

## Dance of the planets

This year began with many of the planets visible to the naked eye over the western horizon in the evening skies, and will end with the same group of planets visible at sunrise. Throughout the next two months, all of these planets, except Saturn and Earth, will be spread across the eastern horizon at sunrise. Saturn will rise a couple of hours after sunset and then be visible all night near Pollux and Castor, the two brightest stars of the Gemini Twins.

Venus will shine very brightly over the southeastern horizon and can be easily followed each morning as it moves eastward along its orbital path across the constellations Virgo, Libra, Ophiuchus, and into the stars of Scorpius, the Scorpion. Along the way Venus will be in conjunction with Jupiter on November 4, the bright bluish star Spica on November 18, Mars on December 6, and Mercury on Christmas morning.

### Showers in the forecast

During the next two months viewing conditions will be favorable for observing two noteworthy annual meteor showers: November's Leonid meteor shower and the December Geminid meteor shower. The peak night for the Leonids is November 17 and for the Geminids, December 14. Throughout this time period there will be several other lesser-known annual meteor showers occurring, which when combined with the Leonids and Geminids should provide opportunities to see meteors or shooting stars nightly. These other meteor showers include the Taurids, November 5; Pegasids, November 12; Monocerids, December 10; Sigma Hydrids, December 11; Leo Minorids, December 14; Delta Arietids, December 20; and the Ursids, December 22.

Most meteor showers owe their origins to the comets that orbit the Sun with a path that intersects or comes very close to the Earth's orbit. As a comet orbits close to the Sun it gradually loses mass as its surface ices sublimate, ejecting ice and dust particles away from the comet. This material, or comet debris, left along its "path," is like a cloud that the Earth passes through regularly during its orbit around the Sun. This comet debris becomes the source material for the annual meteor showers. The "parent comet" for the Leonid meteor shower is Comet Tempel-Tuttle. Unlike other meteor showers, the Geminids shower will occur when the Earth passes through the path of the asteroid Icarus.



Explore meteors at  
[www.scilinks.org](http://www.scilinks.org).



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A meteor shower gets its name from the constellation that the meteors appear to be coming from. This location is called the radiant because the meteors move in all directions from what appears to be a central point. The Leonids radiate from the constellation Leo, the Lion, and the Geminids radiate from the Gemini Twins.

While not related to these meteor showers, there may be an opportunity to view a comet during the first half of November. This is Comet C/2003 K4 LINEAR, named after the automated tracking telescope program that discovered the comet. During the first two weeks of November, look just above the southeast horizon for a faint smudge of light. The comet is predicted to be at about 5<sup>th</sup> magnitude, which would make it bright enough to be seen using binoculars or small telescopes under dark skies with a clear horizon.

### Cosmic dust bunnies

There is always a certain amount of particulate matter in our atmosphere as byproducts of industrial and agricultural pollutants, volcanic activity, dust, and pollens slowly settle toward the Earth's surface. Mixed within this are also particles of comets and meteoroids. Because these particles may come from comets, they are of interest to scientists and NASA because they may provide information about the composition of our solar system. Students can learn more about statospheric dust research by visiting NASA's Cosmic Dust Lab website ([curator.jsc.nasa.gov/curator/dust/dust.htm](http://curator.jsc.nasa.gov/curator/dust/dust.htm)), or learn how to collect cosmic dust by visiting the website resources listed.

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### Visible planets

- Mercury will be very low over the western horizon during November and difficult to see as it will move toward inferior conjunction between the Earth and Sun. However, Mercury will become much easier to see during December over the eastern horizon as it will rise before the Sun.
- Venus will shine brightly over the eastern horizon before the Sun rises.
- Mars will be visible low over the southeastern horizon before the Sun rises.
- Jupiter will rise several hours before the Sun rises and Jupiter will be easily seen shining brightly over the southern horizon at sunrise.
- Saturn will rise about two hours after sunset and will be visible for most of the night.

### Moon phases

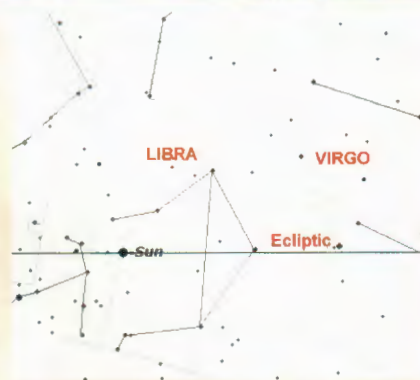
	November	December
Last quarter	11/5	12/4
New moon	11/12	12/11
First quarter	11/19	18/18
Full moon	11/26	12/26

### Internet resources

Stratospheric dust—[curator.jsc.nasa.gov/curator/dust/dust.htm](http://curator.jsc.nasa.gov/curator/dust/dust.htm)  
 National Aeolian Detritus Project—[geo.uri.edu/skydust/#](http://geo.uri.edu/skydust/#)  
 Educator's guide to micrometeorites—[www.reachoutmichigan.org/funexperiments/agesubject/lessons/jpl/micromet.html](http://www.reachoutmichigan.org/funexperiments/agesubject/lessons/jpl/micromet.html)  
 NASA Thursday's Classroom—[www.thursdaysclassroom.com/31jul01/corner.html](http://www.thursdaysclassroom.com/31jul01/corner.html)  
 MESSENGER—[messenger.jhuapl.edu/](http://messenger.jhuapl.edu/)  
 Leonid meteor shower—[comets.amsmeteors.org/meteors/showers/leonids.html](http://comets.amsmeteors.org/meteors/showers/leonids.html)  
 Geminid meteor shower—[www.comets.amsmeteors.org/meteors/showers/geminids.html](http://www.comets.amsmeteors.org/meteors/showers/geminids.html)  
 December solstice—[www.equinox-and-solstice.com/html/winter\\_solstice.html](http://www.equinox-and-solstice.com/html/winter_solstice.html)  
 Deep impact—[deepimpact.jpl.nasa.gov/](http://deepimpact.jpl.nasa.gov/)  
 SFA star charts—[www.cox-internet.com/ast305/SFAStarCharts.html](http://www.cox-internet.com/ast305/SFAStarCharts.html)  
 Gary W. Kronks comet and meteor showers—[comets.amsmeteors.org/](http://comets.amsmeteors.org/)

### Tracking the Sun

Throughout the school year information and data will be provided through this column so that students may indirectly follow the Earth along its orbital path, the ecliptic, around the Sun. Because, from our perspective, it is the Sun that is "moving," students will actually be graphing the Sun's apparent motion caused by the Earth's real orbital and rotational motions. This graph-ready data will include celestial coordinate position



and midday altitude of the mid-month Sun, its distance from the Earth, and the Sun's apparent size. In addition to graphing the data provided each month, students can follow and plot the Sun's location along the ecliptic each month after downloading the free SFA star charts (see link at the end of the article).

### Tracking the Sun: November–December 2004

During November and December the Sun's apparent motion along the ecliptic will take it across the constellation *Virgo, the Harvest Maiden*; *Libra, the Scales*; *Ophiuchus, the Healer*; and into the boundaries of *Scorpius, the Scorpion*.

On these dates at midday EDT:

Date/Time of midday Sun	Distance	Altitude	Apparent size	Right ascension	Declination
Nov 20 (1303)	0.9879 A.U.	31° 12'	32'	17h 56m	-19° 53'
Dec 20 (1315)	0.9837 A.U.	28° 27'	33'	15h 46m	-23° 26'

Meteors and meteor showers—[csep10.phys.utk.edu/astr161/lect/meteors/showers.html](http://csep10.phys.utk.edu/astr161/lect/meteors/showers.html)

NASA TV broadcast "Cool Comets"—[neo.jpl.nasa.gov/images/coolcomets.html](http://neo.jpl.nasa.gov/images/coolcomets.html)



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