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SKY & TELESCOPE

THE ESSENTIAL GUIDE TO ASTRONOMY

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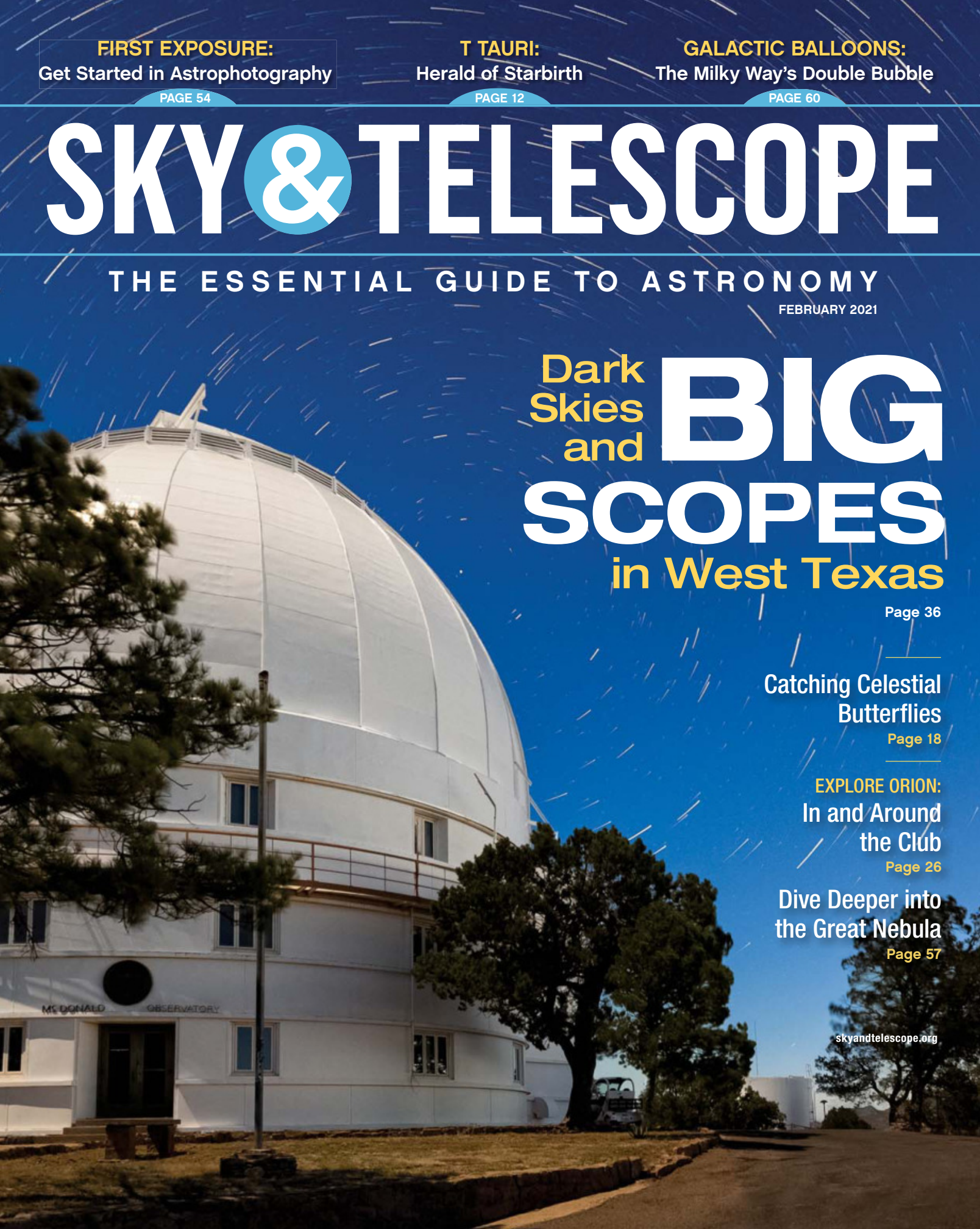

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skyandtelescope.org

Australian imager Dylan O'Donnell created this remarkable photo of the International Space Station transiting the Moon on June 28, 2017. He used a C9.25 SCT and composited seven frames made with a Canon 70D DSLR camera set to ISO 1800 and a shutter speed of 1/1600 second.

Catch an ISS Transit

Being in the right place at (exactly) the right time pays exciting dividends.

The International Space Station is often one of the brightest objects in the night sky. Many of us enjoy its regular appearances during morning and evening twilight when it passes silently across the sky, ferrying its human cargo at more than 27,600 kilometers (17,100 miles) per hour. The space station makes evening passes during the first week of February, then returns to the dawn sky towards the end of the month. For current pass times tailored to your location, go to **heavens-above.com** or google up a free app such as *ISS Spotter* (iPhone) and *ISS Detector* (Android).

Much less frequently, the ISS transits across the face of the Moon or Sun. Such events are quite rare because the disks of the Moon and Sun are only ½° across. As a result, the track of visibility is a narrow one that requires the observer to be in precisely the right spot at the right time. Thanks to the website ISS Transit Finder (**transit-finder.com**), you can easily get a 30-day forecast of lunar and solar ISS transits visible in your area in just seconds.

Visit the site and set your precise latitude and longitude manually, or by clicking either "Auto-detect" or "Select from map." Next, set your preferred time interval using the calendar feature, choose how far you're willing to travel to get to the transit center line, then press "Calculate." A list of upcoming events pops up along with details including the space station's path (with near misses included), transit time, and distance to the center line, where the ISS will appear to transit directly across the center of the Moon or Sun.

If you don't see a transit listed for your location during the specified time frame, click the "Show on Map" button. The red pin gives your location, and the green pin indicates the closest site the center line crosses. Sometimes a transit is just a half-hour drive away.

During a typical transit, the silhouette of the ISS spans about one arc-

minute and takes around one second to cross the disk of the Sun or Moon. (Be sure to use a suitable solar filter when attempting to observe a solar transit.) Binoculars show the space station as a dark speck while a telescope magnifying 50× will clearly show its shape. If you're lucky, the ISS will pass in front of the crescent Moon, and you'll see it dramatically illuminated against the dim, earth-lit portion of the lunar disk.

To photograph an ISS transit, attach your camera to a telescope or long telephoto lens. Because these events are so brief, the trick is to shoot multiple images centered on the predicted transit time. You can either use your camera's burst mode, or record a video sequence. For an excellent tutorial on the subject, go to **is.gd/isstransitimage**.

R Virginis and Chi Cygni Top Out

A YEAR AGO, Betelgeuse kept us in a thrall as it faded to magnitude 1.8 — its faintest in recorded history. Observations made with the Hubble Space Telescope revealed that a large convection cell of super-hot stellar gas had welled up inside the bright Orion variable, and as the material ascended, it cooled and condensed to form a cloud of dust that partially dimmed our view of the star.

Variable stars can be full of surprises, which is one reason they're so fascinating to watch. On February 24th, Mira-type variable R Virginis reaches its maxima of around magnitude 6, making it an easy binocular target. R completes a full pulsation cycle every 145.6 days, so if you start watching then you'll see the star fade to around 12th magnitude later this spring before it returns to maximum again in late July.

In the morning sky, look for Chi (χ) Cygni — another bright Mira-type variable. The star is expected to reach maximum brightness (typically around magnitude 5) on March 4th, but you'll want to start watching earlier than that to see it brighten. Chi has been known to rise as bright as magnitude 3.3 and plummet to as faint as magnitude 14.2 over its 408-day cycle.

You'll find detailed maps and additional information for both stars at the website of the American Association of Variable Star Observers: **aavso.org**.

A Pair of Evening Asteroids

TWO LESSER-KNOWN bright asteroids reach opposition this month: 18 Melpomene (February 1st) and 29 Amphitrite (on February 21st).

Melpomene shines at magnitude 9.4 in Cancer and will be in the same medium-power telescope field as Alpha (α) Cancri on and around opposition night. Amphitrite is a smidgeon brighter at magnitude 9.2 and located in central Leo. Both are easy catches in a small telescope. (The paths for both objects are depicted in the charts below.)

The two objects are members of the S-type or "stony" asteroids. Amphitrite is one of the largest of its kind, with a diameter of about 200 kilometers, while Melpomene is slightly smaller at 140 kilometers. Their light curves indicate that these space rocks have approximately spherical shapes.

In the early days of the solar system, Jupiter's powerful gravity stirred up the material orbiting between it and Mars, preventing millions of individual bodies from coalescing into a single, larger one. Had those pieces come together, we'd instead have one additional dwarf planet about 1.4 times the size of Ceres. A nod to Jupiter — I think we got the better deal!