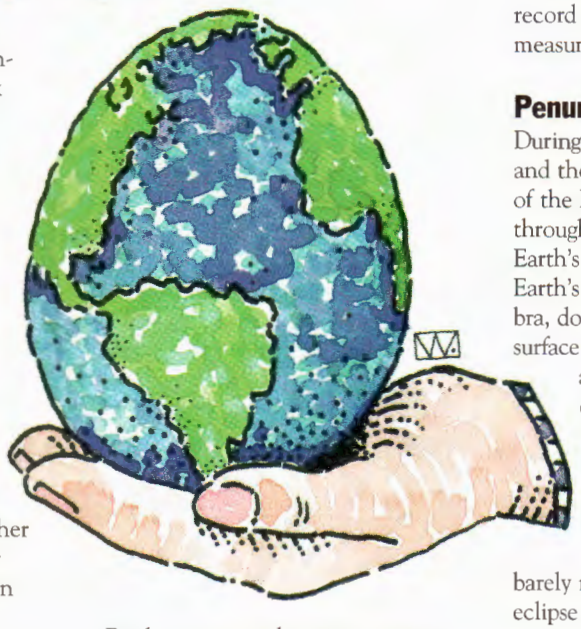
An eggs-citing equinox

How can you determine when the Sun will pass over the equator without checking your calendar? Check your local news for stories about children trying to balance eggs on end and you'll find out about the next equinox. Unfortunately, the idea that it is easier to balance an egg on end during an equinox is one of the all-time great examples of bad science. However, it does provide students with an opportunity to confront a scientific misconception and test its validity.

One frequently given explanation asserts that gravity is "balanced" when the Sun is over the Earth's equator. According to another explanation, the Sun exerts greater gravitational pull upon the Earth on these two days. Regardless of the explanation, misconceptions provide opportunities for encouraging students to think analytically as well as for teachers to delve into students' preconceptions. Discussing students' ideas can lead to observations that evolve into further questions.



Gravity assist?

To fuel and guide the discussion about egg balancing, ask students thought-provoking questions. If gravity is involved in balancing eggs, shouldn't other difficult-to-balance objects balance at this time as well? Or is gravity so selective that only the balancing of eggs is affected on this particular day? Would an egg that balances on the equinox at a certain time of day balance under those same physical conditions and at that same time on any day of the year? Does latitude affect whether an egg balances? Because the Sun is only directly overhead at the equator and never overhead at any other latitude on the equinox, would a balanced egg lean toward the Sun's sky position at nonequatorial latitudes?

By discussing and testing a commonly held misconception such as the egg-balancing notion, students can learn to come to their own conclusions about the validity or usefulness of an idea. At the same time, the teacher will learn about the preconceptions students bring with them to the classroom.

Close encounters of the learning kind

On September 25, the Galileo space probe comes within 3,600 km of the icy surface of the Jovian moon Europa, making this Galileo's seventeenth encounter with Europa. Galileo has now completed about half of its two-year extended mission to explore Jupiter and its moons.

During the next two years, it will continue to relay information back to Earth-based scientists about the icy moon Europa, the water vapor in Jupiter's "soupy" atmosphere, the nonstop volcanic activity on Io (another Jovian moon), and other pheonomena. During the Europa encounter with Jupiter, Galileo will photograph linear surface features and strike-slip faults as well as assess and record atmosphere and gravity field measurements.

Penumbral lunar eclipse

During the evening of September 5 and the morning of September 6, most of the Moon will gradually pass through the outermost edge of the Earth's shadow. This part of the Earth's shadow, known as the penumbra, does not darken the Moon's surface as much as the umbra does. As a result, an umbral eclipse darkens the Moon much more dramatically than a penumbral eclipse. For the upcoming eclipse, only about 85 percent of the Moon will pass within the penumbra, resulting in a barely noticeable event. Therefore, the eclipse will probably be best observed with binoculars.

Local viewing times are provided in Table 1 for four cities across the United States. The Moon sets before mideclipse in the eastern United States, while in Kansas City and Denver, the Moon sets before the end of the eclipse. Only viewers along the West Coast and Hawaii will be able to observe the eclipse from start to finish. Use the web addresses provided in Table 2 to determine viewing times for your location.

Visible planets

Mercury is visible before sunrise for the first few weeks of September and then not again until late December. **Mars** rises about three to four hours before the Sun. **Jupiter** and **Saturn** rise at approximately sunset over the eastern horizon and are visible all night over the southwestern horizon.

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Moon phases

September
Full Moon - September 6
Third Quarter - September 12
New Moon - September 20
First Quarter - September 28

October
Full Moon - October 5
Third Quarter - October 12
New Moon - October 20
First Quarter - October 28

Table 2. Web resources

- Eclipse information
  planets.gsfc.nasa.gov/eclipse/
- Eclipse event calculator
  aa.usno.navy.mil/AA/data/docs/LunarEclipse.html
- Project GEM
  www.jpl.nasa.gov/galileo/

Correction to the May column

The last sentence of the second paragraph should have read,"The earliest sunrise will occur on June 14, about a week before the solstice, and the latest will occur on June 27, about a week before the Earth is most distant from the Sun (aphelion) on July 3. Thank you to Michael Katz, a reader from the Scarsdale, New York, school system for noting the mistake.

Table 1. Lunar eclipse times (September 5–6, local time)

	Moonrise	First contact	Mideclipse	Last contact	Moonset
Washington, D.C.	7:14 P.M.	5:14 P.M.	—	—	6:42 P.M.
Kansas City	7:26 P.M.	4:14 A.M.	6:10 A.M.	—	6:55 A.M.
Denver	7:10 P.M.	3:14 A.M.	5:10 A.M.	—	6:38 A.M.
Los Angeles	6:59 P.M.	2:14 A.M.	4:10 A.M.	6:06 A.M.	6:39 A.M.