon was used as evidence that the Sun is actually the center of the solar system rather than the Earth.	Telescope Types	Standard 6 - The Universe	Standard 6 - The Universe					Earth Science: Standard 1 - The Universe
Sizes and Scales Talk	30 mins	We will present a PowerPoint slideshow about the relative sizes of the planets in our solar system and also compare them to the Sun. We then compare the Sun to other stars and then compare other celestial objects, like nebulae and galaxies, to one another.		Standard 6 - The Universe		Standard 6 - The Universe	Standard 6 - The Universe			Chemistry II - Standard 2 - States of Matter Earth Science: Standard 1 - The Universe Physical Science Standard 4 - Forces in Nature
Planet Walk (Weather Permitting)	45 mins	Students will walk-off a scale model of the solar system in which the Sun is represented by an 8" ball. As we walk to each planet, students are shown the scaled planet size while we discuss various aspects of the planet, such as structure, number of moons, rings, etc.	Sizes and Scales	Standard 6 - The Universe		Standard 6 - The Universe Standard 12 - Forces of Nature	Standard 6 - The Universe		Standard 12 - Forces of Nature	Earth Science: Standard 1 - The Universe
Spectroscopy Talk and Demo	45 mins	We present a PowerPoint presentation about the electromagnetic spectrum and how atoms and molecules produce their own colors of light. We will discuss how these unique sets of colors can be used to determine aspects of celestial objects, such as composition, temperature, and velocity. To give a more hands-on approach to atomic spectra, we will use spectral discharge tubes to show examples of how various elements will produce their own fingerprint of colors. <u>This activity highly benefits from incorporating the "Solar Observation" program.</u>	Solar Observation					Standard 9 - Matter		Chemistry I: Standard 1- Atomic Structure Earth Science: Standard 1 - The Universe Physical World Concepts: Standard 3 - Waves and Optics Physical World Concepts: Standard 5 - Nuclear Science Physics Standard 3 - Waves, Physics Standard 4 - Optics Physical Science: Standard 2 - Energy
Finding things in the night sky / Star Wheels	45 mins	Using the planetarium software <i>Stellarium</i> , we will discuss how objects in the sky move with respect to one's location. We will also discuss how to find certain objects such as planets and constellations. Students will also construct their own star wheels with provided paper and be instructed how to use them to find celestial objects on their own.			Standard 11 - Motion	Standard 6 - The Universe				
Moon Phases	30 mins	Students will use small styrofoam balls and a central light source in our darkened library to simulate the phases of the Moon. The students will act as Earths while they orbit the central light, which acts as the Sun. By orbiting the styrofoam balls around their heads as they orbit the simulated Sun, students will be able to observe their moons going through phases. They will be able to observe the Sun-Earth-Moon spatial relationship for all phases, including eclipses. In addition, we will also use computer applets to display the same setup afterward to give the students a more external view of the Sun-Earth-Moon system. The phases concept can then be extended to allow the students to determine if other bodies in the solar system, such as the other planets, will exhibit phases and, if so, the kinds of phases that would be observed. <u>This activity is greatly enhanced if the "Telescopic Viewing of Venus" program is done afterward (if available).</u>			Standard 6 - The Universe		Standard 6 - The Universe			Earth Science: Standard 1 - The Universe