



# EPHEMERIS

The official newsletter of the Prescott Astronomy Club (PAC)  
*e-phem-er-is*: a time-based listing of future positions of solar system objects

## FEBRUARY 2021

### UPCOMING EVENTS

Wednesday, February 3 - Regular PAC meeting @ 6:30 PM. The meeting will be conducted virtually on Zoom hosted by Jeff Stillman. Invitations will be sent to all members. Guests can register on our webpage. To participate in the meeting, one must register by e-mail.



Jeff Stillman will present *"Publishing Astrophotography"*, showing the book he recently published entitled *"The Messier Collection"*. He'll explain how he proceeded with the photography, formatting the book and how and with whom it was published.

Wednesday, February 10 - METASIG @ 5:00 PM at local restaurant. At this time, no Zoom events will be conducted for METASIG. Anyone wishing to organize a meeting should coordinate with Russell Chappell.

### VOLUNTEERS NEEDED FOR PAC BOARD

Volunteers are needed to fill two positions on the PAC board: Secretary and Vice President. The Secretary position is the most critical. Please consider helping the club with its mission.

### LANDING ON MARS: A TRICKY FEAT!

David Prosper

The Perseverance rover and Ingenuity helicopter will land in Mars's Jezero crater on February 18, 2021, NASA's latest mission to explore the red planet. Landing on Mars is an incredibly difficult feat that has challenged engineers for decades: while missions like Curiosity have

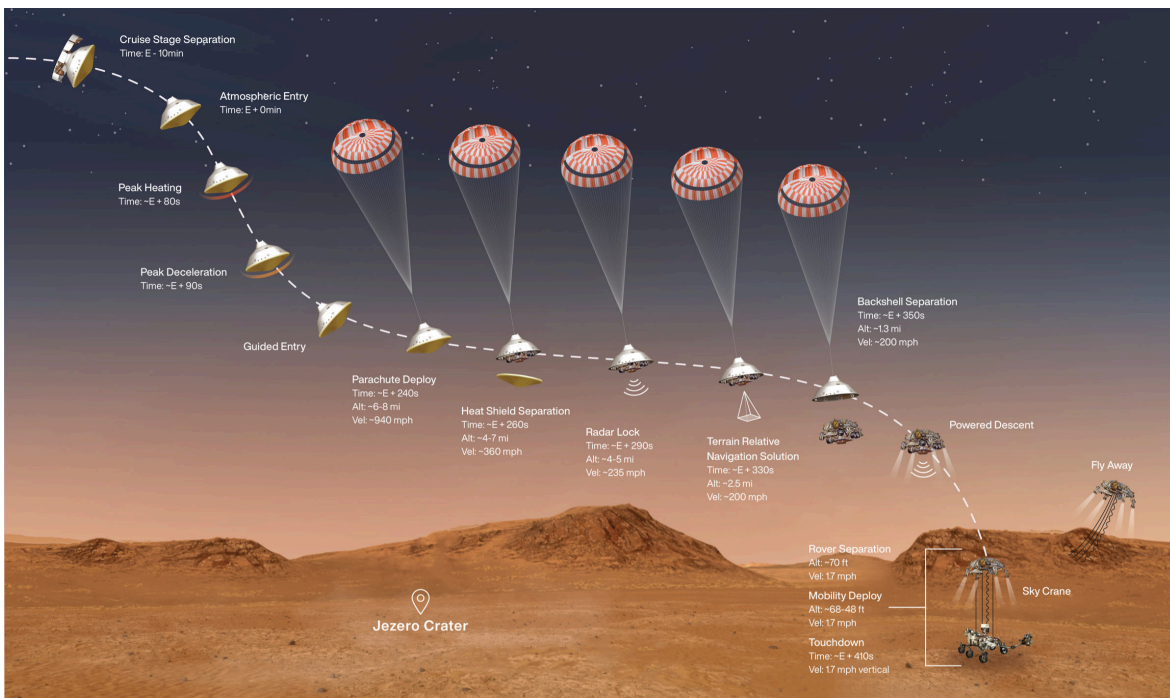
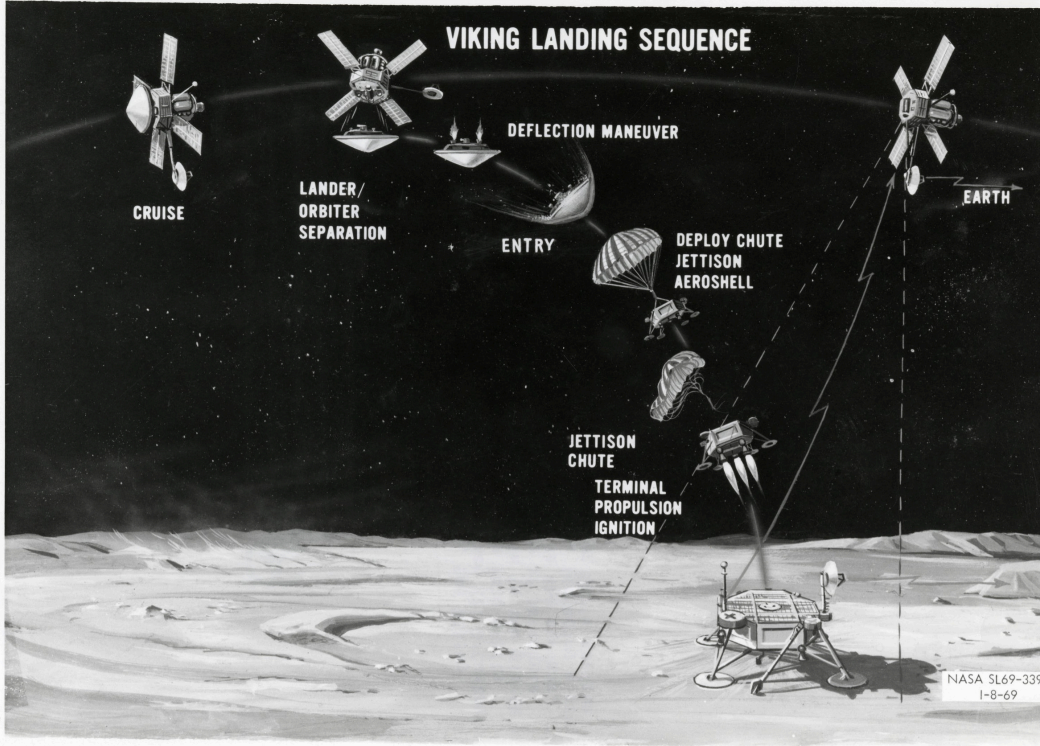


succeeded, its surface is littered with the wreckage of many failures as well. Why is landing on Mars so difficult?

Mars presents a unique problem to potential landers as it possesses a relatively large mass and a thin, but not insubstantial, atmosphere. The atmosphere is thick enough that spacecraft are stuffed inside a streamlined aeroshell sporting a protective heat shield to prevent burning up upon entry - but that same atmosphere is not thick enough to rely on parachutes alone for a safe landing, since they can't catch sufficient air to slow down quickly enough. This is even worse for larger explorers like Perseverance, weighing in at 2,260 lbs (1,025 kg). Fortunately, engineers have crafted some ingenious landing methods over the decades to allow their spacecraft to survive what is called *Entry, Descent, and Landing (EDL)*.

The Viking landers touched down on Mars in 1976 using heat shields, parachutes, and retrorockets. Despite using large parachutes, the large Viking landers fired retrorockets at the end to land at a safe speed. This complex combination has been followed by almost every mission since, but subsequent missions have innovated in the landing segment. The 1997 Mars Pathfinder mission added airbags in conjunction with parachutes and retrorockets to safely bounce its way to a landing on the Martian surface. Then three sturdy “petals” ensured the lander was pushed into an upright position after landing on an ancient floodplain. The Opportunity and Spirit missions used a very similar method to place their rovers on the Martian surface in 2004. Phoenix (2008) and Insight (2018) actually utilized Viking-style landings. The large and heavy Curiosity rover required extra power at the end to safely land the car-sized rover, and so the daring “Sky Crane” deployment system was successfully used in 2012. After an initial descent using a massive heat shield and parachute, powerful retrorockets finished slowing down the spacecraft to about 2 miles per hour. The Sky Crane then safely lowered the rover down to the Martian surface using a strong cable. Its job done, the Sky Crane then flew off and crash-landed a safe distance away. Having proved the efficacy of the Sky Crane system, NASA will use this same method to attempt a safe landing for Perseverance this month!

You can watch coverage of the Mars Perseverance landing starting at 11:00 AM PST (2:00 PM EST) on February 18 at [nasa.gov/nasalive](https://www.nasa.gov/nasalive). Touchdown is expected around 12:55 PM PST (3:55 PM EST). NASA has great resources about the Perseverance Rover and accompanying Ingenuity helicopter on [mars.nasa.gov/mars2020](https://mars.nasa.gov/mars2020) . And of course, find out how we plan to land on many different worlds at [nasa.gov](https://www.nasa.gov).



Illustrations of the Entry, Descent, and Landing (EDL) sequences for Viking in 1976, and Perseverance in 2021. Despite the wide gap between these missions in terms of technology, they both performed their

landing maneuvers automatically, since our planets are too far apart to allow Earth-based engineers to control them in real time! (NASA/JPL/Caltech).

## WHAT'S HAPPENING IN FEBRUARY 2021

This calendar from In-The-Sky.org shows the objects and events visible during February 2021.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	<b>1</b>	<b>2</b> Asteroid 18 Melpomene at opposition	<b>3</b>	<b>4</b> Moon at Last Quarter	<b>5</b>	<b>6</b>
<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>
<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b> Conjunction of the Moon and Mars Close approach of the Moon and Mars	<b>19</b> Moon at First Quarter M81 is well placed	<b>20</b>
<b>21</b>	<b>22</b> Asteroid 29 Amphitrite at opposition	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b> Full Moon
<b>28</b> Mercury reaches highest point in morning sky						

For additional information and details, see: <https://in-the-sky.org/newscal.php> and [www.telescopius.com](http://www.telescopius.com). Observing lists of monthly 'Binocular' and 'Telescope' Showpieces can be found on the club website.

## NEED TO KNOW - ASK A MEMBER

A new 15-minute segment is being added to the regular general meetings where members can have their 'burning' questions answered by other knowledgeable members. If you have an astronomy related question you would like explained, submit the question to John Carter ([jrcpvaz@icloud.com](mailto:jrcpvaz@icloud.com)). You can also bring up the question at the meeting.

## FOR SALE

Please visit the Classified Ads section of the club website to view the items posted there for sale:

<http://prescottastronomyclub.org/classified-ads/>

New items are added now and then, so don't miss out on something that you would like to get for yourself...or a friend.



## PAC MENTORS

If you need advice on the purchase of astronomy equipment, setting up equipment, astrophotography, etc., contact a PAC mentor.

Jeff Stillman - Astrophotography - (928) 379-7088

David Viscio - General - (928) 775-2918

Greg Lutes - Visual Observing - (928) 445-4430

Joel Cohen - Beginner's Astronomy: Selecting & Using a Telescope - (856) 889-6496

John Carter - Video Observing - (928) 458-0570



## OBSERVING LISTS

Observing lists are available in PDF format on the PAC website to provide guidance and goals for visual and astrophotography programs.

Astroleague Lunar 100

Bright Nebulae

Dunlop 100

Globular Clusters

Herschel II

Messier

Binocular Showpieces

Caldwell

Face-On Spiral Galaxies

Herschel 400

Hidden Treasures

Open Clusters



Planet Maps	Planetary Nebulae
Royal Astronomical Society of Canada	Finest NGC
Saguaro Astronomy Club	Best NGC
Telescope Showpieces	S&T Lunar 100
	The Secret Deep

## PAC WEBSITE & YAHOO GROUPS

Website: <http://www.prescottastronomyclub.org>

E-mail: [pacinfo@prescottastronomyclub.org](mailto:pacinfo@prescottastronomyclub.org)

Astrophotography special interest group:

<https://groups.yahoo.com/neo/groups/pacastrophotography/info>



## BOARD OF DIRECTORS

President: Jeff Stillman

Vice President: Open

Secretary: Open

Treasurer: Art Arnold-Roksandich

At Large: Jason Hoover

At Large: Dave Covey

At Large: Doug Tilley

At Large: Pat Bledsoe



## PAC COORDINATORS

Astronomical League Coordinator: John Carter

Facebook: Adam England

Highland Center Coordinator: David Viscio

Membership: Art Arnold-Roksandich

METASIG: Russell Chappell

Newsletter: David Viscio

Night Sky Network: John Carter

PAC Affiliate Partner w/ NAU Space Grant Program – Cory Shaw

PAC Store Sales - John Vanderame

Property Records: Open



Public Relations: Adam England

Refreshments: Open

Schools & Camps Outreach: Don Beaman & Joel Cohen

Starry Nights Coordinator: Don Beaman & Joel Cohen

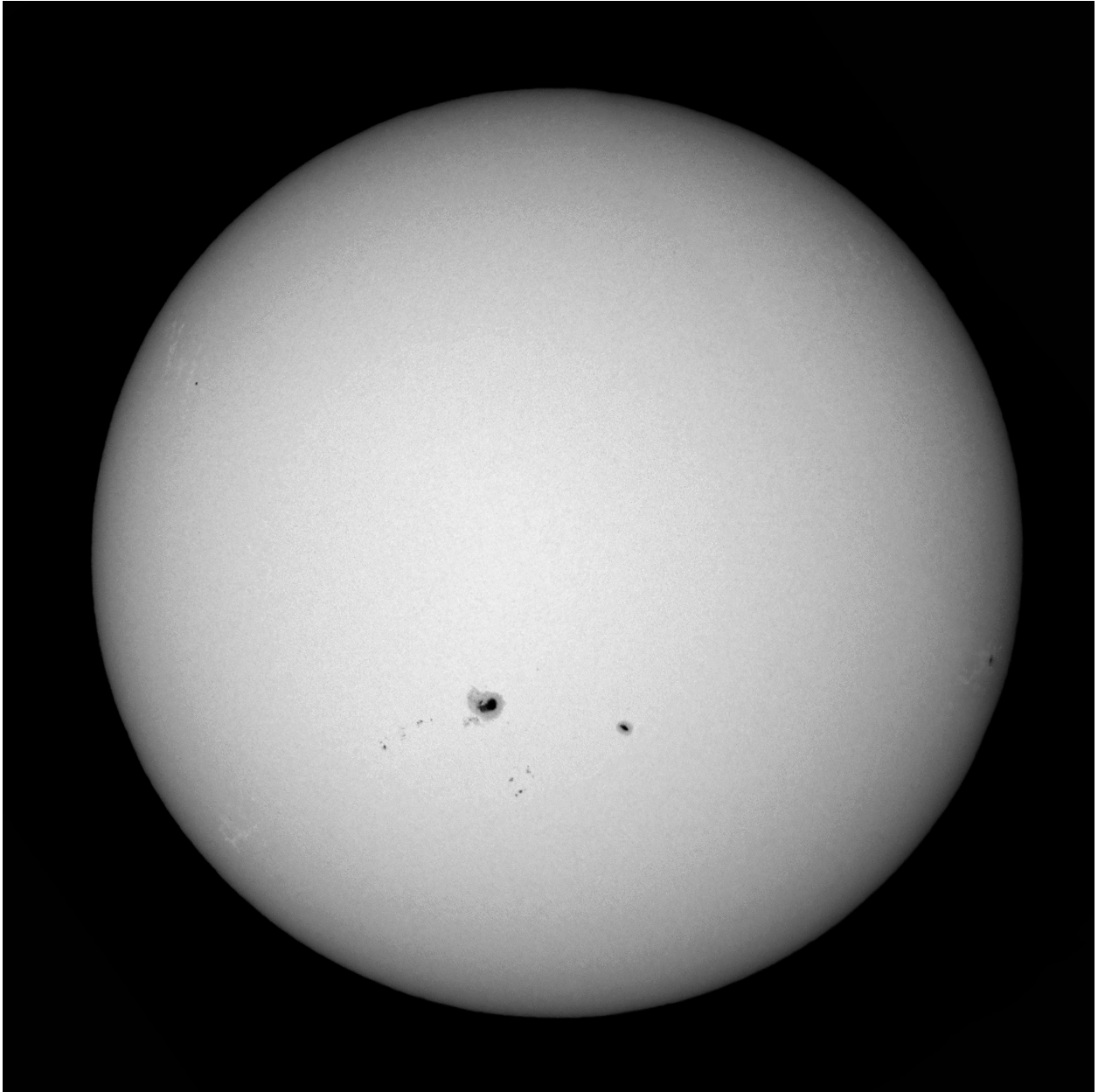
Third Thursday Coordinator: Dave Covey, Marilyn Unruh

Webmaster: Russell Chappell

**THE SUN AWAKENS - NOVEMBER 28, 2020**

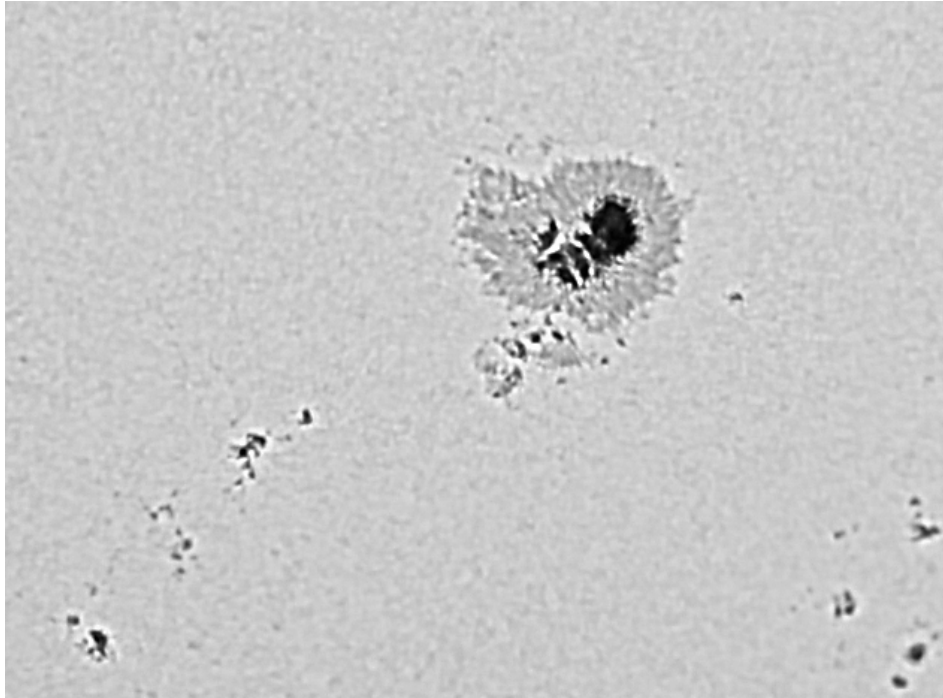
*Image Credit: David B. Viscio*

*Celestron C6, f/10 with white light filter, Canon EOS 60Da*

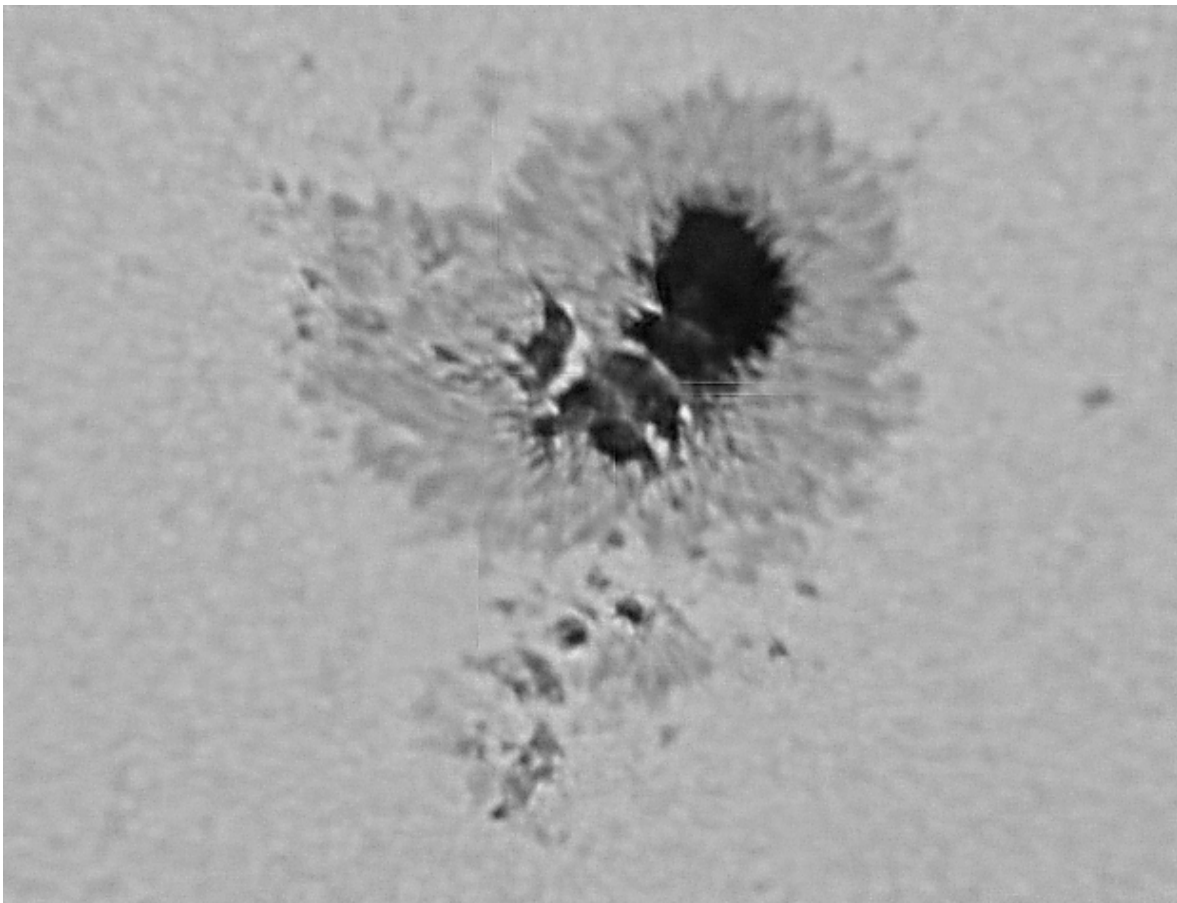


*Prime focus, FL 1500mm, mosaic of 2 images, 1/1000sec, ISO400*





*Prime focus, FL 1500mm, Crop 640x480 video mode, stack of 1000 frames, 5-min video, 60fps*



*1.6x Amplifier, FL 2400mm, Crop 640x480 video mode, stack of 2000 frames, 5-min video, 60fps*