The planetarium is going back to our reservation policy! Please visit our website to reserve spots for upcoming shows. Our children’s shows are now at a new time: 5:30PM and 6:30PM. See calendar for details.

We’re very excited to welcome our new staff members, Jessica and Evan! This quarter, look out for children’s shows at our new time, 5:30pm, and events like special Valentine’s Day shows!
Starlink Disaster!

On November 18, 2019 astronomers were remotely checking in on an observation that was taking place at the Blanco Telescope at Cerro Tololo Interamerican Observatory in Chile. To their surprise and dismay, there were several, bright streaks of light in the data. After a quick investigation they realized that these bright streaks were from a recently launched set of Starlink satellites. One of the astronomers, Clarae Martínez-Vázquez, took to Twitter to explain what happened and exclaimed, "This is not cool!" while showing an image from that observation.

Image Credit: LIFF JOHNSON/CLARAE MARTÍNEZ-VÁZQUEZ/DELVE

When SpaceX first announced that they were going to send up a constellation of 12,000 satellites in low-Earth orbit called Starlink, this did not sit well with astronomers. The purpose of Starlink is to provide global broadband internet coverage which will cover areas that lack service from current internet-providing satellites. Each Starlink mission launches 60 satellites every fortnight to get to the goal of 12,000 by the mid-2020s. The major concern for astronomers is that these satellites are very bright and will add many more points of light to the nighttime sky. Ground-based astronomers already have to combat light pollution, atmospheric effects, and tight scheduling for telescope time on high-demand telescopes around the world. The reality of Starlink now brings a new problem.

The astronomers who noticed the Starlink satellites were collecting data for the DECam Local Volume Exploration (DELVE) Survey. DELVE will provide important insight into the formation of galaxies. The goal of this survey is to understand the faintest and most dark-matter dominated galaxies by utilizing the Dark Energy camera (DEcam) on the Blanco Telescope at Cerro Tololo Interamerican Observatory in Chile. The current understanding is that galaxies like the Milky Way are enveloped in large dark matter halos, where dark matter is a mysterious type of matter that we can only detect through gravitational effects. These halos grow due to the merging and/or accreting of smaller galaxies. There is a lot of evidence for this when looking at larger scales, but on smaller scales it’s still not well understood. By taking a more complete survey of the southern sky, it’s possible to pick up the fainter galaxies that could help answer some of these questions that exist on those smaller scales.

There are three objectives to help meet the goal of this survey: DELVE WIDE, DELVE MC, and DELVE DEEP. DELVE WIDE scans the entire southern sky to complete an initial survey done by DEcam. This objective hopes to answer some of the fundamental questions in near-field cosmology. DELVE MC is a part of the survey that is taking a closer look at the Milky Way’s two nearest and largest satellite galaxies, the Large and Small Magellanic Clouds. Examining the accretion of these two dwarf galaxies onto the Milky Way can help answer some important questions on the formation and evolution of dwarf galaxies. Finally, DELVE DEEP is a part of the survey that seeks to understand the small scale structure of dark matter subhalos by studying the structure of halos around dwarf satellite galaxies like the Large and Small Magellanic Clouds.

Surveys like the DELVE Survey are essential to understanding the fundamental nature of galaxy formation and the history of the Universe. These surveys require dark skies to look at the faintest of objects, and having thousands of bright satellites entering their field of view is definitely “not cool.” While in some cases astronomers can remove several of the bright points from their data, these satellites can still cross the line of sight of a faint galaxy which would ruin that data set. SpaceX has proposed to paint future satellites with a black coating to make them less reflective, but the solar panels on these satellites could still pose a problem. Hopefully there will be a resolution in the future, otherwise it will be even more difficult for ground-based astronomy to properly study the mysteries of the Universe.

For more information on the DELVE Survey you can check out their website: https://delve-survey.github.io/
For the original article on the Starlink incident you can check out this link: https://www.forbes.com/sites/jonathanocallaghan/2019/11/18/this-is-not-cool-astronomers-despair-as-spacex-starlink-train-ruins-observation-of-nearby-galaxies/#5489d95b3b
Planetarium Shows

~Admission to all planetarium shows is free but reservations are required~

For regularly-scheduled evening shows, be sure to send in a reservation from the public shows page of our website so we can get a head count: http://planetarium.wvu.edu/shows

For those who are interested in bringing a group such as schools or scouts, please visit our field trips page on the website and send us an email: http://planetarium.wvu.edu/fieldtrips

**Selected Sunrise/Sunset and Moon Rise/Moon Set Times**

<table>
<thead>
<tr>
<th>Date</th>
<th>Sunrise</th>
<th>Sunset</th>
<th>Moon Rise</th>
<th>Moon Set</th>
<th>Moon Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 8th</td>
<td>7:22 AM</td>
<td>6:51 PM</td>
<td>6:34 AM</td>
<td>7:01 PM</td>
<td>New Moon</td>
</tr>
<tr>
<td>January 23rd</td>
<td>7:46 AM</td>
<td>6:19 PM</td>
<td>1:42 PM</td>
<td>11:44 PM</td>
<td>Waning Gibbous</td>
</tr>
<tr>
<td>February 14th</td>
<td>6:57 AM</td>
<td>5:09 PM</td>
<td>8:44 AM</td>
<td>6:54 PM</td>
<td>Waxing Crescent</td>
</tr>
<tr>
<td>February 28th</td>
<td>7:09 AM</td>
<td>5:00 PM</td>
<td>4:03 AM</td>
<td>3:53 PM</td>
<td>Waxing Gibbous</td>
</tr>
<tr>
<td>March 14th</td>
<td>7:30 AM</td>
<td>4:55 PM</td>
<td>10:48 AM</td>
<td>8:56 PM</td>
<td>Waxing Crescent</td>
</tr>
<tr>
<td>March 20th</td>
<td>7:38 AM</td>
<td>5:01 PM</td>
<td>10:12 AM</td>
<td>8:37 PM</td>
<td>Waning Gibbous</td>
</tr>
</tbody>
</table>

*Note: moon set times can be the next day

Full Moon: January 10th, February 9th, March 9th
New Moon: January 24th, February 23rd, March 24th
January 2020 Sky Chart*

10:00 PM at the beginning of the month
9:00 PM in the middle of the month
8:00 PM at the end of the month

*Sky Chart used with the kind permission of Heavens-Above at http://www.heavens-above.com/
The WVU Planetarium is for the educational benefit of WVU students, staff, and faculty members, as well as the local community. Should you wish to make a contribution to the planetarium, it can be made through the WVU Planetarium Project at the WVU Foundation, Inc., through methods available on our website at http://planetarium.wvu.edu/give. Thank you.
February 2020 Sky Chart*

10:00 PM at the beginning of the month
9:00 PM in the middle of the month
8:00 PM at the end of the month

*Sky Chart used with the kind permission of Heavens-Above at http://www.heavens-above.com/

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March 2020 Sky Chart*

10:00 PM at the beginning of the month
9:00 PM in the middle of the month
8:00 PM at the end of the month

*Sky Chart used with the kind permission of Heavens-Above at http://www.heavens-above.com/

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