

September skies

by Bob Riddle

There are many astronomy and space science resources that may be used to supplement or reinforce your teaching, or even as a stand-alone teaching tool. This month's column brings together a collection of my favorite free online resources to put into your teaching toolbox.

Star maps

Essential to any astronomy instruction is learning how to find one's way around the sky—becoming familiar with constellations and asterisms (other star patterns like the Big Dipper), understanding how the sky changes regularly, being able to locate planets, and so on. Finding your way around the night sky couldn't be easier when you take advantage of the many available star maps. The typical star map is drawn with the horizon as a circle surrounding all of the stars above the horizon in all directions for a particular month. Often the star map will indicate the specific day and time during the month that the map best matches the sky, (for example, 10 p.m. on the first of the month; 9 p.m. in the middle of the month; and 8 p.m. at the end of the month). This indirectly helps explain the gradual shift of stars and constellations toward the west due to Earth's revolution (the same sky is viewed earlier as we move through each month). For example, a star that rises at 10 p.m. will rise approximately four minutes earlier the next day. Some online star maps may be drawn for any date or time selected rather than for a month's time.

Star maps can also be drawn to show the sky like a map of the Earth's surface. The SFA Equatorial Star Charts are a set of four maps; two show the north and south polar regions of the sky down to 60°. The other two maps show the sky centered on the celestial equator and cover the sky in both directions to where the polar maps end (similar to a Mercator map of the Earth, which shows the Earth centered on the equator). By putting these two end to end, you will have a map showing the apparent path the Sun follows along



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the ecliptic for the entire year. The SFA Equatorial and Polar Star Charts are available for downloading from the Stephen F. Austin University Observatory website (<http://observe.phy.sfasu.edu/SFAStarCharts/SFAStarChartsAll.pdf>).

Getting Started in Astronomy is a 10-page booklet that may be downloaded from the Sky and Telescope website (www.skyandtelescope.com/howto/basics). This is a guide that contains viewing help, six bi-monthly star charts, and a detailed map of our Moon.

The Evening Sky Map, a detailed map of the sky produced each month, is, in my opinion, the best of the best with regard to quality and availability. It can be downloaded from the Sky Maps website (<http://skymaps.com/>). Maps are available in English, Spanish, and French, and are drawn for the Northern Hemisphere, the equator, and the southern hemisphere.

The Solar System Star Maps is a set of monthly star maps that highlight the ecliptic area where planets in our solar system are located. This is one of several sets of monthly star maps that feature the location of specific features, such as exo-solar systems, black holes, and supernovas (<http://nightsky.jpl.nasa.gov/download-list.cfm>).

Planisphere

A *planisphere*, or a rotating star wheel, is a manipulative star map that may be set to show the sky for specific dates and times. Typically, these show the sky in all directions but seem to work best when facing south or north. In addition to showing what's up, the planisphere may be manipulated to indicate rising and setting times of stars or constellations.

Uncle Al's Star Wheel may be the most recognizable of the planispheres that are available for downloading. There are several variations on this model, including the Spanish and Portuguese versions, and one meant for use in the Southern Hemisphere; there is even one to show the region of the sky that the Kepler orbiting observatory is observing. (www.lhs.berkeley.edu/starclock/skywheel.html). At the Night Sky Network website there are versions of Uncle Al's Star Wheel for locating Black Holes and Supernova (<http://nightsky.jpl.nasa.gov/index.cfm>).

Software

There are many good astronomy software programs to choose from, and within the public domain there are a few that really stand out. A good selection of software should include a program to generate an ephemeris (a data table of planet information) as well as a program that can simulate sky views to allow you and students to model various celestial situations.

Stellarium is a free, open-source planetarium program that uses the graphic capabilities of a computer to display the sky as it can be seen from any latitude and longitude location on Earth. At the simplest level of use, it can be used to show the sky for any date and time desired, and at higher levels of use it can be programmed using the built-in scripting language to automate celestial situations such as seasonal variations in the Sun's apparent daily path (www.stellarium.org).

The World Wide Telescope (www.worldwidetelescope.org/Home.aspx) is an online program that brings together images and data from many of the world's surface-based and orbiting observatories. There are scripted tours and presentations plus the ability to write one's own script as well.

Websites

Considering the depth of the internet, it would be impossible to do justice to all of the good websites available. The websites listed below provide quick access to many useful

activities, projects, and other sources of useful tools.

- NASA Home (www.nasa.gov) is the home to all things NASA. There are direct links to individual mission websites, current NASA news, NASA TV internet broadcasts, and much more. You can even set up your own MyNASA webpage to more efficiently tap into NASA resources.
- Among the games and other activities at the Space Place website is a great board game about Black Holes (http://spaceplace.nasa.gov/en/kids/svlbi_do1.shtml).
- At the Space Science Institute there is a page with several good activities and puzzle-based sets of materials to download. In particular are the Family Guides to Mars and the Sun (www.spacescience.org/education/instructional_materials.html).
- The Chandra website provides a good activity and coloring book. There are other games and projects there as well (http://chandra.harvard.edu/edu/coloring_booklet.html).
- The National Optical Astronomy Observatory has developed many activities, including one of my favorites, Jewels of the Night (www.noao.edu/education/teachers.php).
- The Night Sky Network website is a collection of resources designed to help facilitate the teaching of astronomy both formally and informally. Resources on the website include information about local astronomy clubs, monthly star maps, activities, videos, and links to relevant websites (<http://nightsky.jpl.nasa.gov/index.cfm>).
- NSTA Communities on the NSTA website (www.nsta.org/communities) is one of the many ways NSTA helps teachers stay connected to other teachers. This would be a great place to follow up this article with suggestions for other websites.
- The U.S. Naval Observatory provides an online ephemeris for calculating information about planets, the Sun, and the Moon (<http://aa.usno.navy.mil/data>).

Other resources

In addition to resources such as those previously described, there are organizations both locally and nationally that provide resources ranging from workshops to outreach education and so on. Local astronomical clubs are an important resource, as are planetariums. Use the Night Sky Network to locate groups in your area or conduct an internet search for the nearest organization. Many of the NASA missions offer some sort of training or outreach in conjunction

with each mission, and there are educators around the country conducting workshops and supporting teachers as part of the Solar System Ambassadors (www2.jpl.nasa.gov/ambassador) and Solar System Educator (<http://solarsystem.nasa.gov/ssep>) programs. The Afterschool Universe program offers a free two-day training workshop that prepares teachers to conduct an after-school astronomy program for middle school students (<http://universe.nasa.gov/au>).

Space exploration this month

September begins and ends with two significant events involving two space agencies. September is the target launch period for the H-2B rocket, a transport vehicle designed and operated by the Japanese Space Agency, JAXA. The H-2B will be used to transport supplies and equipment to the International Space Station beginning with the launch this month. September ends with the third and final flyby of the planet Mercury by *MESSENGER* spacecraft as it works its way toward orbital insertion in 2011.

September

- 1 Venus near Beehive star cluster
H-2B Launch to ISS
- 2 Moon near Jupiter
- 4 Full Moon
Saturn's rings edge-on
- 6 Mercury begins retrograde motion
- 10 Moon near Pleiades
- 11 Pluto ends retrograde motion
- 12 Last quarter Moon
- 13 Moon near Mars
- 16 Moon near Venus

- 17 Uranus at opposition
Saturn at solar conjunction
- 18 New Moon
- 20 Mercury at inferior conjunction
Venus near Regulus
- 22 September equinox
Sun is in Virgo
- 24 Moon near Antares
- 26 First quarter Moon
- 28 Mercury ends retrograde motion
- 29 Moon near Jupiter
MESSENGER Mercury flyby #3

Visible planets

Mercury will start to become visible before sunrise at the end of the month.

Venus will be very visible over the eastern horizon before sunrise.

Mars will rise around midnight and will be visible the rest of the night over the southern horizon.

Jupiter will rise near sunset and will be visible all night, setting before sunrise.

Saturn will be too close to the Sun to be seen this month.

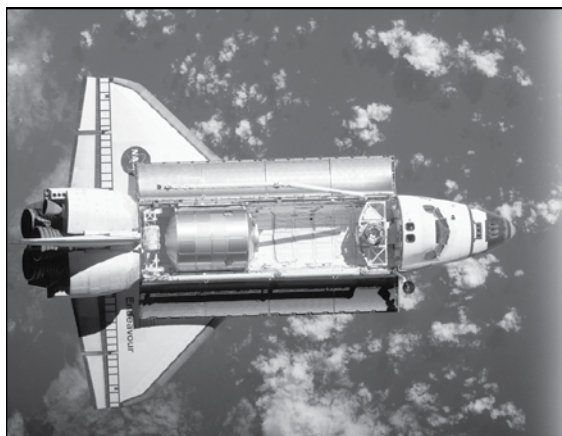
Resources

MESSENGER—<http://messenger.jhuapl.edu>

H-2B Rocket—www.jaxa.jp/projects/rockets/h2b/index_e.html

International Year of Astronomy—<http://iyo09.org>

Bob Riddle (briddle@kcmsd.net) is the planetarium director for the Kansas City, Missouri, school district. Visit his astronomy website at www.currentsky.com.



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